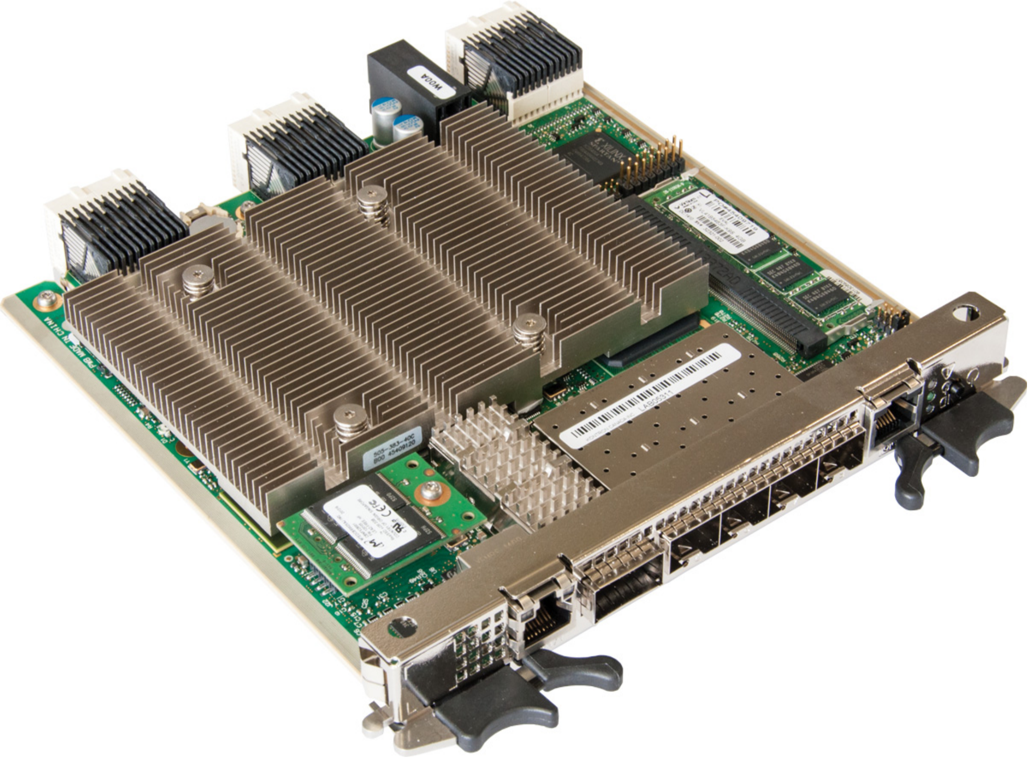
CLI Reference Manual



MSH8910/MSH8911
SymKloud 10G Switching Module

Document Revision 1.5

Date: October 2017

POSSIBILITIES START HERE kontron

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Revision History

Rev. Index	Brief Description of Changes	Date of Issue
1.0	First official release.	2015-02-05
1.1	Added enhanced non-unicast hashing commands. Removed clear config except commands.	2015-08-03
1.2	Added feature set of FASTPATH 8.1.0. Adding references to MSH8911.	2016-02-22
1.3	Added feature set of FASTPATH 8.2.0.	2016-06-29
1.4	Added feature set of FASTPATH 8.3.0. New document template used	2017-07-31
1,5	Removed „board led-flash“ options Changed „clock set“ range description Added „auto-ip'“option for „network protocol“ command Changed Default settings for „SNMP-server community“	2017-10-04

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About this Book

This document describes command-line interface (CLI) commands you use to view and configure FASTPATH software. You can access the CLI by using a direct connection to the serial port or by using telnet or SSH over a remote network connection.

This document is for system administrators who configure and operate systems using FASTPATH software. It provides an understanding of the configuration options of the FASTPATH software.

This document assumes that the reader has a basic knowledge of Ethernet and networking concepts.

Please note, FASTPATH 8.x SW versions and higher are only running on boards, equipped with extended memory.

How to Use this Document

Chapter 1, “Using the Command-Line Interface” on page 14 details the procedure to quickly become acquainted with the FASTPATH software.

NOTICE Refer to the release notes for the FASTPATH application level code. The release notes detail the platform specific functionality of the Switching, Routing, SNMP, Config, Management, and Bandwidth Provisioning packages. The suite of features supported by the FASTPATH packages are not available on all the platforms to which FASTPATH has been ported.

Symbols

The following symbols may be used in this manual.

⚠DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	NOTICE indicates a property damage message.
	Electric Shock! This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material. Please refer also to the „High.Voltage Safety Instructions“ portion below in this section.
	ESD Sensitive Device! This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.
	HOT Surface! Do NOT touch! Allow to cool before servicing.
ℹ	This symbol indicates general information about the product and the user manual. This symbol also indicates detail information about the specific product configuration.
💡	This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.
Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

ESD

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

⚠CAUTION	**Danger of explosion if the battery is replaced incorrectly.** • **Replace only with same or equivalent battery type recommended by the manufacturer.** • **Dispose of used batteries according to the manufacturer's instructions.**

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this User Guide or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version, that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present User Guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

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Kontron aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit http://www.kontron.com/about-kontron/corporate-responsibility/quality-management.

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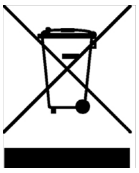
The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- Reduce waste arising from electrical and electronic equipment (EEE)
- Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- Improve the environmental performance of all those involved during the lifecycle of EEE.



Environmental protection is a high priority with Kontron.

Kontron follows the DEEE/WEEE directive

You are encouraged to return our products for proper disposal.

Table of Content

1/ Using the Command-Line Interface

The command-line interface (CLI) is a text-based way to manage and monitor the switch management application. You can access the CLI by using a direct serial connection or by using a remote logical connection with telnet or SSH.

This chapter describes the CLI syntax, conventions, and modes. It contains the following sections:

- "Command Syntax" on page 14
- "Command Conventions" on page 15
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- "Using the "No" Form of a Command" on page 16
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1.1 Command Syntax

A command is one or more words that might be followed by one or more parameters. Parameters can be required or optional values.

Some commands, such as **`show network`** or **`clear vlan,`** do not require parameters. Other commands, such as **`network parms`**, require that you supply a value after the command. You must type the parameter values in a specific order, and optional parameters follow required parameters. The following example describes the **`network parms`** command syntax:

Format **`network parms`** *`ipaddr netmask [gateway]`*

- **`network parms`** is the command name.
- *`ipaddr`* and *`netmask`* are parameters and represent required values that you must enter after you type the command keywords.
- *`[gateway]`* is an optional parameter, so you are not required to enter a value in place of the parameter.

The *CLI Command Reference* lists each command by the command name and provides a brief description of the command. Each command reference also contains the following information:

- Format shows the command keywords and the required and optional parameters.
- Mode identifies the command mode you must be in to access the command.
- Default shows the default value, if any, of a configurable setting on the device.

The **`show`** commands also contain a description of the information that the command shows.

1.2 Command Conventions

In this document, the command name is in **bold** font. Parameters are in *italic font*. You must replace the parameter name with an appropriate value, which might be a name or number. Parameters are order dependent.

The parameters for a command might include mandatory values, optional values, or keyword choices. Table 1 describes the conventions this document uses to distinguish between value types.

Table 1: Parameter Conventions

Symbol	Example	Description
<> angle brackets	*<value>*	Indicates that you must enter a value in place of the brackets and text inside them.
[] square brackets	*[value]*	Indicates an optional parameter that you can enter in place of the brackets and text inside them.
{} curly braces	*{choice1 | choice2}*	Indicates that you must select a parameter from the list of choices.
| Vertical bars	*choice1 | choice2*	Separates the mutually exclusive choices.
[{}] Braces within square brackets	*[{choice1 | choice2}]*	Indicates a choice within an optional element.

1.3 Common Parameter Values

Parameter values might be names (strings) or numbers.To use spaces as part of a name parameter, enclose the name value in double quotes. For example, the expression “System Name with Spaces” forces the system to accept the spaces. Empty strings (“”) are not valid user-defined strings.

The following table describes common parameter values and value formatting.

Table 2: Parameter Descriptions

Parameter	Description
ipaddr	This parameter is a valid IP address. You can enter the IP address in the following formats: **a (32 bits)** **a.b (8.24 bits)** **a.b.c (8.8.16 bits)** **a.b.c.d (8.8.8.8)** In addition to these formats, the CLI accepts decimal, hexidecimal and octal formats through the following input formats (where *n* is any valid hexidecimal, octal or decimal number): **0xn (CLI assumes hexidecimal format)** **0n (CLI assumes octal format with leading zeros)** **n (CLI assumes decimal format)**
ipv6-address	**FE80:0000:0000:0000:020F:24FF:FEBF:DBCB, or** **FE80:0:0:0:20F:24FF:FEBF:DBCB, or** **FE80::20F24FF:FEBF:DBCB, or** **FE80:0:0:0:20F:24FF:128:141:49:32** For additional information, refer to RFC 3513.
Interface or 0/	0/0/
Logical Interface	Represents a logical slot and port number. This is applicable in the case of a port-channel (LAG). You can use the logical 0/ to configure the port-channel.
Character strings	Use double quotation marks to identify character strings, for example, “System Name with Spaces”. An empty string (“”) is not valid.

1.4 slot/port Naming Convention

FASTPATH software references physical entities such as cards and ports by using a slot/port naming convention. The FASTPATH software also uses this convention to identify certain logical entities, such as Port-Channel interfaces.

The slot number has two uses. In the case of physical ports, it identifies the card containing the ports. In the case of logical and CPU ports it also identifies the type of interface or port.

Table 3: Type of Slots

Slot Type	Description
Physical slot numbers	Physical slot numbers begin with zero, and are allocated up to the maximum number of physical slots.
Logical slot numbers	Logical slots immediately follow physical slots and identify port-channel (LAG) or router interfaces.
CPU slot numbers	The CPU slots immediately follow the logical slots.

The port identifies the specific physical port or logical interface being managed on a given slot.

Table 4: Type of Ports

Port Type	Description
Physical Ports	The physical ports for each slot are numbered sequentially starting from zero.
Logical Interfaces	Port-channel or Link Aggregation Group (LAG) interfaces are logical interfaces that are only used for bridging functions. VLAN routing interfaces are only used for routing functions. Loopback interfaces are logical interfaces that are always up. Tunnel interfaces are logical point-to-point links that carry encapsulated packets.
CPU ports	CPU ports are handled by the driver as one or more physical entities located on physical slots.

NOTICE In the CLI, loopback and tunnel interfaces do not use the 0/ format. To specify a loopback interface, you use the loopback ID. To specify a tunnel interface, use the tunnel ID.

1.5 Using the “No” Form of a Command

The `no` keyword is a specific form of an existing command and does not represent a new or distinct command. Almost every configuration command has a `no` form. In general, use the `no` form to reverse the action of a command or reset a value back to the default. For example, the `no shutdown` configuration command reverses the shutdown of an interface. Use the command without the keyword `no` to re-enable a disabled feature or to enable a feature that is disabled by default. Only the configuration commands are available in the `no` form.

1.6 Executing Show Commands

All show commands can be issued from any configuration mode (Global Configuration, Interface Configuration, VLAN Configuration, etc.). The show commands provide information about system and feature-specific configuration, status, and statistics. Previously, show commands could be issued only in User EXEC or Privileged EXEC modes.

1.7 CLI Output Filtering

Many CLI show commands include considerable content to display to the user. This can make output confusing and cumbersome to parse through to find the information of desired importance. The CLI Output Filtering feature allows the user, when executing CLI show display commands, to optionally specify arguments to filter the CLI output to display only desired information. The result is to simplify the display and make it easier for the user to find the information the user is interested in.

The main functions of the CLI Output Filtering feature are:

- Pagination Control
  - Supports enabling/disabling paginated output for all **`show`** CLI commands. When disabled, output is displayed in its entirety. When enabled, output is displayed page-by-page such that content does not scroll off the terminal screen until the user presses a key to continue. --More-- or (q)uit is displayed at the end of each page.
  - When pagination is enabled, press the return key to advance a single line, press q or Q to stop pagination, or press any other key to advance a whole page. These keys are not configurable.

NOTICE Although some FASTPATH **`show`** commands already support pagination, the implementation is unique per command and not generic to all commands.

- Output Filtering
  - "Grep"-like control for modifying the displayed output to only show the user-desired content.
    - Filter displayed output to only include lines containing a specified string match.
    - Filter displayed output to exclude lines containing a specified string match.
    - Filter displayed output to only include lines including and following a specified string match.
    - Filter displayed output to only include a specified section of the content (e.g. "interface 0/1") with a configurable end-of-section delimiter.
    - String matching should be case insensitive.
    - Pagination, when enabled, also applies to filtered output.

Example: The following shows an example of the extensions made to the CLI show commands for the Output Filtering feature.

```
(Routing) #show running-config ?
<cr>                   Press enter to execute the command.
|                        Output filter options.
<scriptname>             Script file name for writing active configuration.
all                      Show all the running configuration on the switch.
interface              Display the running configuration for specificed interface on the
switch.


(Routing) #show running-config | ?
begin                    Begin with the line that matches
exclude                  Exclude lines that matches
include                  Include lines that matches
section                  Display portion of lines
```

1.8 FASTPATH Modules

FASTPATH software consists of flexible modules that can be applied in various combinations to develop advanced Layer 2 / 3/4+ products. The commands and command modes available on your switch depend on the installed modules. Additionally, for some **`show`** commands, the output fields might change based on the modules included in the FASTPATH software.

The FASTPATH software suite includes the following modules:

- Switching (Layer 2)
- Routing (Layer 3)
- IPv6 routing

- Multicast
- Quality of Service
- Management (CLI, Web UI, and SNMP)
- IPv6 Management—Allows management of the FASTPATH device through an IPv6 through an IPv6 address without requiring the IPv6 Routing package in the system. The management address can be associated with the network port (front-panel switch ports), a routine interface (port or VLAN) and the Service port.
- Stacking
- Data Center
- Secure Management

1.9 Command Modes

The CLI groups commands into modes according to the command function. Each of the command modes supports specific FASTPATH software commands. The commands in one mode are not available until you switch to that particular mode, with the exception of the User EXEC mode commands. You can execute the User EXEC mode commands in the Privileged EXEC mode.

The command prompt changes in each command mode to help you identify the current mode. Table 5 describes the command modes and the prompts visible in that mode.

NOTICE The command modes available on your switch depend on the software modules that are installed.

Table 5: CLI Command Modes

Command Mode	Prompt	Mode Description
User EXEC	Switch>	Contains a limited set of commands to view basic system information.
Privileged EXEC	Switch#	Allows you to issue any **EXEC** command, enter the VLAN mode, or enter the Global Configuration mode.
Global Config	Switch (Config)#	Groups general setup commands and permits you to make modifications to the running configuration.
VLAN Config	Switch (Vlan)#	Groups all the VLAN commands.
Interface Config	Switch (Interface *slot/port*)# Switch (Interface Loopback *id*)# Switch (Interface Tunnel id)# Switch (Interface slot/port *(startrange)*-slot/port *(endrange)*# Switch (Interface lag *lag-intf-num*)# Switch (Interface vlan *vlan-id*)#	Manages the operation of an interface and provides access to the router interface configuration commands. Use this mode to set up a physical port for a specific logical connection operation. You can also use this mode to manage the operation of a range of interfaces. For example the prompt may display as follows: Switch (Interface 1/0/1-1/0/4) # Enters LAG Interface configuration mode for the specified LAG. Enters VLAN routing interface configuration mode for the specified VLAN ID.
Line Console	Switch (config-line)#	Contains commands to configure outbound telnet settings and console interface settings, as well as to configure console login/enable authentication.

Table 5: CLI Command Modes (Continued)

Command Mode	Prompt	Mode Description
Line SSH	`Switch (config-ssh)#`	Contains commands to configure SSH login/ enable authentication.
Line Telnet	`Switch (config-telnet)#`	Contains commands to configure telnet login/ enable authentication.
AAA IAS User Config	`Switch (Config-IAS-User)#`	Allows password configuration for a user in the IAS database.
Mail Server Config	`Switch (Mail-Server)#`	Allows configuration of the email server.
Policy Map Config	`Switch (Config-policy-map)#`	Contains the QoS Policy-Map configuration commands.
Policy Class Config	`Switch (Config-policy-class-map)#`	Consists of class creation, deletion, and matching commands. The class match commands specify Layer 2, Layer 3, and general match criteria.
Class Map Config	`Switch (Config-class-map)#`	Contains the QoS class map configuration commands for IPv4.
Ipv6_Class-Map Config	`Switch (Config-class-map)#`	Contains the QoS class map configuration commands for IPv6.
Router OSPF Config	`Switch (Config-router)#`	Contains the OSPF configuration commands.
Router OSPFv3 Config	`Switch (Config rtr)#`	Contains the OSPFv3 configuration commands.
Router RIP Config	`Switch (Config-router)#`	Contains the RIP configuration commands.
Route Map Config	`Switch (config-route-map)#`	Contains the route map configuration commands.
IPv6 Address Family Config	`Switch (Config-router-af)#`	Contains the IPv6 address family configuration commands.
MAC Access-list Config	`Switch (Config-mac-access-list)#`	Allows you to create a MAC Access-List and to enter the mode containing MAC Access-List configuration commands.
TACACS Config	`Switch (Tacacs)#`	Contains commands to configure properties for the TACACS servers.
DHCP Pool Config	`Switch (Config dhcp-pool)#`	Contains the DHCP server IP address pool configuration commands.
DHCPv6 Pool Config	`Switch (Config dhcp6-pool)#`	Contains the DHCPv6 server IPv6 address pool configuration commands.
Stack Global Config Mode	`Switch (Config stack)#`	Allows you to access the Stack Global Config Mode.
ARP Access-List Config Mode	`Switch (Config-arp-access-list)#`	Contains commands to add ARP ACL rules in an ARP Access List.
Support Mode	`Switch (Support)#`	Allows access to the support commands, which should only be used by the manufacturer's technical support personnel as improper use could cause unexpected system behavior and/ or invalidate product warranty.

Table 6 explains how to enter or exit each mode.

Table 6: CLI Mode Access and Exit

Command Mode	Access Method	Exit or Access Previous Mode
User EXEC	This is the first level of access.	To exit, enter **logout**.
Privileged EXEC	From the User EXEC mode, enter **enable**.	To exit to the User EXEC mode, enter **exit** or press **Ctrl-Z**.
Global Config	From the Privileged EXEC mode, enter **configure**.	To exit to the Privileged EXEC mode, enter **exit**, or press **Ctrl-Z.**
VLAN Config	From the Privileged EXEC mode, enter **vlan database**.	To exit to the Privileged EXEC mode, enter **exit**, or press **Ctrl-Z.**
Interface Config	From the Global Config mode, enter: **interface** slot/port or **interface loopback id** or **interface tunnel id** **interface** slot/port(**startrange**)-slot/port(**endrange**) `interface lag` *`lag-intf-num`* `interface vlan` *`vlan-id`*	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z.**
Line Console	From the Global Config mode, enter **line console**.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Line SSH	From the Global Config mode, enter **line ssh**.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Line Telnet	From the Global Config mode, enter **line telnet**.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
AAA IAS User Config	From the Global Config mode, enter `aaa ias-user username name.`	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Mail Server Config	From the Global Config mode, enter `mail-server address`	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Policy-Map Config	From the Global Config mode, enter **policy-map**.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Policy-Class-Map Config	From the Policy Map mode enter **class**.	To exit to the Policy Map mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Class-Map Config	From the Global Config mode, enter **class-map**, and specify the optional keyword **ipv4** to specify the Layer 3 protocol for this class. See "class-map rename" on page 813 for more information.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
VPC	From Global Config mode, enter **vpc**.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.
Ipv6-Class-Map Config	From the Global Config mode, enter **class-map** and specify the optional keyword **ipv6** to specify the Layer 3 protocol for this class. See "class-map" on page 812 for more information.	To exit to the Global Config mode, enter **exit**. To return to the Privileged EXEC mode, enter **Ctrl-Z**.

Table 6: CLI Mode Access and Exit (Continued)

Command Mode	Access Method	Exit or Access Previous Mode
Router OSPF Config	From the Global Config mode, enter `router ospf`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
Router OSPFv3 Config	From the Global Config mode, enter `ipv6 router ospf`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
Router RIP Config	From the Global Config mode, enter `router rip`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
Route Map Config	From the Global Config mode, enter - `route-map` *`map-tag`*.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
IPv6 Address Family Config	From the BGP Router Config mode, enter `address-family ipv6`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
MAC Access-list Config	From the Global Config mode, enter `mac access-list extended name`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
TACACS Config	From the Global Config mode, enter `tacacs-server host ip-addr`, where `ip-addr` is the IP address of the TACACS server on your network.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
DHCP Pool Config	From the Global Config mode, enter `ip dhcp pool pool-name`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
DHCPv6 Pool Config	From the Global Config mode, enter `ip dhcpv6 pool pool-name`.	To exit to the Global Config mode, enter **`exit`**. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
Stack Global Config Mode	From the Global Config mode, enter the `stack` command.	To exit to the Global Config mode, enter the **`exit`** command. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
ARP Access-List Config Mode	From the Global Config mode, enter the `arp access-list command`.	To exit to the Global Config mode, enter the **`exit`** command. To return to the Privileged EXEC mode, enter **`Ctrl-Z`**.
Support Mode	From the Privileged EXEC mode, enter `support`. ***Note:*** The `support` command is available only if the `techsupport enable` command has been issued.	To exit to the Privileged EXEC mode, enter **`exit`**, or press **`Ctrl-Z.`**

1.10 Command Completion and Abbreviation

Command completion finishes spelling the command when you type enough letters of a command to uniquely identify the command keyword. Once you have entered enough letters, press the SPACEBAR or TAB key to complete the word.

Command abbreviation allows you to execute a command when you have entered there are enough letters to uniquely identify the command. You must enter all of the required keywords and parameters before you enter the command.

1.11 CLI Error Messages

If you enter a command and the system is unable to execute it, an error message appears. Table 7 describes the most common CLI error messages.

Table 7: CLI Error Messages

Message Text	Description
`% Invalid input detected at '^' marker.`	Indicates that you entered an incorrect or unavailable command. The carat (^) shows where the invalid text is detected. This message also appears if any of the parameters or values are not recognized.
`Command not found / Incomplete command. Use ? to list commands.`	Indicates that you did not enter the required keywords or values.
`Ambiguous command`	Indicates that you did not enter enough letters to uniquely identify the command.

1.12 CLI Line-Editing Conventions

Table 8 describes the key combinations you can use to edit commands or increase the speed of command entry. You can access this list from the CLI by entering **`help`** from the User or Privileged EXEC modes.

Table 8: CLI Editing Conventions

Key Sequence	Description
DEL or Backspace	Delete previous character
Ctrl-A	Go to beginning of line
Ctrl-E	Go to end of line
Ctrl-F	Go forward one character
Ctrl-B	Go backward one character
Ctrl-D	Delete current character
Ctrl-U, X	Delete to beginning of line
Ctrl-K	Delete to end of line
Ctrl-W	Delete previous word
Ctrl-T	Transpose previous character
Ctrl-P	Go to previous line in history buffer
Ctrl-R	Rewrites or pastes the line
Ctrl-N	Go to next line in history buffer
Ctrl-Y	Prints last deleted character
Ctrl-Q	Enables serial flow
Ctrl-S	Disables serial flow

Table 8: CLI Editing Conventions (Continued)

Key Sequence	Description
Ctrl-Z	Return to root command prompt
Tab, <SPACE>	Command-line completion
Exit	Go to next lower command prompt
?	List available commands, keywords, or parameters

1.13 Using CLI Help

Enter a question mark (?) at the command prompt to display the commands available in the current mode.

```
(switch) >?

enable                    Enter into user privilege mode.
help                      Display help for various special keys.
logout                    Exit this session. Any unsaved changes are lost.
ping                      Send ICMP echo packets to a specified IP address.
quit                      Exit this session. Any unsaved changes are lost.
show                      Display Switch Options and Settings.
telnet                    Telnet to a remote host.
```

Enter a question mark (?) after each word you enter to display available command keywords or parameters.

```
(switch) #network ?

javamode                  Enable/Disable.
mgmt_vlan                 Configure the Management VLAN ID of the switch.
parms                     Configure Network Parameters of the router.
protocol                  Select DHCP, BootP, or None as the network config
                          protocol.
```

If the help output shows a parameter in angle brackets, you must replace the parameter with a value.

```
(switch) #network parms ?

ipaddr                  Enter the IP address.
```

If there are no additional command keywords or parameters, or if additional parameters are optional, the following message appears in the output:

```
<cr>                      Press Enter to execute the command
```

You can also enter a question mark (?) after typing one or more characters of a word to list the available command or parameters that begin with the letters, as shown in the following example:

```
(switch) #show m?

mac-addr-table            mac-address-table         monitor
```

1.14 Accessing the CLI

You can access the CLI by using a direct console connection or by using a telnet or SSH connection from a remote management host.

For the initial connection, you must use a direct connection to the console port. You cannot access the system remotely until the system has an IP address, subnet mask, and default gateway. You can set the network configuration information manually, or you can configure the system to accept these settings from a BOOTP or DHCP server on your network. For more information, see “Network Interface Commands” on page 79.

2 / Stacking Commands

This chapter describes the stacking commands available in the FASTPATH CLI.

The Stacking Commands chapter includes the following sections:

- “Dedicated Port Stacking” on page 24
- “Stack Port Commands” on page 32
- “Stack Firmware Synchronization Commands” on page 37
- “Nonstop Forwarding Commands” on page 39
- “Mixed Stacking Commands” on page 41

NOTICE The commands in this chapter are in one of two functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.

NOTICE The Primary Management Unit is the unit that controls the stack.

2.1 Dedicated Port Stacking

This section describes the commands you use to configure dedicated port stacking.

2.1.1 stack

This command sets the mode to Stack Global Config.

Format	`stack`
Mode	Global Config

2.1.2 member

This command configures a switch. The ***`unit`*** is the switch identifier of the switch to be added/removed from the stack. The ***`switchindex`*** is the index into the database of the supported switch types, indicating the type of the switch being preconfigured. The switch index is a 32-bit integer. This command is executed on the Primary Management Unit.

Format	`member` *`unit switchindex`*
Mode	Stack Global Config

NOTICE Switch index can be obtained by executing the show supported switchtype command in User EXEC or Privileged EXEC mode.

2.1.2.1 no member

This command removes a switch from the stack. The ***unit*** is the switch identifier of the switch to be removed from the stack. This command is executed on the Primary Management Unit.

Format	`no member` *`unit`*
Mode	Stack Global Config

2.1.3 switch priority

This command configures the ability of a switch to become the Primary Management Unit. The ***unit*** is the switch identifier. The ***value*** is the preference parameter that allows the user to specify, priority of one backup switch over another. The range for priority is 1 to 15. The switch with the highest priority value will be chosen to become the Primary Management Unit if the active Primary Management Unit fails. The switch priority defaults to the hardware management preference value 1. Switches that do not have the hardware capability to become the Primary Management Unit are not eligible for management.

Default	enabled
Format	`switch` *`unit`* `priority` *`value`*
Mode	Global Config

2.1.4 switch renumber

This command changes the switch identifier for a switch in the stack. The ***oldunit*** is the current switch identifier on the switch whose identifier is to be changed. The ***newunit*** is the updated value of the switch identifier. Upon execution, the switch will be configured with the configuration information for the new switch, if any. The old switch configuration information will be retained, however the old switch will be operationally unplugged. This command is executed on the Primary Management Unit.

NOTICE If the management unit is renumbered, then the running configuration is no longer applied (i.e. the stack acts as if the configuration had been cleared).

Format	`switch` *`oldunit`* `renumber` *`newunit`*
Mode	Global Config

2.1.5 movemanagement

This command moves the Primary Management Unit functionality from one switch to another. The ***fromunit*** is the switch identifier on the current Primary Management Unit. The ***tounit*** is the switch identifier on the new Primary Management Unit. Upon execution, the entire stack (including all interfaces in the stack) is unconfigured and reconfigured with the configuration on the new Primary Management Unit. After the reload is complete, all stack management capability must be performed on the new Primary Management Unit. To preserve the current configuration across a stack move, execute the `copy system:running-config nvram:startup-config` (in Privileged EXEC) command before performing the stack move. A stack move causes all routes and layer 2 addresses to be lost. This command is executed on the Primary Management Unit. The system prompts you to confirm the management move.

Format	`movemanagement` *`fromunit tounit`*
Mode	Stack Global Config

2.1.6 standby

Use this command to configure a unit as a Standby Management Unit (STBY).

NOTICE The Standby Management Unit cannot be the current Management Unit. The Standby unit should be a management-capable unit.

Format	`standby` *`unit number`*
Mode	Stack Global Config

Parameter	Description
Standby Management Unit Number	Indicates the unit number which is to be the Standby Management Unit. unit number must be a valid unit number.

2.1.6.1 no standby

The no form of this command allows the application to run the auto Standby Management Unit logic.

Format	`no standby`
Mode	Stack Global Config

2.1.7 slot

This command configures a slot in the system. The ***`unit/slot`*** is the slot identifier of the slot. The ***`cardindex`*** is the index into the database of the supported card types, indicating the type of the card being preconfigured in the specified slot. The card index is a 32-bit integer. If a card is currently present in the slot that is unconfigured, the configured information will be deleted and the slot will be reconfigured with default information for the card.

Format	`slot` *`unit/slot cardindex`*
Mode	Global Config

NOTICE Card index can be obtained by executing show supported cardtype command in User EXEC or Privileged EXEC mode.

2.1.7.1 no slot

This command removes configured information from an existing slot in the system.

Format	`no slot` *`unit/slot cardindex`*
Mode	Global Config

NOTICE Card index can be obtained by executing show supported cardtype command in User EXEC or Privileged EXEC mode.

2.1.8 set slot disable

This command configures the administrative mode of the slot(s). If you specify [all], the command is applied to all slots, otherwise the command is applied to the slot identified by ***`unit/slot`***.

If a card or other module is present in the slot, this administrative mode will effectively be applied to the contents of the slot. If the slot is empty, this administrative mode will be applied to any module that is inserted into the slot. If a card is disabled, all the ports on the device are operationally disabled and shown as “unplugged” on management screens.

Format	`set slot disable [unit/slot] | all]`
Mode	Global Config

2.1.8.1 no set slot disable

This command unconfigures the administrative mode of the slot(s). If you specify `all`, the command removes the configuration from all slots, otherwise the configuration is removed from the slot identified by ***unit/slot***.

If a card or other module is present in the slot, this administrative mode removes the configuration from the contents of the slot. If the slot is empty, this administrative mode removes the configuration from any module inserted into the slot. If a card is disabled, all the ports on the device are operationally disabled and shown as "unplugged" on management screens.

Format	`no set slot disable [unit/slot] | all]`
Mode	Global Config

2.1.9 set slot power

This command configures the power mode of the slot(s) and allows power to be supplied to a card located in the slot. If you specify `all`, the command is applied to all slots, otherwise the command is applied to the slot identified by ***unit/slot***.

Use this command when installing or removing cards. If a card or other module is present in this slot, the power mode is applied to the contents of the slot. If the slot is empty, the power mode is applied to any card inserted into the slot.

Format	`set slot power [unit/slot] | all]`
Mode	Global Config

2.1.9.1 no set slot power

This command unconfigures the power mode of the slot(s) and prohibits power from being supplied to a card located in the slot. If you specify `all`, the command prohibits power to all slots, otherwise the command prohibits power to the slot identified by ***unit/slot***.

Use this command when installing or removing cards. If a card or other module is present in this slot, power is prohibited to the contents of the slot. If the slot is empty, power is prohibited to any card inserted into the slot.

Format	`no set slot power [unit/slot] | all]`
Mode	Global Config

2.1.10 reload (Stack)

This command resets the entire stack or the identified *unit.* The *unit* is the switch identifier. The system prompts you to confirm that you want to reset the switch.

Format	`reload [unit]`
Mode	Priviledged EXEC

2.1.11 stack-status sample-mode

Use this command to configure global status management mode, sample size. The mode, sample size parameters are applied globally on all units in the stack. The default sampling mode of the operation is cumulative summing.

NOTICE This configuration command is implemented as part of serviceability functionality and therefore is not expected to be persistent across reloads. This configuration is never visible in the running configuration under any circumstances. It is the responsibility of the user to switch the sample mode on-demand as per the requirement. This configuration is applied to all the members that are part of the stack when the command is triggered. This configuration cannot play onto cards that are part of the stack at later point of the time.

Default	Cumulative Summing
Format	`stack-status sample-mode {cumulative	history} [max-samples` *`100 - 500`*`]`
Mode	Stack Global Config Mode

Keyword	Description
sample-mode	Mode of sampling
cumulative	Tracks the sum of received time stamp offsets cumulatively.
history	Tracks history of received timestamps
max-samples	Maximum number of samples to keep

Example:

The following command sets the sampling mode to cumulative summing.

```
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#stack
(FASTPATH Routing) (Config-stack)# stack-status sample-mode cumulative
```

Example:

The following command sets the sampling mode to history and the sample size to default (that is, 300).

```
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#stack
(FASTPATH Routing) (Config-stack)#stack-status sample-mode history
```

Example:

The following command sets the sampling mode to history and sample size to 100.

```
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#stack
(FASTPATH Routing) (Config-stack)#stack-status sample-mode history max-samples 100
```

2.1.12 show slot

This command displays information about all the slots in the system or for a specific slot.

Format	`show slot` *`[unit/slot]`*
Mode	• User EXEC • Privileged EXEC

Term	Definition
Slot	The slot identifier in a *`unit/slot`* format.
Slot Status	The slot is empty, full, or has encountered an error
Admin State	The slot administrative mode is enabled or disabled.

Term	Definition
Power State	The slot power mode is enabled or disabled.
Configured Card Model Identifier	The model identifier of the card preconfigured in the slot. Model Identifier is a 32-character field used to identify a card.
Pluggable	Cards are pluggable or non-pluggable in the slot.
Power Down	Indicates whether the slot can be powered down.

If you supply a value for ***`unit/slot`***, the following additional information appears:

Term	Definition
Inserted Card Model Identifier	The model identifier of the card inserted in the slot. Model Identifier is a 32-character field used to identify a card. This field is displayed only if the slot is full.
Inserted Card Description	The card description. This field is displayed only if the slot is full.
Configured Card Description	10BASE-T half duplex

2.1.13 show stack-status

Use this command to display the stack unit's received HB message timings, and the dropped/lost statistics for the specified unit.

Format	`show stack stack-status [`*`1-n`*`	all] [clear]`
Mode	Privileged EXEC

Keyword	Description
Current	Current time of heartbeat message reception
Average	Average time of heartbeat messages received
Min	Minimum time of heartbeat messages received
Max	Maximum time of heartbeat messages received
Dropped	Heartbeat message dropped/lost counter

Example:

This example dumps the stack unit heartbeat status information of the specified unit.

```
(Routing) #show stack-status

Stack Unit 1 Status
Sampling Mode: Cumulative Summing
--------------------------------------
Unit Current Average Min  Max  Dropped
--------------------------------------
```

2.1.14 show supported cardtype

This commands displays information about all card types or specific card types supported in the system.

Format	`show supported cardtype [`*`cardindex`*`]`
Mode	• User EXEC • Privileged EXEC

If you do not supply a value for ***cardindex***, the following output appears:

Term	Definition
Card Index (CID)	The index into the database of the supported card types. This index is used when preconfiguring a slot.
Card Model Identifier	The model identifier for the supported card type.

If you supply a value for ***cardindex***, the following output appears:

Term	Definition
Card Type	The 32-bit numeric card type for the supported card.
Model Identifier	The model identifier for the supported card type.
Card Description	The description for the supported card type.

2.1.15 show switch

This command displays switch status information about all units in the stack or a single unit when you specify the unit value.

Format	`show switch [unit]`
Mode	Privileged EXEC

Term	Definition
Switch	The unit identifier assigned to the switch.

When you do not specify a value for ***unit***, the following information appears:

Term	Definition
Management Status	Indicates whether the switch is the Primary Management Unit, a stack member, a configured standby switch, an operational standby switch, or the status is unassigned.
Preconfigured Model Identifier	The model identifier of a preconfigured switch ready to join the stack. The Model Identifier is a 32-character field assigned by the device manufacturer to identify the device.
Plugged-In Model Identifier	The model identifier of the switch in the stack. Model Identifier is a 32-character field assigned by the device manufacturer to identify the device.
Switch Status	The switch status. Possible values for this state are: OK, Unsupported, Code Mismatch, SDM Mismatch, Config Mismatch, or Not Present. A mismatch indicates that a stack unit is running a different version of the code, SDM template, or configuration than the management unit. The SDM Mismatch status indicates that the unit joined the stack, but is running a different SDM template than the management unit. This status is temporary; the stack unit should automatically reload using the template running on the stack manager. If there is a Stacking Firmware Synchronization operation in progress status is shown as Updating Code.
Code Version	The detected version of code on this switch.

Example: The following shows example CLI display output for the command.

```
(Switching) #show switch

       Management   Standby      Preconfig     Plugged-in     Switch     Code
SW     Switch         Status        Model ID   Model ID       Status     Version
------ ------------ -------       ----------- ---------       -------    --------
1      Mgmt SW                    BCM-56224     BCM-56224     OK         M.3.22.1
2      Stack Mbr      Oper Stby   BCM-56224     BCM-56224     OK         M.3.22.1

    Management  Standby    Preconfig     Plugged-in     Switch        Code
SW    Switch    Status     Model ID      Model ID       Status        Version
--- ---------- --------- ------------- ------------- ------------- -----------
1   Stack Mbr            Platform v1   Platform v1   STM Mismatch  10.17.15.8
2   Mgmt Sw              Platform v2   Platform v2   OK            10.17.15.8
```

When you specify a value for *`unit`*, the following information appears.

Term	Definition
Management Status	Indicates whether the switch is the Primary Management Unit, a stack member, or the status is unassigned.
Hardware Management Preference	The hardware management preference of the switch. The hardware management preference can be disabled or unassigned.
Admin Management Preference	The administrative management preference value assigned to the switch. This preference value indicates how likely the switch is to be chosen as the Primary Management Unit.
Switch Type	The 32-bit numeric switch type.
Model Identifier	The model identifier for this switch. Model Identifier is a 32-character field assigned by the device manufacturer to identify the device.
Switch Status	The switch status. Possible values are OK, Unsupported, Code Mismatch, Config Mismatch, SDM Mismatch, STM Mismatch, or Not Present.
Switch Description	The switch description.
Expected Code Type	The expected code type.
Expected Code Version	The expected code version.
Detected Code Version	The version of code running on this switch. If the switch is not present and the data is from preconfiguration, then the code version is “None”.
Detected Code in Flash	The version of code that is currently stored in FLASH memory on the switch. This code executes after the switch is reset. If the switch is not present and the data is from preconfiguration, then the code version is “None”.
SFS Last Attempt Status	The stack firmware synchronization status in the last attempt for the specified unit.
Serial Number	The serial number for the specified unit.
Up Time	The system up time.

Example: The following shows example CLI display output for the command.

```
(Switching) #show switch 1

Switch............................ 1
Management Status................. Management Switch
Hardware Management Preference.... Unassigned
Admin Management Preference....... Unassigned
Switch Type....................... 0xb6240001
Preconfigured Model Identifier.... Platform v1
Plugged-in Model Identifier....... Platform v1
Switch Status..................... STM Mismatch
Switch Description................ Triumph 56624 Development System -
                                   48 GE, 4 TENGIG
Expected Code Type................ 0x100b000
Detected Code Version............. 10.17.15.8
Detected Code in Flash............ 10.17.15.8
SFS Last Attempt Status........... None
Stack Template ID................. 3
Stack Template Description........ v1 and v2 Mix
Up Time........................... 0 days 3 hrs 15 mins 50 secs
```

2.1.16 show supported switchtype

This commands displays information about all supported switch types or a specific switch type.

Format	`show supported switchtype` *`[switchindex]`*
Mode	User EXEC Privileged EXEC

If you do not supply a value for ***switchindex***, the following output appears:

Term	Definition
Switch Index (SID)	The index into the database of supported switch types. This index is used when preconfiguring a member to be added to the stack.
Model Identifier	The model identifier for the supported switch type.
Management Preference	The management preference value of the switch type.
Code Version	The code load target identifier of the switch type.

If you supply a value for ***switchindex***, the following output appears:

Term	Definition
Switch Type	The 32-bit numeric switch type for the supported switch.
Model Identifier	The model identifier for the supported switch type.
Switch Description	The description for the supported switch type.

2.2 Stack Port Commands

This section describes the commands you use to view and configure stack port information.

2.2.1 stack-port

This command sets stacking per port or range of ports to either ***stack*** or ***ethernet*** mode.

Default	stack
Format	`stack-port` *`slot/port`* `[{ethernet	stack}]`
Mode	Stack Global Config

2.2.2 show stack-port

This command displays summary stack-port information for all interfaces.

Format	`show stack-port`
Mode	Privileged EXEC

For Each Interface:

Term	Definition
Unit	The unit number.
Interface	The slot and port numbers.
Configured Stack Mode	Stack or Ethernet.
Running Stack Mode	Stack or Ethernet.
Link Status	Status of the link.
Link Speed	Speed (Gbps) of the stack port link.

2.2.3 show stack-port counters

This command displays summary data counter information for all interfaces.

Format	`show stack-port counters [1-n	all]`
Mode	Privileged EXEC

Term	Definition
Unit	The unit number.
Interface	The slot and port numbers.
Tx Data Rate	Trashing data rate in megabits per second on the stacking port.
Tx Error Rate	Platform-specific number of transmit errors per second.
Tx Total Errors	Platform-specific number of total transmit errors since power-up.
Rx Data Rate	Receive data rate in megabits per second on the stacking port.
Rx Error Rate	Platform-specific number of receive errors per second.
Rx Total Errors	Platform-specific number of total receive errors since power-up.
Link Flaps	The number of up/down events for the link since system boot up.

Example: This example shows the stack ports and associated statistics of unit 2.

```
(FASTPATH Routing) #show stack-port counters 2

                 ------------TX-------------- ------------RX---------------- -------
                  Data      Error                      Data     Error
                  Rate      Rate         Total      Rate     Rate         Total   Link
Unit   Interface      (Mb/s) (Errors/s)  Errors    (Mb/s) (Errors/s)  Errors Flaps
----     -----------    ---------- ----------- ---------- --------  ----------   -------- -------
2       0/53            0         0              0            0         0              0         0
2       0/54            0         0              0            0         0              0         0
2       0/55            0         0              0            0         0              0         0
2       0/56            0         0              0            0         0              0         0

(FASTPATH Routing) #
```

2.2.4 show stack-port diag

This command shows stack port diagnostics for each port and is only intended for Field Application Engineers (FAEs) and developers. An FAE will advise on the necessity to run this command and capture this information.In verbose mode, the statistics and counters for RPC, transport, CPU, and transport RX/TX modules are displayed.

Format	`show stack-port diag [1-n | all] [verbose]`
Mode	Privileged EXEC

Term	Definition
Unit	The unit number.
Interface	The slot and port numbers.
Diagnostic Entry1	80 character string used for diagnostics.
Diagnostic Entry2	80 character string used for diagnostics.
Diagnostic Entry3	80 character string used for diagnostics.
TBYT	Transmitted Bytes
TPKT	Transmitted Packets
TFCS	Transmit FCS Error Frame Counter
TERR	Transmit Error (set by system) Counter
RBYT	Received Bytes
RPKT	Received Packets
RFCS	Received FCS Error Frame Counter
RFRG	Received Fragment Counter
RJBR	Received Jabber Frame Counter
RUND	Received Undersize Frame Counter
ROVR	Received Oversized Frame Counter
RUNT	Received RUNT Frame Counter

Example: This example displays the stack ports and associated statistics of specified unit or all units.

```
(FASTPATH Routing) #show stack-port diag 1

1 - 0/53:
RBYT:27ed9a7b RPKT:bca1b TBYT:28a0739e TPKT:c93ee
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0

1 - 0/54:
RBYT:8072ed RPKT:19a66 TBYT:aecfb80 TPKT:66e4d
RFCS:6e RFRG:4414 RJBR:0 RUND:c19 RUNT:af029b1
TFCS:0 TERR:0

1 - 0/55:
RBYT:0 RPKT:0 TBYT:ae8 TPKT:23
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0

1 - 0/56:
RBYT:0 RPKT:0 TBYT:ae8 TPKT:23
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0
```

`Example 2: ‘show stack-port diag [<1-n> | all] [verbose]’ transport etc module statistics of specified unit or all units.`

`In this example, It dumps RPC, Transport (ATP, Next Hop, and RLink), and CPU Transport Rx/Tx modules Statistics of Unit 2.`

```
(FASTPATH Routing) #show stack-port diag 2 verbose
-----------------------------------------
HPC RPC statistics/counters from unit..2
-----------------------------------------
Registered Functions......................... 58
Client Requests............................ 0
Server Requests.............................. 0
Server Duplicate Requests.................... 0
Server Replies............................... 0
Client Remote Tx............................. 0
Client Remote Retransmit Count............... 0
Tx without Errors............................ 0
Tx with Errors............................... 0
Rx Timeouts.................................. 0
Rx Early Exits............................... 0
Rx Out of Sync............................... 0
No Buffer.................................... 0
Collect Sem Wait Count....................... 0
Collect Sem Dispatch Count................... 0

-------------------------------------
RPC statistics/counters from unit..2
-------------------------------------
Client RPC Requests Count.................... 3
Client RPC Reply Count....................... 0
Client RPC Fail to xmit Count................ 0
Client RPC Response Timedout Count........... 3
Client RPC Missing Requests.................. 0
Client RPC Detach/Remove Count............... 0
Client RPC Current Sequence Number........... 3
Server RPC Request Count..................... 0
Server RPC Reply Count....................... 0
Server RPC Processed Transactions............ 0
Server RPC Received Wrong Version Req......... 0
Server RPC No Handlers....................... 0
Server RPC Retry Transmit Count.............. 0
Server RPC Repetitive Tx Errors.............. 0

-------------------------------------
ATP statistics/counters from unit..2
-------------------------------------
Transmit Pending Count....................... 2
Current number of TX waits................... 2
Rx transactions created...................... 145
Rx transactions freed........................ 145
Rx transactions freed(raw)................... 0
--More-- or (q)uitATP: TX timeout, seq 74. f:cc cli 778. to 1 tx cnt 21.
Tx transactions created...................... 290
BET Rx Dropped Pkts Count.................... 0
ATP Rx Dropped Pkts Count.................... 0
Failed to Add Key Pkt Count.................. 0
Source Lookup Failure Count.................. 0
Old Rx transactions Pkts drop Count.......... 0
Nr of CPUs found in ATP communication......... 2
```

```
-----------------------------------------------
CPU Transport statistics/counters from unit..2
-----------------------------------------------
State Initialization........................... Done
Rx Setup....................................... Done
Tx Setup....................................... Done
Tx CoS[0] Reserve.............................. 100
Tx CoS[1] Reserve.............................. 100
Tx CoS[2] Reserve.............................. 100
Tx CoS[3] Reserve.............................. 100
Tx CoS[4] Reserve.............................. 60
Tx CoS[5] Reserve.............................. 40
Tx CoS[6] Reserve.............................. 20
Tx CoS[7] Reserve.............................. 0
Tx Pkt Pool Size............................... 200
Tx Available Pkt Pool Size..................... 198
Tx failed/error Count.......................... 0
Rx Pkt Pool Size............................... 8

------------------------------------------
Next Hop statistics/counters from unit..2
------------------------------------------
State Initialization........................... Done
Component Setup................................ Done
Thread Priority................................ 100
Rx Priority.................................... 105
Local CPU Key.................................. 00:24:81:d0:0f:c7
MTU Size....................................... 2048
Vlan Id........................................ 4094
CoS Id......................................... 7
Internal Priority for pkt transmission......... 7
Rx Pkt Queue Size.............................. 256
Tx Pkt Queue Size.............................. 64
Rx Pkt Dropped Count........................... 0
Tx Failed Pkt Count............................ 0

---------------------------------------
RLink statistics/counters from unit..2
---------------------------------------
State Initialization........................... Done
L2 Notify In Pkts.............................. 0
L2 Notify In Pkts discarded.................... 0
L2 Notify Out Pkts ............................ 0
L2 Notify Out Pkts discarded................... 0
Linkscan In Pkts............................... 0
Linkscan In Pkts discarded..................... 0
Linkscan Out Pkts ............................. 0
Linkscan Out Pkts discarded.................... 0
Auth/Unauth In Callbacks....................... 0
Auth/Unauth In Callbacks discarded............. 0
Auth/Unauth Out Callbacks...................... 0
Auth/Unauth Out Callbacks discarded............ 0
RX Tunnelling In Pkts.......................... 0
RX Tunnelling In Pkts discarded................ 0
RX Tunnelling Out Pkts......................... 0
RX Tunnelling Out Pkts discarded............... 0
OAM Events In.................................. 0
OAM Events In discarded........................ 0
OAM Events Out................................. 0
OAM Events Out discarded....................... 0
BFD Events In.................................. 0
BFD Events In discarded........................ 0
BFD Events Out................................. 0
BFD Events Out discarded...................... 0
Fabric Events In.............................. 0
Fabric Events In discarded.................... 0
Fabric Events Out............................. 0
Fabric Events Out discarded................... 0
Scan Add Requests In.......................... 0
Scan Del Requests In.......................... 0
Scan Notify(Run Handlers) Out................. 0
Scan Notify(Traverse Processing).............. 0

(FASTPATH Routing) #
```

2.2.5 show stack-port stack-path

This command displays the route a packet will take to reach the destination.

Format	`show stack-port stack-path {`*`1-8`*` | `*`all`*`}`
Mode	Privileged EXEC

2.3 Stack Firmware Synchronization Commands

Stack Firmware Synchronization (SFS) provides the ability to automatically synchronize firmware for all stack members. If a unit joins the stack and its firmware version is different from the version running on the stack manager, the SFS feature can either upgrade or downgrade the firmware on the mismatched stack member. There is no attempt to synchronize the stack to the latest firmware in the stack.

2.3.1 boot auto-copy-sw

Use this command to enable the Stack Firmware Synchronization feature on the stack.

Default	Disabled
Format	`boot auto-copy-sw`
Mode	Privileged EXEC

2.3.1.1 no boot auto-copy-sw

Use this command to disable the Stack Firmware Synchronization feature on the stack

Format	`no boot auto-copy-sw`
Mode	Privileged EXEC

2.3.2 boot auto-copy-sw trap

Use this command to enable the sending of SNMP traps related to the Stack Firmware Synchronization feature.

Default	Enabled
Format	`boot auto-copy-sw trap`
Mode	Privileged EXEC

2.3.2.1 no boot auto-copy-sw trap

Use this command to disable the sending of traps related to the Stack Firmware Synchronization feature.

Format	`no boot auto-copy-sw trap`
Mode	Privileged EXEC

2.3.3 boot auto-copy-sw allow-downgrade

Use this command to allow the stack manager to downgrade the firmware version on the stack member if the firmware version on the manager is older than the firmware version on the member.

Default	Enabled
Format	`boot auto-copy-sw allow-downgrade`
Mode	Privileged EXEC

2.3.3.1 no boot auto-copy-sw allow-downgrade

Use this command to prevent the stack manager from downgrading the firmware version of a stack member.

Format	`no boot auto-copy-sw allow-downgrade`
Mode	Privileged EXEC

2.3.4 show auto-copy-sw

Use this command to display Stack Firmware Synchronization configuration status information.

Format	`show auto-copy-sw`
Mode	Privileged EXEC

Term	Definition
Synchronization	Shows whether the SFS feature is enabled.
SNMP Trap Status	Shows whether the stack will send traps for SFS events.
Allow Downgrade	Shows wether the manager is permitted to downgrade the firmware version of a stack member.

2.4 Nonstop Forwarding Commands

A switch can be described in terms of three semi-independent functions called the forwarding plane, the control plane, and the management plane. The forwarding plane forwards data packets. The forwarding plane is implemented in hardware. The control plane is the set of protocols that determine how the forwarding plane should forward packets, deciding which data packets are allowed to be forwarded and where they should go. Application software on the management unit acts as the control plane. The management plane is application software running on the management unit that provides interfaces allowing a network administrator to configure and monitor the device.

Nonstop forwarding (NSF) allows the forwarding plane of stack units to continue to forward packets while the control and management planes restart as a result of a power failure, hardware failure, or software fault on the management unit. A nonstop forwarding failover can also be manually initiated using the `initiate failover` command. Traffic flows that enter and exit the stack through physical ports on a unit other than the management continue with at most subsecond interruption when the management unit fails.

To prepare the backup management unit in case of a failover, applications on the management unit continuously checkpoint some state information to the backup unit. Changes to the running configuration are automatically copied to the backup unit. MAC addresses stay the same across a nonstop forwarding failover so that neighbors do not have to relearn them.

When a nonstop forwarding failover occurs, the control plane on the backup unit starts from a partially-initialized state and applies the checkpointed state information. While the control plane is initializing, the stack cannot react to external changes, such as network topology changes. Once the control plane is fully operational on the new management unit, the control plane ensures that the hardware state is updated as necessary. Control plane failover time depends on the size of the stack, the complexity of the configuration, and the speed of the CPU.

The management plane restarts when a failover occurs. Management connections must be reestablished.

For NSF to be effective, adjacent networking devices must not reroute traffic around the restarting device. FASTPATH uses three techniques to prevent traffic from being rerouted:

1. A protocol may distribute a part of its control plane to stack units so that the protocol can give the appearance that it is still functional during the restart. Spanning tree and port channels use this technique.
2. A protocol may enlist the cooperation of its neighbors through a technique known as graceful restart. OSPF uses graceful restart if it is enabled.
3. A protocol may simply restart after the failover if neighbors react slowly enough that they will not normally detect the outage. The IP multicast routing protocols are a good example of this behavior.

To take full advantage of nonstop forwarding, layer 2 connections to neighbors should be via port channels that span two or more stack units, and layer 3 routes should be ECMP routes with next hops via physical ports on two or more units. The hardware can quickly move traffic flows from port channel members or ECMP paths on a failed unit to a surviving unit.

2.4.1 nsf (Stack Global Config Mode)

This command enables nonstop forwarding feature on the stack. When nonstop forwarding is enabled, if the management unit of a stack fails, the backup unit takes over as the master without clearing the hardware tables of any of the surviving units. Data traffic continues to be forwarded in hardware while the management functions initialize on the backup unit.

NSF is enabled by default on platforms that support it. The administrator may wish to disable NSF in order to redirect the CPU resources consumed by data checkpointing.

If a unit that does not support NSF is connected to the stack, then NSF is disabled on all stack members. When a unit that does not support NSF is disconnected from the stack and all other units support NSF, and NSF is administratively enabled, then NSF operation resumes.

Default	enabled
Format	`nsf`
Mode	Stack Global Config Mode

2.4.1.1 no nsf

This command disables NSF on the stack.

Format	`no nsf`
Mode	Stack Global Config Mode

2.4.2 show nsf

This command displays global and per-unit information on NSF configuration on the stack.

Format	`show nsf`
Mode	Privileged EXEC

Parameter	Description
NSF Administrative Status	Whether nonstop forwarding is administratively enabled or disabled. Default: Enabled
NSF Operational Status	Indicates whether NSF is enabled on the stack.
Last Startup Reason	The type of activation that caused the software to start the last time: • "Power-On" means that the switch rebooted. This could have been caused by a power cycle or an administrative "Reload" command. • "Administrative Move" means that the administrator issued the `movemanagement` command for the stand-by manager to take over. • "Warm-Auto-Restart" means that the primary management card restarted due to a failure, and the system executed a nonstop forwarding failover. • "Cold-Auto-Restart" means that the system switched from the active manager to the backup manager and was unable to maintain user data traffic. This is usually caused by multiple failures occurring close together.
Time Since Last Restart	Time since the current management unit became the active management unit.
Restart in progress	Whether a restart is in progress.
Warm Restart Ready	Whether the system is ready to perform a nonstop forwarding failover from the management unit to the backup unit.
Copy of Running Configuration to Backup Unit: Status	Whether the running configuration on the backup unit includes all changes made on the management unit. Displays as Current or Stale.
Time Since Last Copy	When the running configuration was last copied from the management unit to the backup unit.
Time Until Next Copy	The number of seconds until the running configuration will be copied to the backup unit. This line only appears when the running configuration on the backup unit is Stale.
NSF Support	Whether a unit supports NSF.

2.4.3 initiate failover

This command forces the backup unit to take over as the management unit and perform a "warm restart" of the stack. On a warm restart, the backup unit becomes the management unit without clearing its hardware tables (on a cold restart, hardware tables are cleared). Applications apply checkpointed data from the former management unit. The original management unit reboots.

If the system is not ready for a warm restart, for example because no backup unit has been elected or one or more members of the stack do not support nonstop forwarding, the command fails with a warning message.

The `movemanagement` command (see page 25) also transfers control from the current management unit; however, the hardware is cleared and all units reinitialize.

Format	`initiate failover`
Mode	Stack Global Config Mode

2.4.4 show checkpoint statistics

This command displays general information about the checkpoint service operation.

Format	`show checkpoint statistics`
Mode	Privileged EXEC

Parameter	Description
Messages Checkpointed	Number of checkpoint messages transmitted to the backup unit. Range: Integer. Default: 0
Bytes Checkpointed	Number of bytes transmitted to the backup unit. Range: Integer. Default: 0
Time Since Counters Cleared	Number of days, hours, minutes and seconds since the counters were reset to zero. The counters are cleared when a unit becomes manager and with a support command. Range: Time Stamp. Default: 0d00:00:00
Checkpoint Message Rate	Average number of checkpoint messages per second. The average is computed over the time period since the counters were cleared. Range: Integer. Default: 0
Last 10-second Message Rate	Average number of checkpoint messages per second in the last 10-second interval. This average is updated once every 10 seconds. Range: Integer. Default: 0
Highest 10-second Message Rate	The highest rate recorded over a 10-second interval since the counters were cleared. Range: Integer. Default: 0

2.4.5 clear checkpoint statistics

This command clears all checkpoint statistics to their initial values.

Format	`clear checkpoint statistics`
Mode	Privileged EXEC

2.5 Mixed Stacking Commands

Mixed stacking allows heterogeneous stacks to form by enforcing a homogenous set of capacities and capabilities through the use of templates. Each template defines operational characteristics for a FASTPATH stacking unit. These characteristics include the capacities of the various tables in the silicon (for example, L2 table size) as well as an implicit set of capabilities based on the underlying silicon for the given template. There is one template for each chip type supported by Mixed Stacking. There are additional templates that provide a *least common denominator* set of capacities and capabilities which allow different chip types to be stacked together.

When more capable devices are stacked with less capable devices, the templates ensure that the stack as a whole operates to the capabilities of the least capable device in the stack. In some cases, one device in a stack may have a larger table size than another device in the stack, but it may not have as many features as the device with the smaller table size. The templates ensure that the stack as a whole operates in a *least common denominator* mode under this condition.

2.5.1 stack-template

This command sets the stack template ID on a single unit (if specified) or on the entire stack. The user is prompted to confirm that the startup configuration will be deleted on the affected units and that the unit(s) being modified will be rebooted.

Default	Platform specific
Format	`stack-template` *`templateId`* `[unit]`
Mode	Stack mode

2.5.1.1 no stack-template

This command restores the stack template ID on a single unit to the default value for that platform. The user is prompted to confirm that the startup configuration will be deleted on the affected unit and that the unit being modified will be rebooted.

Default	Platform specific
Format	`no stack-template` *unit*
Mode	Stack mode

2.5.2 show stack-template list

This command shows a list of template IDs. This command has an optional *switchindex* parameter that correlates to the supported switch models displayed. If the switch index is provided, then this command shows the templates that can be configured on that switch type. Note that not all templates can be configured on all switch types.

Format	`show stack-template list`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show stack-template list

Template ID     Template Description
-----------     --------------------
1               Platform v1
2               Platform v2
3               v1 and v2 Mix
```

Example: The following shows example CLI display output for the command.

```
(Routing) # show supported switchtype

                                         Mgmt       Code
SID         Switch Model ID              Pref       Type
--- -------------------------------- ------------ ---------
1   Platform v1                          1        0x100b000
2   Platform v2                          1        0x100b000
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show stack-template list 1

Template ID     Template Description
-----------     --------------------
1 (Default)     Platform v1
3               v1 and v2 Mix
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show stack-template list 2

Template ID     Template Description
-----------     --------------------
2 (Default)     Platform v2
3               v1 and v2 Mix
```

2.5.3 show stack-template switch

This command shows the template IDs that are configured on each switch in the stack. Preconfigured units or units that have a code mismatch show the template ID as *unknown*.

Format	`show stack-template switch`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show stack-template switch

SW    Model ID       Template ID    Template Description
---   --------       -----------    --------------------
1     Platform v1    1              Platform v1
2     Platform v1    3              v1 and v2 Mix
3     Platform v2    2              Platform v2
4     Platform v2    3              v1 and v2 Mix
5     Platform v2    Unknown

(Routing) #
```

3/ Management Commands

This chapter describes the management commands available in the FASTPATH CLI.

The Management Commands chapter contains the following sections:

- “Network Interface Commands” on page 44
- “Console Port Access Commands” on page 49
- “Telnet Commands” on page 51
- “Secure Shell Commands” on page 55
- “Management Security Commands” on page 57
- “Hypertext Transfer Protocol Commands” on page 58
- “Access Commands” on page 65
- “User Account Commands” on page 66
- “SNMP Commands” on page 91
- “RADIUS Commands” on page 105
- “TACACS+ Commands” on page 123
- “Configuration Scripting Commands” on page 127
- “Prelogin Banner, System Prompt, and Host Name Commands” on page 128
- “Expandable Port Configuration” on page 130

NOTICE

The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

3.1 Network Interface Commands

This section describes the commands you use to configure a logical interface for management access. To configure the management VLAN, see “network mgmt_vlan” on page 320.

3.1.1 enable (Privileged EXEC access)

This command gives you access to the Privileged EXEC mode. From the Privileged EXEC mode, you can configure the network interface.

Format	`enable`
Mode	User EXEC

3.1.2 do (Privileged EXEC commands)

This command executes Privileged EXEC mode commands from any of the configuration modes.

Format	`do` *`Priv Exec Mode Command`*
Mode	• Global Config • Interface Config • VLAN Config • Routing Config

Example: The following is an example of the `do` command that executes the Privileged EXEC command `script list` in Global Config Mode.

```
(Routing) #configure

(Routing)(config)#do script list

Configuration Script Name        Size(Bytes)
-------------------------------- -----------
backup-config                           2105
running-config                          4483
startup-config                           445

3 configuration script(s) found.
2041 Kbytes free.

Routing(config)#
```

3.1.3 serviceport ip

This command sets the IP address, the netmask and the gateway of the network management port. You can specify the `none` option to clear the IPv4 address and mask and the default gateway (i.e., reset each of these values to 0.0.0.0).

Format	`serviceport ip {`*`ipaddr netmask`*` [`*`gateway`*`] | none}`
Mode	Privileged EXEC

3.1.4 serviceport protocol

This command specifies the network management port configuration protocol. If you modify this value, the change is effective immediately. If you use the ***bootp*** parameter, the switch periodically sends requests to a BootP server until a response is received. If you use the ***dhcp*** parameter, the switch periodically sends requests to a DHCP server until a response is received. If you use the ***none*** parameter, you must configure the network information for the switch manually.

Format	`serviceport protocol {none | bootp | dhcp}`
Mode	Privileged EXEC

3.1.5 serviceport protocol dhcp

This command enables the DHCPv4 client on a Service port. If the `client-id` optional parameter is given, the DHCP client messages are sent with the client identifier option.

Default	none
Format	`serviceport protocol dhcp [client-id]`
Mode	Privileged EXEC

There is no support for the no form of the command serviceport protocol dhcp client-id. To remove the `client-id` option from the DHCP client messages, issue the command serviceport protocol dhcp without the `client-id` option. The command serviceport protocol none can be used to disable the DHCP client and client-id option on the interface.

Example: The following shows an example of the command.

```
(Routing) # serviceport protocol dhcp client-id
```

3.1.6 network parms

This command sets the IP address, subnet mask and gateway of the device. The IP address and the gateway must be on the same subnet. When you specify the `none` option, the IP address and subnet mask are set to the factory defaults.

Format	`network parms {`*`ipaddr netmask`*` [`*`gateway`*`]| none}`
Mode	Privileged EXEC

3.1.7 network protocol

This command specifies the network configuration protocol to be used. If you modify this value, change is effective immediately. If you use the bootp parameter, the switch periodically sends requests to a BootP server until a response is received. If you use the dhcp parameter, the switch periodically sends requests to a DHCP server until a response is received. If you use the none parameter, you must configure the network information for the switch manually.

The „auto-ip“ option is an extension to the standard command configuring the network interface protocol. If this protocol is set, a fixed IP address is assigned related to some parameters.

The fixed IP address is related to slot and chassis-Id of the board. For same slot and chassis-Id always the same IP address is assigned.

Default	none
Format	`network protocol {none | bootp | dhcp | auto-ip}`
Mode	Privileged EXEC

3.1.8 network protocol dhcp

This command enables the DHCPv4 client on a Network port. If the `client-id` optional parameter is given, the DHCP client messages are sent with the client identifier option.

Default	none
Format	`network protocol dhcp [client-id]`
Mode	Global Config

There is no support for the no form of the command network protocol dhcp client-id. To remove the `client-id` option from the DHCP client messages, issue the command network protocol dhcp without the `client-id` option. The command network protocol none can be used to disable the DHCP client and client-id option on the interface.

Example: The following shows an example of the command.

```
(Routing) # network protocol dhcp client-id
```

3.1.9 network mac-address

This command sets locally administered MAC addresses. The following rules apply:

- Bit 6 of byte 0 (called the U/L bit) indicates whether the address is universally administered (b'0') or locally administered (b'1').
- Bit 7 of byte 0 (called the I/G bit) indicates whether the destination address is an individual address (b'0') or a group address (b'1').
- The second character, of the twelve character macaddr, must be 2, 6, A or E.

A locally administered address must have bit 6 On (b'1') and bit 7 Off (b'0').

Format	`network mac-address `*`macaddr`*
Mode	Privileged EXEC

3.1.10 network mac-type

This command specifies whether the switch uses the burned in MAC address or the locally-administered MAC address.

Default	burnedin
Format	`network mac-type {local	burnedin}`
Mode	Privileged EXEC

3.1.10.1 no network mac-type

This command resets the value of MAC address to its default.

Format	`no network mac-type`
Mode	Privileged EXEC

3.1.11 network javamode

This command specifies whether or not the switch should allow access to the Java applet in the header frame of the Web interface. When access is enabled, the Java applet can be viewed from the Web interface. When access is disabled, the user cannot view the Java applet.

Default	enabled
Format	`network javamode`
Mode	Privileged EXEC

3.1.11.1 no network javamode

This command disallows access to the Java applet in the header frame of the Web interface. When access is disabled, the user cannot view the Java applet.

Format	`no network javamode`
Mode	Privileged EXEC

3.1.12 show network

This command displays configuration settings associated with the switch's network interface. The network interface is the logical interface used for in-band connectivity with the switch via any of the switch's front panel ports. The configuration parameters associated with the switch's network interface do not affect the configuration of the front panel ports through which traffic is switched or routed. The network interface is always considered to be up, whether or not any member ports are up; therefore, the show network command will always show Interface Status as Up.

Format	`show network`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface Status	The network interface status; it is always considered to be “up”.
IP Address	The IP address of the interface. The factory default value is 0.0.0.0.
Subnet Mask	The IP subnet mask for this interface. The factory default value is 0.0.0.0.
Default Gateway	The default gateway for this IP interface. The factory default value is 0.0.0.0.
IPv6 Administrative Mode	Whether enabled or disabled.
IPv6 Address/Length	The IPv6 address and length.

Term	Definition
IPv6 Default Router	The IPv6 default router address.
Burned In MAC Address	The burned in MAC address used for in-band connectivity.
Locally Administered MAC Address	If desired, a locally administered MAC address can be configured for in-band connectivity. To take effect, 'MAC Address Type' must be set to 'Locally Administered'. Enter the address as twelve hexadecimal digits (6 bytes) with a colon between each byte. Bit 1 of byte 0 must be set to a 1 and bit 0 to a 0, i.e. byte 0 should have the following mask 'xxxx xx10'. The MAC address used by this bridge when it must be referred to in a unique fashion. It is recommended that this be the numerically smallest MAC address of all ports that belong to this bridge. However it is only required to be unique. When concatenated with dot1dStpPriority a unique Bridge Identifier is formed which is used in the Spanning Tree Protocol.
MAC Address Type	The MAC address which should be used for in-band connectivity. The choices are the burned in or the Locally Administered address. The factory default is to use the burned in MAC address.
Configured IPv4 Protocol	The IPv4 network protocol being used. The options are bootp | dhcp | none | auto-ip.
Configured IPv6 Protocol	The IPv6 network protocol being used. The options are dhcp | none.
DHCPv6 Client DUID	The DHCPv6 client's unique client identifier. This row is displayed only when the configured IPv6 protocol is dhcp.
IPv6 Autoconfig Mode	Whether IPv6 Stateless address auto configuration is enabled or disabled.
DHCP Client Identifier	The client identifier is displayed in the output of the command only if DHCP is enabled with the client-id option on the network port. See “network protocol dhcp” on page 46.

Example: The following shows example CLI display output for the network port.

```
(admin) #show network

Interface Status................................ Up
IP Address...................................... 10.250.3.1
Subnet Mask..................................... 255.255.255.0
Default Gateway................................. 10.250.3.3
IPv6 Administrative Mode........................ Enabled
IPv6 Prefix is ................................. fe80::210:18ff:fe82:64c/64
IPv6 Prefix is ................................. 2003::1/128
IPv6 Default Router is ......................... fe80::204:76ff:fe73:423a
Burned In MAC Address........................... 00:10:18:82:06:4C
Locally Administered MAC address................ 00:00:00:00:00:00
MAC Address Type................................ Burned In
Configured IPv4 Protocol ....................... None
Configured IPv6 Protocol ....................... DHCP
DHCPv6 Client DUID ............................. 00:03:00:06:00:10:18:82:06:4C
IPv6 Autoconfig Mode............................ Disabled
Management VLAN ID.............................. 1
DHCP Client Identifier.......................... 0fastpath-0010.1882.160B-vl1
```

3.1.13 show serviceport

This command displays service port configuration information.

Format	`show serviceport`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface Status	The network interface status. It is always considered to be up.
IP Address	The IP address of the interface. The factory default value is 0.0.0.0.
Subnet Mask	The IP subnet mask for this interface. The factory default value is 0.0.0.0.
Default Gateway	The default gateway for this IP interface. The factory default value is 0.0.0.0.
IPv6 Administrative Mode	Whether enabled or disabled. Default value is enabled.
IPv6 Address/Length	The IPv6 address and length. Default is Link Local format.
IPv6 Default Router	TheIPv6 default router address on the service port. The factory default value is an unspecified address.
Configured IPv4 Protocol	The IPv4 network protocol being used. The options are bootp | dhcp | none.
Configured IPv6 Protocol	The IPv6 network protocol being used. The options are dhcp | none.
DHCPv6 Client DUID	The DHCPv6 client's unique client identifier. This row is displayed only when the configured IPv6 protocol is dhcp.
IPv6 Autoconfig Mode	Whether IPv6 Stateless address autoconfiguration is enabled or disabled.
Burned in MAC Address	The burned in MAC address used for in-band connectivity.
DHCP Client Identifier	The client identifier is displayed in the output of the command only if DHCP is enabled with the client-id option on the service port.

Example: The following shows example CLI display output for the service port.

```
(admin) #show serviceport

Interface Status............................... Up
IP Address..................................... 10.230.3.51
Subnet Mask.................................... 255.255.255.0
Default Gateway................................ 10.230.3.1
IPv6 Administrative Mode....................... Enabled
IPv6 Prefix is ................................ fe80::210:18ff:fe82:640/64
IPv6 Prefix is ................................ 2005::21/128
IPv6 Default Router is ........................ fe80::204:76ff:fe73:423a
Configured IPv4 Protocol ...................... DHCP
Configured IPv6 Protocol ...................... DHCP
DHCPv6 Client DUID ............................ 00:03:00:06:00:10:18:82:06:4C
IPv6 Autoconfig Mode........................... Disabled
Burned In MAC Address.......................... 00:10:18:82:06:4D
DHCP Client Identifier......................... 0fastpath-0010.1882.160C
```

3.2 Console Port Access Commands

This section describes the commands you use to configure the console port. You can use a serial cable to connect a management host directly to the console port of the switch.

3.2.1 configure

This command gives you access to the Global Config mode. From the Global Config mode, you can configure a variety of system settings, including user accounts. From the Global Config mode, you can enter other command modes, including Line Config mode.

Format	`configure`
Mode	Privileged EXEC

3.2.2 line

This command gives you access to the Line Console mode, which allows you to configure various Telnet settings and the console port, as well as to configure console login/enable authentication.

Format	`line {console	telnet	ssh}`
Mode	Global Config

Term	Definition
console	Console terminal line.
telnet	Virtual terminal for remote console access (Telnet).
ssh	Virtual terminal for secured remote console access (SSH).

Example: The following shows an example of the CLI command.

```
(FASTPATH Routing)(config)#line telnet
(FASTPATH Routing)(config-telnet)#
```

3.2.3 serial baudrate

This command specifies the communication rate of the terminal interface. The supported rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

Default	9600
Format	`serial baudrate {1200	2400	4800	9600	19200	38400	57600	115200}`
Mode	Line Config

3.2.3.1 no serial baudrate

This command sets the communication rate of the terminal interface.

Format	`no serial baudrate`
Mode	Line Config

3.2.4 serial timeout

This command specifies the maximum connect time (in minutes) without console activity. A value of 0 indicates that a console can be connected indefinitely. The time range is 0 to 160.

Default	5
Format	`serial timeout` *0-160*
Mode	Line Config

3.2.4.1 no serial timeout

This command sets the maximum connect time (in minutes) without console activity.

Format	`no serial timeout`
Mode	Line Config

3.2.5 show serial

This command displays serial communication settings for the switch.

Format `show serial`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Serial Port Login Timeout (minutes)	The time, in minutes, of inactivity on a serial port connection, after which the switch will close the connection. A value of 0 disables the timeout.
Baud Rate (bps)	The default baud rate at which the serial port will try to connect.
Character Size (bits)	The number of bits in a character. The number of bits is always 8.
Flow Control	Whether Hardware Flow-Control is enabled or disabled. Hardware Flow Control is always disabled.
Stop Bits	The number of Stop bits per character. The number of Stop bits is always 1.
Parity	The parity method used on the Serial Port. The Parity Method is always None.

3.3 Telnet Commands

This section describes the commands you use to configure and view Telnet settings. You can use Telnet to manage the device from a remote management host.

3.3.1 ip telnet server enable

Use this command to enable Telnet connections to the system and to enable the Telnet Server Admin Mode. This command opens the Telnet listening port.

Default enabled

Format `ip telnet server enable`

Mode Privileged EXEC

3.3.1.1 no ip telnet server enable

Use this command to disable Telnet access to the system and to disable the Telnet Server Admin Mode. This command closes the Telnet listening port and disconnects all open Telnet sessions.

Format `no ip telnet server enable`

Mode Privileged EXEC

3.3.2 ip telnet port

This command configures the TCP port number on which the Telnet server listens for requests.

Default 23

Format `ip telnet port` *`1-65535`*

Mode Privileged EXEC

3.3.2.1 no ip telnet port

This command restores the Telnet server listen port to its factory default value.

Format	`no ip telnet port`
Mode	Privileged EXEC

3.3.3 telnet

This command establishes a new outbound Telnet connection to a remote host. The *host* value must be a valid IP address or host name. Valid values for *port* should be a valid decimal integer in the range of 0 to 65535, where the default value is 23. If *`[debug]`* is used, the current Telnet options enabled is displayed. The optional *line* parameter sets the outbound Telnet operational mode as linemode where, by default, the operational mode is character mode. The *localecho* option enables local echo.

Format	`telnet ip-address|hostname port [debug] [line] [localecho]`
Modes	• Privileged EXEC • User EXEC

3.3.4 transport input telnet

This command regulates new Telnet sessions. If enabled, new Telnet sessions can be established until there are no more sessions available. An established session remains active until the session is ended or an abnormal network error ends the session.

NOTICE If the Telnet Server Admin Mode is disabled, Telnet sessions cannot be established. Use the `ip telnet server enable` command to enable Telnet Server Admin Mode.

Default	enabled
Format	`transport input telnet`
Mode	Line Config

3.3.4.1 no transport input telnet

Use this command to prevent new Telnet sessions from being established.

Format	`no transport input telnet`
Mode	Line Config

3.3.5 transport output telnet

This command regulates new outbound Telnet connections. If enabled, new outbound Telnet sessions can be established until the system reaches the maximum number of simultaneous outbound Telnet sessions allowed. An established session remains active until the session is ended or an abnormal network error ends it.

Default	enabled
Format	`transport output telnet`
Mode	Line Config

3.3.5.1 no transport output telnet

Use this command to prevent new outbound Telnet connection from being established.

Format	`no transport output telnet`
Mode	Line Config

3.3.6 session-limit

This command specifies the maximum number of simultaneous outbound Telnet sessions. A value of 0 indicates that no outbound Telnet session can be established.

Default	5
Format	`session-limit` *`0-5`*
Mode	Line Config

3.3.6.1 no session-limit

This command sets the maximum number of simultaneous outbound Telnet sessions to the default value.

Format	`no session-limit`
Mode	Line Config

3.3.7 session-timeout

This command sets the Telnet session timeout value.The timeout value unit of time is minutes.

Default	5
Format	`session-timeout` *`1-160`*
Mode	Line Config

3.3.7.1 no session-timeout

This command sets the Telnet session timeout value to the default. The timeout value unit of time is minutes.

Format	`no session-timeout`
Mode	Line Config

3.3.8 telnetcon maxsessions

This command specifies the maximum number of Telnet connection sessions that can be established. A value of 0 indicates that no Telnet connection can be established. The range is 0-5.

Default	5
Format	`telnetcon maxsessions` *`0-5`*
Mode	Privileged EXEC

3.3.8.1 no telnetcon maxsessions

This command sets the maximum number of Telnet connection sessions that can be established to the default value.

Format	`no telnetcon maxsessions`
Mode	Privileged EXEC

3.3.9 telnetcon timeout

This command sets the Telnet connection session timeout value, in minutes. A session is active as long as the session has not been idle for the value set. The time is a decimal value from 1 to 160.

NOTICE

When you change the timeout value, the new value is applied to all active and inactive sessions immediately. Any sessions that have been idle longer than the new timeout value are disconnected immediately.

Default	5
Format	`telnetcon timeout` *`1-160`*
Mode	Privileged EXEC

3.3.9.1 no telnetcon timeout

This command sets the Telnet connection session timeout value to the default.

NOTICE

Changing the timeout value for active sessions does not become effective until the session is accessed again. Also, any keystroke activates the new timeout duration.

Format	`no telnetcon timeout`
Mode	Privileged EXEC

3.3.10 show telnet

This command displays the current outbound Telnet settings. In other words, these settings apply to Telnet connections initiated from the switch to a remote system.

Format	`show telnet`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Outbound Telnet Login Timeout	The number of minutes an outbound Telnet session is allowed to remain inactive before being logged off.
Maximum Number of Outbound Telnet Sessions	The number of simultaneous outbound Telnet connections allowed.
Allow New Outbound Telnet Sessions	Indicates whether outbound Telnet sessions will be allowed.

3.3.11 show telnetcon

This command displays the current inbound Telnet settings. In other words, these settings apply to Telnet connections initiated from a remote system to the switch.

Format	`show telnetcon`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Remote Connection Login Timeout (minutes)	This object indicates the number of minutes a remote connection session is allowed to remain inactive before being logged off. May be specified as a number from 1 to 160. The factory default is 5.
Maximum Number of Remote Connection Sessions	This object indicates the number of simultaneous remote connection sessions allowed. The factory default is 5.
Allow New Telnet Sessions	New Telnet sessions will not be allowed when this field is set to no. The factory default value is yes.
Telnet Server Admin Mode	If Telnet Admin mode is enabled or disabled.
Telnet Server Port	The configured TCP port number on which the Telnet server listens for requests. (The default is 23.)

3.4 Secure Shell Commands

This section describes the commands you use to configure Secure Shell (SSH) access to the switch. Use SSH to access the switch from a remote management host.

NOTICE The system allows a maximum of 5 SSH sessions.

3.4.1 ip ssh

Use this command to enable SSH access to the system. (This command is the short form of the `ip ssh server enable` command)

Default	disabled
Format	`ip ssh`
Mode	Privileged EXEC

3.4.2 ip ssh port

Use this command to configure the TCP port number on which the SSH server listens for requests. Valid port numbers are from 1–65535.

Default	22
Format	`ip ssh port` *`1-65535`*
Mode	Privileged EXEC

3.4.2.1 no ip ssh port

Use this command to restore the SSH server listen port to its factory default value.

Format `no ip ssh port`

Mode Privileged EXEC

3.4.3 ip ssh protocol

This command is used to set or remove protocol levels (or versions) for SSH. Either SSH1 (1), SSH2 (2), or both SSH 1 and SSH 2 (1 and 2) can be set.

Default 2

Format `ip ssh protocol [1] [2]`

Mode Privileged EXEC

3.4.4 ip ssh server enable

This command enables the IP secure shell server. No new SSH connections are allowed, but the existing SSH connections continue to work until timed-out or logged-out.

Default enabled

Format `ip ssh server enable`

Mode Privileged EXEC

3.4.4.1 no ip ssh server enable

This command disables the IP secure shell server.

Format `no ip ssh server enable`

Mode Privileged EXEC

3.4.5 sshcon maxsessions

This command specifies the maximum number of SSH connection sessions that can be established. A value of 0 indicates that no ssh connection can be established. The range is 0 to 5.

Default 5

Format `sshcon maxsessions` *`0-5`*

Mode Privileged EXEC

3.4.5.1 no sshcon maxsessions

This command sets the maximum number of allowed SSH connection sessions to the default value.

Format `no sshcon maxsessions`

Mode Privileged EXEC

3.4.6 sshcon timeout

This command sets the SSH connection session timeout value, in minutes. A session is active as long as the session has been idle for the value set. The time is a decimal value from 1 to 160.

Changing the timeout value for active sessions does not become effective until the session is re accessed. Also, any keystroke activates the new timeout duration.

Default	5
Format	`sshcon timeout` *`1-160`*
Mode	Privileged EXEC

3.4.6.1 no sshcon timeout

This command sets the SSH connection session timeout value, in minutes, to the default.

Changing the timeout value for active sessions does not become effective until the session is re accessed. Also, any keystroke activates the new timeout duration.

Format	`no sshcon timeout`
Mode	Privileged EXEC

3.4.7 show ip ssh

This command displays the ssh settings.

Format	`show ip ssh`
Mode	Privileged EXEC

Term	Definition
Administrative Mode	This field indicates whether the administrative mode of SSH is enabled or disabled.
Protocol Level	The protocol level may have the values of version 1, version 2 or both versions 1 and version 2.
SSH Sessions Currently Active	The number of SSH sessions currently active.
Max SSH Sessions Allowed	The maximum number of SSH sessions allowed.
SSH Timeout	The SSH timeout value in minutes.
Keys Present	Indicates whether the SSH RSA and DSA key files are present on the device.
Key Generation in Progress	Indicates whether RSA or DSA key files generation is currently in progress.

3.5 Management Security Commands

This section describes commands you use to generate keys and certificates, which you can do in addition to loading them as before.

3.5.1 crypto certificate generate

Use this command to generate a self-signed certificate for HTTPS. The generated RSA key for SSL has a length of 1024 bits. The resulting certificate is generated with a common name equal to the lowest IP address of the device and a duration of 365 days.

Format	`crypto certificate generate`
Mode	Global Config

3.5.1.1 no crypto certificate generate

Use this command to delete the HTTPS certificate files from the device, regardless of whether they are self-signed or downloaded from an outside source.

Format	`no crypto certificate generate`
Mode	Global Config

3.5.2 crypto key generate rsa

Use this command to generate an RSA key pair for SSH. The new key files will overwrite any existing generated or downloaded RSA key files.

Format	`crypto key generate rsa`
Mode	Global Config

3.5.2.1 no crypto key generate rsa

Use this command to delete the RSA key files from the device.

Format	`no crypto key generate rsa`
Mode	Global Config

3.5.3 crypto key generate dsa

Use this command to generate a DSA key pair for SSH. The new key files will overwrite any existing generated or downloaded DSA key files.

Format	`crypto key generate dsa`
Mode	Global Config

3.5.3.1 no crypto key generate dsa

Use this command to delete the DSA key files from the device.

Format	`no crypto key generate dsa`
Mode	Global Config

3.6 Hypertext Transfer Protocol Commands

This section describes the commands you use to configure Hypertext Transfer Protocol (HTTP) and secure HTTP access to the switch. Access to the switch by using a Web browser is enabled by default. Everything you can view and configure by using the CLI is also available by using the Web.

3.6.1 ip http accounting exec, ip https accounting exec

This command applies user exec (start-stop/stop-only) accounting list to the line methods HTTP and HTTPS.

NOTICE The user exec accounting list should be created using the command “aaa accounting” on page 86.

Format	`ip {http|https} accounting exec {default|`*`listname`*`}`
Mode	Global Config

Parameter	Description
http/https	The line method for which the list needs to be applied.
default	The default list of methods for authorization services.
listname	An alphanumeric character string used to name the list of accounting methods.

3.6.1.1 no ip http/https accounting exec

This command deletes the authorization method list.

Format	`no ip {http|https} accounting exec {default|`*`listname`*`}`
Mode	Global Config

3.6.2 ip http authentication

Use this command to specify authentication methods for http server users. The default configuration is the local user database is checked. This action has the same effect as the command `ip http authentication local`. The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line. For example, if `none` is specified as an authentication method after `radius`, no authentication is used if the RADIUS server is down.

Default	`local`
Format	`ip http authentication method1 [method2...]`
Mode	Global Config

Parameter	Description
local	Uses the local username database for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Example: The following example configures the http authentication.

```
(switch)(config)# ip http authentication radius local
```

3.6.2.1 no ip http authentication

Use this command to return to the default.

Format	`no ip http authentication`
Mode	Global Config

3.6.3 ip https authentication

Use this command to specify authentication methods for https server users. The default configuration is the local user database is checked. This action has the same effect as the command `ip https authentication local`. The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line. For example, if `none` is specified as an authentication method after `radius`, no authentication is used if the RADIUS server is down.

Default	`local`
Format	`ip https authentication method1 [method2...]`
Mode	Global Config

Parameter	Description
local	Uses the local username database for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Example: The following example configures https authentication.

```
(switch)(config)# ip https authentication radius local
```

3.6.3.1 no ip https authentication

Use this command to return to the default.

Format	`no ip https authentication`
Mode	Global Config

3.6.4 ip http server

This command enables access to the switch through the Web interface. When access is enabled, the user can login to the switch from the Web interface. When access is disabled, the user cannot login to the switch's Web server. Disabling the Web interface takes effect immediately. All interfaces are affected.

Default	enabled
Format	`ip http server`
Mode	Privileged EXEC

3.6.4.1 no ip http server

This command disables access to the switch through the Web interface. When access is disabled, the user cannot login to the switch's Web server.

Format	`no ip http server`
Mode	Privileged EXEC

3.6.5 ip http secure-server

This command is used to enable the secure socket layer for secure HTTP.

Default	disabled
Format	`ip http secure-server`
Mode	Privileged EXEC

3.6.5.1 no ip http secure-server

This command is used to disable the secure socket layer for secure HTTP.

Format	`no ip http secure-server`
Mode	Privileged EXEC

3.6.6 ip http java

This command enables the Web Java mode. The Java mode applies to both secure and un-secure Web connections.

Default	Enabled
Format	`ip http java`
Mode	Privileged EXEC

3.6.6.1 no ip http java

This command disables the Web Java mode. The Java mode applies to both secure and un-secure Web connections.

Format	`no ip http java`
Mode	Privileged EXEC

3.6.7 ip http port

This command configures the TCP port number on which the HTTP server listens for requests.

Default	80
Format	`ip http port` *1-65535*
Mode	Privileged EXEC

3.6.7.1 no ip http port

This command restores the HTTP server listen port to its factory default value.

Format	`no ip http port`
Mode	Privileged EXEC

3.6.8 ip http rest-api port

This command configures the HTTP TCP port number on which the OpEN restful API server listens for restful requests.

Default	8080
Format	`ip http rest-api port` *1025-65535*
Mode	Privileged EXEC

3.6.8.1 no ip http rest-api port

This command restores the OpEN restful API HTTP server listen port to its factory default value.

Format	`no ip http rest-api port`
Mode	Privileged EXEC

3.6.9 ip http rest-api secure-port

This command configures the HTTPS TCP port number on which the OpEN restful API server listens for secure restful requests

Default	8443
Format	`ip http rest-api secure-port` *`1025-65535`*
Mode	Privileged EXEC

3.6.9.1 no ip http rest-api secure-port

This command restores the OpEN restful API HTTP server listen port to its factory default value.

Format	`no ip http rest-api secure-port`
Mode	Privileged EXEC

3.6.10 ip http session hard-timeout

This command configures the hard timeout for un-secure HTTP sessions in hours. Configuring this value to zero will give an infinite hard-timeout. When this timeout expires, the user will be forced to reauthenticate. This timer begins on initiation of the web session and is unaffected by the activity level of the connection.

Default	24
Format	`ip http session hard-timeout` *`1-168`*
Mode	Privileged EXEC

3.6.10.1 no ip http session hard-timeout

This command restores the hard timeout for un-secure HTTP sessions to the default value.

Format	`no ip http session hard-timeout`
Mode	Privileged EXEC

3.6.11 ip http session maxsessions

This command limits the number of allowable un-secure HTTP sessions. Zero is the configurable minimum.

Default	16
Format	`ip http session maxsessions` *`0-16`*
Mode	Privileged EXEC

3.6.11.1 no ip http session maxsessions

This command restores the number of allowable un-secure HTTP sessions to the default value.

Format	`no ip http session maxsessions`
Mode	Privileged EXEC

3.6.12 ip http session soft-timeout

This command configures the soft timeout for un-secure HTTP sessions in minutes. Configuring this value to zero will give an infinite soft-timeout. When this timeout expires the user will be forced to reauthenticate. This timer begins on initiation of the Web session and is restarted with each access to the switch.

Default	5
Format	`ip http session soft-timeout` *`1-60`*
Mode	Privileged EXEC

3.6.12.1 no ip http session soft-timeout

This command resets the soft timeout for un-secure HTTP sessions to the default value.

Format	`no ip http session soft-timeout`
Mode	Privileged EXEC

3.6.13 ip http secure-session hard-timeout

This command configures the hard timeout for secure HTTP sessions in hours. When this timeout expires, the user is forced to reauthenticate. This timer begins on initiation of the Web session and is unaffected by the activity level of the connection. The secure-session hard-timeout can not be set to zero (infinite).

Default	24
Format	`ip http secure-session hard-timeout` *`1-168`*
Mode	Privileged EXEC

3.6.13.1 no ip http secure-session hard-timeout

This command resets the hard timeout for secure HTTP sessions to the default value.

Format	`no ip http secure-session hard-timeout`
Mode	Privileged EXEC

3.6.14 ip http secure-session maxsessions

This command limits the number of secure HTTP sessions. Zero is the configurable minimum.

Default	16
Format	`ip http secure-session maxsessions` *`0-16`*
Mode	Privileged EXEC

3.6.14.1 no ip http secure-session maxsessions

This command restores the number of allowable secure HTTP sessions to the default value.

Format	`no ip http secure-session maxsessions`
Mode	Privileged EXEC

3.6.15 ip http secure-session soft-timeout

This command configures the soft timeout for secure HTTP sessions in minutes. Configuring this value to zero will give an infinite soft-timeout. When this timeout expires, you are forced to reauthenticate. This timer begins on initiation of the Web session and is restarted with each access to the switch. The secure-session soft-timeout can not be set to zero (infinite).

Default	5
Format	`ip http secure-session soft-timeout` *`1-60`*
Mode	Privileged EXEC

3.6.15.1 no ip http secure-session soft-timeout

This command restores the soft timeout for secure HTTP sessions to the default value.

Format	`no ip http secure-session soft-timeout`
Mode	Privileged EXEC

3.6.16 ip http secure-port

This command is used to set the SSL port where port can be 1025-65535 and the default is port 443.

Default	443
Format	`ip http secure-port` *`portid`*
Mode	Privileged EXEC

3.6.16.1 no ip http secure-port

This command is used to reset the SSL port to the default value.

Format	`no ip http secure-port`
Mode	Privileged EXEC

3.6.17 ip http secure-protocol

This command is used to set protocol levels (versions). The protocol level can be set to TLS1, SSL3 or to both TLS1 and SSL3.

Default	SSL3 and TLS1
Format	`ip http secure-protocol` *`[SSL3] [TLS1]`*
Mode	Privileged EXEC

3.6.18 show ip http

This command displays the http settings for the switch.

Format	`show ip http`
Mode	Privileged EXEC

Term	Definition
HTTP Mode (Unsecure)	The unsecure HTTP server administrative mode.
Java Mode	The java applet administrative mode which applies to both secure and un-secure web connections.

Term	Definition
HTTP Port	The configured TCP port on which the HTTP server listens for requests. (The default is 80.)
RESTful API HTTP Port	The HTTPS TCP port number on which the OpEN RESTful API server listens for RESTful requests.
RESTful API HTTPS Port	The HTTPS TCP port number on which the OpEN RESTful API server listens for secure RESTful requests.
Maximum Allowable HTTP Sessions	The number of allowable un-secure http sessions.
HTTP Session Hard Timeout	The hard timeout for un-secure http sessions in hours.
HTTP Session Soft Timeout	The soft timeout for un-secure http sessions in minutes.
HTTP Mode (Secure)	The secure HTTP server administrative mode.
Secure Port	The secure HTTP server port number.
Secure Protocol Level(s)	The protocol level may have the values of SSL3, TSL1, or both SSL3 and TSL1.
Maximum Allowable HTTPS Sessions	The number of allowable secure http sessions.
HTTPS Session Hard Timeout	The hard timeout for secure http sessions in hours.
HTTPS Session Soft Timeout	The soft timeout for secure http sessions in minutes.
Certificate Present	Indicates whether the secure-server certificate files are present on the device.
Certificate Generation in Progress	Indicates whether certificate generation is currently in progress.

3.7 Access Commands

Use the commands in this section to close remote connections or to view information about connections to the system.

3.7.1 disconnect

Use the `disconnect` command to close HTTP, HTTPS, Telnet or SSH sessions. Use `all` to close all active sessions, or use *`session-id`* to specify the session ID to close. To view the possible values for *`session-id`*, use the `show loginsession` command.

Format `disconnect {session_id | all}`

Mode Privileged EXEC

3.7.2 linuxsh

Use the `linuxsh` command to access the Linux shell. Use the `exit` command to exit the Linux shell and return to the CLI. The shell session will timeout after five minutes of inactivity. The inactivity timeout value can be changed using the command “session-timeout” on page 53 in Line Console mode.

Default ip-port:2324

Format `linuxsh [ip-port]`

Mode Privileged EXEC

Parameter	Description
ip-port	The IP port number on which the telnet daemon listens for connections. ip-port is an integer from 1 to 65535. The default value is 2324.

3.7.3 show loginsession

This command displays current Telnet, SSH and serial port connections to the switch. This command displays truncated user names. Use the `show loginsession long` command to display the complete usernames.

Format	`show loginsession`
Mode	Privileged EXEC

Term	Definition
ID	Login Session ID.
User Name	The name the user entered to log on to the system.
Connection From	IP address of the remote client machine or EIA-232 for the serial port connection.
Idle Time	Time this session has been idle.
Session Time	Total time this session has been connected.
Session Type	Shows the type of session, which can be HTTP, HTTPS, telnet, serial, or SSH.

3.7.4 show loginsession long

This command displays the complete user names of the users currently logged in to the switch.

Format	`show loginsession long`
Mode	Privileged EXEC

Example: The following shows an example of the command.

```
(switch) #show loginsession long
User Name
------------
admin
test1111test1111test1111test1111test1111test1111test1111test1111
```

3.8 User Account Commands

This section describes the commands you use to add, manage, and delete system users. FASTPATH software has two default users: admin and guest. The admin user can view and configure system settings, and the guest user can view settings.

NOTICE You cannot delete the admin user. There is only one user allowed with level-15 privileges. You can configure up to five level-1 users on the system.

3.8.1 aaa authentication login

Use this command to set authentication at login. The default and optional list names created with the command are used with the `aaa authentication login` command. Create a list by entering the `aaa authentication login list-name method` command, where `list-name` is any character string used to name this list. The `method` argument identifies the list of methods that the authentication algorithm tries, in the given sequence.

The additional methods of authentication are used only if the previous method returns an error, not if there is an authentication failure. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the fInal method in the command line. For example, if `none` is specified as an authentication method after `radius`, no authentication is used if the RADIUS server is down.

Default
- `defaultList`. Used by the console and only contains the method none.
- `networkList`. Used by telnet and SSH and only contains the method local.

Format `aaa authentication login {default | list-name} method1 [method2...]`

Mode Global Config

Parameter	Definition
default	Uses the listed authentication methods that follow this argument as the default list of methods when a user logs in.
list-name	Character string of up to 15 characters used to name the list of authentication methods activated when a user logs in.
method1... *[***method2...***]*	At least one from the following: • enable. Uses the enable password for authentication. • line. Uses the line password for authentication. • local. Uses the local username database for authentication. • none. Uses no authentication. • radius. Uses the list of all RADIUS servers for authentication. • tacacs. Uses the list of all TACACS servers for authentication.

Example: The following shows an example of the command.

```
(switch)(config)# aaa authentication login default radius local enable none
```

3.8.1.1 no aaa authentication login

This command returns to the default.

Format `aaa authentication login {default | list-name}`

Mode Global Config

3.8.2 aaa authentication enable

Use this command to set authentication for accessing higher privilege levels. The default enable list is `enableList`. It is used by console, and contains the method as `enable` followed by `none`.

A separate default enable list, `enableNetList`, is used for Telnet and SSH users instead of `enableList`. This list is applied by default for Telnet and SSH, and contains `enable` followed by `deny` methods. In FASTPATH, by default, the enable password is not configured. That means that, by default, Telnet and SSH users will not get access to Privileged EXEC mode. On the other hand, with default conditions, a console user always enter the Privileged EXEC mode without entering the `enable` password.

The default and optional list names created with the `aaa authentication enable` command are used with the `enable authentication` command. Create a list by entering the `aaa authentication enable list-name method` command where `list-name` is any character string used to name this list. The `method` argument identifies the list of methods that the authentication algorithm tries in the given sequence.

The user manager returns ERROR (not PASS or FAIL) for enable and line methods if no password is configured, and moves to the next configured method in the authentication list. The method `none` reflects that there is no authentication needed.

The user will only be prompted for an enable password if one is required. The following authentication methods do not require passwords:

1. none
2. deny
3. enable (if no enable password is configured)
4. line (if no line password is configured)

Example: See the examples below.

```
a. aaa authentication enable default enable none
b. aaa authentication enable default line none
c. aaa authentication enable default enable radius none
d. aaa authentication enable default line tacacs none
```

Examples a and b do not prompt for a password, however because examples c and d contain the radius and tacacs methods, the password prompt is displayed.

If the login methods include only enable, and there is no enable password configured, then FASTPATH does not prompt for a username. In such cases, FASTPATH only prompts for a password. FASTPATH supports configuring methods after the local method in authentication and authorization lists. If the user is not present in the local database, then the next configured method is tried.

The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line.

Use the command "show authorization methods" on page 71 to display information about the authentication methods.

NOTICE

Requests sent by the switch to a RADIUS server include the username `$enabx$`, where `x` is the requested privilege level. For enable to be authenticated on Radius servers, add `$enabx$` users to them. The login user ID is now sent to TACACS+ servers for enable authentication.

Default	default
Format	`aaa authentication enable {default	`*`list-name`*`}` *`method1 [method2...]`*
Mode	Global Config

Parameter	Description
default	Uses the listed authentication methods that follow this argument as the default list of methods, when using higher privilege levels.
list-name	Character string used to name the list of authentication methods activated, when using access higher privilege levels. Range: 1-15 characters.
method1 *[***method2...***]*	Specify at least one from the following: • `deny`. Used to deny access. • `enable`. Uses the enable password for authentication. • `line`. Uses the line password for authentication. • `none`. Uses no authentication. • `radius`. Uses the list of all RADIUS servers for authentication. • `tacacs`. Uses the list of all TACACS+ servers for authentication.

Example: The following example sets authentication when accessing higher privilege levels.

```
(switch)(config)# aaa authentication enable default enable.
```

3.8.2.1 no aaa authentication enable

Use this command to return to the default configuration.

Format	`no aaa authentication enable {default	`*`list-name`*`}`
Mode	Global Config

3.8.3 aaa authorization

Use this command to configure command and exec authorization method lists. This list is identified by `default` or a user-specified `list-name`. If `tacacs` is specified as the authorization method, authorization commands are notified to a TACACS-server. If `none` is specified as the authorization method, command authorization is not applicable. A maximum of five authorization method lists can be created for the `commands` type.

NOTICE Local method is not supported for command authorization. Command authorization with RADIUS will work if, and only if, the applied authentication method is also radius.

3.8.3.1 Per-Command Authorization

When authorization is configured for a line mode, the user manager sends information about an entered command to the AAA server. The AAA server validates the received command, and responds with either a PASS or FAIL response. If approved, the command is executed. Otherwise, the command is denied and an error message is shown to the user. The various utility commands like tftp, and ping, and outbound telnet should also pass command authorization. Applying the script is treated as a single command apply script, which also goes through authorization. Startup-config commands applied on device boot-up are not an object of the authorization process.

The per-command authorization usage scenario is this:

1. Configure Authorization Method List
   `aaa authorization commands` *`listname`* `tacacs radius none`
2. Apply AML to an Access Line Mode (console, telnet, SSH)
   `authorization commands` *`listname`*
3. Commands entered by the user will go through command authorization via TACACS+ or RADIUS server and will be accepted or denied.

3.8.3.2 Exec Authorization

When exec authorization is configured for a line mode, the user may not be required to use the enable command to enter Privileged EXEC mode. If the authorization response indicates that the user has sufficient privilege levels for Privileged EXEC mode, then the user bypasses User EXEC mode entirely.

The exec authorization usage scenario is this:

1. Configure Authorization Method List
   `aaa authorization exec` *`listname method1`* `[`*`method2....`*`]`
2. Apply AML to an Access Line Mode (console, telnet, SSH)
   `authorization exec` *`listname`*
3. When the user logs in, in addition to authentication, authorization will be performed to determine if the user is allowed direct access to Privileged EXEC mode.

Format	`aaa authorization {commands|exec} {default|`*`list-name`*`}` *`method1`*`[`*`method2`*`]`
Mode	Global Config

Parameter	Description
commands	Provides authorization for all user-executed commands.
exec	Provides exec authorization.
default	The default list of methods for authorization services.
list-name	Alphanumeric character string used to name the list of authorization methods.
method	`TACACS+/RADIUS/Local` and `none` are supported.

Example: The following shows an example of the command.

```
(FASTPATH Routing) #
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#aaa authorization exec default  tacacs+ none
(FASTPATH Routing) (Config)#aaa authorization commands default tacacs+ none
```

3.8.3.3 no aaa authorization

This command deletes the authorization method list.

Format `no aaa authorization {commands|exec} {default|`*`list-name`*`}`

Mode Global Config

3.8.4 authorization commands

This command applies a command authorization method list to an access method (console, telnet, ssh). For usage scenarios on per command authorization, see the command "aaa authorization" on page 69.

Format `authorization commands [default|`*`list-name`*`]`

Mode Line console, Line telnet, Line SSH

Parameter	Description
commands	This causes command authorization for each command execution attempt.

3.8.4.1 no authorization commands

This command removes command authorization from a line config mode.

Format `no authorization {commands|exec}`

Mode Line console, Line telnet, Line SSH

Example: The following shows an example of the command.

```
(Switching) (Config)#line console
(Switching) (Config-line)#authorization commands list2

(Switching) (Config-line)#
(Switching) (Config-line)#exit

(FASTPATH Switching) (Config)#
```

3.8.5 authorization exec

This command applies a command authorization method list to an access method so that the user may not be required to use the enable command to enter Privileged EXEC mode. For usage scenarios on exec authorization, see the command "aaa authorization" on page 69.

Format `authorization exec `*`list-name`*

Mode Line console, Line telnet, Line SSH

Parameter	Description
list-name	The command authorization method list.

3.8.5.1 no authorization exec

This command removes command authorization from a line config mode.

Format	`no authorization exec`
Mode	Line console, Line telnet, Line SSH

3.8.6 authorization exec default

This command applies a default command authorization method list to an access method so that the user may not be required to use the enable command to enter Privileged EXEC mode. For usage scenarios on exec authorization, see the command “aaa authorization” on page 69.

Format	`authorization exec default`
Mode	Line console, Line telnet, Line SSH

3.8.6.1 no authorization exec default

This command removes command authorization from a line config mode.

Format	`no authorization exec default`
Mode	Line console, Line telnet, Line SSH

3.8.7 show authorization methods

This command displays the configured authorization method lists.

Format	`show authorization methods`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show authorization methods

Command Authorization List       Method
------------------------- -------------------------------------
dfltCmdAuthList                  tacacs         none
list2                            none           undefined
list4                            tacacs         undefined

Line           Command Method List
------------ ------------------------------
Console        dfltCmdAuthList
Telnet         dfltCmdAuthList
SSH            dfltCmdAuthList

Exec Authorization List      Method
----------------------   -------------------------------------
dfltExecAuthList             tacacs         none
list2                        none           undefined
list4                        tacacs         undefined
```

```
Line          Exec Method List
------------ ------------------------------
Console       dfltExecAuthList
Telnet        dfltExecAuthList
SSH           dfltExecAuthList
```

3.8.8 enable authentication

Use this command to specify the authentication method list when accessing a higher privilege level from a remote telnet or console.

Format `enable authentication {default | list-name}`

Mode Line Config

Parameter	Description
default	Uses the default list created with the `aaa authentication enable` command.
list-name	Uses the indicated list created with the `aaa authentication enable` command.

Example: The following example specifies the default authentication method when accessing a higher privilege level console.

```
(switch)(config)# line console
(switch)(config-line)# enable authentication default
```

3.8.8.1 no enable authentication

Use this command to return to the default specified by the `enable authentication` command.

Format `no enable authentication`

Mode Line Config

3.8.9 username (Global Config)

Use the `username` command in Global Config mode to add a new user to the local user database. The default privilege level is 1. Using the `encrypted` keyword allows the administrator to transfer local user passwords between devices without having to know the passwords. When the `password` parameter is used along with `encrypted` parameter, the password must be exactly 128 hexadecimal characters in length. If the password strength feature is enabled, this command checks for password strength and returns an appropriate error if it fails to meet the password strength criteria. Giving the optional parameter `override-complexity-check` disables the validation of the password strength.

Format `username name {password password [encrypted [override-complexity-check] | level level [encrypted [override-complexity-check]] | override-complexity-check]} | {level level [override-complexity-check] password}`

Mode Global Config

Parameter	Description
name	The name of the user. Range: 1-64 characters.
password	The authentication password for the user. Range 8-64 characters. This value can be zero if the `no passwords min-length` command has been executed. The special characters allowed in the password include ! # $ % & ' ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~.
level	The user level. Level 0 can be assigned by a level 15 user to another user to suspend that user's access. Range 0-15. Enter access level 1 for non-privileged (switch> prompt) or 15 for highest privilege (switch# prompt) Access. If not specified where it is optional, the privilege level is 1.
encrypted	Encrypted password entered, copied from another switch configuration.
override-complexity-check	Disables the validation of the password strength.

Example: The following example configures user `bob` with password `xxxyyymmmm` and user level 15.

```
(switch)(config)# username bob password xxxyyymmmm level 15
```

Example: The following example configures user test with password testPassword and assigns a user level of 1. The password strength will not be validated.

```
(switch)(config)# username test password testPassword level 1 override-complexity-check
```

Example: A third example.

```
(Switching) (Config)#username test password testtest
```

Example: A fourth example.

```
(Switching) (Config)# username test password
e8d63677741431114f9e39a853a15e8fd35ad059e2e1b49816c243d7e08152b052eafbf23b528d348cdba1b1b7ab91be84
2278e5e970dbfc62d16dcd13c0b864 level 1 encrypted override-complexity-check

(Switching) (Config)#  username test level 15 password

Enter new password:********

Confirm new password:********
```

Example: A fifth example.

```
(Switching) (Config)# username test level 15 override-complexity-check  password

Enter new password:********

Confirm new password:********
```

3.8.9.1 no username

Use this command to remove a user name.

Format	`no username` *`name`*
Mode	Global Config

3.8.10 username nopassword

Use this command to remove an existing user's password (NULL password).

Format	`username` *`name`* `nopassword` *`[level level]`*
Mode	Global Config

Parameter	Description
name	The name of the user. Range: 1-32 characters.
password	The authentication password for the user. Range 8-64 characters.
level	The user level. Level 0 can be assigned by a level 15 user to another user to suspend that user's access. Range 0-15.

3.8.11 username unlock

Use this command to allows a locked user account to be unlocked. Only a user with Level 1 access can reactivate a locked user account.

Format `username` *`name`* `unlock`

Mode Global Config

3.8.12 username snmpv3 accessmode

This command specifies the snmpv3 access privileges for the specified login user. The valid accessmode values are `readonly` or `readwrite`. The ***`username`*** is the login user name for which the specified access mode applies. The default is `readwrite` for the “admin” user and `readonly` for all other users. You must enter the ***`username`*** in the same case you used when you added the user. To see the case of the ***`username`***, enter the `show users` command.

Defaults
- admin - readwrite
- other - readonly

Format `username snmpv3 accessmode` *`username`* `{`*`readonly`* `|` *`readwrite`*`}`

Mode Global Config

3.8.12.1 no username snmpv3 accessmode

This command sets the snmpv3 access privileges for the specified user as readwrite for the “admin” user and readonly for all other users. The ***`username`*** value is the user name for which the specified access mode will apply.

Format `no username snmpv3 accessmode` *`username`*

Mode Global Config

3.8.13 username snmpv3 authentication

This command specifies the authentication protocol to be used for the specified user. The valid authentication protocols are `none`, `md5` or `sha`. If you specify `md5` or `sha`, the login password is also used as the snmpv3 authentication password and therefore must be at least eight characters in length. The ***`username`*** is the user name associated with the authentication protocol. You must enter the ***`username`*** in the same case you used when you added the user. To see the case of the ***`username`***, enter the `show users` command.

Default no authentication

Format `username snmpv3 authentication` *`username`* `{none | md5 | sha}`

Mode Global Config

3.8.13.1 no username snmpv3 authentication

This command sets the authentication protocol to be used for the specified user to *none*. The ***`username`*** is the user name for which the specified authentication protocol is used.

Format `no username snmpv3 authentication` *`username`*

Mode Global Config

3.8.14 username snmpv3 encryption

This command specifies the encryption protocol used for the specified user. The valid encryption protocols are `des` or `none.`

If you select `des`, you can specify the required key on the command line. The encryption key must be 8 to 64 characters long. If you select the `des` protocol but do not provide a key, the user is prompted for the key. When you use the `des` protocol, the login password is also used as the snmpv3 encryption password, so it must be a minimum of eight characters. If you select **none**, you do not need to provide a key.

The ***username*** value is the login user name associated with the specified encryption. You must enter the ***username*** in the same case you used when you added the user. To see the case of the ***username***, enter the `show users` command.

Default	no encryption
Format	`username snmpv3 encryption` *`username`* `{none	des[`*`key`*`]}`
Mode	Global Config

3.8.14.1 no username snmpv3 encryption

This command sets the encryption protocol to none. The ***username*** is the login user name for which the specified encryption protocol will be used.

Format	`no username snmpv3 encryption` *`username`*
Mode	Global Config

3.8.15 username snmpv3 encryption encrypted

This command specifies the des encryption protocol and the required encryption key for the specified user. The encryption key must be 8 to 64 characters long.

Default	no encryption
Format	`username snmpv3 encryption encrypted` *`username`* `des` *`key`*
Mode	Global Config

3.8.16 show users

This command displays the configured user names and their settings. The `show users` command displays truncated user names. Use the `show users long` command to display the complete usernames. The `show users` command is only available for users with Level 15 privileges. The SNMPv3 fields will only be displayed if SNMP is available on the system.

Format	`show users`
Mode	Privileged EXEC

Term	Definition
User Name	The name the user enters to login using the serial port, Telnet or Web.
Access Mode	Shows whether the user is able to change parameters on the switch (Level 15) or is only able to view them (Level 1). As a factory default, the “admin” user has Level 15 access and the “guest” has Level 1 access.
SNMPv3 Access Mode	The SNMPv3 Access Mode. If the value is set to `ReadWrite,` the SNMPv3 user is able to set and retrieve parameters on the system. If the value is set to `ReadOnly,` the SNMPv3 user is only able to retrieve parameter information. The SNMPv3 access mode may be different than the CLI and Web access mode.
SNMPv3 Authentication	The authentication protocol to be used for the specified login user.
SNMPv3 Encryption	The encryption protocol to be used for the specified login user.

3.8.17 show users long

This command displays the complete usernames of the configured users on the switch.

Format	`show users long`
Mode	Privileged EXEC

Example: The following shows an example of the command.

```
(switch) #show users long
User Name
------------
admin
guest
test1111test1111test1111test1111
```

3.8.18 show users accounts

This command displays the local user status with respect to user account lockout and password aging.This command displays truncated user names. Use the `show users long` command to display the complete usernames.

Format	`show users accounts [detail]`
Mode	Privileged EXEC

Term	Definition
User Name	The local user account's user name.
Access Level	The user's access level (1 for non-privilege (switch>prompt) or 15 for highest privilege (switch# prompt).
Password Aging	Number of days, since the password was configured, until the password expires.
Password Expiry Date	The current password expiration date in date format.
Lockout	Indicates whether the user account is locked out (true or false).

If the detail keyword is included, the following additional fields display.

Term	Definition
Password Override Complexity Check	Displays the user's Password override complexity check status. By default it is disabled.
Password Strength	Displays the user password's strength (Strong or Weak). This field is displayed only if the Password Strength feature is enabled.

Example: The following example displays information about the local user database.

```
(switch)#show users accounts

UserName            Privilege Password Password     Lockout
                              Aging    Expiry date
------------------- --------- -------- ------------ -------
admin               15        ---      ---          False
guest               1         ---      ---          False

console#show users accounts detail

UserName...................................... admin
Privilege..................................... 15
Password Aging................................ ---
Password Expiry............................... ---
Lockout....................................... False
Override Complexity Check..................... Disable
Password Strength............................. ---

UserName...................................... guest
Privilege..................................... 1
Password Aging................................ ---
Password Expiry............................... ---
Lockout....................................... False
Override Complexity Check..................... Disable
Password Strength............................. ---
```

3.8.19 show users login-history [long]

Use this command to display information about the login history of users.

Format `show users login-history [long]`

Mode Privileged EXEC

3.8.20 show users login-history [username]

Use this command to display information about the login history of users.

Format `show users login-history [username` *`name`*`]`

Mode Privileged EXEC

Parameter	Description
name	Name of the user. Range: 1-20 characters.

Example: The following example shows user login history outputs.

```
Console>show users login-history
Login Time           Username  Protocol  Location
-------------------- --------- --------- ---------------
Jan 19 2005 08:23:48 Bob       Serial
Jan 19 2005 08:29:29 Robert    HTTP      172.16.0.8
Jan 19 2005 08:42:31 John      SSH       172.16.0.1
Jan 19 2005 08:49:52 Betty     Telnet    172.16.1.7
```

3.8.21 login authentication

Use this command to specify the login authentication method list for a line (console, telnet, or SSH). The default configuration uses the default set with the command `aaa authentication login`.

Format `login authentication {default | *list-name*}`

Mode Line Configuration

Parameter	Description
default	Uses the default list created with the `aaa authentication login` command.
list-name	Uses the indicated list created with the `aaa authentication login` command.

Example: The following example specifies the default authentication method for a console.

```
(switch) (config)# line console
(switch) (config-line)# login authentication default
```

3.8.21.1 no login authentication

Use this command to return to the default specified by the `authentication login` command.

3.8.22 password

This command allows the currently logged in user to change his or her password without having Level 15 privileges.

Format `password *cr*`

Mode User EXEC

Example: The following is an example of the command.

```
console>password

Enter old password:********

Enter new password:********

Confirm new password:********
```

3.8.23 password (Line Configuration)

Use the `password` command in Line Configuration mode to specify a password on a line. The default configuration is no password is specified.

Format `password [*password* [encrypted]]`

Mode Line Config

Parameter	Definition
password	Password for this level. Range: 8-64 characters
encrypted	Encrypted password to be entered, copied from another switch configuration. The encrypted password should be 128 characters long because the assumption is that this password is already encrypted with AES.

Example: The following example specifies a password `mcmxxyyy` on a line.

```
(switch)(config-line)# password mcmxxyyy
```

Example: The following is another example of the command.

```
(Switching)(Config-line)# password testtest

(Switching) (Config-line)# password
e8d63677741431114f9e39a853a15e8fd35ad059e2e1b49816c243d7e08152b052eafbf23b528d348cdba1b1b7ab91be84
2278e5e970dbfc62d16dcd13c0b864 encrypted

(Switching) (Config-line)# password

Enter new password:********

Confirm new password:********
```

3.8.23.1 no password (Line Configuration)

Use this command to remove the password on a line.

Format	`no password`
Mode	Line Config

3.8.24 password (User EXEC)

Use this command to allow a user to change the password for only that user. This command should be used after the password has aged. The user is prompted to enter the old password and the new password.

Format	`password`
Mode	User EXEC

Example: The following example shows the prompt sequence for executing the password command.

```
(switch)>password
Enter old password:********
Enter new password:********
Confirm new password:********
```

3.8.25 password (aaa IAS User Config)

This command is used to configure a password for a user. An optional parameter [encrypted] is provided to indicate that the password given to the command is already preencrypted.

Format	`password` *`password`* `[encrypted]`
Mode	aaa IAS User Config

3.8.25.1 no password (aaa IAS User Config)

This command is used to clear the password of a user.

Format	`no password`
Mode	aaa IAS User Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) #
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#aaa ias-user username client-1
(FASTPATH Routing) (Config-aaa-ias-User)#password client123
(FASTPATH Routing) (Config-aaa-ias-User)#no password
```

Example: The following is an example of adding a MAB Client to the Internal user database.

```
(FASTPATH Routing) #
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#aaa ias-user username 1f3ccb1157
(FASTPATH Routing) (Config-aaa-ias-User)#password 1f3ccb1157
(FASTPATH Routing) (Config-aaa-ias-User)#exit
(FASTPATH Routing) (Config)#
```

3.8.26 enable password (Privileged EXEC)

Use the `enable password` configuration command to set a local password to control access to the privileged EXEC mode.

Format	`enable password [`*`password`*` [encrypted]]`
Mode	Privileged EXEC

Parameter	Description
password	Password string. Range: 8-64 characters.
encrypted	Encrypted password you entered, copied from another switch configuration. The encrypted password should be 128 characters long because the assumption is that this password is already encrypted with AES.

Example: The following shows an example of the command.

```
(Switching) #enable password testtest

(Switching) #enable password
e8d63677741431114f9e39a853a15e8fd35ad059e2e1b49816c243d7e08152b052eafbf23b528d348cdba1b1b7ab91be84
2278e5e970dbfc62d16dcd13c0b864 encrypted

(Switching) #enable password

Enter old password:********

Enter new password:********

Confirm new password:********
```

3.8.26.1 no enable password (Privileged EXEC)

Use the `no enable password` command to remove the password requirement.

Format	`no enable password`
Mode	Privileged EXEC

3.8.27 passwords min-length

Use this command to enforce a minimum password length for local users. The value also applies to the enable password. The valid range is 8-64.

Default	8
Format	`passwords min-length` *8-64*
Mode	Global Config

3.8.27.1 no passwords min-length

Use this command to set the minimum password length to the default value.

Format	`no passwords min-length`
Mode	Global Config

3.8.28 passwords history

Use this command to set the number of previous passwords that shall be stored for each user account. When a local user changes his or her password, the user will not be able to reuse any password stored in password history. This ensures that users don't reuse their passwords often. The valid range is 0-10.

Default	0
Format	`passwords history` *0-10*
Mode	Global Config

3.8.28.1 no passwords history

Use this command to set the password history to the default value.

Format	`no passwords history`
Mode	Global Config

3.8.29 passwords aging

Use this command to implement aging on passwords for local users. When a user's password expires, the user will be prompted to change it before logging in again. The valid range is 1-365. The default is 0, or no aging.

Default	0
Format	`passwords aging` *1-365*
Mode	Global Config

3.8.29.1 no passwords aging

Use this command to set the password aging to the default value.

Format	`no passwords aging`
Mode	Global Config

3.8.30 passwords lock-out

Use this command to strengthen the security of the switch by locking user accounts that have failed login due to wrong passwords. When a lockout count is configured, a user that is logged in must enter the correct password within that count. Otherwise the user will be locked out from further switch access. Only a user with Level 15 access can reactivate a locked user account. Password lockout does not apply to logins from the serial console. The valid range is 1-5. The default is 0, or no lockout count enforced.

Default	0
Format	`passwords lock-out` *`1-5`*
Mode	Global Config

3.8.30.1 no passwords lock-out

Use this command to set the password lock-out count to the default value.

Format	`no passwords lock-out`
Mode	Global Config

3.8.31 passwords strength-check

Use this command to enable the password strength feature. It is used to verify the strength of a password during configuration.

Default	Disable
Format	`passwords strength-check`
Mode	Global Config

3.8.31.1 no passwords strength-check

Use this command to set the password strength checking to the default value.

Format	`no passwords strength-check`
Mode	Global Config

3.8.32 passwords strength maximum consecutive-characters

Use this command to set the maximum number of consecutive characters to be used in password strength. The valid range is 0-15. The default is 0. Minimum of 0 means no restriction on that set of characters.

Default	0
Format	`passwords strength maximum consecutive-characters` *`0-15`*
Mode	Global Config

3.8.33 passwords strength maximum repeated-characters

Use this command to set the maximum number of repeated characters to be used in password strength. The valid range is 0-15. The default is 0. Minimum of 0 means no restriction on that set of characters.

Default	0
Format	`passwords strength maximum consecutive-characters` *`0-15`*
Mode	Global Config

3.8.34 passwords strength minimum uppercase-letters

Use this command to enforce a minimum number of uppercase letters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	`passwords strength minimum uppercase-letters`
Mode	Global Config

3.8.34.1 no passwords strength minimum uppercase-letters

Use this command to reset the minimum uppercase letters required in a password to the default value.

Format	`no passwords minimum uppercase-letter`
Mode	Global Config

3.8.35 passwords strength minimum lowercase-letters

Use this command to enforce a minimum number of lowercase letters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	`passwords strength minimum lowercase-letters`
Mode	Global Config

3.8.35.1 no passwords strength minimum lowercase-letters

Use this command to reset the minimum lower letters required in a password to the default value.

Format	`no passwords minimum lowercase-letter`
Mode	Global Config

3.8.36 passwords strength minimum numeric-characters

Use this command to enforce a minimum number of numeric characters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	`passwords strength minimum numeric-characters`
Mode	Global Config

3.8.36.1 no passwords strength minimum numeric-characters

Use this command to reset the minimum numeric characters required in a password to the default value.

Format	`no passwords minimum numeric-characters`
Mode	Global Config

3.8.37 passwords strength minimum special-characters

Use this command to enforce a minimum number of special characters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	`passwords strength minimum special-characters`
Mode	Global Config

3.8.37.1 no passwords strength minimum special-characters

Use this command to reset the minimum special characters required in a password to the default value

Format	`no passwords minimum special-characters`
Mode	Global Config

3.8.38 passwords strength minimum character-classes

Use this command to enforce a minimum number of characters classes that a password should contain. Character classes are uppercase letters, lowercase letters, numeric characters and special characters. The valid range is 0-4. The default is 4.

Default	4
Format	`passwords strength minimum character-classes`
Mode	Global Config

3.8.38.1 no passwords strength minimum character-classes

Use this command to reset the minimum number of character classes required in a password to the default value.

Format	`no passwords minimum character-classes`
Mode	Global Config

3.8.39 passwords strength exclude-keyword

Use this command to exclude the specified keyword while configuring the password. The password does not accept the keyword in any form (in between the string, case in-sensitive and reverse) as a substring. User can configure up to a maximum of 3 keywords.

Format	`passwords strength exclude-keyword` *keyword*
Mode	Global Config

3.8.39.1 no passwords strength exclude-keyword

Use this command to reset the restriction for the specified keyword or all the keywords configured.

Format	`no passwords exclude-keyword` *`[keyword]`*
Mode	Global Config

3.8.40 show passwords configuration

Use this command to display the configured password management settings.

Format	`show passwords configuration`
Mode	Privileged EXEC

Term	Definition
Minimum Password Length	Minimum number of characters required when changing passwords.
Password History	Number of passwords to store for reuse prevention.
Password Aging	Length in days that a password is valid.
Lockout Attempts	Number of failed password login attempts before lockout.
Minimum Password Uppercase Letters	Minimum number of uppercase characters required when configuring passwords.
Minimum Password Lowercase Letters	Minimum number of lowercase characters required when configuring passwords.
Minimum Password Numeric Characters	Minimum number of numeric characters required when configuring passwords.
Maximum Password Consecutive Characters	Maximum number of consecutive characters required that the password should contain when configuring passwords.
Maximum Password Repeated Characters	Maximum number of repetition of characters that the password should contain when configuring passwords.
Minimum Password Character Classes	Minimum number of character classes (uppercase, lowercase, numeric and special) required when configuring passwords.
Password Exclude-Keywords	The set of keywords to be excluded from the configured password when strength checking is enabled.

3.8.41 show passwords result

Use this command to display the last password set result information.

Format	`show passwords result`
Mode	Privileged EXEC

Term	Definition
Last User Whose Password Is Set	Shows the name of the user with the most recently set password.
Password Strength Check	Shows whether password strength checking is enabled.
Last Password Set Result	Shows whether the attempt to set a password was successful. If the attempt failed, the reason for the failure is included.

3.8.42 aaa ias-user username

The Internal Authentication Server (IAS) database is a dedicated internal database used for local authentication of users for network access through the IEEE 802.1X feature.

Use the `aaa ias-user username` command in Global Config mode to add the specified user to the internal user database. This command also changes the mode to AAA User Config mode.

Format `aaa ias-user username` *`user`*

Mode Global Config

3.8.42.1 no aaa ias-user username

Use this command to remove the specified user from the internal user database.

Format `no aaa ias-user username` *`user`*

Mode Global Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) #
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#aaa ias-user username client-1
(FASTPATH Routing) (Config-aaa-ias-User)#exit
(FASTPATH Routing) (Config)#no aaa ias-user username client-1
(FASTPATH Routing) (Config)#
```

3.8.43 aaa session-id

Use this command in Global Config mode to specify if the same session-id is used for Authentication, Authorization and Accounting service type within a session.

Default `common`

Format `aaa session-id [common | unique]`

Mode Global Config

Parameter	Description
common	Use the same session-id for all AAA Service types.
unique	Use a unique session-id for all AAA Service types.

3.8.43.1 no aaa session-id

Use this command in Global Config mode to reset the aaa session-id behavior to the default.

Format `no aaa session-id [unique]`

Mode Global Config

3.8.44 aaa accounting

Use this command in Global Config mode to create an accounting method list for user EXEC sessions, user-executed commands, or DOT1X. This list is identified by default or a user-specified list_name. Accounting records, when enabled for a line-mode, can be sent at both the beginning and at the end (start-stop) or only at the end (stop-only). If none is specified, then accounting is disabled for the specified list. If tacacs is specified as the accounting method, accounting records are notified to a TACACS+ server. If radius is the specified accounting method, accounting records are notified to a RADIUS server.

NOTICE

Please note the following:

- A maximum of five Accounting Method lists can be created for each exec and commands type.
- Only the default Accounting Method list can be created for DOT1X. There is no provision to create more.
- The same list-name can be used for both exec and commands accounting type
- AAA Accounting for commands with RADIUS as the accounting method is not supported.
- Start-stop or None are the only supported record types for DOT1X accounting. Start-stop enables accounting and None disables accounting.
- RADIUS is the only accounting method type supported for DOT1X accounting.

Format	`aaa accounting {exec	commands	dot1x} {default	list_name} {start-stop	stop-only |none}` *`method1 [method2…]`*
Mode	Global Config

Parameter	Description
exec	Provides accounting for a user EXEC terminal sessions.
commands	Provides accounting for all user executed commands.
dot1x	Provides accounting for DOT1X user commands.
default	The default list of methods for accounting services.
list-name	Character string used to name the list of accounting methods.
start-stop	Sends a start accounting notice at the beginning of a process and a stop accounting notice at the beginning of a process and a stop accounting notice at the end of a process.
stop-only	Sends a stop accounting notice at the end of the requested user process.
none	Disables accounting services on this line.
method	Use either TACACS or radius server for accounting purposes.

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) #aaa accounting commands default stop-only tacacs
(Routing) #aaa accounting exec default start-stop radius
(Routing) #aaa accounting dot1x default start-stop radius
(Routing) #aaa accounting dot1x default none
(Routing) #exit
```

For the same set of accounting type and list name, the administrator can change the record type, or the methods list, without having to first delete the previous configuration.

```
(Routing) #
(Routing) #configure
(Routing) #aaa accounting exec ExecList stop-only tacacs
(Routing) #aaa accounting exec ExecList start-stop tacacs
(Routing) #aaa accounting exec ExecList start-stop tacacs radius
```

The first aaa command creates a method list for exec sessions with the name *ExecList*, with record-type as *stop-only* and the method as *TACACS+*. The second command changes the record type to *start-stop* from *stop-only* for the same method list. The third command, for the same list changes the methods list to {*tacacs,radius*} from {*tacacs*}.

3.8.44.1 no aaa accounting

This command deletes the accounting method list.

Format `no aaa accounting {exec | commands | dot1x} {default | list_name default}`

Mode Global Config

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) #aaa accounting commands userCmdAudit stop-only tacacs radius
(Routing) #no aaa accounting commands userCmdAudit
(Routing) #exit
```

3.8.45 password (AAA IAS User Configuration)

Use this command to specify a password for a user in the IAS database. An optional parameter encrypted is provided to indicate that the password given to the command is already preencrypted.

Format `password` *`password`* `[encrypted]`

Mode AAA IAS User Config

Parameter	Definition
password	Password for this level. Range: 8-64 characters
encrypted	Encrypted password to be entered, copied from another switch configuration.

3.8.45.1 no password (AAA IAS User Configuration)

Use this command to clear the password of a user.

Format `no password`

Mode AAA IAS User Config

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#aaa ias-user username client-1
(Routing) (Config-aaa-ias-User)#password client123
(Routing) (Config-aaa-ias-User)#no password
```

Example: The following is an example of adding a MAB Client to the Internal user database.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#aaa ias-user username 1f3ccb1157
(Routing) (Config-aaa-ias-User)#password 1f3ccb1157
(Routing) (Config-aaa-ias-User)#exit
(Routing) (Config)#
```

3.8.46 clear aaa ias-users

Use this command to remove all users from the IAS database.

Format `clear aaa ias-users`

Mode Privileged EXEC

Parameter	Definition
password	Password for this level. Range: 8-64 characters
encrypted	Encrypted password to be entered, copied from another switch configuration.

Example: The following is an example of the command.

```
(Routing) #
(Routing) #clear aaa ias-users
(Routing) #
```

3.8.47 show aaa ias-users

Use this command to display configured IAS users and their attributes. Passwords configured are not shown in the show command output.

Format	`show aaa ias-users [username]`
Mode	Privileged EXEC

Example: The following is an example of the command.

```
(Routing) #
(Routing) #show aaa ias-users

UserName
-------------------
Client-1
Client-2
```

Example: Following are the IAS configuration commands shown in the output of show running-config command. Passwords shown in the command output are always encrypted.

```
aaa ias-user username client-1
password a45c74fdf50a558a2b5cf05573cd633bac2c6c598d54497ad4c46104918f2c encrypted
exit
```

3.8.48 accounting

Use this command in Line Configuration mode to apply the accounting method list to a line config (console/telnet/ssh).

Format	`accounting {exec	commands } {default	`*`listname`*`}`
Mode	Line Configuration

Parameter	Description
exec	Causes accounting for an EXEC session.
commands	This causes accounting for each command execution attempt. If a user is enabling accounting for exec mode for the current line-configuration type, the user will be logged out.
default	The default Accounting List
listname	Enter a string of not more than 15 characters.

Example: The following is a example of the command.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#line telnet
(Routing)(Config-line)# accounting exec default
(Routing) #exit
```

3.8.48.1 no accounting

Use this command to remove accounting from a Line Configuration mode.

Format	`no accounting {exec|commands]`
Mode	Line Configuration

3.8.49 show accounting

Use this command to display ordered methods for accounting lists.

Format	`show accounting`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show accounting
Number of Accounting Notifications sent at beginning of an EXEC session:           0
Errors when sending Accounting Notifications beginning of an EXEC session:          0
Number of Accounting Notifications at end of an EXEC session:                      0
Errors when sending Accounting Notifications at end of an EXEC session:             0
Number of Accounting Notifications sent at beginning of a command execution:        0
Errors when sending Accounting Notifications at beginning of a command execution:   0
Number of Accounting Notifications sent at end of a command execution:              0
Errors when sending Accounting Notifications at end of a command execution:         0
```

3.8.50 show accounting methods

Use this command to display configured accounting method lists.

Format	`show accounting methods`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #
(Routing) #show accounting methods

Acct Type       Method Name     Record Type    Method Type
----------     ------------    ------------   ------------
Exec           dfltExecList      start-stop    TACACS
Commands       dfltCmdsList      stop-only     TACACS
Commands       UserCmdAudit      start-stop    TACACS
DOT1X          dfltDot1xList     start-stop    radius

Line     EXEC Method List    Command Method List
-------  ---------------------------------------
Console  dfltExecList          dfltCmdsList
Telnet   dfltExecList          dfltCmdsList
SSH      dfltExecList          UserCmdAudit
```

3.8.51 clear accounting statistics

This command clears the accounting statistics.

Format	`clear accounting statistics`
Mode	Privileged EXEC

3.8.52 show domain-name

This command displays the configured domain-name.

Format	`show domain-name`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #
(Routing) #show domain-name

Domain                 : Enable
Domain-name            :abc
```

3.9 SNMP Commands

This section describes the commands you use to configure Simple Network Management Protocol (SNMP) on the switch. You can configure the switch to act as an SNMP agent so that it can communicate with SNMP managers on your network.

3.9.1 snmp-server

This command sets the name and the physical location of the switch, and the organization responsible for the network. The parameters *`name`*, *`loc`* and *`con`* can be up to 255 characters in length.

Default	none
Format	`snmp-server {sysname` *`name`* `| location` *`loc`* `| contact` *`con`*`}`
Mode	Global Config

NOTICE To clear the snmp-server, enter an empty string in quotes. For example, snmp-server {sysname “ ”} clears the system name.

3.9.2 snmp-server community

This command adds (and names) a new SNMP community, and optionally sets the access mode, allowed IP address, and create a view for the community.

NOTICE Community names in the SNMP Community Table must be unique. When making multiple entries using the same community name, the first entry is kept and processed and all duplicate entries are ignored.

Format	`snmp-server community` *`community-string`* `[{ro	rw |su }] [ipaddress` *`ip-address`*`] [view` *`view-name`*`]`
Mode	Global Config

Parameter	Description
community-name	A name associated with the switch and with a set of SNMP managers that manage it with a specified privileged level. The length of `community-name` can be up to 16 case-sensitive characters.
ro | rw | su	The access mode of the SNMP community, which can be public (Read-Only/RO), private (Read-Write/RW), or Super User (SU).
ip-address	The associated community SNMP packet sending address and is used along with the client IP mask value to denote a range of IP addresses from which SNMP clients may use that community to access the device. A value of 0.0.0.0 allows access from any IP address. Otherwise, this value is ANDed with the mask to determine the range of allowed client IP addresses.
view-name	The name of the view to create or update.

3.9.2.1 no snmp-server community

This command removes this community name from the table. The *name* is the community name to be deleted.

Format `no snmp-server community` *`community-name`*

Mode Global Config

3.9.3 snmp-server community-group

This command configures a community access string to permit access via the SNMPv1 and SNMPv2c protocols.

Format `snmp-server community-group` *`community-string group-name`* `[ipaddress` *`ipaddress`*`]`

Mode Global Config

Parameter	Description
community-string	The community which is created and then associated with the group. The range is 1 to 20 characters.
group-name	The name of the group that the community is associated with. The range is 1 to 30 characters.
ipaddress	Optionally, the IPv4 address that the community may be accessed from.

3.9.4 snmp-server enable traps violation

The Port MAC locking component interprets this command and configures violation action to send an SNMP trap with default trap frequency of 30 seconds. The Global command configures the trap violation mode across all interfaces valid for port-security. There is no global trap mode as such.

NOTICE For other port security commands, see “Port Security Commands” on page 463.

Default disabled

Format `snmp-server enable traps violation`

Mode
- Global Config
- Interface Config

3.9.4.1 no snmp-server enable traps violation

This command disables the sending of new violation traps.

Format	`no snmp-server enable traps violation`
Mode	Interface Config

3.9.5 snmp-server enable traps

This command enables the Authentication Flag.

Default	enabled
Format	`snmp-server enable traps`
Mode	Global Config

3.9.5.1 no snmp-server enable traps

This command disables the Authentication Flag.

Format	`no snmp-server enable traps`
Mode	Global Config

3.9.6 snmp-server enable traps fip-snooping

NOTICE This command may not be available on all platforms.

This command enables FCoE Initialization Protocol (FIP) snooping traps for the entire switch. When enabled, link traps are sent only if the Link Trap flag setting associated with the port is enabled. See “show snmp” on page 101.

Default	enabled
Format	`snmp-server enable traps fip-snooping`
Mode	Global Config

3.9.6.1 no snmp-server enable traps fip-snooping

NOTICE This command may not be available on all platforms.

This command disables FCoE Initialization Protocol (FIP) snooping traps for the entire switch.

Default	enabled
Format	`no snmp-server enable traps fip-snooping`
Mode	Global Config

3.9.7 snmp-server enable traps all

This command enables all traps.

Default	enabled
Format	**`snmp-server enable traps all`**
Mode	Global Config

3.9.7.1 no snmp-sever enable traps

This command disables all traps.

Format	**`no snmp-server enable traps all`**
Mode	Global Config

3.9.8 snmp-server port

This command configures the UDP port number on which the SNMP server listens for requests.

Default	161
Format	`snmp-server port` *`1025-65535`*
Mode	Privileged EXEC

3.9.8.1 no snmp-server port

This command restores the SNMP server listen port to its factory default value.

Format	`no snmp-server port`
Mode	Privileged EXEC

3.9.9 snmp trap link-status

This command enables link status traps on an interface or range of interfaces.

NOTICE This command is valid only when the Link Up/Down Flag is enabled.

Format	`snmp trap link-status`
Mode	Interface Config

3.9.9.1 no snmp trap link-status

This command disables link status traps by interface.

NOTICE This command is valid only when the Link Up/Down Flag is enabled.

Format	`no snmp trap link-status`
Mode	Interface Config

3.9.10 snmp trap link-status all

This command enables link status traps for all interfaces.

NOTICE This command is valid only when the Link Up/Down Flag is enabled.

Format	`snmp trap link-status all`
Mode	Global Config

3.9.10.1 no snmp trap link-status all

This command disables link status traps for all interfaces.

NOTICE This command is valid only when the Link Up/Down Flag is enabled.

Format	`no snmp trap link-status all`
Mode	Global Config

3.9.11 snmp-server enable traps linkmode

NOTICE This command may not be available on all platforms.

This command enables Link Up/Down traps for the entire switch. When enabled, link traps are sent only if the Link Trap flag setting associated with the port is enabled. See "show snmp" on page 101.

Default	enabled
Format	`snmp-server enable traps linkmode`
Mode	Global Config

3.9.11.1 no snmp-server enable traps linkmode

This command disables Link Up/Down traps for the entire switch.

Format	`no snmp-server enable traps linkmode`
Mode	Global Config

3.9.12 snmp-server enable traps multiusers

This command enables Multiple User traps. When the traps are enabled, a Multiple User Trap is sent when a user logs in to the terminal interface (EIA 232 or Telnet) and there is an existing terminal interface session.

Default	enabled
Format	`snmp-server enable traps multiusers`
Mode	Global Config

3.9.12.1 no snmp-server enable traps multiusers

This command disables Multiple User traps.

Format	`no snmp-server enable traps multiusers`
Mode	Global Config

3.9.13 snmp-server enable traps stpmode

This command enables the sending of new root traps and topology change notification traps.

Default	enabled
Format	`snmp-server enable traps stpmode`
Mode	Global Config

3.9.13.1 no snmp-server enable traps stpmode

This command disables the sending of new root traps and topology change notification traps.

Format	`no snmp-server enable traps stpmode`
Mode	Global Config

3.9.14 snmp-server engineID local

This command configures the SNMP engine ID on the local device.

Default	The engineID is configured automatically, based on the device MAC address.
Format	`snmp-server engineID local {`*`engineid-string`*`|default}`
Mode	Global Config

Parameter	Description
engineid-string	A hexadecimal string identifying the engine-id, used for localizing configuration. Engine-id must be an even length in the range of 6 to 32 hexadecimal characters.
default	Sets the engine-id to the default string, based on the device MAC address.
ip	The command is extended by KONTRON to select a RFC 3411 defined algorithm using a specified IP address (ip) . The IP address must be specified as string. A RFC 3411 related prefix (5 octets) is added. Note that the show command shows the engine-id always hexadecimal.
text	The command is extended by KONTRON to select a RFC 3411 defined algorithm using a pecified text (text). The text must be specified as string, it may be quoted to allow spaces, maximum length is 27 characters. A RFC 3411 related prefix (5 octets) is added. Note that the show command shows the engine-id always hexadecimal.

⚠CAUTION Changing the engine-id will invalidate all SNMP configuration that exists on the box.

3.9.14.1 no snmp-server engineID local

This command removes the specified engine ID.

Default	The engineID is configured automatically, based on the device MAC address.
Format	`no snmp-server engineID local`
Mode	Global Config

3.9.15 snmp-server filter

This command creates a filter entry for use in limiting which traps will be sent to a host.

Default	No filters are created by default.
Format	`snmp-server filter` *`filtername oid-tree`* `{included|excluded}`
Mode	Global Config

Parameter	Description
filtername	The label for the filter being created. The range is 1 to 30 characters.
oid-tree	The OID subtree to include or exclude from the filter. Subtrees may be specified by numerical (1.3.6.2.4) or keywords (system), and asterisks may be used to specify a subtree family (1.3.*.4).
included	The tree is included in the filter.
excluded	The tree is excluded from the filter.

3.9.15.1 no snmp-server filter

This command removes the specified filter.

Default	No filters are created by default.
Format	`snmp-server filter` *`filtername`* `[`*`oid-tree`*`]`
Mode	Global Config

3.9.16 snmp-server group

This command creates an SNMP access group.

Default	Generic groups are created for all versions and privileges using the default views.
Format	`snmp-server group` *`group-name`* `{v1	v2c	v3 {noauth	auth	priv}} [context` *`context-name`*`] [read` *`read-view`*`] [write` *`write-view`*`] [notify` *`notify-view`*`]`
Mode	Global Config

Parameter	Description
group-name	The group name to be used when configuring communities or users. The range is 1 to 30 characters.
v1	This group can only access via SNMPv1.
v2	This group can only access via SNMPv2c.
v3	This group can only access via SNMPv3.
noauth	This group can be accessed only when not using Authentication or Encryption. Applicable only if SNMPv3 is selected.
auth	This group can be accessed only when using Authentication but not Encryption. Applicable only if SNMPv3 is selected.
priv	This group can be accessed only when using both Authentication and Encryption. Applicable only if SNMPv3 is selected.
context-name	The SNMPv3 context used during access. Applicable only if SNMPv3 is selected.
read-view	The view this group will use during GET requests. The range is 1 to 30 characters.
write-view	The view this group will use during SET requests. The range is 1 to 30 characters.
notify-view	The view this group will use when sending out traps. The range is 1 to 30 characters.

3.9.16.1 no snmp-server group

This command removes the specified group.

Format	`no snmp-server group` *`group-name`* `{v1|v2c| 3 {noauth|auth|priv}} [context context-name]`
Mode	Global Config

3.9.17 snmp-server host

This command configures traps to be sent to the specified host.

Default	No default hosts are configured.
Format	`snmp-server host` *`host-addr`* `{informs [timeout` *`seconds`*`] [retries` *`retries`*`]|traps version {1	2c }} community-string [udp-port` *`port`*`] [filter` *`filter-name`*`]`
Mode	Global Config

Parameter	Description
host-addr	The IPv4 or IPv6 address of the host to send the trap or inform to.
traps	Send SNMP traps to the host. This option is selected by default.
version 1	Sends SNMPv1 traps. This option is not available if informs is selected.
version 2	Sends SNMPv2c traps. This option is not available if informs is selected. This option is selected by default.
informs	Send SNMPv2 informs to the host.
seconds	The number of seconds to wait for an acknowledgement before resending the Inform. The default is 15 seconds. The range is 1 to 300 seconds.
retries	The number of times to resend an Inform. The default is 3 attempts. The range is 0 to 255 retries.
community-string	Community string sent as part of the notification. The range is 1 to 20 characters.
port	The SNMP Trap receiver port. The default is port 162.
filter-name	The filter name to associate with this host. Filters can be used to specify which traps are sent to this host. The range is 1 to 30 characters.

3.9.17.1 no snmp-server host

This command removes the specified host entry.

Format	`no snmp-server host` *`host-addr`* `[traps|informs]`
Mode	Global Config

3.9.18 snmp-server user

This command creates an SNMPv3 user for access to the system.

Default	No default users are created.
Format	`snmp-server user` *`username groupname`* `[remote` *`engineid-string`*`] [ {auth-md5` *`password`* `| auth-sha` *`password`* `| auth-md5-key` *`md5-key`* `| auth-sha-key` *`sha-key`*`} [priv-des` *`password`* `| priv-des-key` *`des-key`*`]`
Mode	Global Config

Parameter	Description
username	The username the SNMPv3 user will connect to the switch as. The range is 1 to 30 characters.
group-name	The name of the group the user belongs to. The range is 1 to 30 characters.
engineid-string	The engine-id of the remote management station that this user will be connecting from. The range is 5 to 32 characters.
password	The password the user will use for the authentication or encryption mechanism. The range is 1 to 32 characters.
md5-key	A pregenerated MD5 authentication key. The length is 32 characters.
sha-key	A pregenerated SHA authentication key. The length is 48 characters.
des-key	A pregenerated DES encryption key. The length is 32 characters if MD5 is selected, 48 characters if SHA is selected.

3.9.18.1 no snmp-server user

This command removes the specified SNMPv3 user.

Format	`no snmp-server user` *`username`*
Mode	Global Config

3.9.19 snmp-server view

This command creates or modifies an existing view entry that is used by groups to determine which objects can be accessed by a community or user.

Default	Views are created by default to provide access to the default groups.
Format	`snmp-server` *`viewname oid-tree`* `{included|excluded}`
Mode	Global Config

Parameter	Description
viewname	The label for the view being created. The range is 1 to 30 characters.
oid-tree	The OID subtree to include or exclude from the view. Subtrees may be specified by numerical (1.3.6.2.4) or keywords (system), and asterisks may be used to specify a subtree family (1.3.*.4).
included	The tree is included in the view.
excluded	The tree is excluded from the view.

3.9.19.1 no snmp-server view

This command removes the specified view.

Format	`no snmp-server view` *`viewname`* `[`*`oid-tree`*`]`
Mode	Global Config

3.9.20 snmp-server v3-host

This command configures traps to be sent to the specified host.

Default	No default hosts are configured.
Format	`snmp-server v3-host` *`host-addr username`* `[traps	informs [timeout` *`seconds`*`] [retries` *`retries`*`]] [auth	noauth	priv] [udpport` *`port`*`] [filter` *`filtername`*`]`
Mode	Global Config

Parameter	Description
host-addr	The IPv4 or IPv6 address of the host to send the trap or inform to.
user-name	User used to send a Trap or Inform message. This user must be associated with a group that supports the version and access method. The range is 1 to 30 characters.
traps	Send SNMP traps to the host. This is the default option.
informs	Send SNMP informs to the host.
seconds	Number of seconds to wait for an acknowledgement before resending the Inform. The default is 15 seconds. The range is 1 to 300 seconds.
retries	Number of times to resend an Inform. The default is 3 attempts. The range is 0 to 255 retries.
auth	Enables authentication but not encryption.
noauth	No authentication or encryption. This is the default.
priv	Enables authentication and encryption.
port	The SNMP Trap receiver port. This value defaults to port 162.
filter-name	The filter name to associate with this host. Filters can be used to specify which traps are sent to this host. The range is 1 to 30 characters.

3.9.21 snmptrap source-interface

Use this command in Global Configuration mode to configure the global source-interface (Source IP address) for all SNMP communication between the SNMP client and the server.

Format	`snmptrap source-interface {`*`slot/port`*`	loopback `*`loopback-id`*`|tunnel `*`tunnel-id`*`|vlan `*`vlan-id`*`}`
Mode	Global Configuration

Parameter	Description
slot/port	The unit identifier assigned to the switch.
loopback-id	Configures the loopback interface. The range of the loopback ID is 0 to 7.
tunnel-id	Configures the IPv6 tunnel interface. The range of the tunnel ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

3.9.21.1 no snmptrap source-interface

Use this command in Global Configuration mode to remove the global source-interface (Source IP selection) for all SNMP communication between the SNMP client and the server.

Format	`no snmptrap source-interface`
Mode	Global Configuration

3.9.22 snmptrap ipaddr snmpversion

This command modifies the SNMP version of a trap. The maximum length of *name* is 16 case-sensitive alphanumeric characters. The *snmpversion* parameter options are snmpv1 or snmpv2.

NOTICE This command does not support a “no” form.

Format	`snmptrap ipaddr snmpversion` *name snmpversion*
Mode	Global Configuration

3.9.23 snmptrap ip6addr snmpversion

This command modifies the SNMP version of a trap. The maximum length of *name* is 16 case-sensitive alphanumeric characters. The *snmpversion* parameter options are snmpv1 or snmpv2.

NOTICE This command does not support a “no” form.

Format	`snmptrap ip6addr snmpversion` *name snmpversion*
Mode	Global Configuration

3.9.24 show snmp

This command displays the current SNMP configuration.

Format	`show snmp`
Mode	Privileged EXEC

Term		Definition
Community Table:	**Community-String**	The community string for the entry. This is used by SNMPv1 and SNMPv2 protocols to access the switch.
	Community-Access	The type of access the community has: • Read only • Read write • su
	View Name	The view this community has access to.
	IP Address	Access to this community is limited to this IP address.

Term		Definition
Community Group Table:	**Community-String**	The community this mapping configures
	Group Name	The group this community is assigned to.
	IP Address	The IP address this community is limited to.
Host Table:	**Target Address**	The address of the host that traps will be sent to.
	Type	The type of message that will be sent, either traps or informs.
	Community	The community traps will be sent to.
	Version	The version of SNMP the trap will be sent as.
	UDP Port	The UDP port the trap or inform will be sent to.
	Filter name	The filter the traps will be limited by for this host.
	TO Sec	The number of seconds before informs will time out when sending to this host.
	Retries	The number of times informs will be sent after timing out.

3.9.25 show snmp engineID

This command displays the currently configured SNMP engineID.

Format	`show snmp engineID`
Mode	Privileged EXEC

Parameter	Description
Local SNMP EnginID	The current configuration of the displayed SNMP engineID.

3.9.26 show snmp filters

This command displays the configured filters used when sending traps.

Format	`show snmp filters [`*`filtername`*`]`
Mode	Privileged EXEC

Parameter	Description
Name	The filter name for this entry.
OID Tree	The OID tree this entry will include or exclude.
Type	Indicates if this entry includes or excludes the OID Tree.

3.9.27 show snmp group

This command displays the configured groups.

Format	`show snmp group [`*`groupname`*`]`
Mode	Privileged EXEC

Parameter	Description
Name	The name of the group.
Security Model	Indicates which protocol can access the system via this group.

Parameter	Description
Security Level	Indicates the security level allowed for this group.
Read View	The view this group provides read access to.
Write View	The view this group provides write access to.
Notify View	The view this group provides trap access to.

3.9.28 show snmp-server

This command displays the current SNMP server user configuration.

The command is extended by Kontron (parameter 'sysinfo') to display additionally snmp-server system information. This consists of the name, the physical location of the switch or the organisation responsible for network. All parameters are listed for 'all'. This information is provided for the SNMP in the standard MIB-2 in OIDs "sysName", "sysLocation" and "sysContact".

Format	`show snmp-server` **`sysinfo {sysname	location	contact	all}`**
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing)#show snmp-server

SNMP Server Port............................... 161
```

3.9.29 show snmp source-interface

Use this command in Privileged EXEC mode to display the configured global source-interface (Source IP address) details used for an SNMP client.

Format	`show snmp source-interface`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing)# show snmp source-interface
SNMP trap Client Source Interface............. (not configured)
```

3.9.30 show snmp user

This command displays the currently configured SNMPv3 users.

Format	`show snmp user [`*`username`*`]`
Mode	Privileged EXEC

Term	Definition
Name	The name of the user.
Group Name	The group that defines the SNMPv3 access parameters.
Auth Method	The authentication algorithm configured for this user.
Privilege Method	The encryption algorithm configured for this user.
Remote Engine ID	The engineID for the user defined on the client machine.

3.9.31 show snmp views

This command displays the currently configured views.

Format `show snmp views [viewname]`

Mode Privileged EXEC

Parameter	Description
Name	The view name for this entry.
OID Tree	The OID tree that this entry will include or exclude.
Type	Indicates if this entry includes or excludes the OID tree.

3.9.32 show trapflags

This command displays trap conditions. The command's display shows all the enabled OSPFv2 and OSPFv3 trapflags. Configure which traps the switch should generate by enabling or disabling the trap condition. If a trap condition is enabled and the condition is detected, the SNMP agent on the switch sends the trap to all enabled trap receivers. You do not have to reset the switch to implement the changes. Cold and warm start traps are always generated and cannot be disabled.

Format `show trapflags`

Mode Privileged EXEC

Term	Definition
Authentication Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether authentication failure traps will be sent.
Link Up/Down Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether link status traps will be sent.
Multiple Users Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether a trap will be sent when the same user ID is logged into the switch more than once at the same time (either through Telnet or the serial port).
Spanning Tree Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether spanning tree traps are sent.
ACL Traps	May be enabled or disabled. The factory default is disabled. Indicates whether ACL traps are sent.
DVMRP Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether DVMRP traps are sent.
OSPFv2 Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether OSPF traps are sent. If any of the OSPF trap flags are not enabled, then the command displays *`disabled`*. Otherwise, the command shows all the enabled OSPF traps' information.
OSPFv3 Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether OSPF traps are sent. If any of the OSPFv3 trap flags are not enabled, then the command displays *`disabled`*. Otherwise, the command shows all the enabled OSPFv3 traps' information.
PIM Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether PIM traps are sent.

3.10 RADIUS Commands

This section describes the commands you use to configure the switch to use a Remote Authentication Dial-In User Service (RADIUS) server on your network for authentication and accounting.

3.10.1 aaa server radius dynamic-author

This command enables CoA functionality and enters dynamic authorization local server configuration mode.

Default	None
Format	`aaa server radius dynamic-author`
Mode	Global Config

Example:

```
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#aaa server radius dynamic-author
(FASTPATH Routing) (Config- radius-da)#
```

3.10.1.1 no aaa server radius dynamic-author

This command disables CoA functionality.

Default	None
Format	`no aaa server radius dynamic-author`
Mode	Global Config

Example:

```
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#no aaa server radius dynamic-author
```

3.10.2 authentication command bounce-port ignore

This command configures the device to ignore a RADIUS server `bounce-host-port` command. The `bounce-host-port` command causes a host to flap the link on an authentication port. The link flap causes DHCP renegotiation from one or more hosts connected to this port.

Default	FALSE (Bounce-Port messages will be processed)
Format	`authentication command bounce-port ignore`
Mode	Global Config

Example:

```
(Routing) #configure
(Routing) (Config)#authentication command bounce-port ignore
```

3.10.2.1 no authentication command bounce-port ignore

This command resets the device to the default value so that RADIUS server bounce-host-port commands are processed.

Format	`no authentication command bounce-port ignore`
Mode	Global Config

Example:

```
(Routing) #configure
(Routing) (Config)#no authentication command bounce-port ignore
```

3.10.3 auth-type

Use this command to specify the type of authorization that the device uses for RADIUS clients. The client must match the configured attributes for authorization.

Default	All
Format	`auth-type { any | all | session-key }`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#auth-type all
```

3.10.3.1 no auth-type

Use this command to reset the type of authorization that the device must use for RADIUS clients.

Default	None
Format	`no auth-type`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#no auth-type
```

3.10.4 authorization network radius

Use this command to enable the switch to accept VLAN assignment by the radius server.

Default	disable
Format	`authorization network radius`
Mode	Global Config

3.10.4.1 no authorization network radius

Use this command to disable the switch to accept VLAN assignment by the radius server.

Format	`no authorization network radius`
Mode	Global Config

3.10.5 clear radius dynamic-author statistics

This command clears radius dynamic authorization counters.

Default	None
Format	`clear radius dynamic-author statistics`
Mode	Privileged EXEC

Example:

```
 (FASTPATH Routing) #clear radius dynamic-author statistics

Are you sure you want to clear statistics? (y/n) y

Statistics cleared.
```

3.10.6 client

Use this command to configure the IP address or hostname of the AAA server client. Use the optional server-key keyword and string argument to configure the server key at the client level.

Default	None
Format	client { *ip-address* | *hostname* } [server-key [0|7] *key-string*]
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#client 10.0.0.1 server-key 7  device1
```

3.10.6.1 no client

Use this command to remove the configured Dynamic Authorization client and the key associated with that client in the device.

Default	None
Format	no client { *ip-address* | *hostname* }
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#no client 10.0.0.1
```

3.10.7 debug aaa coa

Use this command to display Dynamic Authorization Server processing debug information.

Default	None
Format	debug aaa coa
Mode	Dynamic Authorization

3.10.8 debug aaa pod

Use this command to display Disconnect Message packets.

Default	None
Format	debug aaa pod
Mode	Dynamic Authorization

3.10.9 ignore server-key

Use this optional command to configure the device to ignore the server key.

Default	Disable
Format	ignore server-key
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#ignore server-key
```

3.10.9.1 no ignore server-key

Use this optional command to configure the device not to ignore the server key (that is, it resets the ignore server key property on the device).

Default	Disable
Format	`no ignore server-key`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#no ignore server-key
```

3.10.10 ignore session-key

Use this optional command to configure the device to ignore the session key.

Default	Disable
Format	`ignore session-key`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#ignore session-key
```

3.10.10.1 no ignore session-key

Use this optional command to configure the device to not ignore the session key (that is, it resets the ignore session key property on the device).

Default	Disable
Format	`no ignore session-key`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#no ignore session-key
```

3.10.11 port

Use this command to specify the UDP port on which a device listens for RADIUS requests from configured Dynamic Authorization clients. The supported range for the port-number is 1025 to 65535.

Default	3799
Format	`port` *`port-number`*
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#port 1700
```

3.10.11.1 no port

Use this command to reset the configured UDP port on which a device listens for RADIUS requests from configured Dynamic Authorization clients.

Default	3799
Format	`no port`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config- radius-da)#no port
```

3.10.12 radius accounting mode

This command is used to enable the RADIUS accounting function.

Default	disabled
Format	`radius accounting mode`
Mode	Global Config

3.10.12.1 no radius accounting mode

This command is used to set the RADIUS accounting function to the default value - i.e. the RADIUS accounting function is disabled.

Format	`no radius accounting mode`
Mode	Global Config

3.10.13 radius server attribute

This command specifies the RADIUS client to use the specified RADIUS attribute in the RADIUS requests. The supported attributes are as follows:

- 4: Include the NAS-IP Address attribute. If the specific IP address is configured while enabling this attribute, the RADIUS client uses that IP address while sending NAS-IP-Address attribute in RADIUS communication.
- 95: Include the NAS-IPV6-Address attribute. If the specific IPv6 address is configured while enabling this attribute, the RADIUS client uses that IPv6 address while sending NAS-IPV6-Address attribute in RADIUS communication.
- 31: This command configures the format in which the MAC address is sent to the RADIUS server. Use the ***ipaddr*** option to specify the RADIUS server to which the MAC address format is applicable. If no IP address is provided, the format applies to all RADIUS servers.

Default	(Attribute 31 only) MAC address format: legacy lower case
Format	`radius server attribute {4 [`*`ipaddr`*`]	95 [`*`ipv6_addr`*`]	31 mac-format {leagacy `*`lower-case`*`	`*`upper-case`*`	ietf `*`lower-case`*`	`*`upper-case`*`	unformatted `*`lower-case`*`	`*`upper-case`*` } [`*`ipaddr`*`]}`
Mode	Global Config

Term	Definition
4	NAS-IP-Address attribute to be used in RADIUS requests.
ipaddr	The IP address of the server.
ipv6_addr	The IPv6 address of the server.
ietf	**Format the MAC address as xx-xx-xx-xx-xx-xx.**
legacy	**Format the MAC address as xx:xx:xx:xx:xx:xx**
unformatted	**Format the MAC address as aaaabbbbcccc.**

Example: The following shows an example of the command.

```
(Switch) (Config) #radius server attribute 4  192.168.37.60
```

Example: The following shows an example of the command.

```
(Switch) (Config) #(Config)#radius server attribute 95 3ffe:ffff:100:f101::1
```

Example: The following shows an example of the command.

```
(Switch) (Config) #(Config)#radius server attribute 31 mac-format unformatted lower-case
```

3.10.13.1 no radius server attribute

The no version of this command resets the RADIUS attributes to their default values. For attributes 4 and 95, this command disables the specified attribute global parameter for the RADIUS client. When this parameter is disabled, the RADIUS client does not send the NAS-IP-Address or NAS-IPv6-Address attribute in RADIUS requests.

Format no radius server attribute {4 [*ipaddr*] | 95 [*ipv6_addr*] | 31 mac-format}

Mode Global Config

3.10.14 radius server host

This command configures the IP address or DNS name to use for communicating with the RADIUS server of a selected server type. While configuring the IP address or DNS name for the authenticating or accounting servers, you can also configure the port number and server name. If the authenticating and accounting servers are configured without a name, the command uses the Default_RADIUS_Auth_Server and Default_RADIUS_Acct_Server as the default names, respectively. The same name can be configured for more than one authenticating servers and the name should be unique for accounting servers. The RADIUS client allows the configuration of a maximum 32 authenticating and accounting servers.

If you use the ***auth*** parameter, the command configures the IP address or hostname to use to connect to a RADIUS authentication server. You can configure up to 3 servers per RADIUS client. If the maximum number of configured servers is reached, the command fails until you remove one of the servers by issuing the “no” form of the command. If you use the optional ***port*** parameter, the command configures the UDP port number to use when connecting to the configured RADIUS server. The ***port*** number range is 1 - 65535, with 1812 being the default value.

NOTICE To reconfigure a RADIUS authentication server to use the default UDP ***port***, set the ***port*** parameter to 1812.

If you use the ***acct*** token, the command configures the IP address or hostname to use for the RADIUS accounting server. You can only configure one accounting server. If an accounting server is currently configured, use the “no” form of the command to remove it from the configuration. The IP address or hostname you specify must match that of a previously configured accounting server. If you use the optional ***port*** parameter, the command configures the UDP port to use when connecting to the RADIUS accounting server. If a ***port*** is already configured for the accounting server, the new ***port*** replaces the previously configured ***port***. The ***port*** must be a value in the range 0 - 65535, with 1813 being the default.

NOTICE To reconfigure a RADIUS accounting server to use the default UDP ***port***, set the ***port*** parameter to 1813.

Format radius server host {auth | acct} {*ipaddr*|*dnsname*} [name *servername*] [port *0-65535*]

Mode Global Config

Field	Description
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
0-65535	The port number to use to connect to the specified RADIUS server.
servername	The alias name to identify the server.

3.10.14.1 no radius server host

The **no** version of this command deletes the configured server entry from the list of configured RADIUS servers. If the RADIUS authenticating server being removed is the active server in the servers that are identified by the same server name, then the RADIUS client selects another server for making RADIUS transactions. If the 'auth' token is used, the previously configured RADIUS authentication server is removed from the configuration. Similarly, if the 'acct' token is used, the previously configured RADIUS accounting server is removed from the configuration. The ***ipaddr|dnsname*** parameter must match the IP address or DNS name of the previously configured RADIUS authentication / accounting server.

Format	`no radius server host {auth	acct} {`*ipaddr|dnsname*`}`
Mode	Global Config

Example: The following shows an example of the command.

```
(Switch) (Config) #radius server host acct 192.168.37.60
(Switch) (Config) #radius server host acct 192.168.37.60 port 1813
(Switch) (Config) #radius server host auth 192.168.37.60 name Network1_RS port 1813
(Switch) (Config) #radius server host acct 192.168.37.60 name Network2_RS
(Switch) (Config) #no radius server host acct 192.168.37.60
```

3.10.15 radius server host link-local

This command configures the link-local-address of the RADIUS server and the outgoing interface to be used by the RADIUS client to communicate with the RADIUS server. The outgoing interface can be any physical interface or service port or network port.

Default	None
Format	`radius server host {auth	acct} link-local` *link-local-address* `interface {`*slot/port* `| network	serviceport } [name` *servername*`] [port` *port*`]`
Mode	Global Config

Field	Description
link-local-address	The IP address of the server.
interface	The interface for the RADIUS client to use for outgoing RADIUS messages.
servername	The alias name to identify the server.
port	The port number to use to connect to the specified RADIUS server.

Example: The following shows an examples of the command.

```
(Switch) (Config) #radius server host auth link-local fe80::208:a1ff:fe7e:4519 interface network
name auth_server  port 1813

 (Switch) (Config) #radius server host acct link-local fe80::208:a1ff:fe7e:4519 interface
serviceport name acct_server port 1813
```

3.10.15.1 no radius server host link-local

This command removes the configured radius server link-local-address.

Default	None
Format	`radius server host {auth	acct} link-local` *link-local-address*
Mode	Global Config

Example: The following shows an examples of the command.

```
(Switch) (Config) #no radius server host auth link-local fe80::208:a1ff:fe7e:4519
```

3.10.16 radius server key

This command configures the key to be used in RADIUS client communication with the specified server. Depending on whether the 'auth' or 'acct' token is used, the shared secret is configured for the RADIUS authentication or RADIUS accounting server. The IP address or hostname provided must match a previously configured server. When this command is executed, the secret is prompted.

Text-based configuration supports Radius server's secrets in encrypted and non-encrypted format. When you save the configuration, these secret keys are stored in encrypted format only. If you want to enter the key in encrypted format, enter the key along with the encrypted keyword. In the `show running-config` command's display, these secret keys are displayed in encrypted format. You cannot show these keys in plain text format.

NOTICE The secret must be an alphanumeric value not exceeding 16 characters.

Format `radius server key {auth | acct} {ipaddr|dnsname} encrypted password`

Mode Global Config

Field	Description
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
password	The password in encrypted format.

Example: The following shows an example of the CLI command.

```
radius server key acct 10.240.4.10 encrypted encrypt-string
```

3.10.17 radius server msgauth

This command enables the message authenticator attribute to be used for the specified RADIUS Authenticating server.

Format `radius server msgauth ipaddr|dnsname`

Mode Global Config

Field	Description
ip addr	The IP address of the server.
dnsname	The DNS name of the server.

3.10.17.1 no radius server msgauth

The **no** version of this command disables the message authenticator attribute to be used for the specified RADIUS Authenticating server.

Format `no radius server msgauth ipaddr|dnsname`

Mode Global Config

3.10.18 radius server primary

This command specifies a configured server that should be the primary server in the group of servers which have the same server name. Multiple primary servers can be configured for each number of servers that have the same name. When the RADIUS client has to perform transactions with an authenticating RADIUS server of specified name, the client uses the primary server that has the specified server name by default. If the RADIUS client fails to communicate with the primary server for any reason, the client uses the backup servers configured with the same server name. These backup servers are identified as the Secondary type.

Format	`radius server primary {`*`ipaddr|dnsname`*`}`
Mode	Global Config

Field	Description
ip addr	The IP address of the RADIUS Authenticating server.
dnsname	The DNS name of the server.

3.10.19 radius server retransmit

This command configures the global parameter for the RADIUS client that specifies the number of transmissions of the messages to be made before attempting the fall back server upon unsuccessful communication with the current RADIUS authenticating server. When the maximum number of retries are exhausted for the RADIUS accounting server and no response is received, the client does not communicate with any other server.

Default	4
Format	`radius server retransmit` *`retries`*
Mode	Global Config

Field	Description
retries	The maximum number of transmission attempts in the range of 1 to 15.

3.10.19.1 no radius server retransmit

The no version of this command sets the value of this global parameter to the default value.

Format	`no radius server retransmit`
Mode	Global Config

3.10.20 radius source-interface

Use this command to specify the physical or logical interface to use as the RADIUS client source interface (Source IP address). If configured, the address of source Interface is used for all RADIUS communications between the RADIUS server and the RADIUS client. The selected source-interface IP address is used for filling the IP header of RADIUS management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch.

If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address. If the configured interface is down, the RADIUS client falls back to its default behavior.

Format	`radius source-interface {slot/port	loopback` *`loopback-id`* `| vlan` *`vlan-id`*`}`
Mode	Global Config

Parameter	Description
slot/port	The unit identifier assigned to the switch.
loopback-id	Configures the loopback interface. The range of the loopback ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

3.10.20.1 no radius source-interface

Use this command to reset the RADIUS source interface to the default settings.

Format	`no radius source-interface`
Mode	Global Config

3.10.21 radius server timeout

This command configures the global parameter for the RADIUS client that specifies the timeout value (in seconds) after which a request must be retransmitted to the RADIUS server if no response is received. The timeout value is an integer in the range of 1 to 30.

Default	5
Format	`radius server timeout` *`seconds`*
Mode	Global Config

Field	Description
retries	Maximum number of transmission attempts in the range 1–30.

3.10.21.1 no radius server timeout

The no version of this command sets the timeout global parameter to the default value.

Format	`no radius server timeout`
Mode	Global Config

3.10.22 server-key

Use this command to configure a global shared secret that is used for all dynamic authorization clients that do not have an individual shared secret key configured.

Default	None
Format	`server-key [7]` *`key-string`*
Mode	Dynamic Authorization

Term	Definition
0	An unencrypted key is to be entered
7	An encrypted key is to be entered
string	The shared secret string. Maximum length is 128 characters for unencrypted key and 256 characters for encrypted key. Overrides the global setting for this client only. Enclose in quotes to use special characters or embedded blanks.

Example:

```
(FASTPATH Routing) (Config-radius-da)# server-key encrypted mydevice
```

3.10.22.1 no server-key

Use this command to remove the global shared secret key configuration.

Default	None
Format	`no server-key`
Mode	Dynamic Authorization

Example:

```
(FASTPATH Routing) (Config-radius-da)#no server-key
```

3.10.23 show radius servers

This command displays the summary and details of RADIUS authenticating servers configured for the RADIUS client.

Format	`show radius servers [{`*`ipaddr`*`	`*`ipv6addr`*`	`*`dnsname`*`}	name [`*`servername`*`]}]`
Mode	Privileged EXEC

Parameter	Description
Command Variables	
ipaddr	The IP address of the authenticating server.
ipv6addr	The IPv6 address of the server.
dnsname	The DNS name of the authenticating server.
servername	The alias name to identify the server.
Command Output Fields	
Current	The * symbol preceding the server host address specifies that the server is currently active.
Host Address	The IP address of the host.
Server Name	The name of the authenticating server.
Port	The port used for communication with the authenticating server.
Type	Specifies whether this server is a primary or secondary type.
Current Host Address (*)	An asterisk (*) indicates which configured RADIUS host is the currently active authenticating server.
Number of Retransmits	The configured value of the maximum number of times a request packet is retransmitted.
Timeout Duration	The configured timeout value, in seconds, for request retransmissions.
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.
RADIUS Attribute 4 Mode	A global parameter to indicate whether the NAS-IP-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 4 Value	A global parameter that specifies the IP address to be used in NAS-IP-Address attribute used in RADIUS requests.
RADIUS Attribute 95 Mode	A global parameter to indicate whether the NAS-IPv6-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 95 Value	A global parameter that specifies the IPv6 address to be used in the NAS-IPv6-Address attribute to be used in RADIUS requests.
Link local interface	If configured, the link local IPv6 address.
Secret Configured	Yes or No Boolean value that indicates whether this server is configured with a secret.

Parameter	Description
Message Authenticator	A global parameter to indicate whether the Message Authenticator attribute is enabled or disabled.
CoA Bounce-Host-Port	Indicates whether RADIUS server Bounce-Port messages will be processed (Accept) or ignored.
Number of CoA Requests Received	The number of RADIUS Change of Authorization (CoA) requests messages received from a RADIUS host.
Number of CoA ACK Responses Sent	The number of RADIUS CoA acknowledgments the client has sent.
Number of CoA NAK Responses Sent	The number of RADIUS CoA non-acknowledgments the client has sent.
Number of CoA Requests Ignored	The number of RADIUS CoA requests the client has ignored.
Number of CoA Missing/ Unsupported Attribute R	The number of RADIUS CoA requests the client has received that have a missing or unsupported attribute value.
Number of CoA Session Context Not Found Request	The number of RADIUS CoA requests the client has received in which the session context identified in the CoA-Request or not exist on the NAS.
Number of CoA Invalid Attribute Value Request	The number of RADIUS CoA requests the client has received that have an invalid attribute value.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius servers

Cur  Host Address              Server Name                      Port  Type
rent
---- ------------------------ --------------------------------- ----- ----------
     *   192.168.37.200           Network1_RADIUS_Server           1813  Primary
     192.168.37.201           Network2_RADIUS_Server           1813  Secondary
     192.168.37.202           Network3_RADIUS_Server           1813  Primary
     192.168.37.203           Network4_RADIUS_Server           1813  Secondary

(Switch) #show radius servers name

Current Host Address     Server Name                      Type
------------------------ --------------------------------- ----------192.168.37.200
Network1_RADIUS_Server            Secondary
192.168.37.201           Network2_RADIUS_Server           Primary
192.168.37.202           Network3_RADIUS_Server           Secondary
192.168.37.203           Network4_RADIUS_Server           Primary

(Switch) #show radius servers name Default_RADIUS_Server

Server Name............................ Default_RADIUS_Server
Host Address........................... 192.168.37.58
Secret Configured...................... No
Message Authenticator ................. Enable
Number of Retransmits.................. 4
Time Duration.......................... 10
RADIUS Accounting Mode................. Disable
RADIUS Attribute 4 Mode................ Enable
RADIUS Attribute 4 Value .............. 192.168.37.60
RADIUS Attribute 95 Mode................Enable
RADIUS Attribute 95 Value...............45:45::9

(switch) #show radius servers 192.168.2.10

RADIUS Server IP Address....................... 192.168.2.10
RADIUS Server Name............................. Default-RADIUS-Server
Number of Retransmits.......................... 4
```

```
Timeout Duration.............................. 5
RADIUS Accounting Mode........................ Disable
RADIUS Attribute 4 Mode....................... Disable
RADIUS Attribute 4 Value...................... 0.0.0.0
RADIUS Attribute 95 Mode...................... Disable
RADIUS Attribute 95 Value..................... ::
Link local interface.......................... Not Available
Port.......................................... 1812
Type.......................................... Secondary
Secret Configured............................. No
Message Authenticator......................... Enable
CoA Bounce-Host-Port.......................... Accept
Number of CoA Requests Received............... 0
Number of CoA ACK Responses Sent.............. 0
Number of CoA NAK Responses Sent.............. 0
Number of CoA Requests Ignored................ 0
Number of CoA Missing/Unsupported Attribute R.. 0
Number of CoA Session Context Not Found Reque.. 0
Number of CoA Invalid Attribute Value Request.. 0
Number of Administratively Prohibited Request.. 0
```

3.10.24 show radius

This command displays the values configured for the global parameters of the RADIUS client.

Format `show radius`

Mode Privileged EXEC

Term	Definition
Number of Configured Authentication Servers	The number of RADIUS Authentication servers that have been configured.
Number of Configured Accounting Servers	The number of RADIUS Accounting servers that have been configured.
Number of Named Authentication Server Groups	The number of configured named RADIUS server groups.
Number of Named Accounting Server Groups	The number of configured named RADIUS server groups.
Number of Retransmits	The configured value of the maximum number of times a request packet is retransmitted.
Time Duration	The configured timeout value, in seconds, for request retransmissions.
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.
RADIUS Attribute 4 Mode	A global parameter to indicate whether the NAS-IP-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 4 Value	A global parameter that specifies the IP address to be used in the NAS-IP-Address attribute to be used in RADIUS requests.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius
        Number of Configured Authentication Servers............. 32
        Number of Configured Accounting Servers................. 32
        Number of Named Authentication Server Groups............ 15
        Number of Named Accounting Server Groups................ 3
        Number of Retransmits................................... 4
        Time Duration........................................... 10
        RADIUS Accounting Mode.................................. Disable
        RADIUS Attribute 4 Mode................................. Enable
        RADIUS Attribute 4 Value ............................... 192.168.37.60
```

3.10.25 show radius servers

This command displays the summary and details of RADIUS authenticating servers configured for the RADIUS client.

Format	`show radius servers [{ipaddr/dnsname	name [servername]}]`
Mode	Privileged EXEC

Field	Description
ipaddr	The IP address of the authenticating server.
dnsname	The DNS name of the authenticating server.
servername	The alias name to identify the server.
Current	The * symbol preceding the server host address specifies that the server is currently active.
Host Address	The IP address of the host.
Server Name	The name of the authenticating server.
Port	The port used for communication with the authenticating server.
Type	Specifies whether this server is a primary or secondary type.
Current Host Address	The IP address of the currently active authenticating server.
Secret Configured	Yes or No Boolean value that indicates whether this server is configured with a secret.
Number of Retransmits	The configured value of the maximum number of times a request packet is retransmitted.
Message Authenticator	A global parameter to indicate whether the Message Authenticator attribute is enabled or disabled.
Time Duration	The configured timeout value, in seconds, for request retransmissions.
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.
RADIUS Attribute 4 Mode	A global parameter to indicate whether the NAS-IP-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 4 Value	A global parameter that specifies the IP address to be used in NAS-IP-Address attribute used in RADIUS requests.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius servers

Cur  Host Address              Server Name                       Port  Type
rent
---- ------------------------ --------------------------------- ----- ----------
     *   192.168.37.200          Network1_RADIUS_Server            1813  Primary
     192.168.37.201           Network2_RADIUS_Server            1813  Secondary
     192.168.37.202           Network3_RADIUS_Server            1813  Primary
     192.168.37.203           Network4_RADIUS_Server            1813  Secondary

(Switch) #show radius servers name

Current Host Address     Server Name                        Type
------------------------ --------------------------------- ----------192.168.37.200
Network1_RADIUS_Server            Secondary
192.168.37.201           Network2_RADIUS_Server            Primary
192.168.37.202           Network3_RADIUS_Server            Secondary
192.168.37.203           Network4_RADIUS_Server            Primary

(Switch) #show radius servers name Default_RADIUS_Server
```

```
Server Name........................... Default_RADIUS_Server
Host Address.......................... 192.168.37.58
Secret Configured..................... No
Message Authenticator ................ Enable
Number of Retransmits................. 4
Time Duration......................... 10
RADIUS Accounting Mode................ Disable
RADIUS Attribute 4 Mode............... Enable
RADIUS Attribute 4 Value ............. 192.168.37.60

(Switch) #show radius servers 192.168.37.58

Server Name........................... Default_RADIUS_Server
Host Address.......................... 192.168.37.58
Secret Configured..................... No
Message Authenticator ................ Enable
Number of Retransmits................. 4
Time Duration......................... 10
RADIUS Accounting Mode................ Disable
RADIUS Attribute 4 Mode............... Enable
RADIUS Attribute 4 Value ............. 192.168.37.60
```

3.10.26 show radius accounting

This command displays a summary of configured RADIUS accounting servers.

Format	`show radius accounting name [`*`servername`*`]`
Mode	Privileged EXEC

Field	Description
servername	An alias name to identify the server.
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.

If you do not specify any parameters, then only the accounting mode and the RADIUS accounting server details are displayed.

Term	Definition
Host Address	The IP address of the host.
Server Name	The name of the accounting server.
Port	The port used for communication with the accounting server.
Secret Configured	Yes or No Boolean value indicating whether this server is configured with a secret.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius accounting name

Host Address             Server Name                       Port     Secret
                                                                    Configured
------------------------ --------------------------------- -------- -----------
192.168.37.200           Network1_RADIUS_Server            1813     Yes
192.168.37.201           Network2_RADIUS_Server            1813     No
192.168.37.202           Network3_RADIUS_Server            1813     Yes
192.168.37.203           Network4_RADIUS_Server            1813     No
```

```
 (Switch) #show radius accounting name Default_RADIUS_Server

Server Name............................ Default_RADIUS_Server
Host Address........................... 192.168.37.200
RADIUS Accounting Mode................. Disable
Port .................................. 1813
Secret Configured ..................... Yes
```

3.10.27 show radius accounting statistics

This command displays a summary of statistics for the configured RADIUS accounting servers.

Format	`show radius accounting statistics {`*`ipaddr|dnsname`*`	name `*`servername`*`}`
Mode	Privileged EXEC

Term	Definition
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
servername	The alias name to identify the server.
RADIUS Accounting Server Name	The name of the accounting server.
Server Host Address	The IP address of the host.
Round Trip Time	The time interval, in hundredths of a second, between the most recent Accounting-Response and the Accounting-Request that matched it from this RADIUS accounting server.
Requests	The number of RADIUS Accounting-Request packets sent to this server. This number does not include retransmissions.
Retransmission	The number of RADIUS Accounting-Request packets retransmitted to this RADIUS accounting server.
Responses	The number of RADIUS packets received on the accounting port from this server.
Malformed Responses	The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed accounting responses.
Bad Authenticators	The number of RADIUS Accounting-Response packets containing invalid authenticators received from this accounting server.
Pending Requests	The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response.
Timeouts	The number of accounting timeouts to this server.
Unknown Types	The number of RADIUS packets of unknown types, which were received from this server on the accounting port.
Packets Dropped	The number of RADIUS packets received from this server on the accounting port and dropped for some other reason.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius accounting statistics 192.168.37.200

RADIUS Accounting Server Name................. Default_RADIUS_Server
Host Address.................................. 192.168.37.200
Round Trip Time............................... 0.00
Requests...................................... 0
Retransmissions............................... 0
Responses..................................... 0
Malformed Responses........................... 0
Bad Authenticators............................ 0
Pending Requests.............................. 0
```

```
Timeouts..................................... 0
Unknown Types................................ 0
Packets Dropped.............................. 0

(Switch) #show radius accounting statistics name Default_RADIUS_Server

RADIUS Accounting Server Name................ Default_RADIUS_Server
Host Address................................. 192.168.37.200
Round Trip Time.............................. 0.00
Requests..................................... 0
Retransmissions.............................. 0
Responses.................................... 0
Malformed Responses.......................... 0
Bad Authenticators........................... 0
Pending Requests............................. 0
Timeouts..................................... 0
Unknown Types................................ 0
Packets Dropped.............................. 0
```

3.10.28 show radius source-interface

Use this command in Privileged EXEC mode to display the configured RADIUS client source-interface (Source IP address) information.

Format	`show radius source-interface`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing)# show radius source-interface
RADIUS Client Source Interface............. (not configured)
```

3.10.29 show radius statistics

This command displays the summary statistics of configured RADIUS Authenticating servers.

Format	`show radius statistics {`*`ipaddr|dnsname`*`	name `*`servername`*`}`
Mode	Privileged EXEC

Term	Definition
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
servername	The alias name to identify the server.
RADIUS Server Name	The name of the authenticating server.
Server Host Address	The IP address of the host.
Access Requests	The number of RADIUS Access-Request packets sent to this server. This number does not include retransmissions.
Access Retransmissions	The number of RADIUS Access-Request packets retransmitted to this RADIUS authentication server.
Access Accepts	The number of RADIUS Access-Accept packets, including both valid and invalid packets, that were received from this server.
Access Rejects	The number of RADIUS Access-Reject packets, including both valid and invalid packets, that were received from this server.
Access Challenges	The number of RADIUS Access-Challenge packets, including both valid and invalid packets, that were received from this server.

Term	Definition
Malformed Access Responses	The number of malformed RADIUS Access-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed access responses.
Bad Authenticators	The number of RADIUS Access-Response packets containing invalid authenticators or signature attributes received from this server.
Pending Requests	The number of RADIUS Access-Request packets destined for this server that have not yet timed out or received a response.
Timeouts	The number of authentication timeouts to this server.
Unknown Types	The number of packets of unknown type that were received from this server on the authentication port.
Packets Dropped	The number of RADIUS packets received from this server on the authentication port and dropped for some other reason.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius statistics 192.168.37.200

RADIUS Server Name........................... Default_RADIUS_Server
Server Host Address.......................... 192.168.37.200
Access Requests.............................. 0.00
Access Retransmissions....................... 0
Access Accepts............................... 0
Access Rejects............................... 0
Access Challenges............................ 0
Malformed Access Responses................... 0
Bad Authenticators........................... 0
Pending Requests............................. 0
Timeouts..................................... 0
Unknown Types................................ 0
Packets Dropped.............................. 0

(Switch) #show radius statistics name Default_RADIUS_Server

RADIUS Server Name........................... Default_RADIUS_Server
Server Host Address.......................... 192.168.37.200
Access Requests.............................. 0.00
Access Retransmissions....................... 0
Access Accepts............................... 0
Access Rejects............................... 0
Access Challenges............................ 0
Malformed Access Responses................... 0
Bad Authenticators........................... 0
Pending Requests............................. 0
Timeouts..................................... 0
Unknown Types................................ 0
Packets Dropped.............................. 0
```

3.11 TACACS+ Commands

TACACS+ provides access control for networked devices via one or more centralized servers. Similar to RADIUS, this protocol simplifies authentication by making use of a single database that can be shared by many clients on a large network. TACACS+ is based on the TACACS protocol (described in RFC1492) but additionally provides for separate authentication, authorization, and accounting services. The original protocol was UDP based with messages passed in clear text over the network; TACACS+ uses TCP to ensure reliable delivery and a shared key configured on the client and daemon server to encrypt all messages.

3.11.1 tacacs-server host

Use the `tacacs-server host` command in Global Configuration mode to configure a TACACS+ server. This command enters into the TACACS+ configuration mode. Use the ***ip-address***, ***ipv6-address***, or ***hostname*** parameter to specify the IPv4 address, IPv6 address, or hostname of the TACACS+ server. To specify multiple hosts, multiple `tacacs-server host` commands can be used.

Format `tacacs-server host {`*ip-address*`|` *ipv6-address* `|` *hostname*`}`

Mode Global Config

3.11.1.1 no tacacs-server host

Use the `no tacacs-server host` command to delete the specified hostname or IP address. The ***ip-address***, ***ipv6-address***, or ***hostname*** parameter is the IPv4 address, IPv6 address, or hostname of the TACACS+ server.

Format `no tacacs-server host {`*ip-address*`|` *ipv6-address* `|` *hostname*`}`

Mode Global Config

3.11.2 tacacs-server host link-local

Use this command to configure the link-local-address of the TACACS+ server and the outgoing interface to be used by the TACACS+ client to communicate with the TACACS+ server. The outgoing interface can be any physical interface, the service port, or the network port.

Format `tacacs-server host link-local` *link-local-address* `interface {`*slot/port* `| network | serviceport}`

Mode Global Config

3.11.2.1 no tacacs-server host link-local

Use this command to remove the configured TACACS+ server link-local address.

Format `no tacacs-server host link-local`

Mode Global Config

3.11.3 tacacs-server key

Use the `tacacs-server key` command to set the authentication and encryption key for all TACACS+ communications between the switch and the TACACS+ daemon. The ***key-string*** parameter has a range of 0 - 128 characters and specifies the authentication and encryption key for all TACACS communications between the switch and the TACACS+ server. This key must match the key used on the TACACS+ daemon.

Text-based configuration supports TACACS server's secrets in encrypted and non-encrypted format. When you save the configuration, these secret keys are stored in encrypted format only. If you want to enter the key in encrypted format, enter the key along with the encrypted keyword. In the `show running-config` command's display, these secret keys are displayed in encrypted format. You cannot show these keys in plain text format.

Format `tacacs-server key [`*key-string* `| encrypted` *key-string*`]`

Mode Global Config

3.11.3.1 no tacacs-server key

Use the `no tacacs-server key` command to disable the authentication and encryption key for all TACACS+ communications between the switch and the TACACS+ daemon. The ***`key-string`*** parameter has a range of 0 - 128 characters This key must match the key used on the TACACS+ daemon.

Format	`no tacacs-server key` *`key-string`*
Mode	Global Config

3.11.4 tacacs-server keystring

Use the `tacacs-server keystring` command to set the global authentication encryption key used for all TACACS+ communications between the TACACS+ server and the client.

Format	`tacacs-server keystring`
Mode	Global Config

Example: The following shows an example of the CLI command.

```
(Switching)(Config)#tacacs-server keystring
Enter tacacs key:********
Re-enter tacacs key:********
```

3.11.5 tacacs-server source-interface

Use this command in Global Configuration mode to configure the source interface (Source IP address) for TACACS+ server configuration. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch.

If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address.

Format	`tacacs-server source-interface {`*`slot/port`*`|loopback `*`loopback-id`*`|vlan `*`vlan-id`*`}`
Mode	Global Config

Parameter	Description
slot/port	The unit identifier assigned to the switch, in *slot/port* format.
loopback-id	The loopback interface. The range of the loopback ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

Example: The following shows an example of the command.

```
(Config)#tacacs-server source-interface loopback 0
(Config)#tacacs-server source-interface 0/1
(Config)#no tacacs-server source-interface
```

3.11.5.1 no tacacs-server source-interface

Use this command in Global Configuration mode to remove the global source interface (Source IP selection) for all TACACS+ communications between the TACACS+ client and the server.

Format	`no tacacs-server source-interface`
Mode	Global Config

3.11.6 tacacs-server timeout

Use the `tacacs-server timeout` command to set the timeout value for communication with the TACACS+ servers. The *`timeout`* parameter has a range of 1-30 and is the timeout value in seconds. If you do not specify a timeout value, the command sets the global timeout to the default value. TACACS+ servers that do not use the global timeout will retain their configured timeout values.

Default	5
Format	`tacacs-server timeout` *`timeout`*
Mode	Global Config

3.11.6.1 no tacacs-server timeout

Use the `no tacacs-server timeout` command to restore the default timeout value for all TACACS servers.

Format	`no tacacs-server timeout`
Mode	Global Config

3.11.7 key

Use the `key` command in TACACS Configuration mode to specify the authentication and encryption key for all TACACS communications between the device and the TACACS server. This key must match the key used on the TACACS daemon. The *`key-string`* parameter specifies the key name. For an empty string use “ ”. (Range: 0 - 128 characters).

Text-based configuration supports TACACS server’s secrets in encrypted and non-encrypted format. When you save the configuration, these secret keys are stored in encrypted format only. If you want to enter the key in encrypted format, enter the key along with the encrypted keyword. In the `show running-config` command’s display, these secret keys are displayed in encrypted format. You cannot show these keys in plain text format.

Format	`key [`*`key-string`*`	encrypted `*`key-string`*`]`
Mode	TACACS Config

3.11.8 keystring

Use the `keystring` command in TACACS Server Configuration mode to set the TACACS+ server-specific authentication encryption key used for all TACACS+ communications between the TACACS+ server and the client.

Format	`keystring`
Mode	TACACS Server Config

Example: The following shows an example of the command.

```
(Switching)(Config)#tacacs-server host 1.1.1.1
(Switching)(Tacacs)#keystring

Enter tacacs key:********
Re-enter tacacs key:********
```

3.11.9 port

Use the `port` command in TACACS Configuration mode to specify a server port number. The server *`port-number`* range is 0 - 65535.

Default	49
Format	`port` *`port-number`*
Mode	TACACS Config

3.11.10 priority (TACACS Config)

Use the `priority` command in TACACS Configuration mode to specify the order in which servers are used, where 0 (zero) is the highest priority. The ***`priority`*** parameter specifies the priority for servers. The highest priority is 0 (zero), and the range is 0 - 65535.

Default	0
Format	`priority` *`priority`*
Mode	TACACS Config

3.11.11 timeout

Use the `timeout` command in TACACS Configuration mode to specify the timeout value in seconds. If no timeout value is specified, the global value is used. The ***`timeout`*** parameter has a range of 1-30 and is the timeout value in seconds.

Format	`timeout` *`timeout`*
Mode	TACACS Config

3.11.12 show tacacs

Use the `show tacacs` command to display the configuration, statistics, and source interface details of the TACACS+ client.

Format	`show tacacs [`*`ip-address`*` | `*`ipv6-address`*` | `*`hostname`*`]`
Mode	Privileged EXEC

Term	Definition
Host address	The IP address or hostname of the configured TACACS+ server.
Port	The configured TACACS+ server port number.
TimeOut	The timeout in seconds for establishing a TCP connection.
Priority	The preference order in which TACACS+ servers are contacted. If a server connection fails, the next highest priority server is contacted.

Example: The following examples show output of this command.

```
(Broadcom FASTPATH Routing) #show tacacs
Global Timeout: 5

Host address              Port    Timeout   Priority   Link Local Interface
------------------------  -----   -------   --------   --------------------
10.27.3.6                 49      Global    0
200:25:dead:beaf::1       49      Global    0          Not Available
```

3.11.13 show tacacs source-interface

Use the `show tacacs source-interface` command in Global Config mode to display the configured global source interface details used for a TACACS+ client. The IP address of the selected interface is used as source IP for all communications with the server.

Format	`show tacacs source-interface`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Config)# show tacacs source-interface

TACACS Client Source Interface     : loopback 0
TACACS Client Source IPv4 Address  : 1.1.1.1 [UP]
```

3.12 Configuration Scripting Commands

Configuration Scripting allows you to generate text-formatted script files representing the current configuration of a system. You can upload these configuration script files to a PC or UNIX system and edit them. Then, you can download the edited files to the system and apply the new configuration. You can apply configuration scripts to one or more switches with no or minor modifications.

Use the `show running-config` command (see “show running-config” on page 154) to capture the running configuration into a script. Use the `copy` command (see “copy” on page 179) to transfer the configuration script to or from the switch.

Use the `show` command to view the configuration stored in the startup-config, backup-config, or factory-defaults file (see “show” on page 155).

You should use scripts on systems with default configuration; however, you are not prevented from applying scripts on systems with non-default configurations.

Scripts must conform to the following rules:

- Script files are not distributed across the stack, and only live in the unit that is the master unit at the time of the file download.
- The file extension must be “.scr”.
- A maximum of ten scripts are allowed on the switch.
- The combined size of all script files on the switch shall not exceed 2048 KB.
- The maximum number of configuration file command lines is 2000.

You can type single-line annotations at the command prompt to use when you write test or configuration scripts to improve script readability. The exclamation point (!) character flags the beginning of a comment. The comment flag character can begin a word anywhere on the command line, and all input following this character is ignored. Any command line that begins with the “!” character is recognized as a comment line and ignored by the parser.

The following lines show an example of a script:

```
! Script file for displaying management access

show telnet !Displays the information about remote connections

! Display information about direct connections

show serial

! End of the script file!
```

NOTICE

To specify a blank password for a user in the configuration script, you must specify it as a space within quotes. For example, to change the password for user jane from a blank password to hello, the script entry is as follows:

```
users passwd jane
" "
hello
hello
```

3.12.1 script apply

This command applies the commands in the script to the switch. The ***`scriptname`*** parameter is the name of the script to apply.

Format	`script apply` *`scriptname`*
Mode	Privileged EXEC

3.12.2 script delete

This command deletes a specified script where the ***scriptname*** parameter is the name of the script to delete. The ***all*** option deletes all the scripts present on the switch.

Format	`script delete {`*`scriptname`*`	all}`
Mode	Privileged EXEC

3.12.3 script list

This command lists all scripts present on the switch as well as the remaining available space.

Format	`script list`
Mode	Privileged EXEC

Term	Definition
Configuration Script	Name of the script.
Size	Privileged EXEC

3.12.4 script show

This command displays the contents of a script file, which is named ***scriptname***.

Format	`script show` *`scriptname`*
Mode	Privileged EXEC

Term	Definition
Output Format	`line` *`number: line contents`*

3.12.5 script validate

This command validates a script file by parsing each line in the script file where ***scriptname*** is the name of the script to validate.The validate option is intended to be used as a tool for script development. Validation identifies potential problems. It might not identify all problems with a given script on any given device.

Format	`script validate` *`scriptname`*
Mode	Privileged EXEC

3.13 Prelogin Banner, System Prompt, and Host Name Commands

This section describes the commands you use to configure the prelogin banner and the system prompt. The prelogin banner is the text that displays before you login at the `User:` prompt.

3.13.1 copy (pre-login banner)

The **copy** command includes the option to upload or download the CLI Banner to or from the switch. You can specify local URLs by using FTP, TFTP, SFTP, SCP, or Xmodem.

NOTICE The parameter *ip6address* is also a valid parameter for routing packages that support IPv6.

Default none

Format `copy <tftp://<ipaddr>/<filepath>/<filename>> nvram:clibanner`

`copy nvram:clibanner <tftp://<ipaddr>/<filepath>/<filename>>`

Mode Privileged EXEC

3.13.2 set prompt

This command changes the name of the prompt. The length of name may be up to 64 alphanumeric characters.

Format `set prompt` *`prompt_string`*

Mode Privileged EXEC

3.13.3 hostname

This command sets the system hostname. It also changes the prompt. The length of name may be up to 64 alphanumeric, case-sensitive characters.

Format `hostname` *`hostname`*

Mode Privileged EXEC

3.13.4 show clibanner

Use this command to display the configured prelogin CLI banner. The prelogin banner is the text that displays before displaying the CLI prompt.

Default No contents to display before displaying the login prompt.

Format `show clibanner`

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show clibanner

Banner Message configured :
=========================



--------------------------
         TEST
--------------------------
```

3.13.5 set clibanner

Use this command to configure the prelogin CLI banner before displaying the login prompt.

Format	`set clibanner` *`line`*
Mode	Global Config

Parameter	Description
line	Banner text where "" (double quote) is a delimiting character. The banner message can be up to 2000 characters.

3.13.5.1 no set clibanner

Use this command to unconfigure the prelogin CLI banner.

Format	`no set clibanner`
Mode	Global Config

3.14 Expandable Port Configuration

Some devices contain expandable ports which may be configured to present a different number of ports and speeds.

3.14.1 hardware profile portmode expand

This command is used to configure expandable ports.

A port group includes 4 lanes/ports. The port group is either running in single port mode (e.g. 1 * 40G) or in independent mode (e.g. 4 * 10G).

One of the ports (e.g. the first one) of the port group can be used to expand/not expand all ports of the port group.

If specifying "expand" without any further option and reset the board, all ports within the port group are set to 1x10G

.

NOTICE This command takes effect only after rebooting the switch.

Format	`hardware profile portmode expand [default | auto]`
Mode	Interface Config

Parameter	Description
default	Depending on the interface, default is either 4 * 10G (SFP+) or 1 * 40G (QSFP)
auto	Expandable port option will be set by Shelf Manager

3.14.1.1 no hardware profile portmode expand

Use the no form of the command to return the port to the default mode (1x40G).

3.14.2 clear hardware profile portmode

The command clears the hardware profile. This contains the portmap selection and the expandable port configuration. The default configuration is set.

Note: The new configuration becomes effective only after a reset of the board.

Format	`clear hardware profile portmode`
Mode	Privileged EXEC

3.14.3 show interfaces hardware profile

The command displays expanded information for all currently existing interfaces or for a specified interface.The information consists of status (expandable, expanded or nothing), expanded information (yes/no for expanded command set) and the default speed for the interface. A '*' character for expanded information means that the information has been changed by the user but is currently not applied (board not reset).

You can optionally specify an interface or all 40G interfaces are displayed.

Format	`show hardware profile portmode [interface]`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

NOTICE The port mappings can vary from platform to platform. This example is just for illustration, and may not represent the actual port mappings on all platforms.

```
#show interfaces hardware profile

                              Configured  Oper
40G Interface  10G Interfaces  Mode        Mode
-------------  --------------  ----------  -------
1/0/1          1/0/17-20       1x40G       4x10G
1/0/2          1/0/21-24       1x40G       1x40G
```

Example: The following shows example CLI display output for the command.

```
#show interfaces hardware profile 1/0/1

                              Configured  Oper
40G Interface  10G Interfaces  Mode        Mode
-------------  --------------  ----------  -------
1/0/1          1/0/17-20       1x40G       4x10G
```

4/ Utility Commands

This chapter describes the utility commands available in the FASTPATH CLI.

The Utility Commands chapter includes the following sections:

NOTICE

The commands in this chapter are in one of four functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Copy commands transfer or save configuration and informational files to and from the switch.
- Clear commands clear some or all of the settings to factory defaults.

4.1 AutoInstall Commands

The AutoInstall feature enables the automatic update of the image and configuration of the switch. This feature enables touchless or low-touch provisioning to simplify switch configuration and imaging.

AutoInstall includes the following support:

- Downloading an image from TFTP server using DHCP option 125. The image update can result in a downgrade or upgrade of the firmware on the switch.
- Automatically downloading a configuration file from a TFTP server when the switch is booted with no saved configuration file.
- Automatically downloading an image from a TFTP server in the following situations:
  - When the switch is booted with no saved configuration found.
  - When the switch is booted with a saved configuration that has AutoInstall enabled.

When the switch boots and no configuration file is found, it attempts to obtain an IP address from a network DHCP server. The response from the DHCP server includes the IP address of the TFTP server where the image and configuration flies are located.

After acquiring an IP address and the additional relevant information from the DHCP server, the switch downloads the image file or configuration file from the TFTP server. A downloaded image is automatically installed. A downloaded configuration file is saved to non-volatile memory.

NOTICE AutoInstall from a TFTP server can run on any IP interface, including the network port, service port, and in-band routing interfaces (if supported). To support AutoInstall, the DHCP client is enabled operationally on the service port, if it exists, or the network port, if there is no service port.

4.1.1 boot autoinstall

Use this command to operationally start or stop the AutoInstall process on the switch. The command is non-persistent and is not saved in the startup or running configuration file.

Default	stopped
Format	`boot autoinstall{start | stop}`
Mode	Privileged EXEC

4.1.2 boot host retrycount

Use this command to set the number of attempts to download a configuration file from the TFTP server.

Default	3
Format	`boot host retrycount` *`1-3`*
Mode	Privileged EXEC

4.1.2.1 no boot host retrycount

Use this command to set the number of attempts to download a configuration file to the default value.

Format	`no boot host retrycount`
Mode	Privileged EXEC

4.1.3 boot host dhcp

Use this command to enable AutoInstall on the switch for the next reboot cycle. The command does not change the current behavior of AutoInstall and saves the command to NVRAM.

Default	enabled
Format	`boot host dhcp`
Mode	Privileged EXEC

4.1.3.1 no boot host dhcp

Use this command to disable AutoInstall for the next reboot cycle.

Format	`no boot host dhcp`
Mode	Privileged EXEC

4.1.4 boot host autosave

Use this command to automatically save the downloaded configuration file to the startup-config file on the switch. When autosave is disabled, you must explicitly save the downloaded configuration to non-volatile memory by using the `write memory` or `copy system:running-config nvram:startup-config` command. If the switch reboots and the downloaded configuration has not been saved, the AutoInstall process begins, if the feature is enabled.

Default	disabled
Format	`boot host autosave`
Mode	Privileged EXEC

4.1.4.1 no boot host autosave

Use this command to disable automatically saving the downloaded configuration on the switch.

Format	`no boot host autosave`
Mode	Privileged EXEC

4.1.5 boot host autoreboot

Use this command to allow the switch to automatically reboot after successfully downloading an image. When auto reboot is enabled, no administrative action is required to activate the image and reload the switch.

Default	enabled
Format	`boot host autoreboot`
Mode	Privileged EXEC

4.1.5.1 no boot host autoreboot

Use this command to prevent the switch from automatically rebooting after the image is downloaded by using the Auto-Install feature.

Format	`no boot host autoreboot`
Mode	Privileged EXEC

4.1.6 erase startup-config

Use this command to erase the text-based configuration file stored in non-volatile memory. If the switch boots and no startup-config file is found, the AutoInstall process automatically begins.

Format	`erase startup-config`
Mode	Privileged EXEC

4.1.7 erase factory-defaults

Use this command to erase the text-based factory-defaults file stored in non-volatile memory.

Default	Disable
Format	`erase factory-defaults`
Mode	Privileged EXEC

4.1.8 show autoinstall

This command displays the current status of the AutoInstall process.

Format	`show autoinstall`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show autoinstall

AutoInstall Mode............................... Stopped
AutoInstall Persistent Mode.................... Disabled
AutoSave Mode.................................. Disabled
AutoReboot Mode................................ Enabled
AutoInstall Retry Count........................ 3
```

4.2 CLI Output Filtering Commands

4.2.1 show *xxx*|include "*string*"

The command *xxx* is executed and the output is filtered to only show lines containing the "*string*" match. All other non-matching lines in the output are suppressed.

Example: The following shows an example of the CLI command.

```
(Routing) #show running-config | include “spanning-tree”

spanning-tree configuration name "00-02-BC-42-F9-33"
spanning-tree bpduguard
spanning-tree bpdufilter default
spanning-tree forceversion 802.1w
```

4.2.2 show *xxx*|include "*string*" exclude "*string2*"

The command *xxx* is executed and the output is filtered to only show lines containing the "*string*" match and not containing the "*string2*" match. All other non-matching lines in the output are suppressed. If a line of output contains both the include and exclude strings then the line is not displayed.

Example: The following shows example of the CLI command.

```
(Routing) #show running-config | include “spanning-tree” exclude “configuration”

spanning-tree bpduguard
spanning-tree bpdufilter default
spanning-tree forceversion 802.1w
```

4.2.3 show *xxx*|exclude "*string*"

The command *xxx* is executed and the output is filtered to show all lines not containing the "*string*" match. Output lines containing the "*string*" match are suppressed.

Example: The following shows an example of the CLI command.

```
(Routing) #show interface 0/1

Packets Received Without Error................. 0
Packets Received With Error.................... 0
Broadcast Packets Received..................... 0
Receive Packets Discarded...................... 0
Packets Transmitted Without Errors............. 0
Transmit Packets Discarded..................... 0
Transmit Packet Errors......................... 0
Collision Frames............................... 0
Time Since Counters Last Cleared............... 281 day 4 hr 9 min 0 sec
```

```
(Routing) #show interface 0/1 | exclude "Packets"

Transmit Packet Errors........................ 0
Collision Frames.............................. 0
Time Since Counters Last Cleared.............. 20 day 21 hr 30 min 9 sec
```

4.2.4 show *xxx*|begin "*string*"

The command *xxx* is executed and the output is filtered to show all lines beginning with and following the first line containing the "*string*" match. All prior lines are suppressed.

Example: The following shows an example of the CLI command.

```
(Routing) #show port all | begin "1/1"

1/1          Enable                           Down   Disable N/A    N/A
1/2          Enable                           Down   Disable N/A    N/A
1/3          Enable                           Down   Disable N/A    N/A
1/4          Enable                           Down   Disable N/A    N/A
1/5          Enable                           Down   Disable N/A    N/A
1/6          Enable                           Down   Disable N/A    N/A

(Routing) #
```

4.2.5 show *xxx*|section "*string*"

The command *xxx* is executed and the output is filtered to show only lines included within the section(s) identified by lines containing the "*string*" match and ending with the first line containing the default end-of-section identifier (i.e. "exit").

Example: The following shows an example of the CLI command.

```
(Routing) #show running-config | section "interface 0/1"

interface 0/1
no spanning-tree port mode
exit
```

4.2.6 show *xxx*|section "*string*" "*string2*"

The command *xxx* is executed and the output is filtered to only show lines included within the section(s) identified by lines containing the "*string*" match and ending with the first line containing the "*string2*" match. If multiple sessions matching the specified string match criteria are part of the base output, then all instances are displayed.

4.2.7 show *xxx*|section "*string*" include "*string2*"

The command *xxx* is executed and the output is filtered to only show lines included within the section(s) identified by lines containing the "*string*" match and ending with the first line containing the default end-of-section identifier (i.e. "exit") and that include the "string2" match. This type of filter command could also include "exclude" or user-defined end-of-section identifier parameters as well.

4.3 Dual Image Commands

FASTPATH software supports a dual image feature that allows the switch to have two software images in the permanent storage. You can specify which image is the active image to be loaded in subsequent reboots. This feature allows reduced down-time when you upgrade or downgrade the software.

4.3.1 delete

This command deletes the backup image file from the permanent storage or the core dump file from the local file system.

The optional ***`unit`*** parameter is valid only on Stacks. Error will be returned, if this parameter is provided, on Standalone systems. In a stack, the ***`unit`*** parameter identifies the node on which this command must be executed. When this parameter is not supplied, the command is executed on all nodes in a Stack.

Format	`delete [unit] backup`
	`delete core-dump-file file-name | all`

Mode	Privileged EXEC

4.3.2 boot system

This command activates the specified image. It will be the active-image for subsequent reboots and will be loaded by the boot loader. The current active-image is marked as the backup-image for subsequent reboots. If the specified image doesn't exist on the system, this command returns an error message.

The optional ***unit*** parameter is valid only in Stacking, where the *unit* parameter identifies the node on which this command must be executed. When this parameter is not supplied, the command is executed on all nodes in a Stack.

Format	`boot system [unit] {active | backup}`
Mode	Privileged EXEC

4.3.3 show bootvar

This command displays the version information and the activation status for the current active and backup images on the supplied unit (node) of the Stack. If you do not specify a unit number, the command displays image details for all nodes on the Stack. The command also displays any text description associated with an image. This command, when used on a Standalone system, displays the switch activation status.

For a standalone system, the unit parameter is not valid.

Format	`show bootvar [unit]`
Mode	Privileged EXEC

4.4 System Information and Statistics Commands

This section describes the commands you use to view information about system features, components, and configurations.

4.4.1 show arp switch

This command displays the contents of the IP stack's Address Resolution Protocol (ARP) table. The IP stack only learns ARP entries associated with the management interfaces - network or service ports. ARP entries associated with routing interfaces are not listed.

Format	`show arp switch`
Mode	Privileged EXEC

Term	Definition
IP Address	IP address of the management interface or another device on the management network.
MAC Address	Hardware MAC address of that device.
Interface	For a service port the output is *`Management`*. For a network port, the output is the *`slot/port`* of the physical interface.

4.4.2 show eventlog

This command displays the event log, which contains error messages from the system. The event log is not cleared on a system reset.

The *`unit`* is the switch identifier.

Format	`show eventlog [`*`unit`*`]`
Mode	Privileged EXEC

Term	Definition
File	The file in which the event originated.
Line	The line number of the event.
Task Id	The task ID of the event.
Code	The event code.
Time	The time this event occurred.
Unit	The unit for the event.

NOTICE Event log information is retained across a switch reset.

4.4.3 show hardware

This command displays inventory information for the switch.

NOTICE The `show version` command and the `show hardware` command display the same information. In future releases of the software, the `show hardware` command will not be available. For a description of the command output, see the command “show version” on page 138.

Format	`show hardware`
Mode	Privileged EXEC

4.4.4 show version

This command displays inventory information for the switch.

NOTICE The `show version` command will replace the `show hardware` command in future releases of the software.

Format	`show version`
Mode	Privileged EXEC

Term	Definition
System Description	Text used to identify the product name of this switch.
Machine Type	The machine model as defined by the Vital Product Data.
Machine Model	The machine model as defined by the Vital Product Data
Serial Number	The unique box serial number for this switch.

Term	Definition
FRU Number	The field replaceable unit number.
Part Number	Manufacturing part number.
Maintenance Level	Hardware changes that are significant to software.
Manufacturer	Manufacturer descriptor field.
Burned in MAC Address	Universally assigned network address.
Software Version	The release.version.revision number of the code currently running on the switch.
Operating System	The operating system currently running on the switch.
Network Processing Device	The type of the processor microcode.
Additional Packages	The additional packages incorporated into this system.

4.4.5 show platform vpd

This command displays vital product data for the switch.

Format	`show platform vpd`
Mode	User Privileged

The following information is displayed.

Term	Definition
Operational Code Image File Name	Build Signature loaded into the switch
Software Version	Release Version Maintenance Level and Build (RVMB) information of the switch.
Timestamp	Timestamp at which the image is built

Example: The following shows example CLI display output for the command.

```
(Routing) #show platform vpd

Operational Code Image File Name............... FastPath-Ent-esw-xgs4-gto-BL20R-CS-6AIQHSr3v7m14b35
Software Version............................... 3.7.14.35
Timestamp...................................... Thu Mar  7 14:36:14 IST 2013
```

4.4.6 show interface

This command displays a summary of statistics for a specific interface or a count of all CPU traffic based upon the argument.

Format	`show interface {`*`slot/port`*` | switchport}`
Mode	Privileged EXEC

The display parameters, when the argument is *`slot/port`*, are as follows:

Parameters	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received by the processor.
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.

Parameters	Definition
Receive Packets Discarded	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffered space.
Packets Transmitted Without Error	The total number of packets transmitted out of the interface.
Transmit Packets Discarded	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Transmit Packets Errors	The number of outbound packets that could not be transmitted because of errors.
Collisions Frames	The best estimate of the total number of collisions on this Ethernet segment.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this port were last cleared.

The display parameters, when the argument is “switchport” are as follows:

Term	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received by the processor.
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Packets Transmitted Without Error	The total number of packets transmitted out of the interface.
Broadcast Packets Transmitted	The total number of packets that higher-level protocols requested to be transmitted to the Broadcast address, including those that were discarded or not sent.
Transmit Packet Errors	The number of outbound packets that could not be transmitted because of errors.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this switch were last cleared.

4.4.7 show interfaces status

Use this command to display interface information, including the description, port state, speed and auto-neg capabilities. The command is similar to `show port all` but displays additional fields like interface description and port-capability.

The description of the interface is configurable through the existing command `description <name>` which has a maximum length of 64 characters that is truncated to 28 characters in the output. The long form of the description can be displayed using `show port description`. The interfaces displayed by this command are physical interfaces, LAG interfaces and VLAN routing interfaces.

Format	`show interfaces status [<slot/port>]`
Mode	Privileged EXEC

Field	Description
Port	The interface associated with the rest of the data in the row.
Name	The descriptive user-configured name for the interface.
Link State	Indicates whether the link is up or down.
Physical Mode	The speed and duplex settings on the interface.

Field	Description
Physical Status	Indicates the port speed and duplex mode for physical interfaces. The physical status for LAGs is not reported. When a port is down, the physical status is unknown.
Media Type	The media type of the interface.
Flow Control Status	The 802.3x flow control status.
Flow Control	The configured 802.3x flow control mode.

4.4.8 show interfaces traffic

Use this command to display interface traffic information.

Format	`show interfaces traffic [`*`slot/port`*`]`
Mode	Privileged EXEC

Field	Description
Interface Name	The interface associated with the rest of the data in the row.
Congestion Drops	The number of packets that have been dropped on the interface due to congestion.
TX Queue	The number of cells in the transmit queue.
RX Queue	The number of cells in the receive queue.
Color Drops: Yellow	The number of yellow (conformed) packets that were dropped.
Color Drops: Red	The number of red (exceeded) packets that were dropped.
WRED TX Queue	The number of packets in the WRED transmit queue.

4.4.9 show interface counters

This command reports key summary statistics for all the ports (physical/CPU/port-channel).

Format	`show interface counters`
Mode	Privileged EXEC

Term	Definition
Port	The interface associated with the rest of the data in the row.
InOctects	The total number of octets received on the interface.
InUcastPkts	The total number of unicast packets received on the interface.
InMcastPkts	The total number of multicast packets received on the interface.
InBcastPkts	The total number of broadcast packets received on the interface.
OutOctects	The total number of octets transmitted by the interface.
OutUcastPkts	The total number of unicast packets transmitted by the interface.
OutMcastPkts	The total number of multicast packets transmitted by the interface.
OutBcastPkts	The total number of broadcast packets transmitted by the interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show interface counters

Port              InOctets      InUcastPkts      InMcastPkts      InBcastPkts
--------- ---------------- ---------------- ---------------- ----------------

0/1                      0                0                0                0

Port              InOctets      InUcastPkts      InMcastPkts      InBcastPkts
--------- ---------------- ---------------- ---------------- ----------------
0/1               0                 0                  0             0
0/2               0                 0                  0             0
0/3            15098                0                31              39
0/4               0                 0                  0              0
0/5               0                 0                  0              0
...
...
ch1               0                 0                  0             0
ch2               0                 0                  0             0
...
ch64              0                 0                  0             0
CPU            359533               0               3044             217

Port             OutOctets     OutUcastPkts     OutMcastPkts     OutBcastPkts
--------- ---------------- ---------------- ---------------- ----------------
0/1               0                 0                  0             0
0/2               0                 0                  0             0
0/3            131369                0                 11            89
0/4               0                 0                  0             0
0/5               0                 0                  0             0
...
...
ch1               0                 0                  0             0
ch2               0                 0                  0             0
...
ch64              0                 0                  0             0
CPU            4025293              0               32910            120
```

4.4.10 show interface ethernet

This command displays detailed statistics for a specific interface or for all CPU traffic based upon the argument.

Format	`show interface ethernet` {*slot/port* | `switchport` | `all`}
Mode	Privileged EXEC

When you specify a value for `slot/port`, the command displays the following information.

Term	Definition
Packets Received	• Total Packets Received (Octets) - The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including Frame Check Sequence (FCS) octets). This object can be used as a reasonable estimate of Ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. The result of this equation is the value Utilization which is the percent utilization of the Ethernet segment on a scale of 0 to 100 percent. • Packets Received 64 Octets - The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets). • Packets Received 65–127 Octets - The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Received 128–255 Octets - The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Received 256–511 Octets - The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Received 512–1023 Octets - The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Received 1024–1518 Octets - The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Received > 1518 Octets - The total number of packets received that were longer than 1522 octets (excluding framing bits, but including FCS octets) and were otherwise well formed. • Packets RX and TX 64 Octets - The total number of packets (including bad packets) received and transmitted that were 64 octets in length (excluding framing bits but including FCS octets). • Packets RX and TX 65–127 Octets - The total number of packets (including bad packets) received and transmitted that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets). • Packets RX and TX 128–255 Octets - The total number of packets (including bad packets) received and transmitted that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets). • Packets RX and TX 256–511 Octets - The total number of packets (including bad packets) received and transmitted that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
Packets Received (con't)	• Packets RX and TX 512–1023 Octets - The total number of packets (including bad packets) received and transmitted that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets). • Packets RX and TX 1024–1518 Octets - The total number of packets (including bad packets) received and transmitted that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets). • Packets RX and TX 1519–2047 Octets - The total number of packets received and transmitted that were between 1519 and 2047 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed. • Packets RX and TX 1523–2047 Octets - The total number of packets received and transmitted that were between 1523 and 2047 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed. • Packets RX and TX 2048–4095 Octets - The total number of packets received that were between 2048 and 4095 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed. • Packets RX and TX 4096–9216 Octets - The total number of packets received that were between 4096 and 9216 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed.

Term	Definition
Packets Received Successfully	• Total Packets Received Without Error - The total number of packets received that were without errors. • Unicast Packets Received - The number of subnetwork-unicast packets delivered to a higher-layer protocol. • Multicast Packets Received - The total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address. • Broadcast Packets Received - The total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Receive Packets Discarded	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
Packets Received with MAC Errors	• Total Packets Received with MAC Errors - The total number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. • Jabbers Received - The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). Note that this definition of jabber is different than the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms. • Fragments/Undersize Received - The total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets). • Alignment Errors - The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with a non-integral number of octets. • FCS Errors - The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with an integral number of octets. • Overruns - The total number of frames discarded as this port was overloaded with incoming packets, and could not keep up with the inflow. • **uRPF Discards** - The number of packets dropped due to failing the uRPF.
Received Packets Not Forwarded	• Total Received Packets Not Forwarded - A count of valid frames received which were discarded (in other words, filtered) by the forwarding process • 802.3x Pause Frames Received - A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode. • Unacceptable Frame Type - The number of frames discarded from this port due to being an unacceptable frame type.

Term	Definition
Packets Transmitted Octets	• Total Packets Transmitted (Octets) - The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets). This object can be used as a reasonable estimate of Ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. ----- • Packets Transmitted 64 Octets - The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets). • Packets Transmitted 65-127 Octets - The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Transmitted 128-255 Octets - The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Transmitted 256-511 Octets - The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Transmitted 512-1023 Octets - The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Transmitted 1024-1518 Octets - The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets). • Packets Transmitted > 1518 Octets - The total number of packets transmitted that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed. • Max Frame Size - The maximum size of the Info (non-MAC) field that this port will receive or transmit.
Packets Transmitted Successfully	• Total Packets Transmitted Successfully- The number of frames that have been transmitted by this port to its segment. • Unicast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent. • Multicast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to a Multicast address, including those that were discarded or not sent. • Broadcast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to the Broadcast address, including those that were discarded or not sent.
Transmit Packets Discarded	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Transmit Errors	• Total Transmit Errors - The sum of Single, Multiple, and Excessive Collisions. • FCS Errors - The total number of packets transmitted that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with an integral number of octets. • Underrun Errors - The total number of frames discarded because the transmit FIFO buffer became empty during frame transmission.

Term	Definition
Transmit Discards	• Total Transmit Packets Discards - The sum of single collision frames discarded, multiple collision frames discarded, and excessive frames discarded. • Single Collision Frames - A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by exactly one collision. • Multiple Collision Frames - A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by more than one collision. • Excessive Collisions - A count of frames for which transmission on a particular interface fails due to excessive collisions. • Port Membership Discards - The number of frames discarded on egress for this port due to egress filtering being enabled.
Protocol Statistics	• 802.3x Pause Frames Transmitted - A count of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode. • GVRP PDUs Received - The count of GVRP PDUs received in the GARP layer. • GVRP PDUs Transmitted - The count of GVRP PDUs transmitted from the GARP layer. • GVRP Failed Registrations - The number of times attempted GVRP registrations could not be completed. • GMRP PDUs Received - The count of GMRP PDUs received in the GARP layer. • GMRP PDUs Transmitted - The count of GMRP PDUs transmitted from the GARP layer. • GMRP Failed Registrations - The number of times attempted GMRP registrations could not be completed. • STP BPDUs Transmitted - Spanning Tree Protocol Bridge Protocol Data Units sent. • STP BPDUs Received - Spanning Tree Protocol Bridge Protocol Data Units received. • RST BPDUs Transmitted - Rapid Spanning Tree Protocol Bridge Protocol Data Units sent. • RSTP BPDUs Received - Rapid Spanning Tree Protocol Bridge Protocol Data Units received. • MSTP BPDUs Transmitted - Multiple Spanning Tree Protocol Bridge Protocol Data Units sent. • MSTP BPDUs Received - Multiple Spanning Tree Protocol Bridge Protocol Data Units received.
Dot1x Statistics	• EAPOL Frames Transmitted - The number of EAPOL frames of any type that have been transmitted by this authenticator. • EAPOL Start Frames Received - The number of valid EAPOL start frames that have been received by this authenticator.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this port were last cleared.

If you use the `switchport` keyword, the following information appears.

Term	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received by the processor.
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Packets Received With Error	The total number of packets with errors (including broadcast packets and multicast packets) received by the processor.
Packets Transmitted without Errors	The total number of packets transmitted out of the interface.
Broadcast Packets Transmitted	The total number of packets that higher-level protocols requested be transmitted to the Broadcast address, including those that were discarded or not sent.
Transmit Packet Errors	The number of outbound packets that could not be transmitted because of errors.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds, since the statistics for this switch were last cleared.

If you use the `all` keyword, the following information appears for all interfaces on the switch.

Term	Definition
Port	The Interface ID.
Bytes Tx	The total number of bytes transmitted by the interface.
Bytes Rx	The total number of bytes transmitted by the interface.
Packets Tx	The total number of packets transmitted by the interface.
Packets Rx	The total number of packets transmitted by the interface.

4.4.11 show interface ethernet switchport

This command displays the private VLAN mapping information for the switch interfaces.

Format	`show interface ethernet` *`interface-id`* `switchport`
Mode	Privileged EXEC

Parameter	Description
interface-id	The *slot/port* of the switch.

The command displays the following information.

Term	Definition
Private-vlan host-association	The VLAN association for the private-VLAN host ports.
Private-vlan mapping	The VLAN mapping for the private-VLAN promiscuous ports.

4.4.12 show interface lag

Use this command to display configuration information about the specified LAG interface.

Format	`show interface lag` *`lag-intf-num`*
Mode	Privileged EXEC

Parameters	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received on the LAG interface
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Receive Packets Discarded	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
Packets Transmitted Without Error	The total number of packets transmitted out of the LAG.
Transmit Packets Discarded	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Transmit Packets Errors	The number of outbound packets that could not be transmitted because of errors.

Parameters	Definition
Collisions Frames	The best estimate of the total number of collisions on this Ethernet segment.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this LAG were last cleared.

4.4.13 show fiber-ports optical-transceiver

This command displays the diagnostics information of the SFP like Temp, Voltage, Current, Input Power, Output Power, Tx Fault, and LOS. The values are derived from the SFP's A2 (Diagnostics) table using the I^{2}C interface.

Format `show fiber-ports optical-transceiver {all | slot/port}`

Mode Privileged EXEC

Field	Description
Temp	Internally measured transceiver temperature.
Voltage	Internally measured supply voltage.
Current	Measured TX bias current.
Output Power	Measured optical output power relative to 1mW.
Input Power	Measured optical power received relative to 1mW.
TX Fault	Transmitter fault.
LOS	Loss of signal.

Example: The following information shows an example of the command output:

```
(Switch) #show fiber-ports optical-transceiver all

                                       Output    Input
Port      Temp  Voltage  Current      Power    Power   TX     LOS
           [C]   [Volt]     [mA]      [dBm]    [dBm]   Fault
--------  ----  -------  -------    -------  -------   -----  ---
0/49      39.3    3.256      5.0     -2.234   -2.465   No     No
0/50      33.9    3.260      5.3     -2.374  -40.000   No     Yes
0/51      32.2    3.256      5.6     -2.300   -2.897   No     No
```

4.4.14 show fiber-ports optical-transceiver-info

This command displays the SFP vendor related information like Vendor Name, Serial Number of the SFP, Part Number of the SFP. The values are derived from the SFP's A0 table using the I^{2}C interface.

Format `show fiber-ports optical-transceiver-info {all | slot/port}`

Mode Privileged EXEC

Field	Description
Vendor Name	The vendor name is a 16 character field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h). The vendor name shall be the full name of the corporation, a commonly accepted abbreviation of the name of the corporation, the SCSI company code for the corporation, or the stock exchange code for the corporation.
Length (50um, OM2)	This value specifies link length that is supported by the transceiver while operating in compliance with applicable standards using 50 micron multi-mode OM2 [500MHz*km at 850nm] fiber. A value of zero means that the transceiver does not support 50 micron multimode fiber or that the length information must be determined from the transceiver technology.

Field	Description
Length (62.5um, OM1)	This value specifies link length that is supported by the transceiver while operating in compliance with applicable standards using 62.5 micron multimode OM1 [200 MHz*km at 850nm, 500 MHz*km at 1310nm] fiber. A value of zero means that the transceiver does not support 62.5 micron multimode fiber or that the length information must determined from the transceiver technology
Vendor SN	The vendor serial number (vendor SN) is a 16 character field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h), defining the vendor's serial number for the transceiver. A value of all zero in the 16-byte field indicates that the vendor SN is unspecified.
Vendor PN	The vendor part number (vendor PN) is a 16-byte field that contains ASCII characters, left aligned and added on the right with ASCII spaces (20h), defining the vendor part number or product name. A value of all zero in the 16-byte field indicates that the vendor PN is unspecified.
BR, nominal	The nominal bit (signaling) rate (BR, nominal) is specified in units of 100 MBd, rounded off to the nearest 100 MBd. The bit rate includes those bits necessary to encode and delimit the signal as well as those bits carrying data information. A value of 0 indicates that the bit rate is not specified and must be determined from the transceiver technology. The actual information transfer rate will depend on the encoding of the data, as defined by the encoding value.
Vendor Rev	The vendor revision number (vendor rev) contains ASCII characters, left aligned and padded on the right with ASCII spaces (20h), defining the vendor's product revision number. A value of all zero in this field indicates that the vendor revision is unspecified.

Example: The following information shows an example of the command output:

```
(Switch) #show fiber-ports optical-transceiver-info all

                         Link Link                                 Nominal
                       Length Length                                   Bit
                         50um 62.5um                                  Rate
Port     Vendor Name      [m] [m]  Serial Number    Part Number     [Mbps] Rev
-------- ---------------- --- ---- ---------------- ---------------- ----- ----
0/49    BROADCOM          8    3    A7N2018414       AXM761           10300 10
0/51    BROADCOM          8    3    A7N2018472       AXM761           10300 10
0/52    BROADCOM          8    3    A7N2018501       AXM761           10300 10
```

4.4.15 show mac-addr-table

This command displays the forwarding database entries. These entries are used by the transparent bridging function to determine how to forward a received frame.

Enter **`all`** or no parameter to display the entire table. Enter a MAC Address and VLAN ID to display the table entry for the requested MAC address on the specified VLAN. Enter the ***`count`*** parameter to view summary information about the forwarding database table. Use the ***`interface slot/port`*** parameter to view MAC addresses on a specific interface.

Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number. Use the ***`vlan vlan_id`*** parameter to display information about MAC addresses on a specified VLAN.

Format	`show mac-addr-table [{`*`macaddr vlan_id`*` | all | count | interface `*`slot/port`*` | vlan `*`vlan_id`*`}]`
Mode	Privileged EXEC

The following information displays if you do not enter a parameter, the keyword all, or the MAC address and VLAN ID.

Term	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example `01:23:45:67:89:AB`.
Interface	The port through which this address was learned.
Interface Index	This object indicates the ifIndex of the interface table entry associated with this port.
Status	The status of this entry. The meanings of the values are: • *Static*—The value of the corresponding instance was added by the system or a user when a static MAC filter was defined. It cannot be relearned. • *Learned*—The value of the corresponding instance was learned by observing the source MAC addresses of incoming traffic, and is currently in use. • *Management*—The value of the corresponding instance (system MAC address) is also the value of an existing instance of dot1dStaticAddress. It is identified with interface 0/1. and is currently used when enabling VLANs for routing. • *Self*—The value of the corresponding instance is the address of one of the switch's physical interfaces (the system's own MAC address). • *GMRP Learned*—The value of the corresponding was learned via GMRP and applies to Multicast. • *Other*—The value of the corresponding instance does not fall into one of the other categories.

If you enter ***vlan vlan_id***, only the MAC Address, Interface, and Status fields appear. If you enter the ***interface slot/port*** parameter, in addition to the MAC Address and Status fields, the VLAN ID field also appears.

The following information displays if you enter the ***count*** parameter:

Term	Definition
Dynamic Address count	Number of MAC addresses in the forwarding database that were automatically learned.
Static Address (User-defined) count	Number of MAC addresses in the forwarding database that were manually entered by a user.
Total MAC Addresses in use	Number of MAC addresses currently in the forwarding database.
Total MAC Addresses available	Number of MAC addresses the forwarding database can handle.

4.4.16 process cpu threshold

Use this command to configure the CPU utilization thresholds. The Rising and Falling thresholds are specified as a percentage of CPU resources. The utilization monitoring time period can be configured from 5 seconds to 86400 seconds in multiples of 5 seconds. The CPU utilization threshold configuration is saved across a switch reboot. Configuring the falling utilization threshold is optional. If the falling CPU utilization parameters are not configured, then they take the same value as the rising CPU utilization parameters.

Format	`process cpu threshold type total rising 1-100 interval`
Mode	Global Config

Parameter	Description
rising threshold	The percentage of CPU resources that, when exceeded for the configured rising interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
rising interval	The duration of the CPU rising threshold violation, in seconds, that must be met to trigger a notification. The range is 5 to 86400. The default is 0 (disabled).
falling threshold	The percentage of CPU resources that, when usage falls below this level for the configured interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled). A notification is triggered when the total CPU utilization falls below this level for a configured period of time. The falling utilization threshold notification is made only if a rising threshold notification was previously done. The falling utilization threshold must always be equal or less than the rising threshold value. The CLI does not allow setting the falling threshold to be greater than the rising threshold.
falling interval	The duration of the CPU falling threshold, in seconds, that must be met to trigger a notification. The range is 5 to 86400. The default is 0 (disabled).

4.4.17 show process app-list

This command displays the user and system applications.

NOTICE This command is available in Linux 2.6 only.

Format `show process app-list`

Mode Privileged EXEC

Parameter	Description
ID	The application identifier.
Name	The name that identifies the process.
PID	The number the software uses to identify the process.
Admin Status	The administrative status of the process.
Auto Restart	Indicates whether the process will automatically restart if it stops.
Running Status	Indicates whether the process is currently running or stopped.

Example: The following shows example CLI display output for the command.

```
                            Admin     Auto      Running
ID    Name            PID   Status    Restart   Status
---- ---------------- ----- --------- --------- -------
   1 dataplane        15309 Enabled   Disabled  Running
   2 switchdrvr       15310 Enabled   Disabled  Running
   3 syncdb           15314 Enabled   Disabled  Running
   4 lighttpd         18718 Enabled   Enabled   Running
   5 syncdb-test          0 Disabled  Disabled  Stopped
   6 proctest             0 Disabled  Enabled   Stopped
   7 user.start           0 Enabled   Disabled  Stopped
```

4.4.18 show process app-resource-list

This command displays the configured and in-use resources of each application.

NOTICE This command is available in Linux 2.6 only.

Format	`show process app-resource-list`
Mode	Privileged EXEC

Parameter	Description
ID	The application identifier.
Name	The name that identifies the process.
PID	The number the software uses to identify the process.
Memory Limit	The maximum amount of memory the process can consume.
CPU Share	The maximum percentage of CPU utilization the process can consume.
Memory Usage	The amount of memory the process is currently using.
Max Mem Usage	The maximum amount of memory the process has used at any given time since it started.

```
(Routing) #show process app-resource-list

                              Memory      CPU       Memory      Max Mem
ID   Name                PID  Limit       Share     Usage       Usage
---- ---------------- ---- ----------- --------- ----------- -----------
   1 switchdrvr        251   Unlimited Unlimited      380 MB      381 MB
   2 syncdb            252   Unlimited Unlimited        0 MB        0 MB
   3 syncdb-test       0     Unlimited Unlimited        0 MB        0 MB
   4 proctest          0         10 MB       20%        0 MB        0 MB
   5 utelnetd          0     Unlimited Unlimited        0 MB        0 MB
   6 lxshTelnetd       0     Unlimited Unlimited        0 MB        0 MB
   7 user.start        0     Unlimited Unlimited        0 MB        0 MB
```

4.4.19 show process cpu

This command provides the percentage utilization of the CPU by different tasks.

NOTICE It is not necessarily the traffic to the CPU, but different tasks that keep the CPU busy.

NOTICE This command is available in Linux 2.6 only.

Format	`show process cpu [`*`1-n`*`	all]`
Mode	Privileged EXEC

Keyword	Description
Free	System wide free memory
Alloc	System wide allocated memory (excluding cache, file system used space)
Pid	Process or Thread Id
Name	Process or Thread Name
5Secs	CPU utilization sampling in 5Secs interval
60Secs	CPU utilization sampling in 60Secs interval
300Secs	CPU utilization sampling in 300Secs interval
Total CPU Utilization	Total CPU utilization % within the specified window of 5Secs, 60Secs and 300Secs.

Example: The following shows example CLI display output for the command using Linux.

```
(Routing) #show process cpu
Memory Utilization Report
status      bytes
------ ----------
free    106450944
alloc   423227392

 CPU Utilization:

  PID      Name                     5 Secs     60 Secs    300 Secs
-----------------------------------------------------------------
  765     _interrupt_thread          0.00%       0.01%       0.02%
  767     bcmL2X.0                   0.58%       0.35%       0.28%
  768     bcmCNTR.0                  0.77%       0.73%       0.72%
  773     bcmRX                      0.00%       0.04%       0.05%
  786     cpuUtilMonitorTask         0.19%       0.23%       0.23%
  834     dot1s_task                 0.00%       0.01%       0.01%
  810     hapiRxTask                 0.00%       0.01%       0.01%
  805     dtlTask                    0.00%       0.02%       0.02%
  863     spmTask                    0.00%       0.01%       0.00%
  894     ip6MapLocalDataTask        0.00%       0.01%       0.01%
  908     RMONTask                   0.00%       0.11%       0.12%
-----------------------------------------------------------------
 Total CPU Utilization               1.55%       1.58%       1.50%
```

4.4.20 show process proc-list

This application displays the processes started by applications created by the Process Manager.

NOTICE This command is available in Linux 2.6 only.

Format `show process proc-list`

Mode Privileged EXEC

Parameter	Description
PID	The number the software uses to identify the process.
Process Name	The name that identifies the process.
Application ID-Name	The application identifier and its associated name.
Child	Indicates whether the process has spawned a child process.
VM Size	Virtual memory size.
VM Peak	The maximum amount of virtual memory the process has used at a given time.
FD Count	The file descriptors count for the process.

Example: The following shows example CLI display output for the command.

```
(Routing) #show process proc-list

      Process          Application              VM Size   VM Peak
PID   Name             ID-Name              Chld  (KB)      (KB)     FD Count
---- ---------------- -------------------- ---- -------- -------- --------
15260 procmgr          0-procmgr            No       1984      1984        8
15309 dataplane        1-dataplane          No     293556    293560       11
15310 switchdrvr       2-switchdrvr         No     177220    177408       57
```

```
15314 syncdb          3-syncdb          No       2060     2080        8
18718 lighttpd        4-lighttpd        No       5508     5644       11
18720 lua_magnet      4-lighttpd        Yes     12112    12112        7
18721 lua_magnet      4-lighttpd        Yes     25704    25708        7
```

4.4.21 show running-config

Use this command to display or capture the current setting of different protocol packages supported on the switch. This command displays or captures commands with settings and configurations that differ from the default value. To display or capture the commands with settings and configurations that are equal to the default value, include the `all` option.

NOTICE Show running-config does not display the User Password, even if you set one different from the default.

The output is displayed in script format, which can be used to configure another switch with the same configuration. If the optional ***`scriptname`*** is provided with a file name extension of ".scr", the output is redirected to a script file.

NOTICE If you issue the `show running-config` command from a serial connection, access to the switch through remote connections (such as Telnet) is suspended while the output is being generated and displayed

NOTICE If you use a text-based configuration file, the `show running-config` command only displays configured physical interfaces (i.e. if any interface only contains the default configuration, that interface will be skipped from the `show running-config` command output). This is true for any configuration mode that contains nothing but default configuration. That is, the command to enter a particular config mode, followed immediately by its exit command, are both omitted from the `show running-config` command output (and hence from the startup-config file when the system configuration is saved).

Use the following keys to navigate the command output.

Key	Action
Enter	Advance one line.
Space Bar	Advance one page.
q	Stop the output and return to the prompt.

Note that `--More-- or (q)uit` is displayed at the bottom of the output screen until you reach the end of the output.

This command captures the current settings of OSPFv2 and OSPFv3 trapflag status:

- If all the flags are enabled, then the command displays **`trapflags all`**.
- If all the flags in a particular group are enabled, then the command displays **`trapflags`** *`group name`* **`all`**.
- If some, but not all, of the flags in that group are enabled, the command displays **`trapflags`** *`groupname flag-name`*.

Format `show running-config [all | `*`scriptname`*`]`

Mode Privileged EXEC

4.4.22 show running-config interface

Use this command to display the running configuration for a specific interface. Valid interfaces include physical, LAG, loopback, tunnel and VLAN interfaces.

Format `show running-config interface {`*`interface`*` | lag {`*`lag-intf-num`*`} | loopback {`*`loopback-id`*`} | tunnel {`*`tunnel-id`*`} | vlan {`*`vlan-id`*`}}`

Mode Privileged EXEC

Parameter	Description
interface	Running configuration for the specified interface.
lag-intf-num	Running configuration for the LAG interface.
loopback-id	Running configuration for the loopback interface.
tunnel-id	Running configuration for the tunnel interface.
vlan-id	Running configuration for the VLAN routing interface.

The following information is displayed for the command.

Parameter	Description
slot|port	Enter an interface in slot/port format.
lag	Display the running config for a specified lag interface.
loopback	Display the running config for a specified loopback interface.
tunnel	Display the running config for a specified tunnel interface.
vlan	Display the running config for a specified vlan routing interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show running-config interface 0/1
!Current Configuration:
!
interface  0/1
addport 3/1
exit
(Routing) #
```

4.4.23 show

This command displays the content of text-based configuration files from the CLI. The text-based configuration files (startup-config, backup-config and factory-defaults) are saved compressed in flash. With this command, the files are decompressed while displaying their content.

Format	`show { startup-config	backup-config	factory-defaults }`
Mode	Privileged EXEC

Parameter	Description
startup-config	Display the content of the startup-config file.
backup-config	Display the content of the backup-config file.
factory-defaults	Display the content of the factory-defaults file.

Example: The following shows example CLI display output for the command using the startup-config parameter.

```
(Routing) #show startup-config
!Current Configuration:
!
!System Description "Quanta LB6M, 8.1.14.41, Linux 2.6.27.47, U-Boot 2009.06 (Apr 19 2011 -
15:57:06)"
!System Software Version "8.1.14.41"
!System Up Time          "0 days 0 hrs 48 mins 19 secs"
!Cut-through mode is configured as disabled
!Additional Packages     BGP-4,QOS,IPv6,IPv6 Management,Routing,Data Center
!Current SNTP Synchronized Time: Not Synchronized
!
vlan database
vlan 10
```

```
exit
configure
ipv6 router ospf
exit
line console
exit
line telnet
exit
line ssh
exit
!
--More-- or (q)uit
interface 0/1
description 'intf1'
exit
router ospf
exit
exit
```

Example: The following shows example CLI display output for the command using the backup-config parameter.

```
(Routing) #show backup-config
!Current Configuration:
!
!System Description "Quanta LB6M, 8.1.14.41, Linux 2.6.27.47, U-Boot 2009.06 (Apr 19 2011 -
15:57:06)"
!System Software Version "8.1.14.41"
!System Up Time          "0 days 0 hrs 48 mins 19 secs"
!Cut-through mode is configured as disabled
!Additional Packages     BGP-4,QOS,IPv6,IPv6 Management,Routing,Data Center
!Current SNTP Synchronized Time: Not Synchronized
!
vlan database
vlan 10
exit
configure
ipv6 router ospf
exit
line console
exit
line telnet
exit
line ssh
exit
!
--More-- or (q)uit
interface 0/1
description 'intf1'
exit
router ospf
exit
exit
```

Example: The following shows example CLI display output for the command using the factory-defaults parameter.

```
(Routing) #show factory-defaults
!Current Configuration:
!
!System Description "Quanta LB6M, 8.1.14.41, Linux 2.6.27.47, U-Boot 2009.06 (Apr 19 2011 -
15:57:06)"
!System Software Version "8.1.14.41"
!System Up Time          "0 days 0 hrs 48 mins 19 secs"
!Cut-through mode is configured as disabled
!Additional Packages     BGP-4,QOS,IPv6,IPv6 Management,Routing,Data Center
!Current SNTP Synchronized Time: Not Synchronized
!
vlan database
vlan 10
exit
configure
ipv6 router ospf
exit
line console
exit
line telnet
exit
line ssh
exit
!
--More-- or (q)uit
interface 0/1
description 'intf1'
exit
router ospf
exit
exit
```

4.4.24 dir

Use this command to list the files in the directory /mnt/fastpath in flash from the CLI.

Format `dir`

Mode Privileged EXEC

```
(Routing) #dir

    0  drwx                2048 May 09 2002 16:47:30 .
    0  drwx                2048 May 09 2002 16:45:28 ..
    0  -rwx                 592 May 09 2002 14:50:24 slog2.txt
    0  -rwx                  72 May 09 2002 16:45:28 boot.dim
    0  -rwx                   0 May 09 2002 14:46:36 olog2.txt
    0  -rwx            13376020 May 09 2002 14:49:10 image1
    0  -rwx                   0 Apr 06 2001 19:58:28 fsyssize
    0  -rwx                1776 May 09 2002 16:44:38 slog1.txt
    0  -rwx                 356 Jun 17 2001 10:43:18 crashdump.ctl
    0  -rwx                1024 May 09 2002 16:45:44 sslt.rnd
    0  -rwx            14328276 May 09 2002 16:01:06 image2
    0  -rwx                 148 May 09 2002 16:46:06 hpc_broad.cfg
    0  -rwx                   0 May 09 2002 14:51:28 olog1.txt
    0  -rwx                 517 Jul 23 2001 17:24:00 ssh_host_key
    0  -rwx               69040 Jun 17 2001 10:43:04 log_error_crashdump
    0  -rwx                 891 Apr 08 2000 11:14:28 sslt_key1.pem
    0  -rwx                 887 Jul 23 2001 17:24:00 ssh_host_rsa_key
    0  -rwx                 668 Jul 23 2001 17:24:34 ssh_host_dsa_key
    0  -rwx                 156 Apr 26 2001 13:57:46 dh512.pem
    0  -rwx                 245 Apr 26 2001 13:57:46 dh1024.pem
    0  -rwx                   0 May 09 2002 16:45:30 slog0.txt
```

4.4.25 show sysinfo

This command displays switch information.

Format `show sysinfo`

Mode Privileged EXEC

Term	Definition
Switch Description	Text used to identify this switch.
System Name	Name used to identify the switch.The factory default is blank. To configure the system name, see “snmp-server” on page 91.
System Location	Text used to identify the location of the switch. The factory default is blank. To configure the system location, see “snmp-server” on page 91.
System Contact	Text used to identify a contact person for this switch. The factory default is blank. To configure the system location, see “snmp-server” on page 91.
System ObjectID	The base object ID for the switch’s enterprise MIB.
System Up Time	The time in days, hours and minutes since the last switch reboot.
Current SNTP Synchronized Time	The system time acquired from a network SNTP server.
MIBs Supported	A list of MIBs supported by this agent.

4.4.26 show tech-support

Use the `show tech-support` command to display system and configuration information when you contact technical support. The output of the `show tech-support` command combines the output of the following commands and includes log history files from previous runs:

- show version
- show sysinfo
- show port all
- show isdp neighbors
- show logging
- show event log
- show logging buffered
- show msg-queue
- show trap log
- show running-config

Including the optional `ospf` parameter also displays OSPF information.

Format	`show tech-support [ospf|ospfv3|bfd]`
Mode	Privileged EXEC

4.4.27 length *value*

Use this command to set the pagination length to value number of lines for the sessions specified by configuring on different Line Config modes (telnet/ssh/console) and is persistent.

Example: Length command on Line Console mode applies for Serial Console session.

Default	24
Format	`length` *`value`*
Mode	Line Config

4.4.27.1 no length value

Use this command to set the pagination length to the default value number of lines.

Format	`no length` *`value`*
Mode	Line Config

4.4.28 terminal length

Use this command to set the pagination length to *value* number of lines for the current session. This command configuration takes an immediate effect on the current session and is nonpersistent.

Default	24 lines per page
Format	`terminal length` *`value`*
Mode	Privileged EXEC

4.4.28.1 no terminal length

Use this command to set the *value* to the length value configured on Line Config mode depending on the type of session.

Format	`no terminal length` *`value`*
Mode	Privileged EXEC

4.4.29 show terminal length

Use this command to display all the configured terminal length values.

Format	`show terminal length`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show terminal length
Terminal Length:
----------------------
For Current Session……………….. 24
For Serial Console……………… 24
For Telnet Sessions……………... 24
For SSH Sessions……………….. 24
```

4.4.30 memory free low-watermark processor

Use this command to get notifications when the CPU free memory falls below the configured threshold. A notification is generated when the free memory falls below the threshold. Another notification is generated once the available free memory rises to 10 percent above the specified threshold. To prevent generation of excessive notifications when the CPU free memory fluctuates around the configured threshold, only one Rising or Falling memory notification is generated over a period of 60 seconds. The threshold is specified in kilobytes. The CPU free memory threshold configuration is saved across a switch reboot.

Format	`memory free low-watermark processor` *`1-1034956`*
Mode	Global Config

Parameter	Description
low-watermark	When CPU free memory falls below this threshold, a notification message is triggered. The range is 1 to the maximum available memory on the switch. The default is 0 (disabled).

4.4.31 clear mac-addr-table

Use this command to dynamically clear learned entries from the forwarding database. Using the following options, the user can specify the set of dynamically-learned forwarding database entries to clear.

Default	No default value.
Format	`clear mac-addr-table {all	vlan` *`vlanId`* `| interface` *`slot/port`* `|` *`macAddr`* `[`*`macMask`*`] }`
Mode	Privileged EXEC

Parameter	Description
all	Clears dynamically learned forwarding database entries in the forwarding database table.
vlan *vlanId*	Clears dynamically learned forwarding database entries for this *vlanId*.
interface *slot/port*	Clears forwarding database entries learnt on for the specified interface.
macAddr macMask	Clears dynamically learned forwarding database entries that match the range specified by MAC address and MAC mask. When MAC mask is not entered, only specified MAC is removed from the forwarding database table.

4.5 Logging Commands

This section describes the commands you use to configure system logging, and to view logs and the logging settings.

4.5.1 logging buffered

This command enables logging to an in-memory log.

Default	disabled; critical when enabled
Format	`logging buffered`
Mode	Global Config

4.5.1.1 no logging buffered

This command disables logging to in-memory log.

Format	`no logging buffered`
Mode	Global Config

4.5.2 logging buffered wrap

This command enables wrapping of in-memory logging when the log file reaches full capacity. Otherwise when the log file reaches full capacity, logging stops.

Default	enabled
Format	`logging buffered wrap`
Mode	Privileged EXEC

4.5.2.1 no logging buffered wrap

This command disables wrapping of in-memory logging and configures logging to stop when the log file capacity is full.

Format	`no logging buffered wrap`
Mode	Privileged EXEC

4.5.3 logging cli-command

This command enables the CLI command logging feature, which enables the FASTPATH software to log all CLI commands issued on the system. The commands are stored in a persistent log. Use the `show logging persistent` command to display the stored history of CLI commands.

Default	enabled
Format	`logging cli-command`
Mode	Global Config

4.5.3.1 no logging cli-command

This command disables the CLI command Logging feature.

Format	`no logging cli-command`
Mode	Global Config

4.5.4 logging console

This command enables logging to the console. You can specify the ***severitylevel*** value as either an integer from 0 to 7 or symbolically through one of the following keywords: **emergency** (0), **alert** (1), **critical** (2), **error** (3), **warning** (4), **notice** (5), **info** (6), or **debug** (7).

Default	disabled; critical when enabled
Format	`logging console` *[severitylevel]*
Mode	Global Config

4.5.4.1 no logging console

This command disables logging to the console.

Format	`no logging console`
Mode	Global Config

4.5.5 logging host

This command configures the logging host parameters. You can configure up to eight hosts.

Default	• port: 514 (for UDP) and 6514 (for TLS) • authentication mode: anonymous • certificate index: 0 • level: critical (2)
Format	`logging host {hostaddress|hostname} addresstype tls [anon|x509name] certificate-index {port severitylevel}`
Mode	Global Config

Parameter	Description
hostaddress|hostname	The IP address of the logging host.
address-type	Indicates the type of address being passed: DNS or IPv4.
tls	Enables TLS security for the host.
anon|x509name	The type of authentication mode: anonymous or x509name.

Parameter	Description
certificate-index	The certificate number to be used for authentication. The valid range is 0–8. Index 0 is used to the default file.
port	A port number from 1 to 65535.
severitylevel	Specify this value as either an integer from 0 to 7, or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Example: The following shows examples of the command.

```
The following shows examples of the command.

(Routing) (Config)# logging host google.com dns 214
(Routing) (Config)# logging host 10.130.64.88 ipv4 214 6
(Routing) (Config)# logging host 5.5.5.5 ipv4 tls anon 6514 debug
(Routing) (Config)# logging host 5.5.5.5 ipv4 tls x509name 3 651
```

4.5.6 logging host reconfigure

This command enables logging host reconfiguration.

Format `logging host reconfigure` *`hostindex`*

Mode Global Config

Parameter	Description
hostindex	Enter the Logging Host Index for which to change the IP address.

4.5.7 logging host remove

This command disables logging to host. See “show logging hosts” on page 165 for a list of host indexes.

Format `logging host remove` *`hostindex`*

Mode Global Config

4.5.8 logging protocol

Use this command to configure the logging protocol version number as 0 or 1. RFC 3164 uses version 0 and RFC 5424 uses version 1.

Default The default is version 0 (RFC 3164).

Format `logging protocol {0|1}`

Mode Global Config

4.5.9 logging syslog

This command enables syslog logging.

Format `logging syslog`

Mode Global Config

4.5.9.1 no logging syslog

This command disables syslog logging.

Format	`no logging syslog`
Mode	Global Config

4.5.10 logging syslog port

This command enables syslog logging. The `portid` parameter is an integer with a range of 1-65535.

Default	disabled
Format	`logging syslog port` *`portid`*
Mode	Global Config

4.5.10.1 no logging syslog port

This command disables syslog logging.

Format	`no logging syslog port`
Mode	Global Config

4.5.11 logging syslog source-interface

This command configures the syslog source-interface (source IP address) for syslog server configuration. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address.

Format	`logging syslog source-interface {`*`slot/port`*`|{loopback `*`loopback-id`*`}|{vlan `*`vlan-id`*`}}`
Mode	Global Config

Parameter	Description
slot/port	VLAN or port-based routing interface.
loopback-id	Configures the loopback interface to use as the source IP address. The range of the loopback ID is 0 to 7.
tunnel-id	Configures the tunnel interface to use as the source IP address. The range of the tunnel ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

Example: The following shows examples of the command.

```
(config)#logging syslog source-interface loopback 0
(config)#logging syslog source-interface tunnel 0
(config)#logging syslog source-interface 0/4/1
(config)#logging syslog source-interface 0/1
```

4.5.11.1 no logging syslog source-interface

This command disables syslog logging.

Format	`no logging syslog`
Mode	Global Config

4.5.12 show logging

This command displays logging configuration information.

Format	`show logging`
Mode	Privileged EXEC

Term	Definition
Logging Client Local Port	Port on the collector/relay to which syslog messages are sent.
Logging Client Source Interface	Shows the configured syslog source-interface (source IP address).
CLI Command Logging	Shows whether CLI Command logging is enabled.
Logging Protocol	The logging protocol version number. • 0: RFC 3164 • 1: RFC 5424
Console Logging	Shows whether console logging is enabled.
Console Logging Severity Filter	The minimum severity to log to the console log. Messages with an equal or lower numerical severity are logged.
Buffered Logging	Shows whether buffered logging is enabled.
Persistent Logging	Shows whether persistent logging is enabled.
Persistent Logging Severity Filter	The minimum severity at which the logging entries are retained after a system reboot.
Syslog Logging	Shows whether syslog logging is enabled.
Log Messages Received	Number of messages received by the log process. This includes messages that are dropped or ignored.
Log Messages Dropped	Number of messages that could not be processed due to error or lack of resources.
Log Messages Relayed	Number of messages sent to the collector/relay.

Example: The following shows example CLI display output for the command.

```
(Routing) #show logging

Logging Client Local Port              : 514
Logging Client Source Interface        : (not configured)
CLI Command Logging                    : disabled
Logging Protocol                       : 1
Console Logging                        : enabled
Console Logging Severity Filter        : error
Buffered Logging                       : enabled
Persistent Logging                     : disabled
Persistent Logging Severity Filter     : alert
```

```
Syslog Logging                        : disabled

Log Messages Received                 : 1010
Log Messages Dropped                  : 0
Log Messages Relayed                  : 0
```

4.5.13 show logging buffered

This command displays buffered logging (system startup and system operation logs).

Format	`show logging buffered`
Mode	Privileged EXEC

Term	Definition
Buffered (In-Memory) Logging	Shows whether the In-Memory log is enabled or disabled.
Buffered Logging Wrapping Behavior	The behavior of the In Memory log when faced with a log full situation.
Buffered Log Count	The count of valid entries in the buffered log.

4.5.14 show logging hosts

This command displays all configured logging hosts. Use the "|" character to display the output filter options.

Format	`show logging hosts`
Mode	Privileged EXEC

Term	Definition
Host Index	(Used for deleting hosts.)
IP Address / Hostname	IP address or hostname of the logging host.
Severity Level	The minimum severity to log to the specified address. The possible values are emergency (0), alert (1), critical (2), error (3), warning (4), notice (5), info (6), or debug (7).
Port	The server port number, which is the port on the local host from which syslog messages are sent.
Status	Status field provides the current status of snmp row status. (Active, Not in Service, Not Ready).
Mode	The type of security: UDP or TLS.
Auth	The type of authentication mode: anonymous or x509name.
Cert #	The certificate number to be used for authentication. The valid range is 0–8. Index 0 is used to the default file.

Example: The following shows example CLI display output for the command.

```
(Routing) #show logging hosts
Index  IP Address/Hostname   Severity   Port   Status    Mode
----- --------------------- ---------- ------ --------- -----
1     1.1.1.17              critical   514    Active    udp
2     10.130.191.90         debug      10514  Active    tls
3     5.5.5.5               debug      333    Active    tls

Auth     Cert#
-------- -----

x509name 6
x509name 4
```

4.5.15 show logging persistent

Use the show logging persistent command to display persistent log entries. If `log-files` is specified, the system persistent log files are displayed.

Format `show logging persistent [log-files]`

Mode Privileged EXEC

Parameter	Description
Persistent Logging	If persistent logging is enabled or disabled.
Persistent Log Count	The number of persistent log entries.
Persistent Log Files	The list of persistent log files in the system. Only displayed if `log-files` is specified.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show logging persistent

Persistent Logging    : disabled
Persistent Log Count  : 0

(FASTPATH Switching) #show logging persistent log-files

Persistent Log Files:

slog0.txt
slog1.txt
slog2.txt
olog0.txt
olog1.txt
olog2.txt
```

4.5.16 show logging traplogs

This command displays SNMP trap events and statistics.

Format `show logging traplogs`

Mode Privileged EXEC

Term	Definition
Number of Traps Since Last Reset	The number of traps since the last boot.
Trap Log Capacity	The number of traps the system can retain.
Number of Traps Since Log Last Viewed	The number of new traps since the command was last executed.
Log	The log number.
System Time Up	How long the system had been running at the time the trap was sent.
Trap	The text of the trap message.

4.5.17 clear logging buffered

This command clears buffered logging (system startup and system operation logs).

Format	`clear logging buffered`
Mode	Privileged EXEC

4.6 Email Alerting and Mail Server Commands

4.6.1 logging email

This command enables email alerting and sets the lowest severity level for which log messages are emailed. If you specify a severity level, log messages at or above this severity level, but below the urgent severity level, are emailed in a non-urgent manner by collecting them together until the log time expires. You can specify the ***severitylevel*** value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Default	disabled; when enabled, log messages at or above severity Warning (4) are emailed
Format	`logging email` *[severitylevel]*
Mode	Global Config

4.6.1.1 no logging email

This command disables email alerting.

Format	`no logging email`
Mode	Global Config

4.6.2 logging email urgent

This command sets the lowest severity level at which log messages are emailed immediately in a single email message. Specify the ***severitylevel*** value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7). Specify `none` to indicate that log messages are collected and sent in a batch email at a specified interval.

Default	Alert (1) and emergency (0) messages are sent immediately.
Format	`logging email urgent {`*severitylevel* `| none}`
Mode	Global Config

4.6.2.1 no logging email urgent

This command resets the urgent severity level to the default value.

Format	`no logging email urgent`
Mode	Global Config

4.6.3 logging email message-type to-addr

This command configures the email address to which messages are sent. The message types supported are `urgent`, `non-urgent`, and `both`. For each supported severity level, multiple email addresses can be configured. The ***to-email-addr*** variable is a standard email address, for example admin@yourcompany.com.

Format	`logging email message-type {urgent |non-urgent |both} to-addr` *`to-email-addr`*
Mode	Global Config

4.6.3.1 no logging email message-type to-addr

This command removes the configured to-addr field of email.

Format	`no logging email message-type {urgent |non-urgent |both} to-addr` *`to-email-addr`*
Mode	Global Config

4.6.4 logging email from-addr

This command configures the email address of the sender (the switch).

Default	switch@broadcom.com
Format	`logging email from-addr` *`from-email-addr`*
Mode	Global Config

4.6.4.1 no logging email from-addr

This command removes the configured email source address.

Format	`no logging email from-addr` *`from-email-addr`*
Mode	Global Config

4.6.5 logging email message-type subject

This command configures the subject line of the email for the specified type.

Default	For urgent messages: Urgent Log Messages For non-urgent messages: Non Urgent Log Messages
Format	`logging email message-type {urgent |non-urgent |both} subject` *`subject`*
Mode	Global Config

4.6.5.1 no logging email message-type subject

This command removes the configured email subject for the specified message type and restores it to the default email subject.

Format	`no logging email message-type {urgent |non-urgent |both} subject`
Mode	Global Config

4.6.6 logging email logtime

This command configures how frequently non-urgent email messages are sent. Non-urgent messages are collected and sent in a batch email at the specified interval. The valid range is every 30–1440 minutes.

Default	30 minutes
Format	`logging email logtime` ***`minutes`***
Mode	Global Config

4.6.6.1 no logging email logtime

This command resets the non-urgent log time to the default value.

Format	`no logging email logtime`
Mode	Global Config

4.6.7 logging traps

This command sets the severity at which SNMP traps are logged and sent in an email. Specify the ***severityLevel*** value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Default	Info (6) messages and higher are logged.
Format	`logging traps` *`severityLevel`*
Mode	Global Config

4.6.7.1 no logging traps

This command resets the SNMP trap logging severity level to the default value.

Format	`no logging traps`
Mode	Global Config

4.6.8 logging email test message-type

This command sends an email to the SMTP server to test the email alerting function.

Format	`logging email test message-type {urgent |non-urgent |both} message-body` *`message-body`*
Mode	Global Config

4.6.9 show logging email config

This command displays information about the email alert configuration.

Format	`show logging email config`
Mode	Privileged EXEC

Term	Definition
Email Alert Logging	The administrative status of the feature: enabled or disabled
Email Alert From Address	The email address of the sender (the switch).
Email Alert Urgent Severity Level	The lowest severity level that is considered urgent. Messages of this type are sent immediately.
Email Alert Non Urgent Severity Level	The lowest severity level that is considered non-urgent. Messages of this type, up to the urgent level, are collected and sent in a batch email. Log messages that are less severe are not sent in an email message at all.
Email Alert Trap Severity Level	The lowest severity level at which traps are logged.
Email Alert Notification Period	The amount of time to wait between non-urgent messages.
Email Alert To Address Table	The configured email recipients.
Email Alert Subject Table	The subject lines included in urgent (Type 1) and non-urgent (Type 2) messages.
For Msg Type urgent, subject is	The configured email subject for sending urgent messages.
For Msg Type non-urgent, subject is	The configured email subject for sending non-urgent messages.

4.6.10 show logging email statistics

This command displays email alerting statistics.

Format	`show logging email statistics`
Mode	Privileged EXEC

Term	Definition
Email Alert Operation Status	The operational status of the email alerting feature.
No of Email Failures	The number of email messages that have attempted to be sent but were unsuccessful.
No of Email Sent	The number of email messages that were sent from the switch since the counter was cleared.
Time Since Last Email Sent	The amount of time that has passed since the last email was sent from the switch.

4.6.11 clear logging email statistics

This command resets the email alerting statistics.

Format	`clear logging email statistics`
Mode	Privileged EXEC

4.6.12 mail-server

This command configures the SMTP server to which the switch sends email alert messages and changes the mode to Mail Server Configuration mode. The server address can be in the IPv4, IPv6, or DNS name format.

Format	`mail-server {`*`ip-address`*`	`*`ipv6-address`*`	`*`hostname`*`}`
Mode	Global Config

4.6.12.1 no mail-server

This command removes the specified SMTP server from the configuration.

Format	`no mail-server {`*`ip-address`*`	`*`ipv6-address`*`	`*`hostname`*`}`
Mode	Global Config

4.6.13 security

This command sets the email alerting security protocol by enabling the switch to use TLS authentication with the SMTP Server. If the TLS mode is enabled on the switch but the SMTP sever does not support TLS mode, no email is sent to the SMTP server.

Default	none
Format	`security {tlsv1	none}`
Mode	Mail Server Config

4.6.14 port

This command configures the TCP port to use for communication with the SMTP server. The recommended port for TLSv1 is 465, and for no security (i.e. none) it is 25. However, any nonstandard port in the range 1 to 65535 is also allowed.

Default	25
Format	`port {465	25	1-65535}`
Mode	Mail Server Config

4.6.15 username (Mail Server Config)

This command configures the login ID the switch uses to authenticate with the SMTP server.

Default	admin
Format	`username` *`name`*
Mode	Mail Server Config

4.6.16 password

This command configures the password the switch uses to authenticate with the SMTP server.

Default	admin
Format	`password` *`password`*
Mode	Mail Server Config

4.6.17 show mail-server config

This command displays information about the email alert configuration.

Format	`show mail-server {`*`ip-address`*`	`*`hostname`*`	all} config`
Mode	Privileged EXEC

Term	Definition
No of mail servers configured	The number of SMTP servers configured on the switch.
Email Alert Mail Server Address	The IPv4/IPv6 address or DNS hostname of the configured SMTP server.
Email Alert Mail Server Port	The TCP port the switch uses to send email to the SMTP server
Email Alert Security Protocol	The security protocol (TLS or none) the switch uses to authenticate with the SMTP server.
Email Alert Username	The username the switch uses to authenticate with the SMTP server.
Email Alert Password	The password the switch uses to authenticate with the SMTP server.

4.7 System Utility and Clear Commands

This section describes the commands you use to help troubleshoot connectivity issues and to restore various configurations to their factory defaults.

4.7.1 traceroute

Use the `traceroute` command to discover the routes that IPv4 or IPv6 packets actually take when traveling to their destination through the network on a hop-by-hop basis. Traceroute continues to provide a synchronous response when initiated from the CLI.

The user may specify the source IP address or the virtual router of the traceroute probes. Recall that traceroute works by sending packets that are expected not to reach their final destination, but instead trigger ICMP error messages back to the source address from each hop along the forward path to the destination. By specifying the source address, the user can determine where along the forward path there is no route back to the source address. Note that this is only useful if the route from source to destination and destination to source is symmetric.) It would be common, for example, to send a traceroute from an edge router to a target higher in the network using a source address from a host subnet on the edge router. This would test reachability from within the network back to hosts attached to the edge router. Alternatively, one might send a traceroute with an address on a loopback interface as a source to test reachability back to the loopback interface address.

In the CLI, the user may specify the source as an IPv4 address, IPv6 address, a virtual router, or as a routing interface. When the source is specified as a routing interface, the traceroute is sent using the primary IPv4 address on the source interface. With SNMP, the source must be specified as an address. The source cannot be specified in the web UI.

FASTPATH will not accept an incoming packet, such as a traceroute response, that arrives on a routing interface if the packet's destination address is on one of the out-of-band management interfaces (service port or network port). Similarly, FASTPATH will not accept a packet that arrives on a management interface if the packet's destination is an address on a routing interface. Thus, it would be futile to send a traceroute on a management interface using a routing interface address as source, or to send a traceroute on a routing interface using a management interface as source. When sending a traceroute on a routing interface, the source must be that routing interface or another routing interface. When sending a traceroute on a management interface, the source must be on that management interface. For this reason, the user cannot specify the source as a management interface or management interface address. When sending a traceroute on a management interface, the user should not specify a source address, but instead let the system select the source address from the outgoing interface.

Default
- count: 3 probes
- interval: 3 seconds
- size: 0 bytes
- port: 33434
- maxTtl: 30 hops
- maxFail: 5 probes
- initTtl: 1 hop

Format traceroute {*ip-address* | [ipv6] {*ipv6-address* | *hostname*}} [initTtl *initTtl*] [maxTtl *maxTtl*] [maxFail *maxFail*] [interval *interval*] [count *count*] [port *port*] [size *size*] [source {*ip-address* | | *ipv6-address* | slot/port}]

Mode Privileged EXEC

Using the options described below, you can specify the initial and maximum time-to-live (TTL) in probe packets, the maximum number of failures before termination, the number of probes sent for each TTL, and the size of each probe.

Parameter	Description
ipaddress	The ***ipaddress*** value should be a valid IP address.
ipv6-address	The *ipv6-address* value should be a valid IPv6 address.
hostname	The ***hostname*** `value should be a valid hostname.`
ipv6	The optional *ipv6* keyword can be used before *ipv6-address* or *hostname*. Giving the *ipv6* keyword before the *hostname* tries it to resolve to an IPv6 address.
initTtl	Use `initTtl` to specify the initial time-to-live (TTL), the maximum number of router hops between the local and remote system. Range is 0 to 255.
maxTtl	Use `maxTtle` to specify the maximum TTL. Range is 1 to 255.
maxFail	Use `maxFail` to terminate the traceroute after failing to receive a response for this number of consecutive probes. Range is 0 to 255.
interval	Use the optional `interval` parameter to specify the time between probes, in seconds. If a response is not received within this interval, then traceroute considers that probe a failure (printing *) and sends the next probe. If traceroute does receive a response to a probe within this interval, then it sends the next probe immediately. Range is 1 to 60 seconds.
count	Use the optional `count` parameter to specify the number of probes to send for each TTL value. Range is 1 to 10 probes.
port	Use the optional `port` parameter to specify destination UDP port of the probe. This should be an unused port on the remote destination system. Range is 1 to 65535.
size	Use the optional `size` parameter to specify the size, in bytes, of the payload of the Echo Requests sent. Range is 0 to 65507 bytes.
source	Use the optional *source* parameter to specify the source IP address or interface for the traceroute.

The following are examples of the CLI command.

Example: traceroute Success:

```
(Routing) # traceroute 10.240.10.115 initTtl 1 maxTtl 4 maxFail 0 interval 1 count 3 port 33434 size
43
 Traceroute to 10.240.10.115 ,4 hops max 43 byte packets:
1 10.240.4.1    708 msec     41 msec     11 msec
2 10.240.10.115   0 msec     0 msec     0 msec

Hop Count = 1 Last TTL = 2 Test attempt = 6 Test Success = 6
```

Example: traceroute ipv6 Success

```
(Routing) # traceroute 2001::2 initTtl 1 maxTtl 4 maxFail 0 interval 1 count 3 port 33434
size 43

Traceroute to 2001::2 hops max 43 byte packets:
1      2001::2   708 msec     41 msec     11 msec

The above command can also be execute with the optional ipv6 parameter as follows:


(Routing) # traceroute ipv6 2001::2 initTtl 1 maxTtl 4 maxFail 0 interval 1 count 3 port
33434 size 43
```

Example: traceroute Failure:

```
(Routing) # traceroute 10.40.1.1 initTtl 1 maxFail 0 interval 1 count 3
port 33434 size 43
Traceroute to 10.40.1.1 ,30 hops max 43 byte packets:
1 10.240.4.1   19 msec     18 msec     9 msec
2 10.240.1.252   0 msec     0 msec     1 msec
3 172.31.0.9   277 msec     276 msec     277 msec
4 10.254.1.1   289 msec     327 msec     282 msec
5 10.254.21.2   287 msec     293 msec     296 msec
6 192.168.76.2   290 msec     291 msec     289 msec
7 0.0.0.0   0 msec *
Hop Count = 6 Last TTL = 7 Test attempt = 19 Test Success = 18
```

Example: traceroute ipv6 Failure

```
(Routing)# traceroute 2001::2 initTtl 1 maxFail 0 interval 1 count 3 port 33434 size 43

Traceroute to 2001::2 hops max 43 byte packets:
1   3001::1   708 msec     41 msec     11 msec
2   4001::2   250 msec     200 msec    193 msec
3   5001::3   289 msec     313 msec    278 msec
4   6001::4   651 msec     41 msec     270 msec
5         0             0 msec *
Hop Count = 4 Last TTL = 5 Test attempt = 1 Test Success = 0
```

4.7.2 clear config

This command resets the configuration to the factory defaults without powering off the switch. When you issue this command, a prompt appears to confirm that the reset should proceed. When you enter **y**, you automatically reset the current configuration on the switch to the default values. It does not reset the switch.

Format	`clear config`
Mode	Privileged EXEC

4.7.3 clear config interface

This command resets the configuration in the specified interface or range of interfaces to the factory defaults without powering off the switch. When you issue this command, a prompt appears to confirm that the reset should proceed. When you enter **y**, you automatically reset the current configuration on the interface or interfaces to the default values. It does not reset the switch.

The `clear config interface` command clears the configuration only for commands issued in Interface Config mode. Interface-related commands which were not issued in Interface Config mode, such as enabling routing on a VLAN interface, cannot be cleared using this command

Format `clear config interface {slot/port | lag lag_id | vlan vlan_id | loopback loopback_id}`

Mode Privileged EXEC

4.7.4 clear counters

This command clears the statistics for a specified *slot/port,* for all the ports, or for an interface on a VALN based on the argument, including the loop protection counters.

Format `clear counters {slot/port | all | vlan id}`

Mode Privileged EXEC

4.7.5 clear igmpsnooping

This command clears the tables managed by the IGMP Snooping function and attempts to delete these entries from the Multicast Forwarding Database.

Format `clear igmpsnooping`

Mode Privileged EXEC

4.7.6 clear ip access-list counters

This command clears the counters of the specified IP ACL and IP ACL rule.

Format `clear ip access-list counters acl-ID | acl-name rule-id`

Mode Privileged EXEC

4.7.7 clear ipv6 access-list counters

This command clears the counters of the specified IP ACL and IP ACL rule.

Format `clear ipv6 access-list counters acl-name rule-id`

Mode Privileged EXEC

4.7.8 clear mac access-list counters

This command clears the counters of the specified MAC ACL and MAC ACL rule.

Format `clear mac access-list counters acl-name rule-id`

Mode Privileged EXEC

4.7.9 clear pass

This command resets all user passwords to the factory defaults without powering off the switch. You are prompted to confirm that the password reset should proceed.

Format `clear pass`

Mode Privileged EXEC

4.7.10 clear traplog

This command clears the trap log.

Format `clear traplog`

Mode Privileged EXEC

4.7.11 clear vlan

This command resets VLAN configuration parameters to the factory defaults. When the VLAN configuration is reset to the factory defaults, there are some scenarios regarding GVRP that happen due to this:

1. Static VLANs are deleted.
2. GVRP is restored to the factory default as a result of handling the VLAN RESTORE NOTIFY event. Since GVRP is disabled by default, this means that GVRP should be disabled and all of its dynamic VLANs should be deleted.
3. MVRP is restored to the factory default as a result of handling the VLAN RESTORE NOTIFY event. Since MVRP is enabled by default, this means that any VLANs already created by MVRP are unaffected. However, for customer platforms where MVRP is disabled by default, then the MVRP behavior should match GVRP. That is, MVRP is disabled and the MVRP VLANs are deleted.

Format `clear vlan`

Mode Privileged EXEC

4.7.12 logout

This command closes the current telnet connection or resets the current serial connection.

NOTICE Save configuration changes before logging out.

Format `logout`

Modes
- Privileged EXEC
- User EXEC

4.7.13 ping

Use this command to determine whether another computer is on the network. Ping provides a synchronous response when initiated from the CLI and Web interfaces.

NOTICE For information about the `ping` command for IPv6 hosts, see “ping ipv6” on page 668.

Default

- The default count is 1.
- The default interval is 3 seconds.
- The default size is 0 bytes.

Format `ping {`*`address`*`|` *`hostname`* `| {ipv6 {interface {slot/port | vlan` *`1-4093`* `| loopback` *`loopback-id`* `| network | serviceport | tunnel` *`tunnel-id`* `}` *`link-local-address`*`} |` *`ipv6-address`* `|` *`hostname`*`} [count` *`count`*`] [interval 1-60] [size` *`size`*`] [source` *`ip-address`* `|` *`ipv6-address`* `| {slot/port | vlan` *`1-4093`* `| serviceport | network}]`

Modes

- Privileged EXEC
- User EXEC

Using the options described below, you can specify the number and size of Echo Requests and the interval between Echo Requests.

Parameter	Description
address	IPv4 or IPv6 addresses to ping.
count	Use the **`count`** parameter to specify the number of ping packets (ICMP Echo requests) that are sent to the destination address specified by the ***`ip-address`*** field. The range for *`count`* is 1 to 15 requests.
interval	Use the **`interval`** parameter to specify the time between Echo Requests, in seconds. Range is 1 to 60 seconds.
size	Use the **`size`** parameter to specify the size, in bytes, of the payload of the Echo Requests sent. Range is 0 to 65507 bytes.
source	Use the *source* parameter to specify the source IP/IPv6 address or interface to use when sending the Echo requests packets.
hostname	Use the *hostname* parameter to resolve to an IPv4 or IPv6 address. The *ipv6* keyword is specified to resolve the hostname to IPv6 address. The IPv4 address is resolved if no keyword is specified.
ipv6	The optional keyword *ipv6* can be used before the *ipv6-address* or *hostname* argument. Using the *ipv6* optional keyword before *hostname* tries to resolve it directly to the IPv6 address. Also used for pinging a link-local IPv6 address.
interface	Use the *interface* keyword to ping a link-local IPv6 address over an interface.
link-local-address	The link-local IPv6 address to ping over an interface.

The following are examples of the CLI command.

Example: IPv4 ping success:

```
(FASTPATH Routing) #ping 10.254.2.160 count 3 interval 1 size 255
Pinging 10.254.2.160 with 255 bytes of data:

Received response for icmp_seq = 0. time = 275268 usec
Received response for icmp_seq = 1. time = 274009 usec
Received response for icmp_seq = 2. time = 279459 usec

----10.254.2.160 PING statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (msec) min/avg/max = 274/279/276
```

Example: IPv6 ping success

```
(FASTPATH Routing) #ping 2001::1
 Pinging 2001::1 with 64 bytes of data:

Send count=3, Receive count=3 from 2001::1
Average round trip time = 3.00 ms
```

Example: IPv4 ping failure:

In Case of Unreachable Destination:

```
(FASTPATH Routing) # ping 192.168.254.222 count 3 interval 1 size 255
Pinging 192.168.254.222 with 255 bytes of data:
Received Response: Unreachable Destination
Received Response :Unreachable Destination
Received Response :Unreachable Destination
----192.168.254.222  PING statistics----
3 packets transmitted,3 packets received, 0% packet loss
round-trip (msec) min/avg/max = 0/0
```

In Case Of Request TimedOut:

```
(FASTPATH Routing) # ping 1.1.1.1 count 1 interval 3
Pinging 1.1.1.1 with 0 bytes of data:

----1.1.1.1 PING statistics----
1 packets transmitted,0 packets received, 100% packet loss
round-trip (msec) min/avg/max = 0/0
```

Example: IPv6 ping failure

```
(FASTPATH Routing) #ping ipv6 2001::4
 Pinging 2001::4 with 64 bytes of data:

Send count=3, Receive count=0 from 2001::4
Average round trip time = 0.00 ms
```

4.7.14 quit

This command closes the current telnet connection or resets the current serial connection. The system asks you whether to save configuration changes before quitting.

Format `quit`

Modes
- Privileged EXEC
- User EXEC

4.7.15 reload

This command resets the switch without powering it off. Reset means that all network connections are terminated and the boot code executes. The switch uses the stored configuration to initialize the switch. You are prompted to confirm that the reset should proceed. The LEDs on the switch indicate a successful reset.

Format `reload [configuration [`*`scriptname`*`]]`

Mode Privileged EXEC

Parameter	Description
configuration	Gracefully reloads the configuration. If no configuration file is specified, the startup-config file is loaded.
scriptname	The configuration file to load. The scriptname must include the extension.

4.7.16 copy

The `copy` command uploads and downloads files to and from the switch. You can also use the `copy` command to manage the dual images (active and backup) on the file system. Upload and download files from a server using FTP, TFTP, Xmodem, Ymodem, or Zmodem.

SFTP and SCP are available as additional transfer methods if the software package supports secure management.

If FTP is used, a password is required.

Format copy *source destination* {*verify* | *noverify*}

Mode Privileged EXEC

Replace the ***source*** and ***destination*** parameters with the options in Table 9 on page 180. For the ***url*** source or destination, use one of the following values:

{xmodem | tftp://*ipaddr*|*hostname* | *ip6address*|*hostname/filepath/filename* [noval]| sftp|scp://*username@ipaddr* | *ipv6address/filepath/filename* | ftp://*user@ipaddress* | *hostname/filepath/filename*}

verify | ***noverify*** is only available if the image/configuration verify options feature is enabled (see “file verify” on page 185). `verify` specifies that digital signature verification will be performed for the specified downloaded image or configuration file. `noverify` specifies that no verification will be performed.

The keyword ias-users supports the downloading of the IAS user database file. When the IAS users file is downloaded, the switch IAS user’s database is replaced with the users and its attributes available in the downloaded file. In the command copy *url* ias-users, for *url* one of the following is used for IAS users file:

{ { tftp://<ipaddr | hostname> | <ipv6address | hostname> /<filepath>/<filename> } | { sftp | scp://<username>@<ipaddress>/<filepath>/<filename>} }

NOTICE The maximum length for the file path is 160 characters, and the maximum length for the file name is 31 characters.

For FTP, TFTP, SFTP and SCP, the ***ipaddr|hostname*** parameter is the IP address or host name of the server, ***filepath*** is the path to the file, and ***filename*** is the name of the file you want to upload or download. For SFTP and SCP, the ***username*** parameter is the username for logging into the remote server via SSH.

NOTICE ***ip6address*** is also a valid parameter for routing packages that support IPv6.

To copy OpenFlow SSL certificates to the switch using TFTP or XMODEM, using only the following options pertinent to the OpenFlow SSL certificates.

Format copy [<mode/file>] nvram:{openflow-ssl-ca-cert | openflow-ssl-cert | openflow-ssl-priv-key}

Mode Privileged EXEC

⚠CAUTION Remember to upload the existing fastpath.cfg file off the switch prior to loading a new release image in order to make a backup.

Table 9: Copy Parameters

Source	Destination	Description
nvram:application: *sourcefilename*	*url*	Filename of source application file.
nvram:backup-config	nvram:startup-config	Copies the backup configuration to the startup configuration.
nvram:clibanner	*url*	Copies the CLI banner to a server.
nvram: core-dump	tftp://<ipaddress|hostname>/<filepath>/<filename>|ftp://<user>@<ipaddr|hostname>/<path>/<filename> | scp://<user>@<ipaddr|hostname>/<path>/<filename> | sftp://<user>@<ipaddr|hostname>/<path>/<filename>}	Uploads the core dump file on the local system to an external TFTP/FTP/SCP/SFTP server.
nvram:cpupktcapture.pcap	*url*	Uploads CPU packets capture file.
nvram:crash-log	url	Copies the crash log to a server.
nvram:errorlog	*url*	Copies the error log file to a server.
nvram:factory-defaults	*url*	Uploads factory defaults file.
nvram:fastpath.cfg	*url*	Uploads the binary config file to a server.
nvram:log	*url*	Copies the log file to a server.
nvram:file	*url*	Uploads a specified file
nvram:factory-all	*url*	Copy all factory settings
nvram:oslog	*url*	Copies the OS system log file to a server
nvram:operational-log	url	Copies the operational log file to a server.
nvram:script *scriptname*	*url*	Copies a specified configuration script file to a server.
nvram:startup-config	nvram:backup-config	Copies the startup configuration to the backup configuration.
nvram:startup-config	*url*	Copies the startup configuration to a server.
nvram:startup-log	url	Uploads the startup log file.
nvram:traplog	*url*	Copies the trap log file to a server.
system:running-config	nvram:startup-config	Saves the running configuration to NVRAM.
system:running-config	nvram:factory-defaults	Saves the running configuration to NVRAM to the `factory-defaults` file.
system:image	url	Saves the system image to a server.
url	nvram:application *destfilename*	Destination file name for the application file.
url	nvram:clibanner	Downloads the CLI banner to the system.
url	nvram:fastpath.cfg	Downloads the binary config file to the system.
url	nvram:publickey-config	Downloads the Public Key for Configuration Script validation.
url	nvram:publickey-image	Downloads Public Key for Image validation.

Table 9: Copy Parameters (Continued)

Source	Destination	Description
url	nvram:script *destfilename*	Downloads a configuration script file to the system. During the download of a configuration script, the copy command validates the script. In case of any error, the command lists all the lines at the end of the validation process and prompts you to confirm before copying the script file.
url	nvram:script *destfilename* noval	When you use this option, the copy command will not validate the downloaded script file. An example of the CLI command follows:
`(FASTPATH Routing) #copy tftp://1.1.1.1/file.scr nvram:script file.scr noval`		
url	nvram:sshkey-dsa	Downloads an SSH key file. For more information, see “Secure Shell Commands” on page 55.
url	nvram:sshkey-rsa1	Downloads an SSH key file.
url	nvram:sshkey-rsa2	Downloads an SSH key file.
url	nvram:sslpem-dhweak	Downloads an HTTP secure-server certificate.
url	nvram:sslpem-dhstrong	Downloads an HTTP secure-server certificate.
url	nvram:sslpem-root	Downloads an HTTP secure-server certificate. For more information, see “Hypertext Transfer Protocol Commands” on page 58.
url	nvram:sslpem-server	Downloads an HTTP secure-server certificate.
url	nvram:startup-config	Downloads the startup configuration file to the system.
url	ias-users	Downloads an IAS users database file to the system. When the IAS users file is downloaded, the switch IAS user’s database is replaced with the users and their attributes available in the downloaded file.
url	{active | backup}	Download an image from the remote server to either image.
url	nvram:file	Downloads a specified file
url	*nvram:oem-data*	Downloads and updates OEM data.
active	backup	Copy the active image to the backup image.
{active | backup}	unit://*unit*/{active | backup}	Copy an image from the management node to a given node in a Stack. Use the unit parameter to specify the node to which the image should be copied.
{active | backup}	unit://*/{active | backup}	Copy an image from the management node to all of the nodes in a Stack.

Example: The following shows an example of downloading and applying ias users file.

```
(FASTPATH Routing) #copy tftp://10.131.17.104/aaa_users.txt ias-users

Mode........................................ TFTP
Set Server IP............................... 10.131.17.104
Path........................................ ./
Filename.................................... aaa_users.txt
Data Type................................... IAS Users

Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y

File transfer operation completed successfully.

Validating and updating the users to the IAS users database.
```

```
Updated IAS users database successfully.


(FASTPATH Routing) #
```

4.7.17 set bootstopkey

This command sets the bootstop key. With this key the booting process can be stopped. The key name is “stop”. This is the default setting.

Format **`set bootstopkey`**

Mode Priviledged EXEC

4.7.17.1 no set bootstopkey

This command resets the bootstop key. The boot process can not be interrupted.

Format **`no set bootstopkey`**

Mode Priviledged EXEC

4.7.18 set board root-password

This command changes the current LINUX root password. The user will be asked by a prompt to specify the password and to reconfirm it a second time. An empty password can be specified by simply type <CR>. Then any password may be specified for the login. The factory password can be reconfigured (parameter ‘factory’).

Format **`set board root-password [factory]`**

Mode Priviledged EXEC

4.7.19 set board led-flash

This command starts a LED in flashing mode. Different kind of LED's exist, not all of them are available on all boards. The flashing may be set for a specific time (in seconds) or forever ('time' parameter not set). For option <interface> the internal interface number must be specified.

Format **set board led-flash interface** *<interface>* **[time** *<time>***]**

Mode Priviledged EXEC

4.7.19.1 no set board led-flash

This command stops a LED in flashing mode.

Format **no set board led-flash interface** *<interface>*

Mode Priviledged EXEC

4.7.20 set board port-map

The command selects a specific port-map. It is used for boards where more than one port configuration is available related to e.g. the chassis or the RTM the board is used with. Various port configurations are pre-defined and can be selected via a number or a name (related to FASTPATH version). The “no” command is used to specify the default configuration.

Note that you have to save the specified configuration and reboot the system if the new configuration should become active!

Format	**`set board port-map`** *<name>*
Mode	Priviledged EXEC

4.7.20.1 no set board port-map

The command is used to specify the default configuration.

Format	**`no set board port-map`** *<name>*
Mode	Priviledged EXEC

4.7.21 show board port-map

The command displays the selected port-map number.

Format	**`show board port-map [selected]`**
Mode	Priviledged EXEC

4.7.22 show board port-map list

The command displays all available port-maps together with a description. The currently active port-map is marked.

Format	**`show board port-map list`**
Mode	Priviledged EXEC

4.7.23 show board port-map descr

The command displays the description for all physical ports related to the currently selected port-map.

Format	**`show board port-map descr`**
Mode	Priviledged EXEC

4.7.24 show board port-map all

The command displays all available port-maps together with a description. The currently active port-map is marked.

Format	**`show board port-map all`**
Mode	Priviledged EXEC

4.7.25 show board address

This command displays the global address info of the board.

Format	**`show board address`**
Mode	Priviledged EXEC

4.7.26 show board cpu-load

This command displays the CPU load. It shows the total time, the user time, the system time and the idle time in current interval, 30 seconds interval and 5 minutes interval. All times are reported in percent.

Format	**`show board cpu-load`**
Mode	Priviledged EXEC

4.7.27 show board memory-usage

This command displays the Memory Usage. It shows malloc and kernel statistics.

Format `show board memory-usage`

Mode Priviledged EXEC

4.7.28 show board post-status

This command displays the power on self test status of the board. It checks the status of the system selftest and the IPMC selftest.

Format `show board post-status [system]`

Mode Priviledged EXEC

4.7.29 show board version

This command displays hardware and software revision information. This includes serial-numbers, software and hardware revisions as applicable.

Format `show board version [basic | hardware | release | all]`

Mode Priviledged EXEC

- Basic version information (“show board version” and “show board version basic”)
- System description
- Board name
- Board serial number, part number and manufacturer
- Product serial number, part number and manufacturer
- FASTPATH version
- Hardware version information (“show board version hardware”)
- Broadcom silicon
- Processor CPU type
- Processor clock
- Jumper settings (optional)
- PCB revision *(optional)*
- PLD revision *(optional)*
- PHY 10G type and firmware version
- Updatable firmware releases (“show board version release”)
- System (FASTPATH) release

For “show board version all” all information is displayed.

4.7.30 show logging errcounter

This command displays the trace of the error counters.

Format `show logging errcounter`

Mode Priviledged EXEC

4.7.31 clear errcounter

This command clears the error counters trace.

Format `clear errcounter`

Mode Priviledged EXEC

4.7.32 show logging backtrace

This command displays the backtrace file last created. A backtrace file is created when the application stops unexpectedly.

Format `show logging backtrace`

Mode Priviledged EXEC

4.7.33 show board sensors

This command displays the current sensor readings.

With parameter 'all' a common list of all sensors and types is displayed. Fields are a number, sensor name, current value, unit and status (ok, not-healthy, n/a or failed if not readable). The number consist of a unit number (only for stacking), a slot identifier and a internal sensor number delimited by a '/' character.

With parameter 'slot' a list of available slots and the related type of the source (Board, chip) is displayed.

With specifying a <number> detailed infos for this sensor related to the source are indicated.

Format `show board[info] sensors {all | slot | <number>}`

Mode Priviledged EXEC

4.7.34 file verify

This command enables digital signature verification while an image and/or configuration file is downloaded to the switch.

Format `file verify {all | image | none | script}`

Mode Global Config

Parameter	Description
All	Verifies the digital signature of both image and configuration files.
Image	Verifies the digital signature of image files only.
None	Disables digital signature verification for both images and configuration files.
Script	Verifies the digital signature of configuration files.

4.7.35 no file verify

Resets the configured digital signature verification value to the factory default value.

Format `no file verify`

Mode Global Config

4.7.36 write memory

Use this command to save running configuration changes to NVRAM so that the changes you make will persist across a reboot. This command is the same as `copy system:running-config nvram:startup-config`. Use the **`confirm`** keyword to directly save the configuration to NVRAM without prompting for a confirmation.

Format `write memory [confirm]`

Mode Privileged EXEC

4.8 SFP handling Commands

A new SFP handling is implemented. The SFP present state is periodically polled and if changed the SFP is enabled or disabled. If the SFP present state has changed a SNMP trap (and logging message) is generated.

The feature SFP auto-isolate disables a SFP port as long as no SFP is present.

The feature SFP auto-config reads the ethernet compliance in the EEPROM. If existing and applicable the SFP is configured related to the Ethernet protocol and then enabled, otherwise the SFP keeps disabled. Both features can be overidden and the SFP is then enabled even it is not present (auto-isolate) or the mode is not applicable (auto-config).

4.8.1 sfp auto-isolate

This command enables the feature auto-isolate.

Default enabled

Format **`sfp auto-isolate`**

Mode Interface Config

4.8.1.1 no sfp auto-isolate

This command disables the feature auto-isolate. If the feature is disabled a port is enabled although no SFP is present.

Format **`no sfp auto-isolate`**

Mode Interface Config

4.8.2 sfp auto-configure

This command enables the feature auto-configure.

Default enabled

Format **`sft auto-configure`**

Mode Interface Config

4.8.2.1 no sfp auto-configure

This command disables the feature auto-configure. If the feature is disabled a port is enabled although the ethernet compliance mode is not applicable.

Format **`no sft auto-configure`**

Mode Interface Config

4.8.3 sfp protocol

This command overrides the ethernet protocol read from the EEPROM. If the specified mode is applicable, the SFP is configured with this mode and enabled.

Format

```
sfp protocol 1000BASE-CX
sfp protocol 1000BASE-LX
sfp protocol 1000BASE-SX
sfp protocol 1000BASE-T
sfp protocol 10GBASE-CR
sfp protocol 10GBASE-ER
sfp protocol 10GBASE-LR
sfp protocol 10GBASE-LRM
sfp protocol 10GBASE-SR
sfp protocol 40GBASE-CR4
sfp protocol 40GBASE-LR4
sfp protocol 40GBASE-SR4
```

Mode Interface Config

4.8.3.1 no sfp protocol

This command disables the SFP.

Format `no sfp protocol`

Mode Interface Config

4.8.4 snmp-server enable traps sfp

This command enables the sending of a trap if the SFP present status has changed.

The command ‘snmp-server enable traps’ is a standard FASTPATH command, the parameter ‘sfp’ has been added by Kontron. The ‘show trapflags’ command is the standard FASTPATH command to show the trap settings, the SFP trap indication has been added by Kontron.

Default enabled

Format `snmp-server enable traps sfp`

Mode Global Config

4.8.4.1 no snmp-server enable traps sfp

This command disables the sending of a trap if the SFP present status has changed.

The command ‘snmp-server enable traps’ is a standard FASTPATH command, the parameter ‘sfp’ has been added by Kontron. The ‘show trapflags’ command is the standard FASTPATH command to show the trap settings, the SFP trap indication has been added by Kontron.

Format `no snmp-server enable traps sfp`

Mode Global Config

4.8.5 show sfp

This command displays information for a specified or all existing SFP’s. For ‘detail’ the EEPROM data are indicated, for all other commands the SFP present status, port-status (if port is enabled or disabled) and link-status are indicated. For specified SFP additionally ‘loss-of-signal’ and ‘transmitter-fault’ are indicated.

If feature auto-isolate is set, the status of the feature (enabled/disabled) is indicated.

If feature auto-configure is set, the status of the feature (enabled/disabled), transceiver ID and ethernet protocol are displayed.

Format	`show sfp` *`slot/port [detail]`*
	`show sfp all`

Mode	Priviledged EXEC

4.9 Commands to configure startup services

This feature activates support for listing and configuring startup services. Services are board specific and defined by the BSP.

The commands invoke the /opt/kontron/bin/chkconfig utility directly.

4.9.1 set chkconfig

This command configures a BSP startup service.

Format	`set chkconfig` *`<service>`*
Mode	Priviledged EXEC

4.9.1.1 no set chkconfig

This command disables a BSP startup service.

Format	`no set chkconfig` *`<service>`*
Mode	Priviledged EXEC

Note that disabling basic services may make the system unusable, e.g. disabling syslogd or FASTPATH may make the system inaccessible.

4.9.2 show chkconfig

This command displays all currently installed services. Services are board specific and defined by the BSP.

Format	`show chkconfig`
Mode	Priviledged EXEC

4.10 Simple Network Time Protocol Commands

This section describes the commands you use to automatically configure the system time and date by using Simple Network Time Protocol (SNTP).

4.10.1 sntp broadcast client poll-interval

This command sets the poll interval for SNTP broadcast clients in seconds as a power of two where ***`poll-interval`*** can be a value from 6 to 10.

Default	6
Format	`sntp broadcast client poll-interval` *`poll-interval`*
Mode	Global Config

4.10.1.1 no sntp broadcast client poll-interval

This command resets the poll interval for SNTP broadcast client back to the default value.

Format	`no sntp broadcast client poll-interval`
Mode	Global Config

4.10.2 sntp client mode

This command enables Simple Network Time Protocol (SNTP) client mode and may set the mode to either broadcast or unicast.

Multicast: For multicast mode the SNTP multicast address must be defined as a route to a device. This is set automatically to the network device (if networkport is specified) or serviceport device (if serviceport is specified). If deleting multicast mode the route is automatically deleted too.

Default	disabled
Format	`sntp client mode [broadcast	unicast	multicast]`
Mode	Global Config

4.10.2.1 no sntp client mode

This command disables Simple Network Time Protocol (SNTP) client mode.

Format	`no sntp client mode`
Mode	Global Config

4.10.3 sntp client port

This command sets the SNTP client port ID to 0, 123 or a value between 1025 and 65535. The default value is 0, which means that the SNTP port is not configured by the user. In the default case, the actual client port value used in SNTP packets is assigned by the underlying OS.

Default	0
Format	`sntp client port portid`
Mode	Global Config

4.10.3.1 no sntp client port

This command resets the SNTP client port back to its default value.

Format	`no sntp client port`
Mode	Global Config

4.10.4 sntp unicast client poll-interval

This command sets the poll interval for SNTP unicast clients in seconds as a power of two where *poll-interval* can be a value from 6 to 10.

Default	6
Format	`sntp unicast client poll-interval poll-interval`
Mode	Global Config

4.10.4.1 no sntp unicast client poll-interval

This command resets the poll interval for SNTP unicast clients to its default value.

Format	`no sntp unicast client poll-interval`
Mode	Global Config

4.10.5 sntp multicast client poll-interval

This command will set the poll interval for SNTP multicast clients in seconds as a power of two where *<poll-interval>* can be a value from 6 to 10.

Default	6
Format	**`sntp multicast client poll-interval`** *<poll-interval>*
Mode	Global Config

4.10.5.1 no sntp multicast client poll-interval

This command resets the poll interval for SNTP multicast clients to its default value.

Format	**`no sntp multicast client poll-interval`**
Mode	Global Config

4.10.6 sntp unicast client poll-timeout

This command sets the poll timeout for SNTP unicast clients in seconds to a value from 1-30.

Default	5
Format	`sntp unicast client poll-timeout` *poll-timeout*
Mode	Global Config

4.10.6.1 no sntp unicast client poll-timeout

This command will reset the poll timeout for SNTP unicast clients to its default value.

Format	`no sntp unicast client poll-timeout`
Mode	Global Config

4.10.7 sntp unicast client poll-retry

This command will set the poll retry for SNTP unicast clients to a value from 0 to 10.

Default	1
Format	`sntp unicast client poll-retry` *poll-retry*
Mode	Global Config

4.10.7.1 no sntp unicast client poll-retry

This command will reset the poll retry for SNTP unicast clients to its default value.

Format	`no sntp unicast client poll-retry`
Mode	Global Config

4.10.8 sntp server

This command configures an SNTP server (a maximum of three). The server address can be either an IPv4 address or an IPv6 address. The optional priority can be a value of 1-3, the version a value of 1-4, and the port id a value of 1-65535.

Format	`sntp server {`*ipaddress* `|` *ipv6address* `|` *hostname*`} [`*priority* `[`*version* `[`*portid*`]]]`
Mode	Global Config

4.10.8.1 no sntp server

This command deletes an server from the configured SNTP servers.

Format	`no sntp server remove {`*`ipaddress`*`	`*`ipv6address`*`	`*`hostname`*`}`
Mode	Global Config

4.10.9 sntp source-interface

Use this command to specify the physical or logical interface to use as the source interface (source IP address) for SNTP unicast server configuration. If configured, the address of source Interface is used for all SNTP communications between the SNTP server and the SNTP client. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address. If the configured interface is down, the SNTP client falls back to its default behavior.

Format	`sntp source-interface {slot/port	loopback `*`loopback-id`*`	vlan `*`vlan-id`*`}`
Mode	Global Config

Parameter	Description
slot/port	The unit identifier assigned to the switch.
loopback-id	Configures the loopback interface. The range of the loopback ID is 0 to 7.
tunnel-id	Configures the IPv6 tunnel interface. The range of the tunnel ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

4.10.9.1 no sntp source-interface

Use this command to reset the SNTP source interface to the default settings.

Format	`no sntp source-interface`
Mode	Global Config

4.10.10 show sntp

This command is used to display SNTP settings and status.

Format	`show sntp`
Mode	Privileged EXEC

Term	Definition
Last Update Time	Time of last clock update.
Last Attempt Time	Time of last transmit query (in unicast mode).
Last Attempt Status	Status of the last SNTP request (in unicast mode) or unsolicited message (in broadcast mode).
Broadcast Count	Current number of unsolicited broadcast messages that have been received and processed by the SNTP client since last reboot.

4.10.11 show sntp client

This command is used to display SNTP client settings.

Format	`show sntp client`
Mode	Privileged EXEC

Term	Definition
Client Supported Modes	Supported SNTP Modes (Broadcast or Unicast).
SNTP Version	The highest SNTP version the client supports.
Port	SNTP Client Port. The field displays the value 0 if it is default value. When the client port value is 0, if the client is in broadcast mode, it binds to port 123; if the client is in unicast mode, it binds to the port assigned by the underlying OS.
Client Mode	Configured SNTP Client Mode.

4.10.12 show sntp server

This command is used to display SNTP server settings and configured servers.

Format	`show sntp server`
Mode	Privileged EXEC

Term	Definition
Server Host Address	IP address or hostname of configured SNTP Server.
Server Type	Address type of server (IPv4, IPv6, or DNS).
Server Stratum	Claimed stratum of the server for the last received valid packet.
Server Reference ID	Reference clock identifier of the server for the last received valid packet.
Server Mode	SNTP Server mode.
Server Maximum Entries	Total number of SNTP Servers allowed.
Server Current Entries	Total number of SNTP configured.

For each configured server:

Term	Definition
IP Address / Hostname	IP address or hostname of configured SNTP Server.
Address Type	Address Type of configured SNTP server (IPv4, IPv6, or DNS).
Priority	IP priority type of the configured server.
Version	SNTP Version number of the server. The protocol version used to query the server in unicast mode.
Port	Server Port Number.
Last Attempt Time	Last server attempt time for the specified server.
Last Update Status	Last server attempt status for the server.
Total Unicast Requests	Number of requests to the server.
Failed Unicast Requests	Number of failed requests from server.

4.10.13 show sntp source-interface

Use this command to display the SNTP client source interface configured on the switch.

Format	`show sntp source-interface`
Mode	Privileged EXEC

Field	Description
SNTP Client Source Interface	The interface ID of the physical or logical interface configured as the SNTP client source interface.
SNTP Client Source IPv4 Address	The IP address of the interface configured as the SNTP client source interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show sntp source-interface

SNTP Client Source Interface................... (not configured)

(Routing) #
```

4.11 Time Zone Commands

Use the Time Zone commands to configure system time and date, Time Zone and Summer Time (that is, Daylight Saving Time). Summer time can be recurring or non-recurring.

4.11.1 clock set

This command sets the system time and date.

Format	`clock set` *`hh:mm:ss`*
	`clock set` *`mm/dd/yyyy`*

Mode	Global Config

Parameter	Description
hh:mm:ss	Enter the current system time in 24-hour format in hours, minutes, and seconds. The range is hours: 0 to 23, minutes: 0 to 59, seconds: 0 to 59.
mm/dd/yyyy	Enter the current system date the format month, day, year. The range for month is 1 to 12. The range for the day of the month is 1 to 31. The range for year is 2010 to 2038.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# clock set 03:17:00

(FASTPATH Routing) (Config)# clock set 11/01/2011
```

4.11.2 clock summer-time date

Use the clock summer-time date command to set the summer-time offset to Coordinated Universal Time (UTC). If the optional parameters are not specified, they are read as either 0 or \0, as appropriate.

Format	clock summer-time date {*date month year hh:mm date month year hh:mm*}[offset *offset*] [zone *acronym*]
Mode	Global Config

Parameter	Description
date	Day of the month. Range is 1 to 31.
month	Month. Range is the first three letters by name; jan, for example.
year	Year. The range is 2000 to 2097.
hh:mm	Time in 24-hour format in hours and minutes. The range is hours: 0 to 23, minutes: 0 to 59.
offset	The number of minutes to add during the summertime. The range is 1 to 1440.
acronym	The acronym for the summer-time to be displayed when summertime is in effect. The range is up to four characters are allowed.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# clock summer-time date 1 nov 2011 3:18 2 nov 2011 3:18
(FASTPATH Routing) (Config)# clock summer-time date 1 nov 2011 3:18 2 nov 2011 3:18 offset 120 zone
INDA
```

4.11.3 clock summer-time recurring

This command sets the summer-time recurring parameters.

Format	clock summer-time recurring {*week day month hh:mm week day month hh:mm*} [offset *offset*] [zone *acronym*]
Mode	Global Config

Parameter	Description
EU	The system clock uses the standard recurring summer time settings used in countries in the European Union.
USA	The system clock uses the standard recurring daylight saving time settings used in the United States.
week	Week of the month. The range is 1 to 5, first, last.)
day	Day of the week. The range is the first three letters by name; sun, for example.
month	Month. The range is the first three letters by name; jan, for example.
hh:mm	Time in 24-hour format in hours and minutes. The range is hours: 0 to 23, minutes: 0 to 59.
offset	The number of minutes to add during the summertime. The range is 1 to 1440.
acronym	The acronym for the summertime to be displayed when summertime is in effect. Up to four characters are allowed.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# clock summer-time recurring 2 sun nov 3:18 2 mon nov 3:18
(FASTPATH Routing) (Config)# clock summer-time recurring 2 sun nov 3:18 2 mon nov 3:18 offset 120
zone INDA
```

4.11.3.1 no clock summer-time

This command disables the summer-time settings.

Format	no clock summer-time
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# no clock summer-time
```

4.11.4 clock timezone

Use this command to set the offset to Coordinated Universal Time (UTC). If the optional parameters are not specified, they will be read as either 0 or \0 as appropriate.

Format	clock timezone {*hours*} [minutes *minutes*] [zone *acronym*]
Mode	Global Config

Parameter	Description
hours	Hours difference from UTC. The range is -12 to +13.
minutes	Minutes difference from UTC. The range is 0 to 59.
acronym	The acronym for the time zone. The range is up to four characters.

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# clock timezone 5 minutes 30 zone INDA
```

4.11.4.1 no clock timezone

Use this command to reset the time zone settings.

Format	no clock timezone
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# no clock timezone
```

4.11.5 show clock

Use this command to display the time and date from the system clock.

Format	show clock
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) # show clock

15:02:09 (UTC+0:00) Nov 1 2011
No time source
```

Example: The following shows example CLI display output for the command.

With the above configuration the output appears as below:

```
(FASTPATH Routing) # show clock

10:55:40 INDA(UTC+7:30) Nov 1 2011
No time source
```

4.11.6 show clock detail

Use this command to display the detailed system time along with the time zone and the summertime configuration.

Format	show clock detail
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) # show clock detail

15:05:24 (UTC+0:00) Nov 1 2011
No time source

Time zone:
Acronym not configured
Offset is UTC+0:00

Summertime:
Summer-time is disabled
```

Example: The following shows example CLI display output for the command.

With the above configuration the output appears as below:

```
(FASTPATH Routing) # show clock detail

10:57:57 INDA(UTC+7:30) Nov 1 2011
No time source

 Time zone:
 Acronym is INDA
 Offset is UTC+5:30

 Summertime:
 Acronym is INDA
 Recurring every year
 Begins on second Sunday of Nov at 03:18
 Ends on second Monday of Nov at 03:18
 Offset is 120 minutes
 Summer-time is in effect.
```

4.12 DHCP Server Commands

This section describes the commands you to configure the DHCP server settings for the switch. DHCP uses UDP as its transport protocol and supports a number of features that facilitate in administration address allocations.

4.12.1 ip dhcp pool

This command configures a DHCP address pool name on a DHCP server and enters DHCP pool configuration mode.

Default	none
Format	`ip dhcp pool` *name*
Mode	Global Config

4.12.1.1 no ip dhcp pool

This command removes the DHCP address pool. The name should be previously configured pool name.

Format	`no ip dhcp pool` *name*
Mode	Global Config

4.12.2 client-identifier

This command specifies the unique identifier for a DHCP client. Unique-identifier is a valid notation in hexadecimal format. In some systems, such as Microsoft DHCP clients, the client identifier is required instead of hardware addresses. The unique-identifier is a concatenation of the media type and the MAC address. For example, the Microsoft client identifier for Ethernet address c819.2488.f177 is 01c8.1924.88f1.77 where 01 represents the Ethernet media type. For more information, refer to the “Address Resolution Protocol Parameters” section of RFC 1700, Assigned Numbers for a list of media type codes.

Default	none
Format	`client-identifier` *`uniqueidentifier`*
Mode	DHCP Pool Config

4.12.2.1 no client-identifier

This command deletes the client identifier.

Format	`no client-identifier`
Mode	DHCP Pool Config

4.12.3 client-name

This command specifies the name for a DHCP client. Name is a string consisting of standard ASCII characters.

Default	none
Format	`client-name` *`name`*
Mode	DHCP Pool Config

4.12.3.1 no client-name

This command removes the client name.

Format	`no client-name`
Mode	DHCP Pool Config

4.12.4 default-router

This command specifies the default router list for a DHCP client. {*`address1, address2… address8`*} are valid IP addresses, each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	`default-router` *`address1 [address2....address8]`*
Mode	DHCP Pool Config

4.12.4.1 no default-router

This command removes the default router list.

Format	`no default-router`
Mode	DHCP Pool Config

4.12.5 dns-server

This command specifies the IP servers available to a DHCP client. Address parameters are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	`dns-server` *`address1 [address2....address8]`*
Mode	DHCP Pool Config

4.12.5.1 no dns-server

This command removes the DNS Server list.

Format	`no dns-server`
Mode	DHCP Pool Config

4.12.6 hardware-address

This command specifies the hardware address of a DHCP client. Hardware-address is the MAC address of the hardware platform of the client consisting of 6 bytes in dotted hexadecimal format. Type indicates the protocol of the hardware platform. It is 1 for 10 MB Ethernet and 6 for IEEE 802.

Default	ethernet
Format	`hardware-address` *`hardwareaddress type`*
Mode	DHCP Pool Config

4.12.6.1 no hardware-address

This command removes the hardware address of the DHCP client.

Format	`no hardware-address`
Mode	DHCP Pool Config

4.12.7 host

This command specifies the IP address and network mask for a manual binding to a DHCP client. Address and Mask are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid. The prefix-length is an integer from 0 to 32.

Default	none
Format	`host` *`address`* `[{`*`mask`* `|` *`prefix-length`*`}]`
Mode	DHCP Pool Config

4.12.7.1 no host

This command removes the IP address of the DHCP client.

Format	`no host`
Mode	DHCP Pool Config

4.12.8 lease

This command configures the duration of the lease for an IP address that is assigned from a DHCP server to a DHCP client. The overall lease time should be between 1-86400 minutes. If you specify ***`infinite`***, the lease is set for 60 days. You can also specify a lease duration. ***`Days`*** is an integer from 0 to 59. ***`Hours`*** is an integer from 0 to 23. ***`Minutes`*** is an integer from 0 to 59.

Default	1 (day)
Format	`lease [{days [hours] [minutes] | infinite}]`
Mode	DHCP Pool Config

4.12.8.1 no lease

This command restores the default value of the lease time for DHCP Server.

Format	`no lease`
Mode	DHCP Pool Config

4.12.9 network (DHCP Pool Config)

Use this command to configure the subnet number and mask for a DHCP address pool on the server. Network-number is a valid IP address, made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid. Mask is the IP subnet mask for the specified address pool. The prefix-length is an integer from 0 to 32.

Default	none
Format	`network networknumber [{mask | prefixlength}]`
Mode	DHCP Pool Config

4.12.9.1 no network

This command removes the subnet number and mask.

Format	`no network`
Mode	DHCP Pool Config

4.12.10 bootfile

The command specifies the name of the default boot image for a DHCP client. The ***`filename`*** specifies the boot image file.

Format	`bootfile filename`
Mode	DHCP Pool Config

4.12.10.1 no bootfile

This command deletes the boot image name.

Format	`no bootfile`
Mode	DHCP Pool Config

4.12.11 domain-name

This command specifies the domain name for a DHCP client. The ***domain*** specifies the domain name string of the client.

Default none

Format `domain-name` *`domain`*

Mode DHCP Pool Config

4.12.11.1 no domain-name

This command removes the domain name.

Format `no domain-name`

Mode DHCP Pool Config

4.12.12 domain-name enable

This command enables the domain name functionality in FASTPATH.

Format `domain-name enable [name` *`name`*`]`

Mode Global Config

Example: The following shows an example of the command.

```
(Switching) (Config)#domain-name enable
(Switching) (Config)#exit
```

4.12.12.1 no domain-name enable

This command disables the domain name functionality in FASTPATH.

Format no domain-name enable

Mode Global Config

4.12.13 netbios-name-server

This command configures NetBIOS Windows Internet Naming Service (WINS) name servers that are available to DHCP clients.

One IP address is required, although one can specify up to eight addresses in one command line. Servers are listed in order of preference (address1 is the most preferred server, address2 is the next most preferred server, and so on).

Default none

Format `netbios-name-server` *`address`* `[`*`address2...address8`*`]`

Mode DHCP Pool Config

4.12.13.1 no netbios-name-server

This command removes the NetBIOS name server list.

Format `no netbios-name-server`

Mode DHCP Pool Config

4.12.14 netbios-node-type

The command configures the NetBIOS node type for Microsoft Dynamic Host Configuration Protocol (DHCP) clients.type Specifies the NetBIOS node type. Valid types are:

- b-node—Broadcast
- p-node—Peer-to-peer
- m-node—Mixed
- h-node—Hybrid (recommended)

Default	none
Format	`netbios-node-type` *`type`*
Mode	DHCP Pool Config

4.12.14.1 no netbios-node-type

This command removes the NetBIOS node Type.

Format	`no netbios-node-type`
Mode	DHCP Pool Config

4.12.15 next-server

This command configures the next server in the boot process of a DHCP client.The ***address*** parameter is the IP address of the next server in the boot process, which is typically a TFTP server.

Default	inbound interface helper addresses
Format	`next-server` *`address`*
Mode	DHCP Pool Config

4.12.15.1 no next-server

This command removes the boot server list.

Format	`no next-server`
Mode	DHCP Pool Config

4.12.16 option

The `option` command configures DHCP Server options. The ***code*** parameter specifies the DHCP option code and ranges from 1-254. The ***ascii string*** parameter specifies an NVT ASCII character string. ASCII character strings that contain white space must be delimited by quotation marks. The ***hex string*** parameter specifies hexadecimal data. In hexadecimal, character strings are two hexadecimal digits. You can separate each byte by a period (for example, `a3.4f.22.0c`), colon (for example, `a3:4f:22:0c`), or white space (for example, `a3 4f 22 0c`).

Default	none
Format	`option` *`code`* `{`*`ascii string`* `|` *`hex string1`* `[`*`string2...string8`*`] | ip` *`address1`* `[`*`address2...address8`*`]}`
Mode	DHCP Pool Config

4.12.16.1 no option

This command removes the DHCP Server options. The ***code*** parameter specifies the DHCP option code.

Format	`no option` *`code`*
Mode	DHCP Pool Config

4.12.17 ip dhcp excluded-address

This command specifies the IP addresses that a DHCP server should not assign to DHCP clients. Low-address and high-address are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address `0.0.0.0` is invalid.

Default	none
Format	`ip dhcp excluded-address` *`lowaddress [highaddress]`*
Mode	Global Config

4.12.17.1 no ip dhcp excluded-address

This command removes the excluded IP addresses for a DHCP client. Low-address and high-address are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Format	`no ip dhcp excluded-address` *`lowaddress [highaddress]`*
Mode	Global Config

4.12.18 ip dhcp ping packets

Use this command to specify the number, in a range from 2-10, of packets a DHCP server sends to a pool address as part of a ping operation. By default the number of packets sent to a pool address is 2, which is the smallest allowed number when sending packets. Setting the number of packets to 0 disables this command.

Default	2
Format	`ip dhcp ping packets` *`0,2-10`*
Mode	Global Config

4.12.18.1 no ip dhcp ping packets

This command restores the number of ping packets to the default value.

Format	`no ip dhcp ping packets`
Mode	Global Config

4.12.19 service dhcp

This command enables the DHCP server.

Default	disabled
Format	`service dhcp`
Mode	Global Config

4.12.19.1 no service dhcp

This command disables the DHCP server.

Format	`no service dhcp`
Mode	Global Config

4.12.20 ip dhcp bootp automatic

This command enables the allocation of the addresses to the bootp client. The addresses are from the automatic address pool.

Default	disabled
Format	`ip dhcp bootp automatic`
Mode	Global Config

4.12.20.1 no ip dhcp bootp automatic

This command disables the allocation of the addresses to the bootp client. The address are from the automatic address pool.

Format	`no ip dhcp bootp automatic`
Mode	Global Config

4.12.21 ip dhcp conflict logging

This command enables conflict logging on DHCP server.

Default	enabled
Format	`ip dhcp conflict logging`
Mode	Global Config

4.12.21.1 no ip dhcp conflict logging

This command disables conflict logging on DHCP server.

Format	`no ip dhcp conflict logging`
Mode	Global Config

4.12.22 clear ip dhcp binding

This command deletes an automatic address binding from the DHCP server database. If "*" is specified, the bindings corresponding to all the addresses are deleted. ***address*** is a valid IP address made up of four decimal bytes ranging from 0 to 255. IP address `0.0.0.0` is invalid.

Format	`clear ip dhcp binding {address	*}`
Mode	Privileged EXEC

4.12.23 clear ip dhcp server statistics

This command clears DHCP server statistics counters.

Format	`clear ip dhcp server statistics`
Mode	Privileged EXEC

4.12.24 clear ip dhcp conflict

The command is used to clear an address conflict from the DHCP Server database. The server detects conflicts using a ping. DHCP server clears all conflicts If the asterisk (*) character is used as the address parameter.

Default	none
Format	`clear ip dhcp conflict {`*address*`	*}`
Mode	Privileged EXEC

4.12.25 show ip dhcp binding

This command displays address bindings for the specific IP address on the DHCP server. If no IP address is specified, the bindings corresponding to all the addresses are displayed.

Format	`show ip dhcp binding [`*address*`]`
Modes	• Privileged EXEC • User EXEC

Term	Definition
IP address	The IP address of the client.
Hardware Address	The MAC Address or the client identifier.
Lease expiration	The lease expiration time of the IP address assigned to the client.
Type	The manner in which IP address was assigned to the client.

4.12.26 show ip dhcp global configuration

This command displays address bindings for the specific IP address on the DHCP server. If no IP address is specified, the bindings corresponding to all the addresses are displayed.

Format	`show ip dhcp global configuration`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Service DHCP	The field to display the status of dhcp protocol.
Number of Ping Packets	The maximum number of Ping Packets that will be sent to verify that an ip address id not already assigned.
Conflict Logging	Shows whether conflict logging is enabled or disabled.
BootP Automatic	Shows whether BootP for dynamic pools is enabled or disabled.

4.12.27 show ip dhcp pool configuration

This command displays pool configuration. If `all` is specified, configuration for all the pools is displayed.

Format `show ip dhcp pool configuration {name | all}`

Modes
- Privileged EXEC
- User EXEC

Field	Definition
Pool Name	The name of the configured pool.
Pool Type	The pool type.
Lease Time	The lease expiration time of the IP address assigned to the client.
DNS Servers	The list of DNS servers available to the DHCP client.
Default Routers	The list of the default routers available to the DHCP client

The following additional field is displayed for Dynamic pool type:

Field	Definition
Network	The network number and the mask for the DHCP address pool.

The following additional fields are displayed for Manual pool type:

Field	Definition
Client Name	The name of a DHCP client.
Client Identifier	The unique identifier of a DHCP client.
Hardware Address	The hardware address of a DHCP client.
Hardware Address Type	The protocol of the hardware platform.
Host	The IP address and the mask for a manual binding to a DHCP client.

4.12.28 show ip dhcp server statistics

This command displays DHCP server statistics.

Format `show ip dhcp server statistics`

Modes
- Privileged EXEC
- User EXEC

Field	Definition
Automatic Bindings	The number of IP addresses that have been automatically mapped to the MAC addresses of hosts that are found in the DHCP database.
Expired Bindings	The number of expired leases.
Malformed Bindings	The number of truncated or corrupted messages that were received by the DHCP server.

Message Received:

Message	Definition
DHCP DISCOVER	The number of DHCPDISCOVER messages the server has received.

Message	Definition
DHCP REQUEST	The number of DHCPREQUEST messages the server has received.
DHCP DECLINE	The number of DHCPDECLINE messages the server has received.
DHCP RELEASE	The number of DHCPRELEASE messages the server has received.
DHCP INFORM	The number of DHCPINFORM messages the server has received.

Message Sent:

Message	Definition
DHCP OFFER	The number of DHCPOFFER messages the server sent.
DHCP ACK	The number of DHCPACK messages the server sent.
DHCP NACK	The number of DHCPNACK messages the server sent.

4.12.29 show ip dhcp conflict

This command displays address conflicts logged by the DHCP Server. If no IP address is specified, all the conflicting addresses are displayed.

Format `show ip dhcp conflict [ip-address]`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
IP address	The IP address of the host as recorded on the DHCP server.
Detection Method	The manner in which the IP address of the hosts were found on the DHCP Server.
Detection time	The time when the conflict was found.

4.12.30 ip dhcp option-61

This command specifies the mode for setting a DHCP client identifier (DHCP option 61). The client identifier is sent if one of the options below is specified, otherwise (default, “no”-command) the option is disabled. The user can either select an automatic constructed unique ID (“auto”/“variant-1” or “oem”) or define a fixed string which should be unique too (“fixed”).

If a fixed string is defined, the identifier is preceeded by a byte 0x00 which defines the hardware-type (other).

The automatic identifier is constructed as

- “auto”:
  a byte 0x00 (hardware type) followed by a ascii string containing the MAC Address and the network management VLAN ID separated by “-vl” (e.g. 0x00 “00a0.a573.449c-vl1”)
- “variant-1”/”oem”:
  byte 1: 0x00 (hardware type)
  bytes 2-5: shelf address information (
- cabinet row/column and chassis vertical/horizontal dev)
  bytes 6-8: address information (logical slot number, module type and number)
  bytes 9-10: shelf address information (cabinet and subrack HMS number)
  byte 11-12: device ID
  byte 13: request identifier (=0xff)
  bytes 14-16: release information (version/edition/repair)

Format

```
ip dhcp option-61 <string>
ip dhcp option-61 auto
ip dhcp option-61 oem
```

Modes Global Config

4.12.30.1 no ip dhcp option-61

This command disables DHCP client identifier (DHCP option 61).

Format	`no ip dhcp option-61`
Modes	Global Config

4.12.31 show ip dhcp option-61

This command shows the configured type of the client identifier or (if none) disabled. If the feature is enabled the specified ("fixed") or the automatic client-identifier is shown additionally.

Format	`show ip dhcp option-61`
Modes	Privileged Exec

4.13 DNS Client Commands

These commands are used in the Domain Name System (DNS), an Internet directory service. DNS is how domain names are translated into IP addresses. When enabled, the DNS client provides a hostname lookup service to other components of FASTPATH.

4.13.1 ip domain lookup

Use this command to enable the DNS client.

Default	enabled
Format	`ip domain lookup`
Mode	Global Config

4.13.1.1 no ip domain lookup

Use this command to disable the DNS client.

Format	`no ip domain lookup`
Mode	Global Config

4.13.2 ip domain name

Use this command to define a default domain name that FASTPATH software uses to complete unqualified host names (names with a domain name). By default, no default domain name is configured in the system. ***name*** may not be longer than 255 characters and should not include an initial period. This ***name*** should be used only when the default domain name list, configured using the `ip domain list command,` is empty.

Default	none
Format	`ip domain name` *name*
Mode	Global Config

> ***Example:*** The CLI command `ip domain name yahoo.com` will configure yahoo.com as a default domain name. For an unqualified hostname xxx, a DNS query is made to find the IP address corresponding to xxx.yahoo.com.

4.13.2.1 no ip domain name

Use this command to remove the default domain name configured using the `ip domain name` command.

Format `no ip domain name`

Mode Global Config

4.13.3 ip domain list

Use this command to define a list of default domain names to complete unqualified names. By default, the list is empty. Each name must be no more than 256 characters, and should not include an initial period. The default domain name, configured using the `ip domain name` command, is used only when the default domain name list is empty. A maximum of 32 names can be entered in to this list.

Default none

Format `ip domain list` *`name`*

Mode Global Config

4.13.3.1 no ip domain list

Use this command to delete a name from a list.

Format `no ip domain list` *`name`*

Mode Global Config

4.13.4 ip name server

Use this command to configure the available name servers. Up to eight servers can be defined in one command or by using multiple commands. The parameter ***`server-address`*** is a valid IPv4 or IPv6 address of the server. The preference of the servers is determined by the order they were entered.

Format `ip name-server` *`server-address1`* `[`*`server-address2...server-address8`*`]`

Mode Global Config

4.13.4.1 no ip name server

Use this command to remove a name server.

Format `no ip name-server [`*`server-address1...server-address8`*`]`

Mode Global Config

4.13.5 ip name source-interface

Use this command to specify the physical or logical interface to use as the DNS client (IP name) source interface (source IP address) for the DNS client management application. If configured, the address of source Interface is used for all DNS communications between the DNS server and the DNS client. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address. If the configured interface is down, the DNS client falls back to its default behavior.

Format

```
ip name source-interface {slot/port | loopback loopback-id | tunnel tunnel-id |
vlan vlan-id}
```

Mode Global Config

4.13.5.1 no ip name source-interface

Use this command to reset the DNS source interface to the default settings.

Format	`no ip name source-interface`
Mode	Global Config

4.13.6 ip host

Use this command to define static host name-to-address mapping in the host cache. The parameter ***name*** is host name and *ip address* is the IP address of the host. The hostname can include 1–255 alphanumeric characters, periods, hyphens, underscores, and non-consecutive spaces. Hostnames that include one or more space must be enclosed in quotation marks, for example “lab-pc 45”.

Default	none
Format	`ip host` *name ipaddress*
Mode	Global Config

4.13.6.1 no ip host

Use this command to remove the name-to-address mapping.

Format	`no ip host` *name*
Mode	Global Config

4.13.7 ipv6 host

Use this command to define static host name-to-IPv6 address mapping in the host cache. The parameter ***name*** is host name and *v6 address* is the IPv6 address of the host. The hostname can include 1–255 alphanumeric characters, periods, hyphens, and spaces. Hostnames that include one or more space must be enclosed in quotation marks, for example “lab-pc 45”.

Default	none
Format	`ipv6 host` *name v6 address*
Mode	Global Config

4.13.7.1 no ipv6 host

Use this command to remove the static host name-to-IPv6 address mapping in the host cache.

Format	`no ipv6 host` *name*
Mode	Global Config

4.13.8 ip domain retry

Use this command to specify the number of times to retry sending Domain Name System (DNS) queries. The parameter *number* indicates the number of times to retry sending a DNS query to the DNS server. This number ranges from 0 to 100.

Default	2
Format	`ip domain retry` *number*
Mode	Global Config

4.13.8.1 no ip domain retry

Use this command to return to the default.

Format	`no ip domain retry` *`number`*
Mode	Global Config

4.13.9 ip domain timeout

Use this command to specify the amount of time to wait for a response to a DNS query. The parameter ***seconds*** specifies the time, in seconds, to wait for a response to a DNS query. The parameter ***seconds*** ranges from 0 to 3600.

Default	3
Format	`ip domain timeout` *`seconds`*
Mode	Global Config

4.13.9.1 no ip domain timeout

Use this command to return to the default setting.

Format	`no ip domain timeout` *`seconds`*
Mode	Global Config

4.13.10 clear host

Use this command to delete entries from the host name-to-address cache. This command clears the entries from the DNS cache maintained by the software. This command clears both IPv4 and IPv6 entries.

Format	`clear host {`*`name`*`	all}`
Mode	Privileged EXEC

Field	Description
name	A particular host entry to remove. The parameter ***name*** ranges from 1-255 characters.
all	Removes all entries.

4.13.11 show hosts

Use this command to display the default domain name, a list of name server hosts, the static and the cached list of host names and addresses. The parameter ***name*** ranges from 1-255 characters. This command displays both IPv4 and IPv6 entries.

Format	`show hosts` *`[name]`*
Mode	Privileged EXEC User EXEC

Field	Description
Host Name	Domain host name.
Default Domain	Default domain name.
Default Domain List	Default domain list.
Domain Name Lookup	DNS client enabled/disabled.

Field	Description
Number of Retries	Number of time to retry sending Domain Name System (DNS) queries.
Retry Timeout Period	Amount of time to wait for a response to a DNS query.
Name Servers	Configured name servers.
DNS Client Source Interface	Shows the configured source interface (source IP address) used for a DNS client. The IP address of the selected interface is used as source IP for all communications with the server.

Example: The following shows example CLI display output for the command.

```
<FASTPATH SWITCHING> show hosts

Host name......................... Device
Default domain.................... gm.com
Default domain list............... yahoo.com, Stanford.edu, rediff.com
Domain Name lookup................ Enabled
Number of retries................. 5
Retry timeout period.............. 1500
Name servers (Preference order)... 176.16.1.18 176.16.1.19
DNS Client Source Interface....... (not configured)

Configured host name-to-address mapping:

Host                           Addresses
------------------------------ ------------------------------
accounting.gm.com              176.16.8.8

Host               Total    Elapsed      Type       Addresses
--------------- -------- ------    --------     --------------
www.stanford.edu   72        3          IP         171.64.14.203
```

4.13.12 show ip name source-interface

Use this command to display the configured source interface details used for a DNS client. The IP address of the selected interface is used as source IP for all communications with the server.

Format `show ip name source-interface`

Mode Privileged EXEC

4.14 IP Address Conflict Commands

The commands in this section help troubleshoot IP address conflicts.

4.14.1 ip address-conflict-detect run

This command triggers the switch to run active address conflict detection by sending gratuitous ARP packets for IPv4 addresses on the switch.

Format `ip address-conflict-detect run`

Mode
- Global Config
- Virtual Router Config

4.14.2 show ip address-conflict

This command displays the status information corresponding to the last detected address conflict.

Format `show ip address-conflict`

Modes Privileged EXEC

Term	Definition
Address Conflict Detection Status	Identifies whether the switch has detected an address conflict on any IP address.
Last Conflicting IP Address	The IP Address that was last detected as conflicting on any interface.
Last Conflicting MAC Address	The MAC Address of the conflicting host that was last detected on any interface.
Time Since Conflict Detected	The time in days, hours, minutes and seconds since the last address conflict was detected.

4.14.3 clear ip address-conflict-detect

This command clears the detected address conflict status information.

Format	`clear ip address-conflict-detect`
Modes	Privileged EXEC

4.15 Serviceability Packet Tracing Commands

These commands improve the capability of network engineers to diagnose conditions affecting their FASTPATH product.

Remember to upload the existing fastpath.cfg file off the switch prior to loading a new release image in order to make a backup.

⚠CAUTION The output of “debug” commands can be long and may adversely affect system performance.

4.15.1 capture start

Use the command capture start to manually start capturing CPU packets for packet trace.

The packet capture operates in three modes:

- capture file
- remote capture
- capture line

The command is not persistent across a reboot cycle.

Format	`capture start [{all|receive|transmit}]`
Mode	Privileged EXEC

Parameter	Description
all	Capture all traffic.
receive	Capture only received traffic.
transmit	Capture only transmitted traffic.

4.15.2 capture stop

Use the command capture stop to manually stop capturing CPU packets for packet trace.

Format	`capture stop`
Mode	Privileged EXEC

4.15.3 capture file|remote|line

Use this command to configure file capture options. The command is persistent across a reboot cycle.

Format	`capture {file|remote|line}`
Mode	Global Config

Parameter	Description
file	In the capture file mode, the captured packets are stored in a file on NVRAM. The maximum file size defaults to 524288 bytes. The switch can transfer the file to a TFTP server via TFTP, SFTP, SCP via CLI, and SNMP. The file is formatted in pcap format, is named cpuPktCapture.pcap, and can be examined using network analyzer tools such as Wireshark or Ethereal. Starting a file capture automatically terminates any remote capture sessions and line capturing. After the packet capture is activated, the capture proceeds until the capture file reaches its maximum size, or until the capture is stopped manually using the CLI command capture stop.
remote	In the remote capture mode, the captured packets are redirected in real time to an external PC running the Wireshark tool for Microsoft Windows. A packet capture server runs on the switch side and sends the captured packets via a TCP connection to the Wireshark tool. The remote capture can be enabled or disabled using the CLI. There should be a Windows PC with the Wireshark tool to display the captured file. When using the remote capture mode, the switch does not store any captured data locally on its file system. You can configure the IP port number for connecting Wireshark to the switch. The default port number is 2002. If a firewall is installed between the Wireshark PC and the switch, then these ports must be allowed to pass through the firewall. You must configure the firewall to allow the Wireshark PC to initiate TCP connections to the switch. If the client successfully connects to the switch, the CPU packets are sent to the client PC, then Wireshark receives the packets and displays them. This continues until the session is terminated by either end. Starting a remote capture session automatically terminates the file capture and line capturing.
line	In the capture line mode, the captured packets are saved into the RAM and can be displayed on the CLI. Starting a line capture automatically terminates any remote capture session and capturing into a file. There is a maximum 128 packets of maximum 128 bytes that can be captured and displayed in line mode.

4.15.4 capture remote port

Use this command to configure file capture options. The command is persistent across a reboot cycle. The *id* parameter is a TCP port number from 1024– 49151.

Format	`capture remote port` *`id`*
Mode	Global Config

4.15.5 capture file size

Use this command to configure file capture options. The command is persistent across a reboot cycle. The ***max-file-size*** parameter is the maximum size the pcap file can reach, which is 2–512 KB.

Format	`capture file size` *`max file size`*
Mode	Global Config

4.15.6 capture line wrap

This command enables wrapping of captured packets in line mode when the captured packets reaches full capacity.

Format	`capture line wrap`
Mode	Global Config

4.15.6.1 no capture line wrap

This command disables wrapping of captured packets and configures capture packet to stop when the captured packet capacity is full.

Format	`no capture line wrap`
Mode	Global Config

4.15.7 show capture packets

Use this command to display packets captured and saved to RAM. It is possible to capture and save into RAM, packets that are received or transmitted through the CPU. A maximum 128 packets can be saved into RAM per capturing session. A maximum 128 bytes per packet can be saved into the RAM. If a packet holds more than 128 bytes, only the first 128 bytes are saved; data more than 128 bytes is skipped and cannot be displayed in the CLI.

Capturing packets is stopped automatically when 128 packets are captured and have not yet been displayed during a capture session. Captured packets are not retained after a reload cycle.

Format	`show capture packets`
Mode	Privileged EXEC

4.15.8 cpu-traffic direction interface

Use this command to associate CPU filters to an interface or list of interfaces. The interfaces can be a physical or logical LAG. The statistics counters are updated only for the configured interfaces. The traces can also be obtained for the configured interfaces.

NOTICE **The offset should consider the VLAN tag headers as the packet to the CPU is always a tagged packet.**

Default	None
Format	`cpu-traffic direction {tx|rx|both} interface` *`interface-range`*
Mode	Global Config

4.15.8.1 no cpu-traffic direction interface

Use this command to remove all interfaces from the CPU filters.

Format	`no cpu-traffic direction {tx|rx|both} interface interface-range`
Mode	Global Config

4.15.9 cpu-traffic direction match cust-filter

Use this command to configure a custom filter. The statistics and/or traces for configured filters are obtained for the packet matching configured data at the specific offset. If the mask is not specified then the default mask is 0xFF. There can be three different offsets specified as match conditions. Each time a custom filter is configured, the switch overrides the previous configuration.

NOTICE The offset should consider the VLAN tag headers as the packet to the CPU is always a tagged packet.

Default	None
Format	`cpu-traffic direction {tx|rx|both} match cust-filter offset1 data1 [mask1 mask1] offset2 data2 [mask2 mask2] offset3 data3 [mask3 mask3]`
Mode	Global Config

4.15.9.1 no cpu-traffic direction match cust-filter

Use this command to remove the configured custom filter.

Format	`no cpu-traffic direction {tx|rx|both} match cust-filter offset1 data1 [mask1 mask1] offset2 data2 [mask2 mask2] offset3 data3 [mask3 mask3]`
Mode	Global Config

4.15.10 cpu-traffic direction match srcip

Use this command to configure the source IP address-specific filter. The statistics and/or the traces for configured filters are obtained for the packet matching configured source IP/Mask.

Default	None
Format	`cpu-traffic direction {tx|rx|both} match srcip ipaddress [mask mask]`
Mode	Global Config

4.15.10.1 no cpu-traffic direction match srcip

Use this command to disable the configured source IP address filter.

Format	`no cpu-traffic direction {tx|rx|both} match srcip ipaddress [mask mask]`
Mode	Global Config

4.15.11 cpu-traffic direction match dstip

Use this command to configure the destination IP address-specific filter. The statistics and/or the traces for configured filters are obtained for the packet matching configured destination IP/Mask.

Default	None
Format	`cpu-traffic direction {tx|rx|both} match dstip ipaddress [mask mask]`
Mode	Global Config

4.15.11.1 no cpu-traffic direction match dstip

Use this command to disable the configured destination IP address filter.

Format `no cpu-traffic direction {tx|rx|both} match dstip` *ipaddress* `[mask` *mask*`]`

Mode Global Config

4.15.12 cpu-traffic direction match tcp

Use this command to configure the source or destination TCP port-specific filter. The statistics and/or traces for configured filters are obtained for the packet matching configured source/destination TCP port.

Default None

Format `cpu-traffic direction {tx|rx|both} match {srctcp|dsttcp}` *port* `[mask` *mask*`]`

Mode Global Config

4.15.12.1 no cpu-traffic direction match tcp

Use this command to remove the configured source/destination TCP port filter.

Format `no cpu-traffic direction {tx|rx|both} match {srctcp|dsttcp}` *port* `[mask` *mask*`]`

Mode Global Config

4.15.13 cpu-traffic direction match udp

Use this command to configure the source or destination UDP port-specific filter. The statistics and/or traces for configured filters are obtained for the packet matching configured source/destination UDP port.

Default None

Format `cpu-traffic direction {tx|rx|both} match {srcudp|dstudp}` *port* `[mask` *mask*`]`

Mode Global Config

4.15.13.1 no cpu-traffic direction match udp

Use this command to remove the configured source/destination UDP port filter.

Format `no cpu-traffic direction {tx|rx|both} match {srcudp|dstudp}` *port* `[mask` *mask*`]`

Mode Global Config

4.15.14 cpu-traffic mode

Use this command to configure CPU-traffic mode. The packets in the RX/TX direction are matched when the mode is enabled.

Default Disabled

Format `cpu-traffic mode`

Mode Global Config

4.15.14.1 no cpu-traffic mode

Use this command to disable CPU-traffic mode.

Format `no cpu-traffic mode`

Mode Global Config

4.15.15 cpu-traffic trace

Use this command to configure CPU packet tracing. The packet can be received by multiple components. If the feature is enabled and tracing configured, the packets are traced per the defined filter. If dump-pkt is enabled, the first 64 bytes of the packet are displayed along wtih the trace statistics.

Default Disabled

Format `cpu-traffic trace {dump-pkt}`

Mode Global Config

4.15.15.1 no cpu-traffic trace

Use this command to disable CPU packet tracing and dump-pkt (if configured).

Format `no cpu-traffic trace {dump-pkt}`

Mode Global Config

4.15.15.2 show cpu-traffic

Use this command to display the current configuration parameters.

Default None

Format `show cpu-traffic`

Mode Privileged EXEC

Example:

```
(Routing) #show cpu-traffic

Admin Mode..................................... Disable
Packet Trace................................... Disable
Packet Dump.................................... Disable

Direction TX:
Filter Options................................. N/A
Interface...................................... N/A
Src TCP parameters............................. 0 0
Dst TCP parameters............................. 0 0
Src UDP parameters............................. 0 0
Dst UDP parameters............................. 0 0
Src IP parameters.............................. 0.0.0.0 0.0.0.0
Dst IP parameters.............................. 0.0.0.0 0.0.0.0
Src MAC parameters............................. 00:00:00:00:00:00 00:00:00:00:00:00
Dst MAC parameters............................. 00:00:00:00:00:00 00:00:00:00:00:00
Custom filter parameters1...................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters2...................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters3...................... Offset=0x0 Value=0x0 Mask=0x0

Direction RX:
Filter Options................................. N/A
Interface...................................... N/A
```

```
Src TCP parameters............................ 0 0
Dst TCP parameters............................ 0 0
Src UDP parameters............................ 0 0
Dst UDP parameters............................ 0 0
Src IP parameters............................. 0.0.0.0 0.0.0.0
Dst IP parameters............................. 0.0.0.0 0.0.0.0
Src MAC parameters............................ 00:00:00:00:00:00 00:00:00:00:00:00
Dst MAC parameters............................ 00:00:00:00:00:00 00:00:00:00:00:00
Custom filter parameters1..................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters2..................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters3..................... Offset=0x0 Value=0x0 Mask=0x0
```

4.15.16 show cpu-traffic interface

Use this command to display per interface statistics for configured filters. The statistics can be displayed for a specific filter (e.g., stp, udld, arp etc). If no filter is specified, statistics are displayed for all configured filters. Similarly, source/destination IP, TCP, UDP or MAC along with custom filter can be used as command option to get statistics.

Default	None
Format	`show cpu-traffic interface {all	slot/port	cpu } filter`
Mode	Privileged EXEC

4.15.17 show cpu-traffic summary

Use this command to display summary statistics for configured filters for all interfaces.

Default	None
Format	`show cpu-traffic summary`
Mode	Privileged EXEC

Example:

```
(Routing) #show cpu-traffic summary

Filter       Received   Transmitted
------------ ---------- -----------
STP          0          0
LACPDU       0          0
ARP          0          0
UDLD         0          0
LLDP         0          0
IP           0          0
OSPF         0          0
BGP          0          0
DHCP         0          0
BCAST        0          0
MCAST        0          0
UCAST        0          0
SRCIP        0          0
DSTIP        0          0
SRCMAC       0          0
DSTMAC       0          0
CUSTOM       0          0
SRCTCP       0          0
DSTTCP       0          0
SRCUDP       0          0
```

4.15.18 show cpu-traffic trace

Use this command to display traced information. The trace information can be displayed either for all available packets or for specific filter (e.g., stp, udld, arp etc). Similarly, source/destination IP or MAC along with custom filter can be used as command option to get specific traces from history. If enabled, packet dump information is displayed along with packet trace statistics. By default, packet dump buffer size is set to store first 64 bytes of packet.

Default	None
Format	`show cpu-traffic trace` *`filter`*
Mode	Privileged EXEC

Example:

```
(Routing) #show cpu-traffic summary
Packet #1: IP; DHCP; UCAST; SRCMAC=00:10:10:10:10:10;
<08:06:10> Sysnet received in sysNetNotifyPduReceive()
<08:06:10> Packet delivered to IP via ipMapRecvIP()
<08:06:10> Freed
0000 00 10 18 82 18 b3 00 10 10 10 10 10 81 00 00 01    ................
0010 08 00 45 10 01 21 00 00 00 00 40 11 79 bd 00 00    ..E..!....@.y...
0020 00 00 ff ff ff ff 00 44 00 43 01 0d 48 10 03 01    .......D.C..H...
0030 06 00 18 85 4a 83 00 00 80 00 00 00 00 00 00 00    ....J...........
```

4.15.19 clear cpu-traffic

Use this command to clear cpu-traffic statistics or trace information on all interfaces.

Default	None
Format	`clear cpu-traffic {counters | traces}`
Mode	Global Config

4.15.20 debug aaa accounting

This command is useful to debug accounting configuration and functionality in User Manager.

Format	`debug aaa accounting`
Mode	Privileged EXEC

4.15.20.1 no debug aaa accounting

Use this command to turn off debugging of User Manager accounting functionality.

Format	`no debug aaa accounting`
Mode	Privileged EXEC

4.15.21 debug aaa authorization

Use this command to enable the tracing for AAA in User Manager. This is useful to debug authorization configuration and functionality in the User Manager. Each of the parameters are used to configure authorization debug flags.

Format	`debug aaa authorization commands|exec`
Mode	Privileged EXEC

4.15.21.1 no debug aaa authorization

Use this command to turn off debugging of the User Manager authorization functionality.

Format	`no debug aaa authorization`
Mode	Privileged EXEC

Example: The following is an example of the command.

```
(Switching) #debug aaa authorization
Tacacs authorization receive packet tracing enabled.

(Switching) #debug tacacs authorization packet transmit

authorization tracing enabled.

(Switching) #no debug aaa authorization

AAA authorization tracing enabled

(Switching) #
```

4.15.22 debug arp

Use this command to enable ARP debug protocol messages.

Default	disabled
Format	`debug arp`
Mode	Privileged EXEC

4.15.22.1 no debug arp

Use this command to disable ARP debug protocol messages.

Format	`no debug arp`
Mode	Privileged EXEC

4.15.23 debug authentication

This command displays either the debug trace for either a single event or all events for an interface

Default	none
Format	`debug authentication packet {all	event}` *interface*
Mode	Privileged EXEC

4.15.24 debug auto-voip

Use this command to enable Auto VOIP debug messages. Use the optional parameters to trace H323, SCCP, or SIP packets respectively.

Default	disabled
Format	`debug auto-voip [H323|SCCP|SIP|oui]`
Mode	Privileged EXEC

4.15.24.1 no debug auto-voip

Use this command to disable Auto VOIP debug messages.

Format	`no debug auto-voip`
Mode	Privileged EXEC

4.15.25 debug clear

This command disables all previously enabled “debug” traces.

Default	disabled
Format	`debug clear`
Mode	Privileged EXEC

4.15.26 debug console

This command enables the display of “debug” trace output on the login session in which it is executed. Debug console display must be enabled in order to view any trace output. The output of debug trace commands will appear on all login sessions for which debug console has been enabled. The configuration of this command remains in effect for the life of the login session. The effect of this command is not persistent across resets.

Default	disabled
Format	`debug console`
Mode	Privileged EXEC

4.15.26.1 no debug console

This command disables the display of “debug” trace output on the login session in which it is executed.

Format	`no debug console`
Mode	Privileged EXEC

4.15.27 debug crashlog

Use this command to view information contained in the crash log file that the system maintains when it experiences an unexpected reset. The crash log file contains the following information:

- Call stack information in both primitive and verbose forms
- Log Status
- Buffered logging
- Event logging
- Persistent logging
- System Information (output of sysapiMbufDump)
- Message Queue Debug Information
- Memory Debug Information
- Memory Debug Status
- OS Information (output of osapiShowTasks)
- /proc information (meminfo, cpuinfo, interrupts, version and net/sockstat)

Default	disabled
Format	`debug crashlog {[kernel]` *`crashlog-number`* `[upload` *`url`*`] | proc | verbose | deleteall}`
Mode	Privileged EXEC

Parameter	Description
kernel	View the crash log file for the kernel
crashlog-number	Specifies the file number to view. The system maintains up to four copies, and the valid range is 1–4."deb
upload *url*	To upload the crash log (or crash dump) to a TFTP server, use the `upload` keyword and specify the required TFTP server information.
proc	View the application process crashlog.
verbose	Enable the verbose crashlog.
deleteall	Delete all crash log files on the system.
data	Crash log data recorder.
crashdump-number	Specifies the crash dump number to view. The valid range is 0–2.
download *url*	To download a crash dump to the switch, use the `download` keyword and specify the required TFTP server information.
component-id	The ID of the component that caused the crash.
item-number	The item number.
additional-parameter	Additional parameters to include.

4.15.28 debug dcbx packet

Use this command to enable debug tracing for DCBX packets that are transmitted or received.

Default	disabled
Format	`debug dcbx packet {receive | transmit}`
Mode	Privileged EXEC

4.15.29 debug debug-config

Use this command to download or upload the debug-config.ini file. The debug-config. ini file executes CLI commands (including devshell and drivshell commands) on specific predefined events. The debug config file is created manually and downloaded to the switch.

Default	disabled
Format	`debug debug-config {download <url> | upload <url>}`
Mode	Privileged EXEC

4.15.30 debug dhcp packet

This command displays “debug” information about DHCPv4 client activities and traces DHCPv4 packets to and from the local DHCPv4 client.

Default	disabled
Format	`debug dhcp packet [transmit | receive]`
Mode	Privileged EXEC

4.15.30.1 no debug dhcp

This command disables the display of "debug" trace output for DHCPv4 client activity.

Format	`no debug dhcp packet [transmit | receive]`
Mode	Privileged EXEC

4.15.31 debug dot1ag

Use this command to enable debugging of the messages sent between MPs and MEPs.

Default	disabled
Format	`debug dot1ag {all | ccm | events | lbm | lbr | ltm | ltr | pdu}`
Mode	Privileged EXEC

Parameter	Description
all	Debug all dot1ag message types.
CCM	Configure debug flags for Continuity Check Message information. A multicast CFM PDU transmitted periodically by a MEP in order to ensure continuity over the MA to which the transmitting MEP belongs. No reply is sent by any MP in response to receiving a CCM.
LTM	Configure debug flags for Linktrace Message information. A CFM PDU initiated by a MEP to trace a path to a target MAC address, forwarded from MIP to MIP, up to the point at which the LTM reaches its target, a MEP, or can no longer be forwarded. Each MP along the path to the target generates an LTR.
LTR	Configure debug flags for Linktrace Reply information. A unicast CFM PDU sent by an MP to a MEP, in response to receiving an LTM from that MEP.
LBM	Configure debug flags for Loopback Message information. A unicast CFM PDU transmitted by a MEP, addressed to a specific MP, in the expectation of receiving an LBR.
LBR	Configure debug flags for Loopback Reply information. A unicast CFM PDU transmitted by an MP to a MEP, in response to an LBM received from that MEP.
PDU	Configure debug flags for CFM PDU information.

4.15.32 debug dot1x packet

Use this command to enable dot1x packet debug trace.

Default	disabled
Format	`debug dot1x`
Mode	Privileged EXEC

4.15.32.1 no debug dot1x packet

Use this command to disable dot1x packet debug trace.

Format	`no debug dot1x`
Mode	Privileged EXEC

4.15.33 debug fip-snooping packet

Use the `debug fip-snooping packet` command in Privileged EXEC mode to enable FIP packet debug trace on transmit or receive path with different filter options configured.

Default	disabled
Format	`debug fip-snooping packet [{transmit | receive | filter {dst-mac` *`mac-addr`* `| fip-proto-code` *`1-15`* `| src-intf` *`slot/port`* `| src-mac` *`mac-addr`* `| vlan` *`1-4093`*`}]`
Mode	• User EXEC • Privileged EXEC

Parameter	Description
dst-mac	If the dst-mac filter option is given, trace output is filtered on matching the given Destination MAC Address.
fip-proto-code	If the fip-proto-code filter option is given, trace output is filtered on matching the supported types.
src-intf	If the src-intf filter option is given, trace output is filtered on matching the incoming source interface.
src-mac	If the src-mac filter option is given, trace output is filtered on matching the given Source MAC Address.
vlan	If the vlan filter option is given, trace output is filtered on matching the given VLAN ID.

4.15.33.1 no debug fip-snooping packet

Use the `no debug fip-snooping packet` command in Privileged EXEC mode to disable FIP packet debug trace on transmit or receive path with different filter options configured.

Format	`no debug fip-snooping packet [{transmit | receive | filter {dst-mac` *`mac-addr`* `| fip-proto-code` *`1-15`* `| src-intf` *`slot/port`* `| src-mac` *`mac-addr`* `| vlan` *`1-4093`*`}]`
Mode	• User EXEC • Privileged EXEC

4.15.34 debug igmpsnooping packet

This command enables tracing of IGMP Snooping packets received and transmitted by the switch.

Default	disabled
Format	`debug igmpsnooping packet`
Mode	Privileged EXEC

4.15.34.1 no debug igmpsnooping packet

This command disables tracing of IGMP Snooping packets.

Format	`no debug igmpsnooping packet`
Mode	Privileged EXEC

4.15.35 debug igmpsnooping packet transmit

This command enables tracing of IGMP Snooping packets transmitted by the switch. Snooping should be enabled on the device and the interface in order to monitor packets for a particular interface.

Default	disabled
Format	`debug igmpsnooping packet transmit`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 02:45:06 192.168.17.29-1 IGMPSNOOP[185429992]: igmp_snooping_debug.c(116) 908 % Pkt TX
- Intf: 0/20(20), Vlan_Id:1 Src_Mac: 00:03:0e:00:00:00 Dest_Mac: 01:00:5e:00:00:01 Src_IP: 9.1.1.1
Dest_IP: 225.0.0.1 Type: V2_Membership_Report Group: 225.0.0.1
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX	A packet transmitted by the device.
Intf	The interface that the packet went out on. Format used is slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Src_Mac	Source MAC address of the packet.
Dest_Mac	Destination multicast MAC address of the packet.
Src_IP	The source IP address in the IP header in the packet.
Dest_IP	The destination multicast IP address in the packet.
Type	The type of IGMP packet. Type can be one of the following: • `Membership Query` – IGMP Membership Query • `V1_Membership_Report` – IGMP Version 1 Membership Report • `V2_Membership_Report` – IGMP Version 2 Membership Report • `V3_Membership_Report` – IGMP Version 3 Membership Report • `V2_Leave_Group` – IGMP Version 2 Leave Group
Group	Multicast group address in the IGMP header.

4.15.35.1 no debug igmpsnooping transmit

This command disables tracing of transmitted IGMP snooping packets.

Format	`no debug igmpsnooping transmit`
Mode	Privileged EXEC

4.15.36 debug igmpsnooping packet receive

This command enables tracing of IGMP Snooping packets received by the switch. Snooping should be enabled on the device and the interface in order to monitor packets for a particular interface.

Default	disabled
Format	`debug igmpsnooping packet receive`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 02:45:06 192.168.17.29-1 IGMPSNOOP[185429992]: igmp_snooping_debug.c(116) 908 % Pkt RX
- Intf: 0/20(20), Vlan_Id:1 Src_Mac: 00:03:0e:00:00:10 Dest_Mac: 01:00:5e:00:00:05 Src_IP: 11.1.1.1
Dest_IP: 225.0.0.5 Type: Membership_Query Group: 225.0.0.5
```

The following parameters are displayed in the trace message:

Parameter	Definition
RX	A packet received by the device.
Intf	The interface that the packet went out on. Format used is slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Src_Mac	Source MAC address of the packet.
Dest_Mac	Destination multicast MAC address of the packet.
Src_IP	The source IP address in the ip header in the packet.
Dest_IP	The destination multicast ip address in the packet.
Type	The type of IGMP packet. Type can be one of the following: • `Membership_Query` – IGMP Membership Query • `V1_Membership_Report` – IGMP Version 1 Membership Report • `V2_Membership_Report` – IGMP Version 2 Membership Report • `V3_Membership_Report` – IGMP Version 3 Membership Report • `V2_Leave_Group` – IGMP Version 2 Leave Group
Group	Multicast group address in the IGMP header.

4.15.36.1 no debug igmpsnooping receive

This command disables tracing of received IGMP Snooping packets.

Format	`no debug igmpsnooping receive`
Mode	Privileged EXEC

4.15.37 debug ip acl

Use this command to enable debug of IP Protocol packets matching the ACL criteria.

Default	disabled
Format	`debug ip acl` *`acl Number`*
Mode	Privileged EXEC

4.15.37.1 no debug ip acl

Use this command to disable debug of IP Protocol packets matching the ACL criteria.

Format	`no debug ip acl acl Number`
Mode	Privileged EXEC

4.15.38 debug ip dvmrp packet

Use this command to trace DVMRP packet reception and transmission. receive traces only received DVMRP packets and transmit traces only transmitted DVMRP packets. When neither keyword is used in the command, then all DVMRP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console

Default	disabled
Format	`debug ip dvmrp packet [receive | transmit]`
Mode	Privileged EXEC

4.15.38.1 no debug ip dvmrp packet

Use this command to disable debug tracing of DVMRP packet reception and transmission.

Format	`no debug ip dvmrp packet [receive	transmit]`
Mode	Privileged EXEC

4.15.39 debug ip igmp packet

Use this command to trace IGMP packet reception and transmission. receive traces only received IGMP packets and transmit traces only transmitted IGMP packets. When neither keyword is used in the command, then all IGMP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ip igmp packet [receive	transmit]`
Mode	Privileged EXEC

4.15.39.1 no debug ip igmp packet

Use this command to disable debug tracing of IGMP packet reception and transmission.

Format	`no debug ip igmp packet [receive	transmit]`
Mode	Privileged EXEC

4.15.40 debug ip mcache packet

Use this command for tracing MDATA packet reception and transmission. receive traces only received data packets and transmit traces only transmitted data packets. When neither keyword is used in the command, then all data packet traces are dumped. Vital information such as source address, destination address, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ip mcache packet [receive	transmit]`
Mode	Privileged EXEC

4.15.40.1 no debug ip mcache packet

Use this command to disable debug tracing of MDATA packet reception and transmission.

Format	`no debug ip mcache packet [receive	transmit]`
Mode	Privileged EXEC

4.15.41 debug ip pimdm packet

Use this command to trace PIMDM packet reception and transmission. receive traces only received PIMDM packets and transmit traces only transmitted PIMDM packets. When neither keyword is used in the command, then all PIMDM packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ip pimdm packet [receive	transmit]`
Mode	Privileged EXEC

4.15.41.1 no debug ip pimdm packet

Use this command to disable debug tracing of PIMDM packet reception and transmission.

Format	`no debug ip pimdm packet [receive	transmit]`
Mode	Privileged EXEC

4.15.42 debug ip pimsm packet

Use this command to trace PIMSM packet reception and transmission. receive traces only received PIMSM packets and transmit traces only transmitted PIMSM packets. When neither keyword is used in the command, then all PIMSM packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ip pimsm packet [receive	transmit]`
Mode	Privileged EXEC

4.15.42.1 no debug ip pimsm packet

Use this command to disable debug tracing of PIMSM packet reception and transmission.

Format	`no debug ip pimsm packet [receive	transmit]`
Mode	Privileged EXEC

4.15.43 debug ip vrrp

Use this command to enable VRRP debug protocol messages.

Default	disabled
Format	`debug ip vrrp`
Mode	Privileged EXEC

4.15.43.1 no debug ip vrrp

Use this command to disable VRRP debug protocol messages.

Format	`no debug ip vrrp`
Mode	Privileged EXEC

4.15.44 debug ipv6 dhcp

This command displays “debug” information about DHCPv6 client activities and traces DHCPv6 packets to and from the local DHCPv6 client.

Default	disabled
Format	`debug ipv6 dhcp`
Mode	Privileged EXEC

4.15.44.1 no debug ipv6 dhcp

This command disables the display of "debug" trace output for DHCPv6 client activity.

Format	`no debug ipv6 dhcp`
Mode	Privileged EXEC

4.15.45 debug ipv6 mcache packet

Use this command for tracing MDATAv6 packet reception and transmission. receive traces only received data packets and transmit traces only transmitted data packets. When neither keyword is used in the command, then all data packet traces are dumped. Vital information such as source address, destination address, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ipv6 mcache packet [receive | transmit]`
Mode	Privileged EXEC

4.15.45.1 no debug ipv6 mcache packet

Use this command to disable debug tracing of MDATAv6 packet reception and transmission.

Format	`no debug ipv6 mcache packet [receive | transmit]`
Mode	Privileged EXEC

4.15.46 debug ipv6 mld packet

Use this command to trace MLDv6 packet reception and transmission. receive traces only received MLDv6 packets and transmit traces only transmitted MLDv6 packets. When neither keyword is used in the command, then all MLDv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ipv6 mld packet [receive | transmit]`
Mode	Privileged EXEC

4.15.46.1 no debug ipv6 mld packet

Use this command to disable debug tracing of MLDv6 packet reception and transmission.

Format	`no debug ipv6 mld packet [receive | transmit]`
Mode	Privileged EXEC

4.15.47 debug ipv6 ospfv3 packet

Use this command to enable IPv6 OSPFv3 packet debug trace.

Default	disabled
Format	`debug ipv6 ospfv3 packet`
Mode	Privileged EXEC

4.15.47.1 no debug ipv6 ospfv3 packet

Use this command to disable tracing of IPv6 OSPFv3 packets.

Format	`no debug ipv6 ospfv3 packet`
Mode	Privileged EXEC

4.15.48 debug ipv6 pimdm packet

Use this command to trace PIMDMv6 packet reception and transmission. receive traces only received PIMDMv6 packets and transmit traces only transmitted PIMDMv6 packets. When neither keyword is used in the command, then all PIMDMv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ipv6 pimdm packet [receive | transmit]`
Mode	Privileged EXEC

4.15.48.1 no debug ipv6 pimdm packet

Use this command to disable debug tracing of PIMDMv6 packet reception and transmission.

4.15.49 debug ipv6 pimsm packet

Use this command to trace PIMSMv6 packet reception and transmission. receive traces only received PIMSMv6 packets and transmit traces only transmitted PIMSMv6 packets. When neither keyword is used in the command, then all PIMSMv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug ipv6 pimsm packet [receive | transmit]`
Mode	Privileged EXEC

4.15.49.1 no debug ipv6 pimsm packet

Use this command to disable debug tracing of PIMSMv6 packet reception and transmission.

Format	`no debug ipv6 pimsm packet [receive | transmit]`
Mode	Privileged EXEC

4.15.50 debug lacp packet

This command enables tracing of LACP packets received and transmitted by the switch.

Default	disabled
Format	`debug lacp packet`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 14:04:51 10.254.24.31-1 DOT3AD[183697744]: dot3ad_debug.c(385) 58 %%
 Pkt TX - Intf: 0/1(1), Type: LACP, Sys: 00:11:88:14:62:e1, State: 0x47, Key:
0x36
```

4.15.50.1 no debug lacp packet

This command disables tracing of LACP packets.

Format	`no debug lacp packet`
Mode	Privileged EXEC

4.15.51 debug mldsnooping packet

Use this command to trace MLD snooping packet reception and transmission. receive traces only received MLD snooping packets and transmit traces only transmitted MLD snooping packets. When neither keyword is used in the command, then all MLD snooping packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	`debug mldsnooping packet [receive | transmit]`
Mode	Privileged EXEC

4.15.51.1 no debug mldsnooping packet

Use this command to disable debug tracing of MLD snooping packet reception and transmission.

4.15.52 debug ospf packet

This command enables tracing of OSPF packets received and transmitted by the switch or, optionally, a virtual router can be specified.

Default	disabled
Format	`debug ospf packet`
Mode	Privileged EXEC

Sample outputs of the trace messages are shown below.

```
<15> JAN 02 11:03:31 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(297) 25430 % Pkt RX - Intf:0/48 Src
Ip:192.168.50.2 DestIp:224.0.0.5 AreaId:0.0.0.0 Type:HELLO NetMask:255.255.255.0 D
esigRouter:0.0.0.0 Backup:0.0.0.0

<15> JAN 02 11:03:35 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(293) 25431 % Pkt TX - Intf:0/48 Src
Ip:10.50.50.1 DestIp:192.168.50.2 AreaId:0.0.0.0 Type:DB_DSCR Mtu:1500 Options:E
Flags: I/M/MS Seq:126166

<15> JAN 02 11:03:36 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(297) 25434 % Pkt RX - Intf:0/48 Src
Ip:192.168.50.2 DestIp:192.168.50.1 AreaId:0.0.0.0 Type:LS_REQ Length: 1500

<15> JAN 02 11:03:36 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(293) 25435 % Pkt TX - Intf:0/48 Src
Ip:10.50.50.1 DestIp:192.168.50.2 AreaId:0.0.0.0 Type:LS_UPD Length: 1500

<15> JAN 02 11:03:37 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(293) 25441 % Pkt TX - Intf:0/48 Src
Ip:10.50.50.1 DestIp:224.0.0.6 AreaId:0.0.0.0 Type:LS_ACK Length: 1500
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX/RX	TX refers to a packet transmitted by the device. RX refers to packets received by the device.
Intf	The interface that the packet came in or went out on. Format used is slot/port (internal interface number).
SrcIp	The source IP address in the IP header of the packet.
DestIp	The destination IP address in the IP header of the packet.

Parameter	Definition
AreaId	The area ID in the OSPF header of the packet.
Type	Could be one of the following: `HELLO` – Hello packet `DB_DSCR` – Database descriptor `LS_REQ` – LS Request `LS_UPD` – LS Update `LS_ACK` – LS Acknowledge

The remaining fields in the trace are specific to the type of OSPF Packet.

HELLO packet field definitions:

Parameter	Definition
Netmask	The netmask in the hello packet.
DesignRouter	Designated Router IP address.
Backup	Backup router IP address.

DB_DSCR packet field definitions:

Field	Definition
MTU	MTU
Options	Options in the OSPF packet.
Flags	Could be one or more of the following: • `I` – Init • `M` – More • `MS` – Master/Slave
Seq	Sequence Number of the DD packet.

LS_REQ packet field definitions.

Field	Definition
Length	Length of packet

LS_UPD packet field definitions.

Field	Definition
Length	Length of packet

LS_ACK packet field definitions.

Field	Definition
Length	Length of packet

4.15.52.1 no debug ospf packet

This command disables tracing of OSPF packets.

Format	`no debug ospf packet`
Mode	Privileged EXEC

4.15.53 debug ospfv3 packet

Use this command to enable OSPFv3 packet debug trace.

Default	disabled
Format	`debug ospfv3 packet`
Mode	Privileged EXEC

4.15.53.1 no debug ospfv3 packet

Use this command to disable tracing of OSPFv3 packets.

Format	`no debug ospfv3 packet`
Mode	Privileged EXEC

4.15.54 debug ping packet

This command enables tracing of ICMP echo requests and responses. The command traces pings on the network port/ service port for switching packages. For routing packages, pings are traced on the routing ports as well.

Default	disabled
Format	`debug ping packet`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 00:21:22 192.168.17.29-1 SIM[181040176]: sim_debug.c(128) 20 % Pkt TX - Intf: 0/1(1),
SRC_IP:10.50.50.2, DEST_IP:10.50.50.1, Type:ECHO_REQUEST


<15> JAN 01 00:21:22 192.168.17.29-1 SIM[182813968]: sim_debug.c(82) 21 % Pkt RX - Intf: 0/1(1), S
RC_IP:10.50.50.1, DEST_IP:10.50.50.2, Type:ECHO_REPLY
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX/RX	TX refers to a packet transmitted by the device. RX refers to packets received by the device.
Intf	The interface that the packet came in or went out on. Format used is slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
SRC_IP	The source IP address in the IP header in the packet.
DEST_IP	The destination IP address in the IP header in the packet.
Type	Type determines whether or not the ICMP message is a REQUEST or a RESPONSE.

4.15.54.1 no debug ping packet

This command disables tracing of ICMP echo requests and responses.

Format	`no debug ping packet`
Mode	Privileged EXEC

4.15.55 debug rip packet

This command turns on tracing of RIP requests and responses. This command takes no options. The output is directed to the log file.

Default	disabled
Format	`debug rip packet`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 00:35:15 192.168.17.29-1 RIP[181783160]: rip_map_debug.c(96) 775 %
Pkt RX on Intf: 0/1(1), Src_IP:43.1.1.1 Dest_IP:43.1.1.2
Rip_Version: RIPv2 Packet_Type:RIP_RESPONSE
ROUTE 1): Network: 10.1.1.0 Mask: 255.255.255.0 Metric: 1
ROUTE 2): Network: 40.1.0.0 Mask: 255.255.0.0 Metric: 1
ROUTE 3): Network: 10.50.50.0 Mask: 255.255.255.0 Metric: 1
ROUTE 4): Network: 41.1.0.0 Mask: 255.255.0.0 Metric: 1
ROUTE 5): Network:42.0.0.0 Mask:255.0.0.0 Metric:1
Another 6 routes present in packet not displayed.
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX/RX	TX refers to a packet transmitted by the device. RX refers to packets received by the device.
Intf	The interface that the packet came in or went out on. Format used is slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Src_IP	The source IP address in the IP header of the packet.
Dest_IP	The destination IP address in the IP header of the packet.
Rip_Version	RIP version used: RIPv1 or RIPv2.
Packet_Type	Type of RIP packet: RIP_REQUEST or RIP_RESPONSE.
Routes	Up to 5 routes in the packet are displayed in the following format: `Network:` *a.b.c.d* `Mask` *a.b.c.d* `Next_Hop` *a.b.c.d* `Metric` *a* The next hop is only displayed if it is different from `0.0.0.0`. For RIPv1 packets, Mask is always `0.0.0.0`.
Number of routes not printed	Only the first five routes present in the packet are included in the trace. There is another notification of the number of additional routes present in the packet that were not included in the trace.

4.15.55.1 no debug rip packet

This command disables tracing of RIP requests and responses.

Format	`no debug rip packet`
Mode	Privileged EXEC

4.15.56 debug sflow packet

Use this command to enable sFlow debug packet trace.

Default	disabled
Format	`debug sflow packet`
Mode	Privileged EXEC

4.15.56.1 no debug sflow packet

Use this command to disable sFlow debug packet trace.

Format	`no debug sflow packet`
Mode	Privileged EXEC

4.15.57 debug spanning-tree bpdu

This command enables tracing of spanning tree BPDUs received and transmitted by the switch.

Default	disabled
Format	`debug spanning-tree bpdu`
Mode	Privileged EXEC

4.15.57.1 no debug spanning-tree bpdu

This command disables tracing of spanning tree BPDUs.

Format	`no debug spanning-tree bpdu`
Mode	Privileged EXEC

4.15.58 debug spanning-tree bpdu receive

This command enables tracing of spanning tree BPDUs received by the switch. Spanning tree should be enabled on the device and on the interface in order to monitor packets for a particular interface.

Default	disabled
Format	`debug spanning-tree bpdu receive`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 01:02:04 192.168.17.29-1 DOT1S[191096896]: dot1s_debug.c(1249) 101 % Pkt RX - Intf: 0/
9(9), Source_Mac: 00:11:88:4e:c2:10 Version: 3, Root Mac: 00:11:88:4e:c2:00, Root Priority: 0x8000
Path Cost: 0
```

The following parameters are displayed in the trace message:

Parameter	Definition
RX	A packet received by the device.
Intf	The interface that the packet came in on. Format used is unit/port/slot (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Source_Mac	Source MAC address of the packet.
Version	Spanning tree protocol version (0-3). 0 refers to STP, 2 RSTP and 3 MSTP.
Root_Mac	MAC address of the CIST root bridge.
Root_Priority	Priority of the CIST root bridge. The value is between 0 and 61440. It is displayed in hex in multiples of 4096.
Path_Cost	External root path cost component of the BPDU.

4.15.58.1 no debug spanning-tree bpdu receive

This command disables tracing of received spanning tree BPDUs.

Format	`no debug spanning-tree bpdu receive`
Mode	Privileged EXEC

4.15.59 debug spanning-tree bpdu transmit

This command enables tracing of spanning tree BPDUs transmitted by the switch. Spanning tree should be enabled on the device and on the interface in order to monitor packets on a particular interface.

Default	disabled
Format	`debug spanning-tree bpdu transmit`
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 01:02:04 192.168.17.29-1 DOT1S[191096896]: dot1s_debug.c(1249) 101 % Pkt TX - Intf: 0/
7(7), Source_Mac: 00:11:88:4e:c2:00 Version: 3, Root_Mac: 00:11:88:4e:c2:00, Root_Priority: 0x8000
Path_Cost: 0
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX	A packet transmitted by the device.
Intf	The interface that the packet went out on. Format used is unit/port/slot (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Source_Mac	Source MAC address of the packet.
Version	Spanning tree protocol version (0-3). 0 refers to STP, 2 RSTP and 3 MSTP.
Root_Mac	MAC address of the CIST root bridge.
Root_Priority	Priority of the CIST root bridge. The value is between 0 and 61440. It is displayed in hex in multiples of 4096.
Path_Cost	External root path cost component of the BPDU.

4.15.59.1 no debug spanning-tree bpdu transmit

This command disables tracing of transmitted spanning tree BPDUs.

Format	`no debug spanning-tree bpdu transmit`
Mode	Privileged EXEC

4.15.60 debug tacacs

Use the `debug tacacs packet` command to turn on TACACS+ debugging.

Format	`debug tacacs {packet [receive | transmit] | accounting | authentication}`
Mode	Global Config

Parameter	Description
packet receive	Turn on TACACS+ receive packet debugs.
packet transmit	Turn on TACACS+ transmit packet debugs.
accounting	Turn on TACACS+ authentication debugging.
authentication	Turn on TACACS+ authorization debugging.

4.15.61 debug telnetd start

Use this command to start the debug telnet daemon. The debug telnet daemon gives access to a Linux shell prompt. The telnet user ID is “root”. If the telnet daemon is already running when this command is issued, the command stops and restarts the telnet daemon.

Format	`debug telnetd start [password][port]`
Mode	Privileged EXEC

Parameter	Description
password	The optional telnet password. If no password is specified, the default password lvl7dbg is used.
port	The optional telnet port number. If no telnet port is specified, the default port 2323 is used.

4.15.62 debug telnetd stop

Use this command to stop the telnet daemon previously started by the `debug telnetd start` command. If the daemon is not running when this command is issued, the command has no effect.

Format	`debug telnetd stop`
Mode	Privileged EXEC

4.15.63 debug transfer

This command enables debugging for file transfers.

Format	`debug transfer`
Mode	Privileged EXEC

4.15.63.1 no debug transfer

This command disables debugging for file transfers.

Format	`no debug transfer`
Mode	Privileged EXEC

4.15.64 debug udld events

This command enables debugging for the UDLD events.

Default	`Disabled`
Format	`debug udld events`
Mode	Privileged EXEC

4.15.65 debug udld packet receive

This command enables debugging on the received UDLD PDU's.

Default	`Disabled`
Format	`debug udld packet receive`
Mode	Privileged EXEC

4.15.66 debug udld packet transmit

This command enables debugging on the transmitted UDLD PDU's.

Default	`Disabled`
Format	`debug udld packet transmit`
Mode	Privileged EXEC

4.15.67 show debugging

Use the `show debugging` command to display enabled packet tracing configurations.

Format	`show debugging`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
console# debug arp
Arp packet tracing enabled.

console# show debugging
Arp packet tracing enabled.
```

4.15.67.1 no show debugging

Use the `no show debugging` command to disable packet tracing configurations.

Format	`no show debugging`
Mode	Privileged EXEC

4.15.68 exception protocol

Use this command to specify the protocol used to store the core dump file.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`exception protocol {nfs	tftp	ftp	local	usb	none}`
Mode	Global Config

4.15.68.1 no exception protocol

Use this command to reset the exception protocol configuration to its factory default value.

NOTICE This command is only available on Linux-based platforms.

Default	None
Format	`no exception protocol`
Mode	Global Config

4.15.69 exception dump tftp-server

Use this command to configure the IP address of a remote TFTP server in order to dump core files to an external server.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`exception dump tftp-server {`*ip-address*`}`
Mode	Global Config

4.15.69.1 no exception dump tftp-server

Use this command to reset the exception dump remote server configuration to its factory default value.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`no exception dump tftp-server`
Mode	Global Config

4.15.70 exception dump nfs

Use this command to configure an NFS mount point in order to dump core file to the NFS file system.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`exception dump nfs` *`ip-address/dir`*
Mode	Global Config

4.15.70.1 no exception dump nfs

Use this command to reset the exception dump NFS mount point configuration to its factory default value.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`no exception dump nfs`
Mode	Global Config

4.15.71 exception dump filepath

Use this command to configure a file-path to dump core file to a TFTP server, NFS mount or USB device subdirectory.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`exception dump  filepath` *`dir`*
Mode	Global Config

4.15.71.1 no exception dump filepath

Use this command to reset the exception dump filepath configuration to its factory default value.

NOTICE This command is only available on selected Linux-based platforms.

Default	None
Format	`exception dump  filepath`
Mode	Global Config

4.15.72 exception core-file

Use this command to configure a prefix for a core-file name. The core file name is generated with the prefix as follows:

If `hostname` is selected:

`file-name-prefix_hostname_Time_Stamp``.bin`

If `hostname` is not selected:

`file-name-prefix_MAC_Address_Time_Stamp``.bin`

If `hostname` is configured the core file name takes the `hostname`, otherwise the core-file names uses the MAC address when generating a core dump file. The prefix length is 15 characters.

NOTICE This command is only available on selected Linux-based platforms.

Default	Core
Format	`exception core-file {`*`file-name-prefix`*`	[hostname]	[time-stamp]}`
Mode	Global Config

4.15.72.1 no exception core-file

Use this command to reset the exception core file prefix configuration to its factory default value. The hostname and time-stamp are disabled.

NOTICE This command is only available on selected Linux-based platforms.

Default	Core
Format	`no exception core-file`
Mode	Global Config

4.15.73 exception switch-chip-register

This command enables or disables the switch-chip-register dump in case of an exception. The switch-chip-register dump is taken only for a master unit and not for member units

NOTICE This command is only available on selected Linux-based platforms.

Default	Disable
Format	`exception switch-chip-register {enable	disable}`
Mode	Global Config

4.15.74 exception dump ftp-server

This command configures the IP address of remote FTP server to dump core files to an external server. If the username and password are not configured, the switch uses anonymous FTP. (The FTP server should be configured to accept anonymous FTP.)

Default	None
Format	`exception dump ftp-server` *`ip-address`* `[{username` *`user-name`* `password` *`password`*`}]`
Mode	Global Config

4.15.74.1 no exception dump ftp-server

This command resets exception dump remote FTP server configuration to its factory default value. This command also resets the FTP username and password to empty string.

Default	None
Format	`no exception dump ftp-server`
Mode	Global Config

4.15.75 exception dump compression

This command enables compression mode.

Default	Enabled
Format	`exception dump compression`
Mode	Global Config

4.15.75.1 no exception dump compression

This command disables compression mode.

Default	None
Format	`no exception compression`
Mode	Global Config

4.15.76 exception dump stack-ip-address protocol

This command configures protocol (dhcp or static) to be used to configure service port when a unit has crashed. If configured as dhcp then the unit gets the IP address from dhcp server available in the network.

Default	dhcp
Format	`exception dump stack-ip-address protocol {dhcp	static}`
Mode	Global Config

4.15.76.1 no exception dump stack-ip-address protocol

This command resets stack IP protocol configuration (dhcp or static) to its default value.

Default	None
Format	`no exception dump stack-ip-address protocol`
Mode	Global Config

4.15.77 exception dump stack-ip-address add

This command adds static IP address to be assigned to individual unit's service port in the stack when the switch has crashed. This IP address is used to perform the core dump.

Default	None
Format	`exception dump  stack-ip-address add` *`ip-address netmask`* `[`*`gateway`*`]`
Mode	Global Config

4.15.78 exception dump stack-ip-address remove

This command removes stack IP address configuration. If this IP address is assigned to any unit in the stack then this IP is removed from the unit.

Default	None
Format	`exception dump stack-ip-address remove` *`ip-address netmask`*
Mode	Global Config

4.15.79 exception nmi

This command enables or disables taking core dump in case of NMI occurs.

Default	Disable
Format	`exception nmi {enable | disable}`
Mode	Global Config

4.15.80 write core

Use the *write core* command to generate a core dump file on demand. The `write core test` command is helpful when testing the core dump setup. For example, if the TFTP protocol is configured, `write core test` communicates with the TFTP server and informs the user if the TFTP server can be contacted. Similarly, if protocol is configured as `nfs`, this command mounts and unmounts the file system and informs the user of the status.

NOTICE

`write core` reloads the switch which is useful when the device malfunctions, but has not crashed.

For `write core test`, the destination file name is used for the TFTP test. Optionally, you can specify the destination file name when the protocol is configured as TFTP.

NOTICE

This command is only available on selected Linux-based platforms.

Default None

Format `write core [test [`*dest_file_name*`]]`

Mode Privileged EXEC

4.15.81 debug exception

The command displays core dump features support.

Default None

Format `debug exception`

Mode Privileged EXEC

4.15.82 show exception

Use this command to display the configuration parameters for generating a core dump file.

NOTICE This command is only available on selected Linux-based platforms.

Default None

Format `show exception`

Mode Privileged EXEC

Example: The following shows an example of this command.

```
show exception

Coredump file name                  core
Coredump filename uses hostname     False
Coredump filename uses time-stamp TRUE
TFTP Server Address                 TFTP server configuration
FTP Server IP                       FTP server configuration
FTP user name                       FTP user name
FTP password                        FTP password
NFS Mount point                     NFS mount point configuration
File path                           Remote file path
Core File name prefix               Core file prefix configuration.
Hostname                            Core file name contains hostname if enabled.
Timestamp                           Core file name contains timestamp if enabled.
Switch Chip Register Dump           Switch chip register dump configuration
Compression mode                    TRUE/FALSE
Stack IP Address Protocol           DHCP/Static
Stack IP Address                    List of IP addresses configured
```

4.15.83 show exception core-dump-file

This command displays core dump files existing on the local file system.

Default None

Format `show exception core-dump-file`

Mode Privileged EXEC, Config Mode

4.15.84 show exception log

This command displays core dump traces on the local file system.

Default	None
Format	`show exception log [previous]`
Mode	Privileged EXEC, Config Mode

4.15.85 logging persistent

Use this command to configure the Persistent logging for the switch. The severity level of logging messages is specified at severity level. Possible values for severity level are (emergency|0, alert|1, critical|2, error|3, warning|4, notice|5, info|6, debug|7).

Default	Disable
Format	`logging persistent` *`severity level`*
Mode	Global Config

4.15.85.1 no logging persistent

Use this command to disable the persistent logging in the switch.

Format	`no logging persistent`
Mode	Global Config

4.15.86 mbuf

Use this command to configure memory buffer (MBUF) threshold limits and generate notifications when MBUF limits have been reached.

Format	`mbuf {falling-threshold | rising threshold | severity}`
Mode	Global Config

Field	Description
Rising Threshold	The percentage of the memory buffer resources that, when exceeded for the configured rising interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Falling Threshold	The percentage of memory buffer resources that, when usage falls below this level for the configured interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Severity	The severity level at which Mbuf logs messages. The range is 1 to 7. The default is 5 (L7_LOG_SEVERITY_NOTICE).

4.15.87 show mbuf

Use this command to display the memory buffer (MBUF) Utilization Monitoring parameters.

Format	`show mbuf`
Mode	Privileged EXEC

Field	Description
Rising Threshold	The percentage of the memory buffer resources that, when exceeded for the configured rising interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).

Field	Description
Falling Threshold	The percentage of memory buffer resources that, when usage falls below this level for the configured interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Severity	The severity level.

4.15.88 show mbuf total

Use this command to display memory buffer (MBUF) information.

Format	`show mbuf total`
Mode	Privileged EXEC

Field	Description
Mbufs Total	Total number of message buffers in the system.
Mbufs Free	Number of message buffers currently available.
Mbufs Rx Used	Number of message buffers currently in use.
Total Rx Norm Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Norm.
Total Rx Mid2 Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Mid2.
Total Rx Mid1 Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Mid1.
Total Rx Mid0 Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Mid0.
Total Rx High Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX High.
Total Tx Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class TX.
Total Rx Norm Alloc Failures	Number of message buffer allocation failures for RX Norm class of message buffer.
Total Rx Mid2 Alloc Failures	Number of message buffer allocation failures for RX Mid2 class of message buffer.
Total Rx Mid1 Alloc Failures	Number of message buffer allocation failures for RX Mid1 class of message buffer.
Total Rx Mid0 Alloc Failures	Number of message buffer allocation failures for RX Mid0 class of message buffer.
Total Rx High Alloc Failures	Number of message buffer allocation failures for RX High class of message buffer.
Total Tx Alloc Failures	Number of message buffer allocation failures for TX class of message buffer.

4.15.89 show msg-queue

Use this command to display the message queues.

Default	None
Format	`show msg-queue`
Mode	Priveleged EXEC mode

4.15.90 debug packet-trace

Use this command to enable traces for the packet trace feature.

Default	None
Format	`debug packet-trace`
Mode	Privileged Exec

4.15.91 packet-trace eth

Use this command to specify the ethernet packet fields for a packets for which a trace profile is required. If the optional vlan parameter is not specified, the PVID/internal VLAN associated with the ingress port (specified in the show packet-trace command) is used in the VLAN tag.

Default	None
Format	`packet-trace eth src-mac` *`src-mac`* `dst-mac` *`dst-mac`* `vlan` *`vlan`*
Mode	Privileged Exec

4.15.92 packet-trace ipv4

Use this command to specify the IPv4 packet header fields.

Default	None
Format	`packet-trace ipv4 src-ip` *`src-ip`* `dst-ip` *`dst-ip`* `tos` *`tos`*
Mode	Privileged Exec

4.15.93 packet-trace ipv6

Use this command to specify the IPv6 packet header fields.

Default	None
Format	`packet-trace ipv6 src-ip` *`src-ip`* `dst-ip` *`dst-ip`* `tos` *`tos`*
Mode	Privileged Exec

4.15.94 packet-trace l4

Use this command to specify TCP packet fields.

Default	None
Format	`packet-trace l4 src-port` *`src-port`* `dst-port` *`dst-port`*
Mode	Privileged Exec

4.15.95 show packet-trace ecmp

Use this command for getting a summary (link utilization percentage) for all complete packets present in the PCAP file (uploaded onto the system using the copy command).

Default	None
Format	`show packet-trace ecmp` *`prefix/prefix-length`* `port` *`slot/port`* `pcap summary`
Mode	Privileged Exec

4.15.96 show packet-trace lag

Use this command for getting a summary (link utilization percentage) for all complete packets present in the PCAP file (uploaded onto the system using the copy command).

Default None

Format `show packet-trace lag` *`lag-id`* `port` *`slot/port`* `pcap summary`

Mode Privileged Exec

Example:

```
(Routing)#show packet-trace lag 1 port 0/1 pcap summary

LAG   ............................... 3/1
Link State................................... Up
Admin Mode................................... Enabled
Type......................................... Static
Port-channel Min-links....................... 1
Load Balance Option.......................... 3
(Src/Dest MAC, VLAN, EType, incoming port)

Mbr    Device/       Port      Port
Ports  Timeout       Speed     Active
------ ------------- --------- -------
0/3   actor/long    10G Full  True
        partner/long
0/2   actor/long    10G Full  True
        partner/long

LAG 1 member port link utilization %:
-------------------------------------
Total number of valid packets in pcap file: 20
Member port 0/3 utilization: 20%
Member port 0/4 utilization: 80%
```

4.15.97 show packet-trace packet-data

Use this command to dump all the configured packet header fields.

Default By default, all packet fields are set to 0.

Format `show packet-trace trace-data`

Mode Privileged Exec

Example:

```
DUT#show packet-trace packet-data

L2 Header fields:
-----------------------
Src MAC: 00 00 00 0a 0b 0c
Dst MAC: 00 00 00 0d 0e 0f
VLAN: 10

L3 Header fields:
-------------------------
IPv4:
Src IP: 10.0.10.1
Dst IP: 10.0.10.10
TOS: 0

IPv6:
Src IP: 4001::1/8
```

```
Dst IP: 5001::1/8
Traffic Class: 0

L4 header fields:
-----------------------
Src Port: 80
Dst Port: 80
```

4.15.98 show packet-trace port

Use this command for getting detailed information for the maximum packets in the PCAP file.

Default	None
Format	`show packet-trace port` *`slot/port`* `pcap detailed` *`maxpkts`*
Mode	Privileged Exec

Example:

```
DUT#show packet-trace port 0/1 pcap detailed 5

            Packet fields:
src-Mac      --------------     00:00:00:00:00:0a
dst-mac      --------------     00:00:00:00:00:0b
vlan         --------------     10
src-ip       --------------     10.0.1.10
dst-ip       --------------     10.0.1.20

LAG                Destination member port
---------         ---------------------------------
Lag 1                     0/4


Packet fields:
src-Mac      --------------     00:00:00:00:00:0c
dst-mac      --------------     00:00:00:00:00:0d
vlan         --------------     10
src-ip       --------------     10.0.1.10
dst-ip       --------------     10.0.1.20

LAG                Destination member port
---------         ---------------------------------
Lag 1                     0/3


Packet fields:
src-Mac      --------------     00:00:00:00:00:0e
dst-mac      --------------     00:00:00:00:00:0f
vlan         --------------     10
src-ip       --------------     10.0.1.10
dst-ip       --------------     10.0.1.20

LAG                Destination member port
---------         ---------------------------------
Lag 1                     0/2

Packet fields:
src-Mac      --------------     00:00:00:00:00:1a
dst-mac      --------------     00:00:00:00:00:1b
vlan         --------------     10
src-ip       --------------     10.0.1.10
dst-ip       --------------     10.0.1.20

LAG                Destination member port
```

```
---------         --------------------------------
Lag 1                     0/4

Packet fields:
src-Mac       --------------     00:00:00:00:00:1c
dst-mac       --------------     00:00:00:00:00:1d
vlan          --------------     10
src-ip        --------------     10.0.1.10
dst-ip        --------------     10.0.1.20

LAG                Destination member port
---------         --------------------------------
Lag 1                     0/3
```

4.15.99 show packet-trace port eth

Use this command to retrieve the trace profile for an ethernet packet created from the configured packet fields. The trace profile indicates if the packet went out on LAG/ECMP route and also the corresponding member/link information.

Default	None
Format	`show packet-trace port` *slot/port* `eth`
Mode	Privileged Exec

Example:

```
(Routing)# show packet-trace port 0/1 eth

LAG                Destination member port
---------         --------------------------------
Lag 1                             0/3

LAG   ............................... 3/1
Link State.................................... Up
Admin Mode.................................... Enabled
Type.......................................... Static
Port-channel Min-links........................ 1
Load Balance Option........................... 3
(Src/Dest MAC, VLAN, EType, incoming port)

Mbr    Device/       Port      Port
Ports  Timeout       Speed     Active
------ ------------- --------- -------
0/3   actor/long    10G Full  True
        partner/long
0/2   actor/long    10G Full  True
        partner/long
```

4.15.100 show packet-trace port ipv4

Use this command to retrieve the trace profile for an IPv4 packet created from the configured packet fields. The trace profile indicates if the packet went out on LAG/ECMP route and also the corresponding member/link information. Note that in order to get the trace profile for an IP packet, both the Ethernet and IP packet fields need to be configured.

Default	None
Format	`show packet-trace port` *slot/port* `ipv4`
Mode	Privileged Exec

Example:

```
(Routing)# show packet-trace port 0/1 ipv4
ECMP               Egress port           Next Hop IP
-----------      ----------------         -----------------
10.0.0.2/16            0/4                  3.3.3.3

ECMP routes to 10.0.0.2/16:
--------------------------------
via 3.3.3.3 on interface 0/4
via 2.2.2.2 on interface 0/5
```

4.15.101 show packet-trace port ipv6

Use this command to retrieve the trace profile for an IPv6 packet created from the configured packet fields. The trace profile indicates if the packet went out on LAG/ECMP route and also the corresponding member/link information. Note that in order to get the trace profile for an IP packet, both the ethernet and IP packet fields need to be configured.

Default	None
Format	`show packet-trace port` *`slot/port`* `ipv6`
Mode	Privileged Exec

Example:

```
(Routing)# show packet-trace port 0/1 udpv6

ECMP               Egress port           Next Hop IP
-----------      ----------------         -----------------
6001::200/64         0/4                    8001::200

ECMP routes to 6001::200/64:
--------------------------------
via 8001::200 on interface 0/32
via 7001::200 on interface 0/5
```

4.15.102 show packet-trace port tcpv4

Use this command to get the egress LAG member port for a L3 IPv4 packet specified by the configured packet fields and to get the egressing ECMP route link information (physical port) for a TCP-IPv4 packet specified by the configured packet fields. Note that, in order to get the trace profile for a TCP packet, the L2, L3, and L4 packet fields need to be configured.

Default	None
Format	`show packet-trace port` *`slot/port`* `tcpv4`
Mode	Privileged Exec

4.15.103 show packet-trace port tcpv6

Use this command to retrieve the trace profile for a TCP-IPv6 packet created from the configured packet fields. The trace profile indicates if the packet went out on LAG/ECMP route and also the corresponding member/link information. Note that in order to get the trace profile for a TCP packet, the ethernet, IP and L4 packet fields need to be configured.

Default	None
Format	`show packet-trace port` *`slot/port`* `tcpv6`
Mode	Privileged Exec

4.15.104 show packet-trace port udpv4

Use this command to retrieve the trace profile for a UDP-IPv4 packet created from the configured packet fields. The trace profile indicates if the packet went out on LAG/ECMP route and also the corresponding member/link information. Note that in order to get the trace profile for a UDP packet, the ethernet, IP and L4 packet fields need to be configured.

Default	None
Format	`show packet-trace port` *`slot/port`* `udpv4`
Mode	Privileged Exec

4.15.105 show packet-trace port udpv6

Use this command to retrieve the trace profile for a UDP-IPv4 packet created from the configured packet fields. The trace profile indicates if the packet went out on LAG/ECMP route and also the corresponding member/link information. Note that in order to get the trace profile for a UDP packet, the ethernet, IP and L4 packet fields need to be configured.

Default	None
Format	`show packet-trace port` *`slot/port`* `udpv6`
Mode	Privileged Exec

4.15.106 clear packet-trace packet-data

Use this command to clear the configured packet header fields.

Format	`clear packet-trace packet-data`
Mode	Privileged Exec

4.15.107 session start

Use this command to initiate a console session from the stack master to another unit in the stack, or from a member unit to a manager or another member unit. During the session, troubleshooting and debugging commands can be issued on the member unit, and the output displays the relevant information from the member unit specified in the session. Commands are displayed on the member unit using the user help option ?.

Default	Disable
Format	`session start {unit` *`unit-number`* `| manager}`
Mode	Global Config

Parameter	Description
unit	Use to connect to the specified unit from the stack master.
manager	Use to connect directly to the manager unit from any member unit without entering the manager's unit number.

4.15.108 session stop

Use this command to terminate a session started from a manager to a member, a member to a member, or a member to manager that was started with the `session start` command.

Default	Disable
Format	`session stop {unit` *`unit-number`* `| manager}`
Mode	Global Config

Parameter	Description
unit	Use to disconnect from the specified unit from the stack master.
manager	Use to disconnect from the manager unit from any member unit without entering the manager's unit number.

4.15.109 watchdog clear

This command clears the watchdog settings and history and resets the timeout interval to the default value.

Format	`watchdog clear`
Mode	Privileged EXEC

4.15.110 watchdog disable

This command disables watchdog services. Watchdog is automatically changed (that is, no reboot is required).

Default	Disabled
Format	`watchdog disable`
Mode	Privileged EXEC

4.15.111 watchdog enable

This command enables watchdog services. Watchdog services give FASTPATH the ability to recover when it is no longer executing properly. When a recovery is attempted, debug information is saved and the switch is reset.

Default	Disabled
Format	`watchdog enable`
Mode	Privileged EXEC

4.16 BCM Shell Command

The BCM (SDK) shell is mainly used for debugging the Broadcom SDK. BCM shell commands can be executed directly from the CLI without entering the BCM shell itself by using the keyword `drivshell` before the BCM command. However, you can also enter the BCM shell to directly execute any of the BCM commands on the shell using the `bcmsh` command.

4.16.1 bcmsh

The `bcmsh` command is used to enter into the BCM shells from Privileged EXEC mode. Only users with Level 15 permissions can execute this command. Management is blocked during this mode; the user is notified and asked whether to continue. This command is only supported on the serial console and not via telnet/ssh.

Format	`bcmsh`
Mode	Privileged EXEC

NOTICE

To exit the shell and return to the CLI, enter `exit`.

4.17 Cable Test Command

The cable test feature enables you to determine the cable connection status on a selected port.

NOTICE The cable test feature is supported only for copper cable. It is not supported for optical fiber cable.

If the port has an active link while the cable test is run, the link can go down for the duration of the test.

4.17.1 cablestatus

This command returns the status of the specified port.

Format `cablestatus` *`slot/port`*

Mode Privileged EXEC

Field	Description
Cable Status	One of the following statuses is returned: • Normal: The cable is working correctly. • Open: The cable is disconnected or there is a faulty connector. • Short: There is an electrical short in the cable. • Cable Test Failed: The cable status could not be determined. The cable may in fact be working. • Crosstalk: There is crosstalk present on the cable. • No Cable: There is no cable present.
Cable Length	If this feature is supported by the PHY for the current link speed, the cable length is displayed as a range between the shortest estimated length and the longest estimated length. Note that if the link is down and a cable is attached to a 10/100 Ethernet adapter, then the cable status may display as Open or Short because some Ethernet adapters leave unused wire pairs unterminated or grounded. Unknown is displayed if the cable length could not be determined.

4.18 sFlow Commands

sFlow is the standard for monitoring high-speed switched and routed networks. sFlow technology is built into network equipment and gives complete visibility into network activity, enabling effective management and control of network resources.

4.18.1 sflow poller

A data source configured to collect counter samples is called a poller. Use this command to enable a new sFlow poller instance on an interface or range of interfaces for this data source if *`rcvr_idx`* is valid.

Format `sflow poller {`*`rcvr-indx`*` | interval `*`poll-interval`*`}`

Mode Interface Config

Field	Description
Receiver Index	Enter the sFlow Receiver associated with the sampler/poller. A value of zero (0) means that no receiver is configured. The range is 1-8. The default is 0.
Poll Interval	Enter the sFlow instance polling interval. A poll interval of zero (0) disables counter sampling. When set to zero (0), all the poller parameters are set to their corresponding default value. The range is 0-86400. The default is 0. A value of N means once in N seconds a counter sample is generated.

NOTICE

The sFlow task is heavily loaded when the sFlow polling interval is configured at the minimum value (i.e., one second for all the sFlow supported interfaces). In this case, the sFlow task is always busy collecting the counters on all the configured interfaces. This can cause the device to hang for some time when the user tries to configure or issue show sFlow commands. To overcome this situation, sFlow polling interval configuration on an interface or range of interfaces is controlled as mentioned below:

- The maximum number of allowed interfaces for the polling intervals max (1, (interval – 10)) to min ((interval + 10), 86400) is:

interval * 5

- For every one second increment in the polling interval that is configured, the number of allowed interfaces that can be configured increases by 5.

4.18.1.1 no sflow poller

Use this command to reset the sFlow poller instance to the default settings.

Format `no sflow poller [interval]`

Mode Interface Config

4.18.2 sflow receiver

Use this command to configure the sFlow collector parameters (owner string, receiver timeout, max datagram size, IP address, and port).

Format `sflow receiver rcvr_idx {owner owner-string timeout rcvr_timeout | max datagram size | ip ip | port port}`

Mode Global Config

Parameter	Description
Receiver Owner	The identity string for the receiver, the entity making use of this sFlowRcvrTable entry. The range is 127 characters. The default is a null string. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string to a non-null value. The entry must be claimed before assigning a receiver to a sampler or poller.
Receiver Timeout	The time, in seconds, remaining before the sampler or poller is released and stops sending samples to receiver. A management entity wanting to maintain control of the sampler is responsible for setting a new value before the old one expires. The allowed range is 0-2147483647 seconds. The default is zero (0).
No Timeout	The configured entry will be in the config until you explicitly removes the entry.
Receiver Max Datagram Size	The maximum number of data bytes that can be sent in a single sample datagram. The management entity should set this value to avoid fragmentation of the sFlow datagrams. The allowed range is 200 to 9116). The default is 1400.
Receiver IP	The sFlow receiver IP address. If set to 0.0.0.0, no sFlow datagrams will be sent. The default is 0.0.0.0.
Receiver Port	The destination Layer4 UDP port for sFlow datagrams. The range is 1-65535. The default is 6343.

4.18.2.1 no sflow receiver

Use this command to set the sFlow collector parameters back to the defaults.

Format	`no sflow receiver` *`indx`* `{ip` *`ip-address`* `|` `maxdatagram` *`size`* `|` `owner` *`string`* `timeout` *`interval`* `|` `port` *`14-port`*`}`
Mode	Global Config

4.18.3 sflow receiver owner timeout

Use this command to configure a receiver as a timeout entry. As the sFlow receiver is configured as a timeout entry, information related to sampler and pollers are also shown in the running-config and are retained after reboot.

If a receiver is configured with a specific value, these configurations will not be shown in running-config. Samplers and pollers information related to this receiver will also not be shown in running-config.

Format	`sflow receiver` *`index`* `owner` *`owner-string`* `timeout`
Mode	Global Config

Field	Description
index	Receiver index identifier. The range is 1 to 8.
Receiver Owner	The owner name corresponds to the receiver name. The identity string for the receiver, the entity making use of this sFlowRcvrTable entry. The range is 127 characters. The default is a null string. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string to a non-null value. The entry must be claimed before assigning a receiver to a sampler or poller.

4.18.4 sflow receiver owner notimeout

Use this command to configure a receiver as a non-timeout entry. Unlike entries configured with a specific timeout value, this command will be shown in show running-config and retained after reboot. As the sFlow receiver is configured as a non-timeout entry, information related to sampler and pollers will also be shown in the running-config and will be retained after reboot.

If a receiver is configured with a specific value, these configurations will not be shown in running-config. Samplers and pollers information related to this receiver will also not be shown in running-config.

Format	`sflow receiver` *`index`* `owner` *`owner-string`* `notimeout`
Mode	Global Config

Field	Description
index	Receiver index identifier. The range is 1 to 8.
Receiver Owner	The owner name corresponds to the receiver name. The identity string for the receiver, the entity making use of this sFlowRcvrTable entry. The range is 127 characters. The default is a null string. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string to a non-null value. The entry must be claimed before assigning a receiver to a sampler or poller.

4.18.5 sflow remote-agent ip

Use this command to assign an IPv4 address to a remote agent. When sFlow hardware sampling is enabled, the switch/ hardware sends sampled packets encapsulated in sFlow custom packet to this IP address.

Default	0.0.0.0
Format	`sflow remote-agent` *index* `ip` *ipv4-address*
Mode	Global Config

4.18.5.1 no sflow remote-agent ip

Use this command to remove the remote agent IPv4 address.

Format	`no sflow remote-agent` *index* `ip`
Mode	Global Config

4.18.6 sflow remote-agent monitor-session

Use this command to assign the monitor ID (MTP) for the remote agent session. The destination port is an outgoing interface for sFlow sampled packets. The sflow sampled packets are sent to all the configured destination ports, irrespective of monitor session index.

Default	0 for both monitor session and destination port
Format	`sflow remote-agent` *index* `monitor-session` *session id range 1-4* `destination interface slot/port`
Mode	Global Config

4.18.6.1 no sflow remote-agent monitor-session

This command removes the remote-agent configuration.

Format	`no sflow remote-agent` *index* `monitor-session`
Mode	Global Config

4.18.7 sflow remote-agent port

This command configures the destination UDP port for the remote-agent.

Default	16343
Format	`sflow remote-agent` *index* `port` *value*
Mode	Global Config

4.18.7.1 no sflow remote-agent port

This command removes remote agent port configuration.

Format	`no sflow remote-agent port`
Mode	Global Config

4.18.8 sflow sampler

A data source configured to collect flow samples is called a poller. Use this command to configure a new sFlow sampler instance on an interface or range of interfaces for this data source if *rcvr_idx* is valid.

Format	`sflow sampler {`*`rcvr-indx`*`	rate `*`sampling-rate`*`	maxheadersize `*`size`*`}`
Mode	Interface Config

Field	Description
Receiver Index	The sFlow Receiver for this sFlow sampler to which flow samples are to be sent. A value of zero (0) means that no receiver is configured, no packets will be sampled. Only active receivers can be set. If a receiver expires, then all samplers associated with the receiver will also expire. Possible values are 1-8. The default is 0.
Maxheadersize	The maximum number of bytes that should be copied from the sampler packet. The range is 20-256. The default is 128. When set to zero (0), all the sampler parameters are set to their corresponding default value.
Sampling Rate	The statistical sampling rate for packet sampling from this source. A sampling rate of 1 counts all packets. A value of zero (0) disables sampling. A value of N means that out of N incoming packets, 1 packet will be sampled. The range is 1024-65536 and 0. The default is 0.

4.18.8.1 no sflow sampler

Use this command to reset the sFlow sampler instance to the default settings.

Format	`no sflow sampler {`*`rcvr-indx`*`	rate `*`sampling-rate`*`	maxheadersize `*`size`*`}`
Mode	Interface Config

4.18.9 sflow sampler rate

Use this command to set the sampling rate for ingress/egress/flow-based sampling on this interface.

Default	0 for the ingress sampling rate.
Format	`sflow sampler rate `*`value`*` {ingress	egress	flow-based}`
Mode	Interface Config

4.18.9.1 no sflow sample rate

Use this command to remove the sampling rate for ingress/egress/flow-based sampling on this interface.

Format	`no sflow sampler rate `*`value`*` {ingress	egress	flow-based}`
Mode	Interface Config

4.18.10 sflow sampler remote-agent

Use this command to enable a new sFlow sampler remote agent instance for this data source.

Default	None
Format	`sflow sampler remote-agent `*`index`*
Mode	Interface Config

4.18.10.1 no sflow sampler remote-agent

Use this command to disable an sFlow sampler remote agent instance for this data source.

Format	`no sflow sampler remote-agent`
Mode	Interface Config

4.18.11 sflow sampler filter ip access-group

Use this command to enable flow-based ingress packet sampling on an interface for an IP ACL identified by ACL name or ACL ID. The packet matching the defined flow/ACL may get sampled by this configuration.

Default	None
Format	`sflow sampler filter ip access-group {aclid | aclName}`
Mode	Interface Config

4.18.11.1 no sflow sampler filter ip access-group

Use this command to disable the sFlow for an IP ACL identified by name or ID on the interface.

Format	`no sflow sampler filter ip access-group {aclid | aclName}`
Mode	Interface Config

4.18.12 sflow sampler filter mac access-group

Use this command to enable flow-based ingress packet sampling on an interface for MAC ACL identified by ACL name. The packet matching the defined flow/ACL may get sampled by this configuration.

Default	None
Format	`sflow sampler filter mac access-group` *`aclName`*
Mode	Interface Config

4.18.12.1 no sflow sampler filter mac access-group

Use this command to disable the sFlow for MAC ACL identified by name on the interface.

Format	`no sflow sampler filter mac access-group`
Mode	Interface Config

4.18.13 sflow source-interface

Use this command to specify the physical or logical interface to use as the sFlow client source interface. If configured, the address of source Interface is used for all sFlow communications between the sFlow receiver and the sFlow client. Otherwise there is no change in behavior. If the configured interface is down, the sFlow client falls back to normal behavior.

Format	`sflow source-interface {slot/port | loopback` *`loopback-id`* `| tunnel` *`tunnel-id`* `| vlan` *`vlan-id`*`}`
Mode	Global Config

Parameter	Description
slot/port	VLAN or port-based routing interface.

Parameter	Description
loopback-id	Configures the loopback interface to use as the source IP address. The range of the loopback ID is 0 to 7.
tunnel-id	Configures the tunnel interface to use as the source IP address. The range of the tunnel ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

4.18.13.1 no sflow source-interface

Use this command to reset the sFlow source interface to the default settings.

Format	`no sflow source-interface`
Mode	Global Config

4.18.14 show sflow agent

The sFlow agent collects time-based sampling of network interface statistics and flow-based samples. These are sent to the configured sFlow receivers. Use this command to display the sFlow agent information.

Format	`show sflow agent`
Mode	Privileged EXEC

Field	Description
sFlow Version	Uniquely identifies the version and implementation of this MIB. The version string must have the following structure: MIB Version; Organization; Software Revision where: • MIB Version: 1.3, the version of this MIB. • Organization: Broadcom Corp. • Revision: 1.0
IP Address	The IP address associated with this agent.

Example: The following shows example CLI display output for the command.

```
(switch) #show sflow agent

sFlow Version.................................. 1.3;Broadcom Corp;1.0
IP Address..................................... 10.131.12.66
```

4.18.15 show sflow pollers

Use this command to display the sFlow polling instances created on the switch. Use “-” for range.

Format	`show sflow pollers`
Mode	Privileged EXEC

Field	Description
Poller Data Source	The sFlowDataSource (slot/port) for this sFlow sampler. This agent will support Physical ports only.
Receiver Index	The sFlowReceiver associated with this sFlow counter poller.
Poller Interval	The number of seconds between successive samples of the counters associated with this data source.

4.18.16 show sflow receivers

Use this command to display configuration information related to the sFlow receivers.

Format	`show sflow receivers [`*`index`*`]`
Mode	Privileged EXEC

Parameter	Description
Receiver Index	The sFlow Receiver associated with the sampler/poller.
Owner String	The identity string for receiver, the entity making use of this sFlowRcvrTable entry.
Time Out	The time (in seconds) remaining before the receiver is released and stops sending samples to sFlow receiver. The no timeout value of this parameter means that the sFlow receiver is configured as a non-timeout entry.
Max Datagram Size	The maximum number of bytes that can be sent in a single sFlow datagram.
Port	The destination Layer4 UDP port for sFlow datagrams.
IP Address	The sFlow receiver IP address.
Address Type	The sFlow receiver IP address type. For an IPv4 address, the value is 1 and for an IPv6 address, the value is 2.
Datagram Version	The sFlow protocol version to be used while sending samples to sFlow receiver.

Example: The following shows example CLI display output for the show sflow receivers command.

```
(switch) #show sflow receivers 1
Receiver Index................................. 1
Owner String................................... tulasi
Time out....................................... 0
IP Address:.................................... 0.0.0.0
Address Type................................... 1
Port........................................... 6343
Datagram Version............................... 5
Maximum Datagram Size.......................... 1400
```

Example: The following examples show CLI display output for the command when a receiver is configured as a non-timeout entry.

```
(FASTPATH Routing) #show sflow receivers

Rcvr Owner                            Timeout    Max Dgram Port  IP Address
Indx String                                      Size
---- -------------------------------- ---------- --------- ----- ---------------
1    tulasi                           No Timeout 1400      6343  0.0.0.0 <= No Timeout string
2                                     0          1400      6343  0.0.0.0
3                                     0          1400      6343  0.0.0.0
4                                     0          1400      6343  0.0.0.0
5                                     0          1400      6343  0.0.0.0
6                                     0          1400      6343  0.0.0.0
7                                     0          1400      6343  0.0.0.0
8                                     0          1400      6343  0.0.0.0


(FASTPATH Routing) #show sflow receivers 1

Receiver Index................................. 1
Owner String................................... tulasi
Time out....................................... No Timeout           <= No Timeout string is added
IP Address:.................................... 0.0.0.0
Address Type................................... 1
Port........................................... 6343
Datagram Version............................... 5
Maximum Datagram Size.......................... 1400
```

4.18.17 show sflow remote-agents

Use this command to display the details for configured sFlow remote agents.

Format	`show sflow remote-agents`
Mode	Privileged EXEC

Example:

```
(Routing) (Config)#show sflow remote-agents

Rem Agent  Port      IP Address       Monitor     Dest.
Index                                 Session     Port
--------- --------   ---------------  ---------   ----------
1          16343     1.1.1.1           1          0/4
2          26343     2.2.1.1           2          0/8
3          16343     0.0.0.0
4          16343     0.0.0.0
```

4.18.18 show sflow samplers

Use this command to display the sFlow sampling instances created on the switch.

Format	`show sflow samplers`
Mode	Privileged EXEC

Field	Description
Sampler Data Source	The sFlowDataSource (slot/port) for this sFlow sampler. This agent will support Physical ports only.
Receiver Index	The sFlowReceiver configured for this sFlow sampler.
Remote Agent	The remote agent instance index number.
Ingress Sampling Rate	The sampling rate for the ingress.
Flow Sampling Rate	The statistical sampling rate for packet sampling from this source.
Egress Sampling Rate	The sampling rate for the egress.
Max Header Size	The maximum number of bytes that should be copied from a sampled packet to form a flow sample.
IP ACL	The associated IP ACL.
MAC ACL	The associated MAC ACL.

Example:

```
(Routing) (Config)#show sflow samplers
Sampler      Receiver    Remote     Ingress      Flow         Egress        Max      IP      MAC
Data         Index       Agent      Sampling     Sampling     Sampling      Header   ACL     ACL
Source                              Rate         Rate         Rate          Size
----------  ----------  --------  -----------  ------------  -----------  -------- ------  ------
 0/1         1           2          1024         2048          4096         128      1001
```

4.18.19 show sflow source-interface

Use this command to display the sFlow source interface configured on the switch.

Format	`show sflow source-interface`
Mode	Privileged EXEC

Field	Description
sFlow Client Source Interface	The interface ID of the physical or logical interface configured as the sFlow client source interface.
sFlow Client Source IPv4 Address	The IP address of the interface configured as the sFlow client source interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show sflow source-interface

sFlow Client Source Interface................. (not configured)
```

4.19 Switch Database Management Template Commands

A Switch Database Management (SDM) template is a description of the maximum resources a switch or router can use for various features. Different SDM templates allow different combinations of scaling factors, enabling different allocations of resources depending on how the device is used. In other words, SDM templates enable you to reallocate system resources to support a different mix of features based on your network requirements.

NOTICE If you attach a unit to a stack and its template does not match the stack's template, then the new unit will automatically reboot using the template used by other stack members. To avoid the automatic reboot, you may first set the template to the template used by existing members of the stack. Then power off the new unit, attach it to the stack, and power it on.

4.19.1 sdm prefer

Use this command to change the template that will be active after the next reboot. The keywords are as follows:

- dual-ipv4-and-ipv6—Filters subsequent template choices to those that support both IPv4 and IPv6. The `default` template maximizes the number of IPv4 and IPv6 unicast routes, while limiting the number of ECMP next hops in each route to 4. The `data-center` template support increases the number of ECMP next hops to 32. The `alpm` and `alpm-mpls-data-center` templates accommodate larger routes. The values for the `alpm` and `alpm-mpls-data-center` templates are shown below:

  ```
  dual-ipv4-and-ipv6 alpm:

  ARP Entries.................................. 2560
  IPv4 Unicast Routes.......................... 32768
  IPv6 NDP Entries............................. 2560
  IPv6 Unicast Routes.......................... 24576
  ECMP Next Hops............................... 48
  IPv4 Multicast Routes........................ 0
  IPv6 Multicast Routes........................ 0


  dual-ipv4-and-ipv6 alpm-mpls-data-center:

  ARP Entries.................................. 2560
  IPv4 Unicast Routes.......................... 32768
  IPv6 NDP Entries............................. 2560
  IPv6 Unicast Routes.......................... 24576
  ECMP Next Hops............................... 16
  IPv4 Multicast Routes........................ 0
  IPv6 Multicast Routes........................ 0
  ```

- ipv4-routing—Filters subsequent template choices to those that support IPv4, and not IPv6. The IPv4-routing default template maximizes the number of IPv4 unicast routes, while limiting the number of ECMP next hops in each route to 4. The data-center default template supports increases the number of ECMP next hops to 32 and reduces the number of routes. The data-center plus template increases the number of ECMP next hops to 32 while keeping the maximum IPv4 routes.

NOTICE After setting the template, you must reboot in order for the configuration change to take effect.

Default dual IPv4 and IPv6 template

Format *sdm prefer {dual-ipv4-and-ipv6 {default|data-center} | ipv4-routing {default|data-center {default|plus}}}*

Mode Global Config

4.19.1.1 no sdm prefer

Use this command to revert to the default template after the next reboot.

Format `no sdm prefer`

Mode Global Config

4.19.2 show sdm prefer

Use this command to view the currently active SDM template and its scaling parameters, or to view the scaling parameters for an inactive template. When invoked with no optional keywords, this command lists the currently active template and the template that will become active on the next reboot, if it is different from the currently active template. If the system boots with a non-default template, and you clear the template configuration, either using `no sdm prefer` or by deleting the startup configuration, `show sdm prefer` lists the default template as the next active template. To list the scaling parameters of a specific template, use that template's keyword as an argument to the command.

Use the optional keywords to list the scaling parameters of a specific template.

Format show sdm prefer [dual-ipv4-and-ipv6 {*default*|*data-center*}| ipv4-routing {default | data-center {*default*|*plus*}}]

Mode Privileged EXEC

Syntax	Description
dual-ipv4-and-ipv6 default	(Optional) List the scaling parameters for the template supporting IPv4 and IPv6.
dual-ipv4-and-ipv6 data-center	(Optional) List the scaling parameters for the Dual IPv4 and IPv6 template supporting more ECMP next hops.
ipv4-routing default	(Optional) List the scaling parameters for the IPv4-only template maximizing the number of unicast routes.
ipv4-routing data-center default	(Optional) List the scaling parameters for the IPv4-only template supporting more ECMP next hops.
ipv4-routing data-center plus	(Optional) List the scaling parameters for the IPv4-only template maximizing the number of unicast routes and also supporting more ECMP next hops.

Field	Description
ARP Entries	The maximum number of entries in the IPv4 Address Resolution Protocol (ARP) cache for routing interfaces.
IPv4 Unicast Routes	The maximum number of IPv4 unicast forwarding table entries.
IPv6 NDP Entries	The maximum number of IPv6 Neighbor Discovery Protocol (NDP) cache entries.
IPv6 Unicast Routes	The maximum number of IPv6 unicast forwarding table entries.

Field	Description
ECMP Next Hops	The maximum number of next hops that can be installed in the IPv4 and IPv6 unicast forwarding tables.

Example: This example shows the current SDM template. The user has not changed the next active SDM template.

```
(router)#show sdm prefer

The current template is the Dual IPv4 and IPv6 template.

ARP Entries................................... 6144
IPv4 Unicast Routes........................... 8160
IPv6 NDP Entries.............................. 2560
IPv6 Unicast Routes........................... 4096
ECMP Next Hops................................ 4
IPv4 Multicast Routes......................... 1536
IPv6 Multicast Routes......................... 512
```

Now the user sets the next active SDM template.

```
(router) # configure

(router) (Config)#sdm prefer ipv4-routing data-center default

Changes to the running SDM preferences have been stored, but cannot take effect until the next reload.
Use 'show sdm prefer' to see what SDM preference is currently active.

(router) (Config)#ex

(router) #show sdm prefer

The current template is the Dual IPv4 and IPv6 template.

ARP Entries................................... 6144
IPv4 Unicast Routes........................... 8160
IPv6 NDP Entries.............................. 2560
IPv6 Unicast Routes........................... 4096
ECMP Next Hops................................ 4
IPv4 Multicast Routes......................... 1536
IPv6 Multicast Routes......................... 512

On the next reload, the template will be the IPv4 Data Center template.


(router) #
```

To list the scaling parameters for the data center template, invoke the command with the ipv4-routing data-center default keywords.

```
(router) #show sdm prefer ipv4-routing data-center default

ARP Entries................................... 6144
IPv4 Unicast Routes........................... 8160
IPv6 NDP Entries.............................. 0
IPv6 Unicast Routes........................... 0
ECMP Next Hops................................ 16
IPv4 Multicast Routes......................... 2048
IPv6 Multicast Routes......................... 0
```

4.20 Remote Monitoring Commands

Remote Monitoring (RMON) is a method of collecting a variety of data about network traffic. RMON supports 64-bit counters (RFC 3273) and High Capacity Alarm Table (RFC 3434).

NOTICE There is no configuration command for ether stats and high capacity ether stats. The data source for ether stats and high capacity ether stats are configured during initialization.

4.20.1 rmon alarm

This command sets the RMON alarm entry in the RMON alarm MIB group.

Format	`rmon alarm` *`alarm number variable sample interval`* `{absolute|delta} rising-threshold` *`value`* `[`*`rising-event-index`*`] falling-threshold` *`value`* `[`*`falling-event-index`*`] [startup {`*`rising`*`|`*`falling`*`|`*`rising-falling`*`}] [owner` *`string`*`]`
Mode	Global Config

Parameter	Description
Alarm Index	An index that uniquely identifies an entry in the alarm table. Each entry defines a diagnostic sample at a particular interval for an object on the device. The range is 1 to 65535.
Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
Alarm Absolute Value	The value of the statistic during the last sampling period. This object is a read-only, 32-bit signed value.
Alarm Rising Threshold	The rising threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
Alarm Falling Threshold	The falling threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
Alarm Startup Alarm	The alarm that may be sent. Possible values are rising, falling or both rising-falling. The default is rising-falling.
Alarm Owner	The owner string associated with the alarm entry. The default is monitorAlarm.

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# rmon alarm 1 ifInErrors.2 30 absolute rising-threshold 100 1 falling-
threshold 10 2 startup rising owner myOwner
```

4.20.1.1 no rmon alarm

This command deletes the RMON alarm entry.

Format	`no rmon alarm` *`alarm number`*
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# no rmon alarm 1
```

4.20.2 rmon hcalarm

This command sets the RMON hcalarm entry in the High Capacity RMON alarm MIB group.

Format

```
rmon hcalarm alarm number variable sample interval {absolute|delta} rising-threshold
high value low value status {positive|negative} [rising-event-index] falling-
threshold high value low value status {positive|negative} [falling-event-index]
[startup {rising|falling|rising-falling}] [owner string]
```

Mode Global Config

Parameter	Description
High Capacity Alarm Index	An arbitrary integer index value used to uniquely identify the high capacity alarm entry. The range is 1 to 65535.
High Capacity Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
High Capacity Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
High Capacity Alarm Sample Type	The method of sampling the selected variable and calculating the value to be compared against the thresholds. Possible types are Absolute Value or Delta Value. The default is Absolute Value.
High Capacity Alarm Absolute Value	The absolute value (that is, the unsigned value) of the hcAlarmVariable statistic during the last sampling period. The value during the current sampling period is not made available until the period is complete. This object is a 64-bit unsigned value that is Read-Only.
High Capacity Alarm Absolute Alarm Status	This object indicates the validity and sign of the data for the high capacity alarm absolute value object (hcAlarmAbsValueobject). Possible status types are valueNotAvailable, value-Positive, or valueNegative. The default is valueNotAvailable.
High Capacity Alarm Startup Alarm	High capacity alarm startup alarm that may be sent. Possible values are rising, falling, or rising-falling. The default is rising-falling.
High Capacity Alarm Rising-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Rising-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Rising-Threshold Value Status	This object indicates the sign of the data for the rising threshold, as defined by the objects hcAlarmRisingThresAbsValueLow and hcAlarmRisingThresAbsValueHigh. Possible values are valueNotAvailable, valuePositive, or valueNegative. The default is valuePositive.
High Capacity Alarm Falling-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Falling-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Falling-Threshold Value Status	This object indicates the sign of the data for the falling threshold, as defined by the objects hcAlarmFallingThresAbsValueLow and hcAlarmFallingThresAbsValueHigh. Possible values are valueNotAvailable, valuePositive, or valueNegative. The default is valuePositive.

Parameter	Description
High Capacity Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
High Capacity Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
High Capacity Alarm Failed Attempts	The number of times the associated hcAlarmVariable instance was polled on behalf of the hcAlarmEntry (while in the active state) and the value was not available. This object is a 32-bit counter value that is read-only.
High Capacity Alarm Owner	The owner string associated with the alarm entry. The default is monitorHCAlarm.
High Capacity Alarm Storage Type	The type of non-volatile storage configured for this entry. This object is read-only. The default is volatile.

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# rmon hcalarm 1 ifInOctets.1 30 absolute rising-threshold high 1 low 100
status positive 1 falling-threshold high 1 low 10 status positive startup rising owner myOwner
```

4.20.2.1 no rmon hcalarm

This command deletes the rmon hcalarm entry.

Format	`no rmon hcalarm` *`alarm number`*
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# no rmon hcalarm 1
```

4.20.3 rmon event

This command sets the RMON event entry in the RMON event MIB group.

Format	`rmon event` *`event number`* `[description` *`string`*`|log|owner` *`string`*`|trap` *`community`*`]`
Mode	Global Config

Parameter	Description
Event Index	An index that uniquely identifies an entry in the event table. Each such entry defines one event that is to be generated when the appropriate conditions occur. The range is 1 to 65535.
Event Description	A comment describing the event entry. The default is alarmEvent.
Event Type	The type of notification that the probe makes about the event. Possible values are None, Log, SNMP Trap, Log and SNMP Trap. The default is None.
Event Owner	Owner string associated with the entry. The default is monitorEvent.
Event Community	The SNMP community specific by this octet string which is used to send an SNMP trap. The default is public.

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# rmon event 1 log description test
```

4.20.3.1 no rmon event

This command deletes the rmon event entry.

Format	`no rmon event` *`event number`*
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Config)# no rmon event 1
```

4.20.4 rmon collection history

This command sets the history control parameters of the RMON historyControl MIB group.

NOTICE This command is not supported on interface range. Each RMON history control collection entry can be configured on only one interface. If you try to configure on multiple interfaces, DUT displays an error.

Format	`rmon collection history` *`index number`* `[buckets` *`number`*`|interval` *`interval in sec`*`|owner` *`string`*`]`
Mode	Interface Config

Parameter	Description
History Control Index	An index that uniquely identifies an entry in the historyControl table. Each such entry defines a set of samples at a particular interval for an interface on the device. The range is 1 to 65535.
History Control Data Source	The source interface for which historical data is collected.
History Control Buckets Requested	The requested number of discrete time intervals over which data is to be saved. The range is 1 to 65535. The default is 50.
History Control Buckets Granted	The number of discrete sampling intervals over which data shall be saved. This object is read-only. The default is 10.
History Control Interval	The interval in seconds over which the data is sampled. The range is 1 to 3600. The default is 1800.
History Control Owner	The owner string associated with the history control entry. The default is monitorHistory-Control.

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Interface 0/1)# rmon collection history 1 buckets 10 interval 30 owner myOwner
```

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Interface 0/1-0/10)#rmon collection history 1 buckets 10 interval 30 owner
myOwner

Error: 'rmon collection history' is not supported on range of interfaces.
```

4.20.4.1 no rmon collection history

This command will delete the history control group entry with the specified index number.

Format	`no rmon collection history` *`index number`*
Mode	Interface Config

Example: The following shows an example of the command.

```
(FASTPATH Routing) (Interface 0/1-0/10)# no rmon collection history 1
```

4.20.5 show rmon

This command displays the entries in the RMON alarm table.

Format `show rmon {alarms | alarm` *`alarm-index`*`}`

Mode Privileged EXEC

Parameter	Description
Alarm Index	An index that uniquely identifies an entry in the alarm table. Each entry defines a diagnostic sample at a particular interval for an object on the device. The range is 1 to 65535.
Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
Alarm Absolute Value	The value of the statistic during the last sampling period. This object is a read-only, 32-bit signed value.
Alarm Rising Threshold	The rising threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
Alarm Falling Threshold	The falling threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
Alarm Startup Alarm	The alarm that may be sent. Possible values are rising, falling or both rising-falling. The default is rising-falling.
Alarm Owner	The owner string associated with the alarm entry. The default is monitorAlarm.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon alarms

Index    OID                       Owner
----------------------------------------------
1      alarmInterval.1             MibBrowser
2      alarmInterval.1             MibBrowser
```

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon alarm 1

Alarm 1
----------
OID: alarmInterval.1
Last Sample Value: 1
Interval: 1
Sample Type: absolute
Startup Alarm: rising-falling
Rising Threshold: 1
Falling Threshold: 1
Rising Event: 1
Falling Event: 2
Owner: MibBrowser
```

4.20.6 show rmon collection history

This command displays the entries in the RMON history control table.

Format	`show rmon collection history [interfaces` *`slot/port`*`]`
Mode	Privileged EXEC

Parameter	Description
History Control Index	An index that uniquely identifies an entry in the historyControl table. Each such entry defines a set of samples at a particular interval for an interface on the device. The range is 1 to 65535.
History Control Data Source	The source interface for which historical data is collected.
History Control Buckets Requested	The requested number of discrete time intervals over which data is to be saved. The range is 1 to 65535. The default is 50.
History Control Buckets Granted	The number of discrete sampling intervals over which data shall be saved. This object is read-only. The default is 10.
History Control Interval	The interval in seconds over which the data is sampled. The range is 1 to 3600. The default is 1800.
History Control Owner	The owner string associated with the history control entry. The default is monitorHistory-Control.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon collection history

Index   Interface    Interval   Requested   Granted     Owner
                                 Samples    Samples
----------------------------------------------------------------------
1       0/1         30          10          10          myowner
2       0/1          1800       50          10          monitorHistoryControl
3       0/2          30         50          10          monitorHistoryControl
4       0/2          1800       50          10          monitorHistoryControl
5       0/3          30         50          10          monitorHistoryControl
6       0/3          1800       50          10          monitorHistoryControl
7       0/4          30         50          10          monitorHistoryControl
8       0/4          1800       50          10          monitorHistoryControl
9       0/5          30         50          10          monitorHistoryControl
10      0/5          1800       50          10          monitorHistoryControl
11      0/6          30         50          10          monitorHistoryControl
12      0/6          1800       50          10          monitorHistoryControl
13      0/7          30         50          10          monitorHistoryControl
14      0/7          1800       50          10          monitorHistoryControl
15      0/8          30         50          10          monitorHistoryControl
16      0/8          1800       50          10          monitorHistoryControl
17      0/9          30         50          10          monitorHistoryControl
18      0/9          1800       50          10          monitorHistoryControl
19      0/10         30         50          10          monitorHistoryControl
--More-- or (q)uit
```

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon collection history interfaces 0/1

Index    Interface     Interval    Requested    Granted      Owner
                                    Samples     Samples
----------------------------------------------------------------------
1        0/1           30          10           10           myowner
2        0/1           1800        50           10           monitorHistoryControl
```

4.20.7 show rmon events

This command displays the entries in the RMON event table.

Format	`show rmon events`
Mode	Privileged EXEC

Parameter	Description
Event Index	An index that uniquely identifies an entry in the event table. Each such entry defines one event that is to be generated when the appropriate conditions occur. The range is 1 to 65535.
Event Description	A comment describing the event entry. The default is alarmEvent.
Event Type	The type of notification that the probe makes about the event. Possible values are None, Log, SNMP Trap, Log and SNMP Trap. The default is None.
Event Owner	Owner string associated with the entry. The default is monitorEvent.
Event Community	The SNMP community specific by this octet string which is used to send an SNMP trap. The default is public.
Owner	Event owner. The owner string associated with the entry.
Last time sent	The last time over which a log or a SNMP trap message is generated.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) # show rmon events

Index  Description        Type      Community   Owner      Last time sent
-------------------------------------------------------------------------------
1      test               log       public      MIB        0 days 0 h:0 m:0 s
```

4.20.8 show rmon history

This command displays the specified entry in the RMON history table.

Format	`show rmon history` *`index`* `{errors |other |throughput	high-capacity}[period` *`seconds`*`]`
Mode	Privileged EXEC

Parameter	Description
Common Fields	
Sample set	The index (identifier) for the RMON history entry within the RMON history group. Each such entry defines a set of samples at a particular interval for an interface on the device.
Owner	The owner string associated with the history control entry. The default is monitorHistoryControl.
Interface	The interface that was sampled.
Interval	The time between samples, in seconds.
Requested Samples	The number of samples (intervals) requested for the RMON history entry.

Parameter	Description
Granted Samples	The number of samples granted for the RMON history entry.
Maximum Table Size	Maximum number of entries that the history table can hold.
Output for Errors Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
CRC Align	Number of CRC align errors.
Undersize Packets	Total number of undersize packets. Packets are less than 64 octets long (excluding framing bits, including FCS octets).
Oversize Packets	Total number of oversize packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets).
Fragments	Total number of fragment packets. Packets are not an integral number of octets in length or had a bad Frame Check Sequence (FCS), and are less than 64 octets in length (excluding framing bits, including FCS octets).
Jabbers	Total number of jabber packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets), and are not an integral number of octets in length or had a bad Frame Check Sequence (FCS).
Output for Others Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
Dropped Collisions	Total number of dropped collisions.
Output for Throughput Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
Octets	Total number of octets received on the interface.
Packets	Total number of packets received (including error packets) on the interface.
Broadcast	Total number of good broadcast packets received on the interface.
Multicast	Total number of good multicast packets received on the interface.
Util	Port utilization of the interface associated with the history index specified.
Output for High-Capacity Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
Overflow Pkts	The number of times the associated packet counter has overflowed.
Pkts	The total number of packets (including bad packets, broadcast packets, and multicast packets) received.
Overflow Octets	The number of times the associated octet counter has overflowed.
Octets	The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon history 1 errors

Sample set: 1   Owner: myowner
Interface: 1/0/1   Interval: 30
Requested Samples: 10   Granted Samples: 10
Maximum table size: 1758

Time                  CRC Align  Undersize Oversize  Fragments  Jabbers
--------------------- ---------- --------- --------- ---------- -------
Jan 01 1970 21:41:43  0          0         0         0          0
Jan 01 1970 21:42:14  0          0         0         0          0
Jan 01 1970 21:42:44  0          0         0         0          0
Jan 01 1970 21:43:14  0          0         0         0          0
Jan 01 1970 21:43:44  0          0         0         0          0
Jan 01 1970 21:44:14  0          0         0         0          0
Jan 01 1970 21:44:45  0          0         0         0          0
Jan 01 1970 21:45:15  0          0         0         0          0
Jan 01 1970 21:45:45  0          0         0         0          0
Jan 01 1970 21:46:15  0          0         0         0          0
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon history 1 throughput

Sample set: 1   Owner: myowner
Interface: 1/0/1   Interval: 30
Requested Samples: 10   Granted Samples: 10
Maximum table size: 1758

Time                 Octets     Packets   Broadcast Multicast  Util
-------------------- ---------- --------- --------- ---------- --------
Jan 01 1970 21:41:43 0          0         0         0          1
Jan 01 1970 21:42:14 0          0         0         0          1
Jan 01 1970 21:42:44 0          0         0         0          1
Jan 01 1970 21:43:14 0          0         0         0          1
Jan 01 1970 21:43:44 0          0         0         0          1
Jan 01 1970 21:44:14 0          0         0         0          1
Jan 01 1970 21:44:45 0          0         0         0          1
Jan 01 1970 21:45:15 0          0         0         0          1
Jan 01 1970 21:45:45 0          0         0         0          1
Jan 01 1970 21:46:15 0          0         0         0          1

(Routing) #show rmon history 1 other

Sample set: 1   Owner: myowner
Interface: 1/0/1   Interval: 30
Requested Samples: 10   Granted Samples: 10
Maximum table size: 1758

Time                 Dropped Collisions
-------------------- ------- ----------
Jan 01 1970 21:41:43 0       0
Jan 01 1970 21:42:14 0       0
Jan 01 1970 21:42:44 0       0
Jan 01 1970 21:43:14 0       0
Jan 01 1970 21:43:44 0       0
Jan 01 1970 21:44:14 0       0
Jan 01 1970 21:44:45 0       0
Jan 01 1970 21:45:15 0       0
Jan 01 1970 21:45:45 0       0
Jan 01 1970 21:46:15 0       0
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon history 1 high-capacity

Sample set: 1   Owner: monitorHistoryControl
Interface: 0/1   Interval: 30
Requested Samples: 50   Granted Samples: 10
Maximum table size: 414

Time                  OverFlow Pkts    Pkts             Overflow Octets   Octets
--------------------  -------------    ----             -------------   ------

Jan 17 2017 09:12:56  0                0                0                 0
Jan 17 2017 09:13:27  0                0                0                 0
Jan 17 2017 09:13:57  0                0                0                 0
Jan 17 2017 09:14:27  0                0                0                 0
Jan 17 2017 09:14:57  0                0                0                 0
Jan 17 2017 09:15:28  0                0                0                 0
Jan 17 2017 09:15:58  0                0                0                 0
Jan 17 2017 09:16:28  0                0                0                 0
Jan 17 2017 09:16:58  0                0                0                 0
Jan 17 2017 09:17:29  0                0                0                 0
```

4.20.9 show rmon log

This command displays the entries in the RMON log table.

Format	`show rmon log [`*`event-index`*`]`
Mode	Privileged EXEC

Parameter	Description
Maximum table size	Maximum number of entries that the log table can hold.
Event	Event index for which the log is generated.
Description	A comment describing the event entry for which the log is generated.
Time	Time at which the event is generated.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon log

Event   Description                        Time
------------------------------------------------
```

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon log 1

Maximum table size: 10

Event   Description                        Time
------------------------------------------------
```

4.20.10 show rmon statistics interfaces

This command displays the RMON statistics for the given interfaces.

Format	`show rmon statistics interfaces `*`slot/port`*
Mode	Privileged EXEC

Parameter	Description
Port	slot/port
Dropped	Total number of dropped events on the interface.
Octets	Total number of octets received on the interface.
Packets	Total number of packets received (including error packets) on the interface.
Broadcast	Total number of good broadcast packets received on the interface.
Multicast	Total number of good multicast packets received on the interface.
CRC Align Errors	Total number of packets received have a length (excluding framing bits, including FCS octets) of between 64 and 1518 octets inclusive.
Collisions	Total number of collisions on the interface.
Undersize Pkts	Total number of undersize packets. Packets are less than 64 octets long (excluding framing bits, including FCS octets).
Oversize Pkts	Total number of oversize packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets).
Fragments	Total number of fragment packets. Packets are not an integral number of octets in length or had a bad Frame Check Sequence (FCS), and are less than 64 octets in length (excluding framing bits, including FCS octets).

Parameter	Description
Jabbers	Total number of jabber packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets), and are not an integral number of octets in length or had a bad Frame Check Sequence (FCS).
64 Octets	Total number of packets which are 64 octets in length (excluding framing bits, including FCS octets).
65-127 Octets	Total number of packets which are between 65 and 127 octets in length (excluding framing bits, including FCS octets).
128-255 Octets	Total number of packets which are between 128 and 255 octets in length (excluding framing bits, including FCS octets).
256-511 Octets	Total number of packets which are between 256 and 511 octets in length (excluding framing bits, including FCS octets).
512-1023 Octets	Total number of packets which are between 512 and 1023 octets in length (excluding framing bits, including FCS octets).
1024-1518 Octets	Total number of packets which are between 1024 and 1518 octets in length (excluding framing bits, including FCS octets).
HC Overflow Pkts	Total number of times the packet counter has overflowed.
HC Overflow Octets	Total number of times the octet counter has overflowed.
HC Overflow Pkts 64 Octets	The number of times the associated 64-octet counter has overflowed.
HC Overflow Pkts 65 - 127 Octets	The number of times the associated 65–127 octet counter has overflowed.
HC Overflow Pkts 128 - 255 Octets	The number of times the associated 128–255 octet counter has overflowed.
HC Overflow Pkts 256 - 511 Octets	The number of times the associated 256–511 octet counter has overflowed.
HC Overflow Pkts 512 - 1023 Octets	The number of times the associated 512–1023 octet counter has overflowed.
HC Overflow Pkts 1024 - 1518 Octets	The number of times the associated 1024–1518 octet counter has overflowed.

Example: The following shows example CLI display output for the command.

```
(Routing) # show rmon statistics interfaces 1/0/1
Port: 1/0/1
Dropped: 0
Octets: 0  Packets: 0
Broadcast: 0  Multicast: 0
CRC Align Errors: 0  Collisions: 0
Undersize Pkts: 0  Oversize Pkts: 0
Fragments: 0  Jabbers: 0
64 Octets: 0  65 - 127 Octets: 0
128 - 255 Octets: 0  256 - 511 Octets: 0
512 - 1023 Octets: 0  1024 - 1518 Octets: 0
HC Overflow Pkts: 0  HC Pkts: 0
HC Overflow Octets: 0  HC Octets: 0
HC Overflow Pkts 64 Octets: 0  HC Pkts 64 Octets: 0
HC Overflow Pkts 65 - 127 Octets: 0  HC Pkts 65 - 127 Octets: 0
HC Overflow Pkts 128 - 255 Octets: 0  HC Pkts 128 - 255 Octets: 0
HC Overflow Pkts 256 - 511 Octets: 0  HC Pkts 256 - 511 Octets: 0
HC Overflow Pkts 512 - 1023 Octets: 0  HC Pkts 512 - 1023 Octets: 0
HC Overflow Pkts 1024 - 1518 Octets: 0  HC Pkts 1024 - 1518 Octets: 0
```

4.20.11 show rmon hcalarms

This command displays the entries in the RMON high-capacity alarm table.

Format	`show rmon {hcalarms|hcalarm *alarm index*}`
Mode	Privileged EXEC

Parameter	Description
High Capacity Alarm Index	An arbitrary integer index value used to uniquely identify the high capacity alarm entry. The range is 1 to 65535.
High Capacity Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
High Capacity Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
High Capacity Alarm Sample Type	The method of sampling the selected variable and calculating the value to be compared against the thresholds. Possible types are Absolute Value or Delta Value. The default is Absolute Value.
High Capacity Alarm Absolute Value	The absolute value (that is, the unsigned value) of the hcAlarmVariable statistic during the last sampling period. The value during the current sampling period is not made available until the period is complete. This object is a 64-bit unsigned value that is Read-Only.
High Capacity Alarm Absolute Alarm Status	This object indicates the validity and sign of the data for the high capacity alarm absolute value object (hcAlarmAbsValueobject). Possible status types are valueNotAvailable, value-Positive, or valueNegative. The default is valueNotAvailable.
High Capacity Alarm Startup Alarm	High capacity alarm startup alarm that may be sent. Possible values are rising, falling, or rising-falling. The default is rising-falling.
High Capacity Alarm Rising-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Rising-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Rising-Threshold Value Status	This object indicates the sign of the data for the rising threshold, as defined by the objects hcAlarmRisingThresAbsValueLow and hcAlarmRisingThresAbsValueHigh. Possible values are valueNotAvailable, valuePositive, or valueNegative. The default is valuePositive.
High Capacity Alarm Falling-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Falling-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Falling-Threshold Value Status	This object indicates the sign of the data for the falling threshold, as defined by the objects hcAlarmFallingThresAbsValueLow and hcAlarmFallingThresAbsValueHigh. Possible values are valueNotAvailable, valuePositive, or valueNegative. The default is valuePositive.

Parameter	Description
High Capacity Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
High Capacity Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
High Capacity Alarm Failed Attempts	The number of times the associated hcAlarmVariable instance was polled on behalf of thie hcAlarmEntry (while in the active state) and the value was not available. This object is a 32-bit counter value that is read-only.
High Capacity Alarm Owner	The owner string associated with the alarm entry. The default is monitorHCAlarm.
High Capacity Alarm Storage Type	The type of non-volatile storage configured for this entry. This object is read-only. The default is volatile.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show rmon hcalarms

Index    OID                      Owner
----------------------------------------------
1      alarmInterval.1            MibBrowser
2      alarmInterval.1            MibBrowser

(FASTPATH Routing) #show rmon hcalarm 1

Alarm 1
----------
OID: alarmInterval.1
Last Sample Value: 1
Interval: 1
Sample Type: absolute
Startup Alarm: rising-falling
Rising Threshold High: 0
Rising Threshold Low: 1
Rising Threshold Status: Positive
Falling Threshold High: 0
Falling Threshold Low: 1
Falling Threshold Status: Positive
Rising Event: 1
Falling Event: 2
Startup Alarm: Rising-Falling
Owner: MibBrowser
```

4.21 Statistics Application Commands

The statistics application gives you the ability to query for statistics on port utilization, flow-based and packet reception on programmable time slots. The statistics application collects the statistics at a configurable time range. You can specify the port number(s) or a range of ports for statistics to be displayed. The configured time range applies to all ports. Detailed statistics are collected between a specified time range in date and time format. You can define the time range as having an absolute time entry and/or a periodic time. For example, you can specify the statistics to be collected and displayed between 9:00 12 NOV 2011 (START) and 21:00 12 NOV 2012 (END) or schedule it on every Mon, Wed, and Fri 9:00 (START) to 21:00 (END).

You can receive the statistics in the following ways:

- User requests through the CLI for a set of counters.
- Configuring the device to display statistics using syslog or email alert. The syslog or email alert messages are sent by the statistics application at END time.

You can configure the device to display statistics on the console. The collected statistics are presented on the console at END time.

4.21.1 stats group

This command creates a new group with the specified id or name and configures the time range and the reporting mechanism for that group.

Format	`stats group` *`group id|name`* `timerange` *`time range name`* `reporting` *`list of reporting methods`*
Mode	Global Config

Parameter	Description
group ID, name	Name of the group of statistics or its identifier to apply on the interface. The range is: 1 received 2 received-errors 3 transmitted 4 transmitted-errors 5 received-transmitted 6 port-utilization 7 congestion The default is None.
time range name	Name of the time range for the group or the flow-based rule. The range is 1 to 31 alphanumeric characters. The default is None.
list of reporting methods	Report the statistics to the configured method. The range is: 0. none 1 console 2 syslog 3 e-mail The default is None.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# stats group received timerange test reporting console email syslog

(FASTPATH Routing) (Config)# stats group received-errors timerange test reporting email syslog

(FASTPATH Routing) (Config)# stats group received-   transmitted timerange test reporting none
```

4.21.1.1 no stats group

This command deletes the configured group.

Format	`no stats group` *`group id|name`*
Mode	Global Config

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# no stats group received
(FASTPATH Routing) (Config)# no stats group received-errors
(FASTPATH Routing) (Config)# no stats group received-transmitted
```

4.21.2 stats flow-based

This command configures flow based statistics rules for the given parameters over the specified time range. Only an IPv4 address is allowed as source and destination IP address.

Format	`stats flow-based` *`rule-id`* `timerange` *`time range name`* `[{srcip` *`ip-address`*`} {dstip` *`ip-address`*`} {srcmac` *`mac-address`*`} {dstmac` *`mac-address`*`} {srctcpport` *`portid`*`} {dsttcpport` *`portid`*`} {srcudpport` *`portid`*`} {dstudpport` *`portid`*`}]`
Mode	Global Config

Parameter	Description
rule ID	The flow-based rule ID. The range is 1 to 16. The default is None.
time range name	Name of the time range for the group or the flow-based rule. The range is 1 to 31 alphanumeric characters. The default is None.
srcip ip-address	The source IP address.
dstip ip-address	The destination IP address.
srcmac mac-address	The source MAC address.
dstmac mac-address	The destination MAC address.
srctcpport portid	The source TCP port number.
dsttcpport portid	The destination TCP port number.
srcudpport portid	The source UDP port number.
dstudpport portid	The destination UDP port number.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)#stats flow-based 1 timerange test srcip 1.1.1.1 dstip 2.2.2.2 srcmac
1234 dstmac 1234 srctcpport 123 dsttcpport 123 srcudpport 123 dstudpport  123

(FASTPATH Routing) (Config)#stats flow-based 2 timerange test srcip 1.1.1.1 dstip 2.2.2.2 srctcpport
123 dsttcpport 123 srcudpport 123 dstudpport 123
```

4.21.2.1 no stats flow-based

This command deletes flow-based statistics.

Format	`stats flow-based` *`rule-id`*
Mode	Global Config

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# no stats flow-based 1
(FASTPATH Routing) (Config)# no stats flow-based 2
```

4.21.3 stats flow-based reporting

This command configures the reporting mechanism for all the flow-based rules configured on the system. There is no per flow-based rule reporting mechanism. Setting the reporting method as none resets all the reporting methods.

Format	`stats flow-based reporting` *`list of reporting methods`*
Mode	Global Config

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Config)# stats flow-based reporting console email syslog
(FASTPATH Routing) (Config)# stats flow-based reporting email syslog
(FASTPATH Routing) (Config)# stats flow-based reporting none
```

4.21.4 stats group

This command applies the group specified on an interface or interface-range.

Format	`stats group <group id	name>`
Mode	Interface Config

Parameter	Description
group id	The unique identifier for the group.
name	The name of the group.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Interface 0/1-0/10)# stats group 1
(FASTPATH Routing) (Interface 0/1-0/10)# stats group 2
```

4.21.4.1 no stats group

This command deletes the interface or interface-range from the group specified.

Format	`no stats group <group id	name>`
Mode	Interface Config

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Interface 0/1-0/10)# no stats group 1
(FASTPATH Routing) (Interface 0/1-0/10)# no stats group 2
```

4.21.5 stats flow-based

This command applies the flow-based rule specified by the ID on an interface or interface-range.

Format	`stats flow-based <rule-id>`
Mode	Interface Config

Parameter	Description
rule-id	The unique identifier for the flow-based rule.

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Interface 0/1-0/10)# stats flow-based 1
(FASTPATH Routing) (Interface 0/1-0/10)# stats flow-based 2
```

4.21.5.1 no stats flow-based

This command deletes the interface or interface-range from the flow-based rule specified.

Format	`no stats flow-based <rule-id>`
Mode	Interface Config

Example: The following shows examples of the command.

```
(FASTPATH Routing) (Interface 0/1-0/10)# no stats flow-based 1
(FASTPATH Routing) (Interface 0/1-0/10)# no stats flow-based 2
```

4.21.6 show stats group

This command displays the configured time range and the interface list for the group specified and shows collected statistics for the specified time-range name on the interface list after the time-range expiry.

Format	`show stats group <group id | name>`
Mode	Privileged EXEC

Parameter	Description
group id	The unique identifier for the group.
name	The name of the group.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show stats group received

Group: received
Time Range: test
Interface List
-----------------
0/2, 0/4, lag 1

Counter ID                  Interface  Counter Value
-------------------------   ---------  ------------
Rx Total                      0/2        951600
Rx Total                      0/4        304512
Rx Total                      lag 1      0
Rx 64                         0/2        0
Rx 64                         0/4        4758
Rx 64                         lag 1      0
Rx 65to128                    0/2        0
Rx 65to128                    0/4        0
Rx 65to128                    lag 1      0
Rx 128to255                   0/2        4758
Rx 128to255                   0/4        0
Rx 128to255                   lag 1      0
Rx 256to511                   0/2        0
```

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show stats group port-utilization

Group: port-utilization
Time Range: test
Interface List
--------------
0/2, 0/4, lag 1
Interface  Utilization (%)
```

```
---------  ---------------
0/2        0
0/4        0
lag 1      0
```

4.21.7 show stats flow-based

This command displays the configured time range, flow-based rule parameters, and the interface list for the flow specified.

Format `show stats flow-based rule-id|all`

Mode Privileged EXEC

Parameter	Description
rule-id	The unique identifier for the flow-based rule.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show stats flow-based all

Flow based rule Id............................. 1
Time Range..................................... test
Source IP...................................... 1.1.1.1
Source MAC..................................... 1234
Source TCP Port................................ 123
Source UDP Port................................ 123
Destination IP................................. 2.2.2.2
Destination MAC................................ 1234
Destination TCP Port........................... 123
Destination UDP Port........................... 123
Interface List
--------------
0/1 - 0/2

Interface  Hit Count
---------  ---------
0/1        100
0/2        0

Flow based rule Id............................. 2
Time Range..................................... test
Source IP...................................... 1.1.1.1
Source TCP Port................................ 123
Source UDP Port................................ 123
Destination IP................................. 2.2.2.2
Destination TCP Port........................... 123
Destination UDP Port........................... 123

Interface List
--------------
0/1 - 0/2

Interface  Hit Count
---------  ---------
0/1        100
0/2        0
```

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show stats flow-based 2

Flow based rule Id............................ 2
Time Range.................................... test
Source IP..................................... 1.1.1.1
Source TCP Port............................... 123
Source UDP Port............................... 123
Destination IP................................ 2.2.2.2
Destination TCP Port.......................... 123
Destination UDP Port.......................... 123
Interface List
--------------
0/1 - 0/2

Interface  Hit Count
---------  ---------
0/1        100
0/2        0
```

5/ Switching Commands

This chapter describes the switching commands available in the FASTPATH CLI.

The Switching Commands chapter includes the following sections:

NOTICE

The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

5.1 Port Configuration Commands

This section describes the commands you use to view and configure port settings.

5.1.1 interface

This command gives you access to the Interface Config mode, which allows you to enable or modify the operation of an interface (port). You can also specify a range of ports to configure at the same time by specifying the starting *slot/port* and ending *slot/port*, separated by a hyphen.

Format	`interface {slot/port	slot/port(startrange)-slot/port(endrange)}`
Mode	Global Config

Example: The following example enters Interface Config mode for port 0/1:

```
(switch) #configure
(switch) (config)#interface 0/1
(switch) (interface 0/1)#
```

Example: The following example enters Interface Config mode for ports 0/1 through 0/4:

```
(switch) #configure
(switch) (config)#interface 0/1-0/4
(switch) (interface 0/1-0/4)#
```

5.1.2 auto-negotiate

This command enables automatic negotiation on a port or range of ports.

Default	enabled
Format	`auto-negotiate`
Mode	Interface Config

5.1.2.1 no auto-negotiate

This command disables automatic negotiation on a port.

NOTICE Automatic sensing is disabled when automatic negotiation is disabled.

Format	`no auto-negotiate`
Mode	Interface Config

5.1.3 auto-negotiate all

This command enables automatic negotiation on all ports.

Default	enabled
Format	`auto-negotiate all`
Mode	Global Config

5.1.3.1 no auto-negotiate all

This command disables automatic negotiation on all ports.

Format	`no auto-negotiate all`
Mode	Global Config

5.1.4 description

Use this command to create an alpha-numeric description of an interface or range of interfaces.

Format	`description` *`description`*
Mode	Interface Config

5.1.5 media-type

Use this command to change between fiber and copper mode on the Combo port.

- Combo Port: A port or an interface that can operate in either copper or in fiber mode.
- Copper and Fiber port: A port that uses copper a medium for communication (for example, RJ45 ports). A fiber port uses the fiber optics as a medium for communication (for example, example SFP ports).

Default	Auto-select, SFP preferred
Format	`media-type {auto-select | rj45 | sfp }`
Mode	Interface Config

The following modes are supported by the `media-type` command.

- Auto-select, SFP preferred: The medium is selected automatically based on the physical medium presence. However, when both the fiber and copper links are connected, the fiber link takes precedence and the fiber link is up.
- Auto-select, RJ45 preferred: The medium is selected automatically based on the physical medium presence. However, when both the fiber and copper links are connected, the copper link takes precedence and the copper link is up.
- SFP: Only the fiber medium works. The copper medium is always down.
- RJ45: Only the copper medium works. The fiber medium is always down.

5.1.5.1 no media-type

Use this command to revert the `media-type` configuration and configure the default value on the interface.

Format	`no media-type`
Mode	Interface Config

5.1.6 mtu

Use the **`mtu`** command to set the maximum transmission unit (MTU) size, in bytes, for frames that ingress or egress the interface. You can use the **`mtu`** command to configure jumbo frame support for physical and port-channel (LAG) interfaces. For the standard FASTPATH implementation, the MTU size is a valid integer between 1522–9216 for tagged packets and a valid integer between 1518 - 9216 for untagged packets.

NOTICE To receive and process packets, the Ethernet MTU must include any extra bytes that Layer-2 headers might require. To configure the IP MTU size, which is the maximum size of the IP packet (IP Header + IP payload), see “ip mtu” on page 549.

Default	1518 (untagged)
Format	`mtu` *`1518-12288`*
Mode	Interface Config

5.1.6.1 no mtu

This command sets the default MTU size (in bytes) for the interface.

Format	`no mtu`
Mode	Interface Config

5.1.7 shutdown

This command disables a port or range of ports.

NOTICE You can use the `shutdown` command on physical and port-channel (LAG) interfaces, but not on VLAN routing interfaces.

Default	enabled
Format	`shutdown`
Mode	Interface Config

5.1.7.1 no shutdown

This command enables a port.

Format	`no shutdown`
Mode	Interface Config

5.1.8 shutdown all

This command disables all ports.

NOTICE You can use the `shutdown all` command on physical and port-channel (LAG) interfaces, but not on VLAN routing interfaces.

Default	enabled
Format	`shutdown all`
Mode	Global Config

5.1.8.1 no shutdown all

This command enables all ports.

Format	`no shutdown all`
Mode	Global Config

5.1.9 speed

Use this command to enable or disable auto-negotiation and set the speed that will be advertised by that port. The duplex parameter allows you to set the advertised speed for both half as well as full duplex mode.

Use the `auto` keyword to enable auto-negotiation on the port. Use the command without the `auto` keyword to ensure auto-negotiation is disabled and to set the port speed and mode according to the command values. If auto-negotiation is disabled, the speed and duplex mode must be set.

Default	Auto-negotiation is enabled.

Format	`speed auto {10|100|1000|10G|40G} [10|100|1000|10G|40G] [half-duplex|full-duplex]`
	`speed {10|100|1000|10G|40G} {half-duplex|full-duplex}.`

Mode	Interface Config

5.1.10 speed all

This command sets the speed and duplex setting for all interfaces if auto-negotiation is disabled. If auto-negotiation is enabled, an error message is returned. Use the no auto-negotiate command to disable.

Default	Auto-negotiation is enabled. Adv. is 10h, 10f, 100h, 100f, 1000f.
Format	`speed all {100 | 10} {half-duplex | full-duplex}`
Mode	Global Config

5.1.11 show interface media-type

Use this command to display the media-type configuration of the interface.

Format	`show interface media-type`
Mode	Privileged EXEC

The following information is displayed for the command.

Term	Definition
Port	Interface in slot/port format.
Configured Media Type	The media type for the interface. auto-select—The media type is automatically selected. The preferred media type is displayed. RJ45—RJ45 SFP—SFP
Active	Displays the current operational state of the combo port.

Example: The following command shows the command output:

```
(Routing) #show interface media-type

Port      Configured Media Type       Active
--------- --------------------------- ------
0/21      SFP                         RJ45
0/22      auto-select, SFP preferred  Down
0/23      auto-select, SFP preferred  RJ45
0/24      auto-select, SFP preferred  Down
```

5.1.12 show port

This command displays port information.

Format	`show port {`*`intf-range`*`	all}`
Mode	Privileged EXEC

Parameter	Definition
Interface	slot/port
Type	If not blank, this field indicates that this port is a special type of port. The possible values are: - Mirror — this port is a monitoring port. For more information, see "Port Mirroring Commands" on page 412. - PC Mbr— this port is a member of a port-channel (LAG). - Probe — this port is a probe port.
Admin Mode	The Port control administration state. The port must be enabled in order for it to be allowed into the network. May be enabled or disabled. The factory default is enabled.
Physical Mode	The desired port speed and duplex mode. If auto-negotiation support is selected, then the duplex mode and speed is set from the auto-negotiation process. Note that the maximum capability of the port (full duplex -100M) is advertised. Otherwise, this object determines the port's duplex mode and transmission rate. The factory default is Auto.
Physical Status	The port speed and duplex mode.
Link Status	The Link is up or down.
Link Trap	This object determines whether or not to send a trap when link status changes. The factory default is enabled.
LACP Mode	LACP is enabled or disabled on this port.

Example: The following command shows an example of the command output for all ports.

```
(Routing) #show port all

                 Admin     Physical   Physical   Link   Link    LACP   Actor
Intf      Type   Mode      Mode       Status     Status Trap    Mode   Timeout
--------- ------ --------- ---------- ---------- ------ ------- ------ --------
0/1              Enable    Auto       100 Full   Up     Enable  Enable long
0/2              Enable    Auto       100 Full   Up     Enable  Enable long
0/3              Enable    Auto                  Down   Enable  Enable long
0/4              Enable    Auto       100 Full   Up     Enable  Enable long
0/5              Enable    Auto       100 Full   Up     Enable  Enable long
0/6              Enable    Auto       100 Full   Up     Enable  Enable long
0/7              Enable    Auto       100 Full   Up     Enable  Enable long
0/8              Enable    Auto       100 Full   Up     Enable  Enable long
1/1              Enable                          Down   Disable N/A    N/A
1/2              Enable                          Down   Disable N/A    N/A
1/3              Enable                          Down   Disable N/A    N/A
1/4              Enable                          Down   Disable N/A    N/A
1/5              Enable                          Down   Disable N/A    N/A
1/6              Enable                          Down   Disable N/A    N/A
```

Example: The following command shows an example of the command output for a range of ports.

```
(Routing) #show port 0/1-1/6

                 Admin     Physical   Physical   Link   Link    LACP   Actor
Intf      Type   Mode      Mode       Status     Status Trap    Mode   Timeout
--------- ------ --------- ---------- ---------- ------ ------- ------ --------
0/1              Enable    Auto       100 Full   Up     Enable  Enable long
0/2              Enable    Auto       100 Full   Up     Enable  Enable long
0/3              Enable    Auto                  Down   Enable  Enable long
0/4              Enable    Auto       100 Full   Up     Enable  Enable long
0/5              Enable    Auto       100 Full   Up     Enable  Enable long
0/6              Enable    Auto       100 Full   Up     Enable  Enable long
0/7              Enable    Auto       100 Full   Up     Enable  Enable long
0/8              Enable    Auto       100 Full   Up     Enable  Enable long
1/1              Enable                          Down   Disable N/A    N/A
1/2              Enable                          Down   Disable N/A    N/A
1/3              Enable                          Down   Disable N/A    N/A
1/4              Enable                          Down   Disable N/A    N/A
1/5              Enable                          Down   Disable N/A    N/A
1/6              Enable                          Down   Disable N/A    N/A
```

5.1.13 show port advertise

Use this command to display the local administrative link advertisement configuration, local operational link advertisement, and the link partner advertisement for an interface. It also displays priority Resolution for speed and duplex as per 802.3 Annex 28B.3. It displays the Auto negotiation state, Phy Master/Slave Clock configuration, and Link state of the port.

If the link is down, the Clock is displayed as *No Link*, and a dash is displayed against the Oper Peer advertisement, and Priority Resolution. If Auto negotiation is disabled, then the admin Local Link advertisement, operational local link advertisement, operational peer advertisement, and Priority resolution fields are not displayed.

If this command is executed without the optional ***slot/port*** parameter, then it displays the Auto-negotiation state and operational Local link advertisement for all the ports. Operational link advertisement will display speed only if it is supported by both local as well as link partner. If auto-negotiation is disabled, then operational local link advertisement is not displayed.

Format	`show port advertise [`*`slot/port`*`]`
Mode	Privileged EXEC

Example: The following commands show the command output with and without the optional parameter:

```
(FASTPATH Switching)#show port advertise 0/1

Port: 0/1
Type: Gigabit - Level
Link State: Down
Auto Negotiation: Enabled
Clock: Auto
                               1000f 1000h 100f 100h 10f 10h
                               ----- ----- ---- ---- --- ---
Admin Local Link Advertisement no    no    yes  no   yes no
Oper Local Link Advertisement  no    no    yes  no   yes no
Oper Peer Advertisement        no    no    yes  yes  yes yes
Priority Resolution            -     -     yes  -    -   -

(FASTPATH Switching)#show port advertise

Port      Type                                    Neg      Operational Link Advertisement
--------- ------------------------------ ----------- ------------------------------
0/1   Gigabit - Level                    Enabled  1000f, 100f, 100h, 10f, 10h
0/2   Gigabit - Level                    Enabled  1000f, 100f, 100h, 10f, 10h
0/3   Gigabit - Level                    Enabled  1000f, 100f, 100h, 10f, 10h
```

5.1.14 show port description

This command displays the interface description. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

Format `show port description` *`slot/port`*

Mode Privileged EXEC

Term	Definition
Interface	slot/port
ifIndex	The interface index number associated with the port.
Description	The alpha-numeric description of the interface created by the command “description” on page 287.
MAC address	The MAC address of the port. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Bit Offset Val	The bit offset value.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show port description 0/1

Interface...........0/1
ifIndex.............1
Description.........
MAC address.........00:10:18:82:0C:10
Bit Offset Val......1
```

5.1.15 advertise speed

This command sets auto-negotiation advertised speed parameters to an interface or a range of interfaces. If full/half-duplex is not specified the speed is valid for both modes.

Format **`advertise speed`** *`{10 | 100} [half-duplex | full-duplex]`*
`advertise speed` *`{10g | 40g} [full-duplex]`*

Mode Interface Config

5.1.15.1 no advertise speed

This command resets auto-negotiation advertised speed parameters.

Format **`no advertise speed`** *`{10 | 100} [half-duplex | full-duplex]`*
`no advertise speed` *`{1000 | 10g | 40g} [full-duplex]`*

Mode Interface Config

5.1.16 show advertise speed

This command lists the auto-negotiation advertised speed parameters. The values are listed for a specified interface.

Format **`show advertise speed`** *`slot/port`*

Mode Privileged Exec

5.1.17 block

This command sets an interface or a range of interfaces in blocking mode. A blocking ports will not receive or forward data frames. The command is only allowed if no spanning tree is enabled because the spanning tree is setting the port states itself. If the ports are currently disabled, the state is not changed until they will become enabled. The state of the ports can be listed (spanning tree) by **`show spanning-tree mst port summary 0 all.`**

Format `block`

Mode Interface Config

5.1.17.1 no block

This command resets an interface or a range of interfaces in non-blocking mode.

Format `no block`

Mode Interface Config

5.1.18 show port block

This command displays the blocking mode for all or a specified port. Additionally other administrative port information (e.g. general admin mode) is displayed.

Format `show port block {all | <slot/port>`

Mode Privileged Exec

5.1.19 mac-learn

This command sets the HW learning for an interface. For default the HW learning mode is enabled.

Format `mac-learn`

Mode Interface Config

5.1.19.1 no mac-learn

If the "no"-command is set the interface will not learn any MAC address.

Format `no mac-learn`

Mode Interface Config

5.1.20 show port mac-learn

This command displays the HW learning mode for all or a specified port. Additionally other administrative port information (e.g. general admin mode) is displayed.

Format `show port mac-learn`

Mode Privileged Exec

5.2 Spanning Tree Protocol Commands

This section describes the commands you use to configure Spanning Tree Protocol (STP). STP helps prevent network loops, duplicate messages, and network instability.

NOTICE STP is enabled on the switch and on all ports and LAGs by default.

NOTICE If STP is disabled, the system does not forward BPDU messages.

5.2.1 spanning-tree

This command sets the spanning-tree operational mode to enabled.

Default	enabled
Format	`spanning-tree`
Mode	Global Config

5.2.1.1 no spanning-tree

This command sets the spanning-tree operational mode to disabled. While disabled, the spanning-tree configuration is retained and can be changed, but is not activated.

Format	`no spanning-tree`
Mode	Global Config

5.2.2 spanning-tree auto-edge

Use this command to allow the interface to become an edge port if it does not receive any BPDUs within a given amount of time.

Default	Enabled
Format	`spanning-tree auto-edge`
Mode	Interface Config

5.2.2.1 no spanning-tree auto-edge

This command resets the auto-edge status of the port to the default value.

Format	`no spanning-tree auto-edge`
Mode	Interface Config

5.2.3 spanning-tree backbonefast

Use this command to enable the detection of indirect link failures and accelerate spanning tree convergence on PVSTP configured switches.

Backbonefast accelerates finding an alternate path when an indirect link to the root port goes down.

Backbonefast can be configured even if the switch is configured for MST(RSTP) or PVST mode. It only has an effect when the switch is configured for the PVST mode.

If a backbonefast-enabled switch receives an inferior BPDU from its designated switch on a root or blocked port, it sets the maximum aging time on the interfaces on which it received the inferior BPDU if there are alternate paths to the designated switch. This allows a blocked port to immediately move to the listening state where the port can be transitioned to the forwarding state in the normal manner.

On receipt of an inferior BPDU from a designated bridge, backbonefast enabled switches send a Root Link Query (RLQ) request to all non-designated ports except the port from which it received the inferior BPDU. This check validates that the switch can receive packets from the root on ports where it expects to receive BPDUs. The port from which the original inferior BPDU was received is excluded because it has already encountered a failure. Designated ports are excluded as they do not lead to the root.

On receipt of an RLQ response, if the answer is negative, the receiving port has lost connection to the root and its BPDU is immediately aged out. If all nondesignated ports have already received a negative answer, the whole bridge has lost the root and can start the STP calculation from scratch.

If the answer confirms the switch can access the root bridge on a port, it can immediately age out the port on which it initially received the inferior BPDU.

A bridge that sends an RLQ puts its bridge ID in the PDU. This ensures that it does not flood the response on designated ports.

A bridge that receives an RLQ and has connectivity to the root forwards the query toward the root through its root port.

A bridge that receives a RLQ request and does not have connectivity to the root (switch bridge ID is different from the root bridge ID in the query) or is the root bridge immediately answers the query with its root bridge ID.

RLQ responses are flooded on designated ports.

Default	NA
Format	`spanning-tree backbonefast`
Mode	Global Config

5.2.3.1 no spanning-tree backbonefast

This command disables backbonefast.

NOTICE PVRSTP embeds support for FastBackbone and FastUplink. Even if FastUplink and FastBackbone are configured, they are effective only in PVSTP mode.

Format	`no spanning-tree backbonefast`
Mode	Global Config

5.2.4 spanning-tree bpdufilter

Use this command to enable BPDU Filter on an interface or range of interfaces.

Default	disabled
Format	`spanning-tree bpdufilter`
Mode	Interface Config

5.2.4.1 no spanning-tree bpdufilter

Use this command to disable BPDU Filter on the interface or range of interfaces.

Default	disabled
Format	`no spanning-tree bpdufilter`
Mode	Interface Config

5.2.5 spanning-tree bpdufilter default

Use this command to enable BPDU Filter on all the edge port interfaces.

Default	disabled
Format	`spanning-tree bpdufilter default`
Mode	Global Config

5.2.5.1 no spanning-tree bpdufilter default

Use this command to disable BPDU Filter on all the edge port interfaces.

Default	disabled
Format	`no spanning-tree bpdufilter default`
Mode	Global Config

5.2.6 spanning-tree bpduflood

Use this command to enable BPDU Flood on an interface or range of interfaces.

Default	disabled
Format	`spanning-tree bpduflood`
Mode	Interface Config

5.2.6.1 no spanning-tree bpduflood

Use this command to disable BPDU Flood on the interface or range of interfaces.

Default	disabled
Format	`no spanning-tree bpduflood`
Mode	Interface Config

5.2.7 spanning-tree bpduguard

Use this command to enable BPDU Guard on the switch.

Default	disabled
Format	`spanning-tree bpduguard`
Mode	Global Config

5.2.7.1 no spanning-tree bpduguard

Use this command to disable BPDU Guard on the switch.

Default	disabled
Format	`no spanning-tree bpduguard`
Mode	Global Config

5.2.8 spanning-tree bpdumigrationcheck

Use this command to force a transmission of rapid spanning tree (RSTP) and multiple spanning tree (MSTP) BPDUs. Use the *slot/port* parameter to transmit a BPDU from a specified interface, or use the *all* keyword to transmit RST or MST BPDUs from all interfaces. This command forces the BPDU transmission when you execute it, so the command does not change the system configuration or have a no version.

Format	`spanning-tree bpdumigrationcheck {slot/port	all}`
Mode	Global Config

5.2.9 spanning-tree configuration name

This command sets the Configuration Identifier Name for use in identifying the configuration that this switch is currently using. The *name* is a string of up to 32 characters.

Default	base MAC address in hexadecimal notation
Format	`spanning-tree configuration name` *name*
Mode	Global Config

5.2.9.1 no spanning-tree configuration name

This command resets the Configuration Identifier Name to its default.

Format	`no spanning-tree configuration name`
Mode	Global Config

5.2.10 spanning-tree configuration revision

This command sets the Configuration Identifier Revision Level for use in identifying the configuration that this switch is currently using. The Configuration Identifier Revision Level is a number in the range of 0 to 65535.

Default	0
Format	`spanning-tree configuration revision` *0-65535*
Mode	Global Config

5.2.10.1 no spanning-tree configuration revision

This command sets the Configuration Identifier Revision Level for use in identifying the configuration that this switch is currently using to the default value.

Format	`no spanning-tree configuration revision`
Mode	Global Config

5.2.11 spanning-tree cost

Use this command to configure the external path cost for port used by a MST instance. When the `auto` keyword is used, the path cost from the port to the root bridge is automatically determined by the speed of the interface. To configure the cost manually, specify a ***`cost`*** value from 1–200000000.

Default	auto
Format	`spanning-tree cost {`*`cost`*`	auto}`
Mode	Interface Config

5.2.11.1 no spanning-tree cost

This command resets the auto-edge status of the port to the default value.

Format	`no spanning-tree cost`
Mode	Interface Config

5.2.12 spanning-tree edgeport

This command specifies that an interface (or range of interfaces) is an Edge Port within the common and internal spanning tree. This allows this port to transition to Forwarding State without delay.

Format	`spanning-tree edgeport`
Mode	Interface Config

5.2.12.1 no spanning-tree edgeport

This command specifies that this port is not an Edge Port within the common and internal spanning tree.

Format	`no spanning-tree edgeport`
Mode	Interface Config

5.2.13 spanning-tree forceversion

This command sets the Force Protocol Version parameter to a new value.

Default	802.1s
Format	`spanning-tree forceversion {802.1d	802.1s	802.1w}`
Mode	Global Config

- Use 802.1d to specify that the switch transmits ST BPDUs rather than MST BPDUs (IEEE 802.1d functionality supported).
- Use 802.1s to specify that the switch transmits MST BPDUs (IEEE 802.1s functionality supported).
- Use 802.1w to specify that the switch transmits RST BPDUs rather than MST BPDUs (IEEE 802.1w functionality supported).

5.2.13.1 no spanning-tree forceversion

This command sets the Force Protocol Version parameter to the default value.

Format	`no spanning-tree forceversion`
Mode	Global Config

5.2.14 spanning-tree forward-time

This command sets the Bridge Forward Delay parameter to a new value for the common and internal spanning tree. The forward-time value is in seconds within a range of 4 to 30, with the value being greater than or equal to "(Bridge Max Age / 2) + 1".

Default	15
Format	`spanning-tree forward-time` *4-30*
Mode	Global Config

5.2.14.1 no spanning-tree forward-time

This command sets the Bridge Forward Delay parameter for the common and internal spanning tree to the default value.

Format	`no spanning-tree forward-time`
Mode	Global Config

5.2.15 spanning-tree guard

This command selects whether loop guard or root guard is enabled on an interface or range of interfaces. If neither is enabled, then the port operates in accordance with the multiple spanning tree protocol.

Default	none
Format	`spanning-tree guard {none | root | loop}`
Mode	Interface Config

5.2.15.1 no spanning-tree guard

This command disables loop guard or root guard on the interface.

Format	`no spanning-tree guard`
Mode	Interface Config

5.2.16 spanning-tree max-age

This command sets the Bridge Max Age parameter to a new value for the common and internal spanning tree. The max-age value is in seconds within a range of 6 to 40, with the value being less than or equal to *2 x (Bridge Forward Delay - 1)*.

Default	20
Format	`spanning-tree max-age` *6-40*
Mode	Global Config

5.2.16.1 no spanning-tree max-age

This command sets the Bridge Max Age parameter for the common and internal spanning tree to the default value.

Format	`no spanning-tree max-age`
Mode	Global Config

5.2.17 spanning-tree max-hops

This command sets the Bridge Max Hops parameter to a new value for the common and internal spanning tree. The max-hops value is a range from 6 to 40.

Default	20
Format	`spanning-tree max-hops` *`6-40`*
Mode	Global Config

5.2.17.1 no spanning-tree max-hops

This command sets the Bridge Max Hops parameter for the common and internal spanning tree to the default value.

Format	`no spanning-tree max-hops`
Mode	Global Config

5.2.18 spanning-tree mode

This command configures global spanning tree mode per VLAN spanning tree. On a switch, only one mode can be enabled at a time.

When PVSTP or rapid PVSTP (PVRSTP) is enabled, MSTP/RSTP/STP is operationally disabled. To reenable MSTP/RSTP/STP, disable PVSTP/PVRSTP. By default, FASTPATH has MSTP enabled. In PVSTP or PVRSTP mode, BPDUs contain per-VLAN information instead of the common spanning-tree information (MST/RSTP).

PVSTP maintains independent spanning tree information about each configured VLAN. PVSTP uses IEEE 802.1Q trunking and allows a trunked VLAN to maintain blocked or forwarding state per port on a per-VLAN basis. This allows a trunk port to be forwarded on some VLANs and blocked on other VLANs.

PVRSTP is based on the IEEE 8012.1w standard. It supports fast convergence IEEE 802.1D. PVRSTP is compatible with IEEE 802.1D spanning tree. PVRSTP sends BPDUs on all ports, instead of only the root bridge sending BPDUs, and supports the discarding, learning, and forwarding states.

When the mode is changed to PVRSTP, version 0 STP BPDUs are no longer transmitted and version 2 PVRSTP BPDUs that carry per-VLAN information are transmitted on the VLANs enabled for spanning-tree. If a version 0 BPDU is seen, PVRSTP reverts to sending version 0 BPDUs.

Per VLAN Rapid Spanning Tree Protocol (PVRSTP) embeds support for PVSTP FastBackbone and FastUplink. There is no provision to enable or disable these features in PVRSTP.

Default	Disabled
Format	`spanning-tree mode {pvst|rapid-pvst}`
Mode	Global Config

5.2.18.1 no spanning-tree mode

This command globally configures the switch to the default FASTPATH spanning-tree mode, MSTP.

Format	`no spanning-tree mode { pvst | rapid-pvst }`
Mode	Global Configuration

5.2.19 spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance or in the common and internal spanning tree. If you specify an ***mstid*** parameter that corresponds to an existing multiple spanning tree instance, the configurations are done for that multiple spanning tree instance. If you specify 0 (defined as the default CIST ID) as the ***mstid***, the configurations are done for the common and internal spanning tree instance.

If you specify the cost option, the command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the ***mstid*** parameter. You can set the path cost as a number in the range of 1 to 200000000 or auto. If you select auto the path cost value is set based on Link Speed.

If you specify the port-priority option, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the ***mstid*** parameter. The port-priority value is a number in the range of 0 to 240 in increments of 16.

Default
- cost—auto
- port-priority—128

Format `spanning-tree mst` *`mstid`* `{{cost` *`1-200000000`* `| auto} | port-priority` *`0-240`*`}`

Mode Interface Config

5.2.19.1 no spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance, or in the common and internal spanning tree to the respective default values. If you specify an ***mstid*** parameter that corresponds to an existing multiple spanning tree instance, you are configuring that multiple spanning tree instance. If you specify 0 (defined as the default CIST ID) as the ***mstid***, you are configuring the common and internal spanning tree instance.

If the you specify cost, this command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the ***mstid*** parameter, to the default value, i.e., a path cost value based on the Link Speed.

If you specify port-priority, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the ***mstid*** parameter, to the default value.

Format `no spanning-tree mst` *`mstid`* `{cost | port-priority}`

Mode Interface Config

5.2.20 spanning-tree mst instance

This command adds a multiple spanning tree instance to the switch. The parameter ***mstid*** is a number within a range of 1 to 4094, that corresponds to the new instance ID to be added. The maximum number of multiple instances supported by the switch is 4.

Default none

Format `spanning-tree mst instance` *`mstid`*

Mode Global Config

5.2.20.1 no spanning-tree mst instance

This command removes a multiple spanning tree instance from the switch and reallocates all VLANs allocated to the deleted instance to the common and internal spanning tree. The parameter ***mstid*** is a number that corresponds to the desired existing multiple spanning tree instance to be removed.

Format `no spanning-tree mst instance` *`mstid`*

Mode Global Config

5.2.21 spanning-tree mst priority

This command sets the bridge priority for a specific multiple spanning tree instance. The parameter ***mstid*** is a number that corresponds to the desired existing multiple spanning tree instance. The priority value is a number within a range of 0 to 4094.

If you specify 0 (defined as the default CIST ID) as the ***mstid***, this command sets the Bridge Priority parameter to a new value for the common and internal spanning tree. The bridge priority value is a number within a range of 0 to 4094. The twelve least significant bits are masked according to the 802.1s specification. This causes the priority to be rounded down to the next lower valid priority.

Default	32768
Format	`spanning-tree mst priority` *`mstid 0-4094`*
Mode	Global Config

5.2.21.1 no spanning-tree mst priority

This command sets the bridge priority for a specific multiple spanning tree instance to the default value. The parameter ***mstid*** is a number that corresponds to the desired existing multiple spanning tree instance.

If 0 (defined as the default CIST ID) is passed as the ***mstid***, this command sets the Bridge Priority parameter for the common and internal spanning tree to the default value.

Format	`no spanning-tree mst priority` *`mstid`*
Mode	Global Config

5.2.22 spanning-tree mst vlan

This command adds an association between a multiple spanning tree instance and one or more VLANs so that the VLAN(s) are no longer associated with the common and internal spanning tree. The parameter ***mstid*** is a multiple spanning tree instance identifier, in the range of 0 to 4094, that corresponds to the desired existing multiple spanning tree instance. The ***vlanid*** can be specified as a single VLAN, a list, or a range of values. To specify a list of VLANs, enter a list of VLAN IDs in the range 1 to 4093, each separated by a comma with no spaces in between. To specify a range of VLANs, separate the beginning and ending VLAN ID with a dash (-). Spaces and zeros are not permitted. The VLAN IDs may or may not exist in the system.

Format	`spanning-tree mst vlan` *`mstid vlanid`*
Mode	Global Config

5.2.22.1 no spanning-tree mst vlan

This command removes an association between a multiple spanning tree instance and one or more VLANs so that the VLAN(s) are again associated with the common and internal spanning tree.

Format	`no spanning-tree mst vlan` *`mstid vlanid`*
Mode	Global Config

5.2.23 spanning-tree port mode

This command sets the Administrative Switch Port State for this port to enabled for use by spanning tree.

Default	enabled
Format	`spanning-tree port mode`
Mode	Interface Config

5.2.23.1 no spanning-tree port mode

This command sets the Administrative Switch Port State for this port to disabled, disabling the port for use by spanning tree.

Format	`no spanning-tree port mode`
Mode	Interface Config

5.2.24 spanning-tree port mode all

This command sets the Administrative Switch Port State for all ports to enabled.

Default	enabled
Format	`spanning-tree port mode all`
Mode	Global Config

5.2.24.1 no spanning-tree port mode all

This command sets the Administrative Switch Port State for all ports to disabled.

Format	`no spanning-tree port mode all`
Mode	Global Config

5.2.25 spanning-tree port-priority

Use this command to change the priority value of the port to allow the operator to select the relative importance of the port in the forwarding process. Set this value to a lower number to prefer a port for forwarding of frames.

All LAN ports have 128 as priority value by default. PVSTP/PVRSTP puts the LAN port with the lowest LAN port number in the forwarding state and blocks other LAN ports.

The application uses the port priority value when the LAN port is configured as an edge port.

Default	enabled
Format	`spanning-tree port-priority` *`0-240`*
Mode	Interface Config

5.2.26 spanning-tree tcnguard

Use this command to enable TCN guard on the interface. When enabled, TCN Guard restricts the interface from propagating any topology change information received through that interface.

Default	Enabled
Format	`spanning-tree tcnguard`
Mode	Interface Config

5.2.26.1 no spanning-tree tcnguard

This command resets the TCN guard status of the port to the default value.

Format	`no spanning-tree tcnguard`
Mode	Interface Config

5.2.27 spanning-tree transmit

This command sets the Bridge Transmit Hold Count parameter.

Default	6
Format	`spanning-tree transmit hold-count`
Mode	Global Config

Parameter	Description
hold-count	The Bridge Tx hold-count parameter. The value in an integer between 1 and 10.

5.2.28 spanning-tree uplinkfast

Use this command to configure the rate at which gratuitous frames are sent (in packets per second) after switchover to an alternate port on PVSTP configured switches and enables uplinkfast on PVSTP switches. The range is 0-32000; the default is 150. This command has the effect of accelerating spanning-tree convergence after switchover to an alternate port.

Uplinkfast can be configured even if the switch is configured for MST(RSTP) mode, but it only has an effect when the switch is configured for PVST mode. Enabling FastUplink increases the priority by 3000. Path costs less than 3000 have an additional 3000 added when uplinkfast is enabled. This reduces the probability that the switch will become the root switch.

Uplinkfast immediately changes to an alternate root port on detecting a root port failure and changes the new root port directly to the fowarding state. A TCN is sent for this event.

After a switchover to an alternate port (new root port), uplinkfast multicasts a gratuitous frame on the new root port on behalf of each attached machine so that the rest of the network knows to use the secondary link to reach that machine.

PVRSTP embeds support for backbonefast and uplinkfast. There is no provision to enable or disable these features in PVRSTP configured switches.

Default	`150`
Format	`spanning-tree uplinkfast [max-update-rate packets]`
Mode	Global Config

5.2.28.1 no spanning-tree uplinkfast

This command disables uplinkfast on PVSTP configured switches. All switch priorities and path costs that have not been modified from their default values are set to their default values.

Format	`no spanning-tree uplinkfast [max-update-rate]`
Mode	Global Config

5.2.29 spanning-tree vlan

Use this command to enable/disable spanning tree on a VLAN.

Default	None
Format	`spanning-tree vlan vlan-list`
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.

5.2.30 spanning-tree vlan cost

Use this command to set the path cost for a port in a VLAN. The valid values are in the range of 1 to 200000000 or auto. If auto is selected, the path cost value is set based on the link speed.

Default	None
Format	`spanning-tree vlan` *`vlan-id`* `cost {auto |`*`1-200000000`*`}`
Mode	Interface Config

5.2.31 spanning-tree vlan forward-time

Use this command to configure the spanning tree forward delay time for a VLAN or a set of VLANs. The default is 15 seconds.

Set this value to a lower number to accelerate the transition to forwarding. The network operator should take into account the end-to-end BPDU propagation delay, the maximum frame lifetime, the maximum transmission halt delay, and the message age overestimate values specific to their network when configuring this parameter.

Default	`15 seconds`
Format	`spanning-tree vlan` *`vlan-list`* `forward-time` *`4-30`*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
forward-time	The spanning tree forward delay time. The range is 4-30 seconds.

5.2.32 spanning-tree vlan hello-time

Use this command to configure the spanning tree hello time for a specified VLAN or a range of VLANs. The default is 2 seconds. Set this value to a lower number to accelerate the discovery of topology changes.

Default	`2 seconds`
Format	`spanning-tree vlan` *`vlan-list`* `hello-time` *`1-10`*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
hello-time	The spanning tree forward hello time. The range is 1-10 seconds.

5.2.33 spanning-tree vlan max-age

Use this command to configure the spanning tree maximum age time for a set of VLANs. The default is 20 seconds.

Set this value to a lower number to accelerate the discovery of topology changes. The network operator must take into account the end-to-end BPDU propagation delay and message age overestimate for their specific topology when configuring this value.

The default setting of 20 seconds is suitable for a network of diameter 7, lost message value of 3, transit delay of 1, hello interval of 2 seconds, overestimate per bridge of 1 second, and a BPDU delay of 1 second. For a network of diameter 4, a setting of 16 seconds is appropriate if all other timers remain at their default values.

Default	`20 seconds`
Format	`spanning-tree vlan` *`vlan-list`* `max-age` *`6-40`*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
hello-time	The spanning tree forward hello time. The range is 1-10 seconds.

5.2.34 spanning-tree vlan root

Use this command to configure the switch to become the root bridge or standby root bridge by modifying the bridge priority from the default value of 32768 to a lower value calculated to ensure the bridge is the root (or standby) bridge.

The logic takes care of setting the bridge priority to a value lower (primary) or next lower (secondary) than the lowest bridge priority for the specified VLAN or a range of VLANs.

Default	32768
Format	`spanning-tree vlan` *`vlan-list`* `root {primary|secondary}`
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.

5.2.35 spanning-tree vlan port-priority

Use this command to change the VLAN port priority value of the VLAN port to allow the operator to select the relative importance of the VLAN port in the forwarding selection process when the port is configured as a point-to-point link type. Set this value to a lower number to prefer a port for forwarding of frames.

Default	None
Format	`spanning-tree vlan` *`vlan-id`* `port-priority` *`priority`*
Mode	Interface Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
priority	The VLAN port priority. The range is 0-255.

5.2.36 spanning-tree vlan priority

Use this command to configure the bridge priority of a VLAN. The default value is 32768.

If the value configured is not among the specifed values, it will be rounded off to the nearest valid value.

Default	32768
Format	`spanning-tree vlan` *`vlan-list`* `priority` *`priority`*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
priority	The VLAN bridge priority. Valid values are 0, 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344, and 61440.

5.2.37 show spanning-tree

This command displays spanning tree settings for the common and internal spanning tree. The following details are displayed.

Format `show spanning-tree`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
Bridge Priority	Specifies the bridge priority for the Common and Internal Spanning tree (CST). The value lies between 0 and 61440. It is displayed in multiples of 4096.
Bridge Identifier	The bridge identifier for the CST. It is made up using the bridge priority and the base MAC address of the bridge.
Time Since Topology Change	Time in seconds.
Topology Change Count	Number of times changed.
Topology Change in Progress	Boolean value of the Topology Change parameter for the switch indicating if a topology change is in progress on any port assigned to the common and internal spanning tree.
Designated Root	The bridge identifier of the root bridge. It is made up from the bridge priority and the base MAC address of the bridge.
Root Path Cost	Value of the Root Path Cost parameter for the common and internal spanning tree.
Root Port Identifier	Identifier of the port to access the Designated Root for the CST
Bridge Max Age	Derived value.
Bridge Max Hops	Bridge max-hops count for the device.
Root Port Bridge Forward Delay	Derived value.
Hello Time	Configured value of the parameter for the CST.
Bridge Hold Time	Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs).
CST Regional Root	Bridge Identifier of the CST Regional Root. It is made up using the bridge priority and the base MAC address of the bridge.
Regional Root Path Cost	Path Cost to the CST Regional Root.
Associated FIDs	List of forwarding database identifiers currently associated with this instance.
Associated VLANs	List of VLAN IDs currently associated with this instance.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show spanning-tree

Bridge Priority................................ 32768
Bridge Identifier.............................. 80:00:00:10:18:48:FC:07
Time Since Topology Change..................... 8 day 3 hr 22 min 37 sec
Topology Change Count.......................... 0
Topology Change in progress.................... FALSE
Designated Root................................ 80:00:00:10:18:48:FC:07
Root Path Cost................................. 0
Root Port Identifier........................... 00:00
Bridge Max Age................................. 20
Bridge Max Hops................................ 20
Bridge Tx Hold Count........................... 6
Bridge Forwarding Delay........................ 15
Hello Time..................................... 2
```

```
Bridge Hold Time............................... 6
CST Regional Root.............................. 80:00:00:10:18:48:FC:07
Regional Root Path Cost........................ 0

     Associated FIDs           Associated VLANs
     ---------------           ----------------

(FASTPATH Routing) #
```

5.2.38 show spanning-tree backbonefast

This command displays spanning tree information for backbonefast.

Format `show spanning-tree backbonefast`

Mode

- Privileged EXEC
- User EXEC

Term	Definition
Transitions via Backbonefast	The number of backbonefast transitions.
Inferior BPDUs received (all VLANs)	The number of inferior BPDUs received on all VLANs.
RLQ request PDUs received (all VLANs)	The number of root link query (RLQ) requests PDUs received on all VLANs.
RLQ response PDUs received (all VLANs)	The number of RLQ response PDUs received on all VLANs.
RLQ request PDUs sent (all VLANs)	The number of RLQ request PDUs sent on all VLANs.
RLQ response PDUs sent (all VLANs)	The number of RLQ response PDUs sent on all VLANs.

Example: The following shows example output from the command.

```
(Routing)#show spanning-tree backbonefast

Backbonefast Statistics
-----------------------
Transitions via Backbonefast (all VLANs)          : 0
Inferior BPDUs received (all VLANs)               : 0
RLQ request PDUs received (all VLANs)             : 0
RLQ response PDUs received (all VLANs)            : 0
RLQ request PDUs sent (all VLANs)                 : 0
RLQ response PDUs sent (all VLANs)                : 0
```

5.2.39 show spanning-tree brief

This command displays spanning tree settings for the bridge. The following information appears.

Format `show spanning-tree brief`

Mode

- Privileged EXEC
- User EXEC

Term	Definition
Bridge Priority	Configured value.
Bridge Identifier	The bridge identifier for the selected MST instance. It is made up using the bridge priority and the base MAC address of the bridge.
Bridge Max Age	Configured value.
Bridge Max Hops	Bridge max-hops count for the device.
Bridge Hello Time	Configured value.

Term	Definition
Bridge Forward Delay	Configured value.
Bridge Hold Time	Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs).

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show spanning-tree brief

Bridge Priority................................ 32768
Bridge Identifier.............................. 80:00:00:10:18:48:FC:07
Bridge Max Age................................. 20
Bridge Max Hops................................ 20
Bridge Hello Time.............................. 2
Bridge Forward Delay........................... 15
Bridge Hold Time............................... 6

(FASTPATH Routing) #
```

5.2.40 show spanning-tree interface

This command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The ***slot/port*** is the desired switch port. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number. The following details are displayed on execution of the command.

Format	`show spanning-tree interface` ***slot/port***|`lag` *`lag-intf-num`*
Mode	Privileged EXEC User EXEC

Term	Definition
Hello Time	Admin hello time for this port.
Port Mode	Enabled or disabled.
BPDU Guard Effect	Enabled or disabled.
Root Guard	Enabled or disabled.
Loop Guard	Enabled or disabled.
TCN Guard	Enable or disable the propagation of received topology change notifications and topology changes to other ports.
BPDU Filter Mode	Enabled or disabled.
BPDU Flood Mode	Enabled or disabled.
Auto Edge	To enable or disable the feature that causes a port that has not seen a BPDU for edge delay time, to become an edge port and transition to forwarding faster.
Port Up Time Since Counters Last Cleared	Time since port was reset, displayed in days, hours, minutes, and seconds.
STP BPDUs Transmitted	Spanning Tree Protocol Bridge Protocol Data Units sent.
STP BPDUs Received	Spanning Tree Protocol Bridge Protocol Data Units received.
RSTP BPDUs Transmitted	Rapid Spanning Tree Protocol Bridge Protocol Data Units sent.
RSTP BPDUs Received	Rapid Spanning Tree Protocol Bridge Protocol Data Units received.

Term	Definition
MSTP BPDUs Transmitted	Multiple Spanning Tree Protocol Bridge Protocol Data Units sent.
MSTP BPDUs Received	Multiple Spanning Tree Protocol Bridge Protocol Data Units received.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) >show spanning-tree interface 0/1

Hello Time..................................... Not Configured
Port Mode...................................... Enabled
BPDU Guard Effect.............................. Disabled
Root Guard..................................... FALSE
Loop Guard..................................... FALSE
TCN Guard...................................... FALSE
BPDU Filter Mode............................... Disabled
BPDU Flood Mode................................ Disabled
Auto Edge...................................... TRUE
Port Up Time Since Counters Last Cleared....... 8 day 3 hr 39 min 58 sec
STP BPDUs Transmitted.......................... 0
STP BPDUs Received............................. 0
RSTP BPDUs Transmitted......................... 0
RSTP BPDUs Received............................ 0
MSTP BPDUs Transmitted......................... 0
MSTP BPDUs Received............................ 0

(FASTPATH Routing) >
```

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) >show spanning-tree interface lag 1

Hello Time..................................... Not Configured
Port Mode...................................... Enabled
BPDU Guard Effect.............................. Disabled
Root Guard..................................... FALSE
Loop Guard..................................... FALSE
TCN Guard...................................... FALSE
BPDU Filter Mode............................... Disabled
BPDU Flood Mode................................ Disabled
Auto Edge...................................... TRUE
Port Up Time Since Counters Last Cleared....... 8 day 3 hr 42 min 5 sec
STP BPDUs Transmitted.......................... 0
STP BPDUs Received............................. 0
RSTP BPDUs Transmitted......................... 0
RSTP BPDUs Received............................ 0
MSTP BPDUs Transmitted......................... 0
MSTP BPDUs Received............................ 0

(FASTPATH Routing) >
```

5.2.41 show spanning-tree mst detailed

This command displays the detailed settings for an MST instance.

Format `show spanning-tree mst detailed` *`mstid`*

Mode
- Privileged EXEC
- User EXEC

Parameter	Description
mstid	A multiple spanning tree instance identifier. The value is 0–4094.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) >show spanning-tree mst detailed 0

MST Instance ID................................ 0
MST Bridge Priority............................ 32768
MST Bridge Identifier.......................... 80:00:00:10:18:48:FC:07
Time Since Topology Change..................... 8 day 3 hr 47 min 7 sec
Topology Change Count.......................... 0
Topology Change in progress.................... FALSE
Designated Root................................ 80:00:00:10:18:48:FC:07
Root Path Cost................................. 0
Root Port Identifier........................... 00:00

     Associated FIDs          Associated VLANs
     ---------------          ----------------

(FASTPATH Routing) >
```

5.2.42 show spanning-tree mst port detailed

This command displays the detailed settings and parameters for a specific switch port within a particular multiple spanning tree instance. The parameter ***mstid*** is a number that corresponds to the desired existing multiple spanning tree instance. The ***slot/port*** is the desired switch port. Instead of *slot/port*, `lag` *lag-intf-num* can be used as an alternate way to specify the LAG interface. `lag` *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format `show spanning-tree mst port detailed` ***mstid slot/port***|`lag` *lag-intf-num*

Mode
- Privileged EXEC
- User EXEC

Term	Definition
MST Instance ID	The ID of the existing multiple spanning tree (MST) instance identifier. The value is 0–4094.
Port Identifier	The port identifier for the specified port within the selected MST instance. It is made up from the port priority and the interface number of the port.
Port Priority	The priority for a particular port within the selected MST instance. The port priority is displayed in multiples of 16.
Port Forwarding State	Current spanning tree state of this port.
Port Role	Each enabled MST Bridge Port receives a Port Role for each spanning tree. The port role is one of the following values: Root Port, Designated Port, Alternate Port, Backup Port, Master Port or Disabled Port
Auto-Calculate Port Path Cost	Indicates whether auto calculation for port path cost is enabled.
Port Path Cost	Configured value of the Internal Port Path Cost parameter.
Designated Root	The Identifier of the designated root for this port.
Root Path Cost	The path cost to get to the root bridge for this instance. The root path cost is zero if the bridge is the root bridge for that instance.
Designated Bridge	Bridge Identifier of the bridge with the Designated Port.
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN.

Term	Definition
Loop Inconsistent State	The current loop inconsistent state of this port in this MST instance. When in loop inconsistent state, the port has failed to receive BPDUs while configured with loop guard enabled. Loop inconsistent state maintains the port in a blocking state until a subsequent BPDU is received.
Transitions Into Loop Inconsistent State	The number of times this interface has transitioned into loop inconsistent state.
Transitions Out of Loop Inconsistent State	The number of times this interface has transitioned out of loop inconsistent state.

If you specify 0 (defined as the default CIST ID) as the ***`mstid`***, this command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The ***`slot/port`*** is the desired switch port. In this case, the following are displayed.

Term	Definition
Port Identifier	The port identifier for this port within the CST.
Port Priority	The priority of the port within the CST.
Port Forwarding State	The forwarding state of the port within the CST.
Port Role	The role of the specified interface within the CST.
Auto-Calculate Port Path Cost	Indicates whether auto calculation for port path cost is enabled or not (disabled).
Port Path Cost	The configured path cost for the specified interface.
Auto-Calculate External Port Path Cost	Indicates whether auto calculation for external port path cost is enabled.
External Port Path Cost	The cost to get to the root bridge of the CIST across the boundary of the region. This means that if the port is a boundary port for an MSTP region, then the external path cost is used.
Designated Root	Identifier of the designated root for this port within the CST.
Root Path Cost	The root path cost to the LAN by the port.
Designated Bridge	The bridge containing the designated port.
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN.
Topology Change Acknowledgement	Value of flag in next Configuration Bridge Protocol Data Unit (BPDU) transmission indicating if a topology change is in progress for this port.
Hello Time	The hello time in use for this port.
Edge Port	The configured value indicating if this port is an edge port.
Edge Port Status	The derived value of the edge port status. True if operating as an edge port; false otherwise.
Point To Point MAC Status	Derived value indicating if this port is part of a point to point link.
CST Regional Root	The regional root identifier in use for this port.
CST Internal Root Path Cost	The internal root path cost to the LAN by the designated external port.
Loop Inconsistent State	The current loop inconsistent state of this port in this MST instance. When in loop inconsistent state, the port has failed to receive BPDUs while configured with loop guard enabled. Loop inconsistent state maintains the port in a blocking state until a subsequent BPDU is received.
Transitions Into Loop Inconsistent State	The number of times this interface has transitioned into loop inconsistent state.

Term	Definition
Transitions Out of Loop Inconsistent State	The number of times this interface has transitioned out of loop inconsistent state.

Example: The following shows example CLI display output for the command in `slot/port` format.

```
(FASTPATH Routing) >show spanning-tree mst port detailed 0 0/1

Port Identifier................................ 80:01
Port Priority.................................. 128
Port Forwarding State.......................... Disabled
Port Role...................................... Disabled
Auto-calculate Port Path Cost.................. Enabled
Port Path Cost................................. 0
Auto-Calculate External Port Path Cost......... Enabled
External Port Path Cost........................ 0
Designated Root................................ 80:00:00:10:18:48:FC:07
Root Path Cost................................. 0
Designated Bridge.............................. 80:00:00:10:18:48:FC:07
Designated Port Identifier..................... 00:00
Topology Change Acknowledge.................... FALSE
Hello Time..................................... 2
Edge Port...................................... FALSE
Edge Port Status............................... FALSE
Point to Point MAC Status...................... TRUE
CST Regional Root.............................. 80:00:00:10:18:48:FC:07
CST Internal Root Path Cost.................... 0
Loop Inconsistent State........................ FALSE
Transitions Into Loop Inconsistent State....... 0
Transitions Out Of Loop Inconsistent State..... 0
```

Example: The following shows example CLI display output for the command using a LAG interface number.

```
(FASTPATH Routing) >show spanning-tree mst port detailed 0 lag 1

Port Identifier................................ 60:42
Port Priority.................................. 96
Port Forwarding State.......................... Disabled
Port Role...................................... Disabled
Auto-calculate Port Path Cost.................. Enabled
Port Path Cost................................. 0
Auto-Calculate External Port Path Cost......... Enabled
External Port Path Cost........................ 0
Designated Root................................ 80:00:00:10:18:48:FC:07
Root Path Cost................................. 0
Designated Bridge.............................. 80:00:00:10:18:48:FC:07
Designated Port Identifier..................... 00:00
Topology Change Acknowledge.................... FALSE
Hello Time..................................... 2
Edge Port...................................... FALSE
Edge Port Status............................... FALSE
Point to Point MAC Status...................... TRUE
CST Regional Root.............................. 80:00:00:10:18:48:FC:07
CST Internal Root Path Cost.................... 0
Loop Inconsistent State........................ FALSE
Transitions Into Loop Inconsistent State....... 0
Transitions Out Of Loop Inconsistent State..... 0
--More-- or (q)uit

(FASTPATH Routing) >
```

5.2.43 show spanning-tree mst port summary

This command displays the settings of one or all ports within the specified multiple spanning tree instance. The parameter ***mstid*** indicates a particular MST instance. The parameter **{*slot/port*|all}** indicates the desired switch port or all ports. Instead of `slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

If you specify 0 (defined as the default CIST ID) as the ***mstid***, the status summary displays for one or all ports within the common and internal spanning tree.

Format `show spanning-tree mst port summary mstid {slot/port |lag lag-intf-num| all}`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
MST Instance ID	The MST instance associated with this port.
Interface	*slot/port*
STP Mode	Indicates whether spanning tree is enabled or disabled on the port.
Type	Currently not used.
STP State	The forwarding state of the port in the specified spanning tree instance.
Port Role	The role of the specified port within the spanning tree.
Desc	Indicates whether the port is in loop inconsistent state or not. This field is blank if the loop guard feature is not available.

Example: The following shows example CLI display output for the command in `slot/port` format.

```
(FASTPATH Routing) >show spanning-tree mst port summary 0 0/1

MST Instance ID............................... CST

            STP                   STP           Port
Interface   Mode    Type          State         Role       Desc
--------- -------- ------- ----------------- ---------- ----------
0/1       Enabled          Disabled          Disabled
```

Example: The following shows example CLI display output for the command using a LAG interface number.

```
(FASTPATH Routing) >show spanning-tree mst port summary 0 lag 1

MST Instance ID............................... CST

            STP                   STP           Port
Interface   Mode    Type          State         Role       Desc
--------- -------- ------- ----------------- ---------- ----------
3/1       Enabled          Disabled          Disabled
```

5.2.44 show spanning-tree mst port summary active

This command displays settings for the ports within the specified multiple spanning tree instance that are active links.

Format `show spanning-tree mst port summary mstid active`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
MST Instance ID	The ID of the existing MST instance.
Interface	*slot/port*
STP Mode	Indicates whether spanning tree is enabled or disabled on the port.
Type	Currently not used.
STP State	The forwarding state of the port in the specified spanning tree instance.
Port Role	The role of the specified port within the spanning tree.
Desc	Indicates whether the port is in loop inconsistent state or not. This field is blank if the loop guard feature is not available.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) >show spanning-tree mst port summary 0 active

            STP                  STP             Port
Interface   Mode   Type         State            Role       Desc
--------- -------- ------- ----------------- ---------- ---------
```

5.2.45 show spanning-tree mst summary

This command displays summary information about all multiple spanning tree instances in the switch. On execution, the following details are displayed.

Format	`show spanning-tree mst summary`
Mode	• Privileged EXEC • User EXEC

Term	Definition
MST Instance ID List	List of multiple spanning trees IDs currently configured.
For each MSTID: • Associated FIDs • Associated VLANs	• List of forwarding database identifiers associated with this instance. • List of VLAN IDs associated with this instance.

5.2.46 show spanning-tree summary

This command displays spanning tree settings and parameters for the switch. The following details are displayed on execution of the command.

Format	`show spanning-tree summary`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Spanning Tree Adminmode	Enabled or disabled.
Spanning Tree Version	Version of 802.1 currently supported (IEEE 802.1s, IEEE 802.1w, or IEEE 802.1d) based upon the Force Protocol Version parameter.
BPDU Guard Mode	Enabled or disabled.
BPDU Filter Mode	Enabled or disabled.

Term	Definition
Configuration Name	Identifier used to identify the configuration currently being used.
Configuration Revision Level	Identifier used to identify the configuration currently being used.
Configuration Digest Key	A generated Key used in the exchange of the BPDUs.
Configuration Format Selector	Specifies the version of the configuration format being used in the exchange of BPDUs. The default value is zero.
MST Instances	List of all multiple spanning tree instances configured on the switch.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) >show spanning-tree summary

Spanning Tree Adminmode........... Enabled
Spanning Tree Version............. IEEE 802.1s
BPDU Guard Mode................... Disabled
BPDU Filter Mode.................. Disabled
Configuration Name................ ****
Configuration Revision Level...... ****
Configuration Digest Key.......... ****
Configuration Format Selector..... 0
No MST instances to display.
```

5.2.47 show spanning-tree uplinkfast

This command displays spanning tree information for uplinkfast.

Format	`show spanning-tree uplinkfast`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Uplinkfast transitions (all VLANs)	The number of uplinkfast transitions on all VLANs.
Proxy multicast addresses transmitted (all VLANs)	The number of proxy multicast addresses transmitted on all VLANs.

Example: The following shows example output from the command.

```
(Routing) #show spanning-tree uplinkfast

Uplinkfast is enabled.
BPDU update rate : 150 packets/sec

Uplinkfast Statistics
---------------------
Uplinkfast transitions (all VLANs)................. 0
Proxy multicast addresses transmitted (all VLANs).. 0
```

5.2.48 show spanning-tree vlan

This command displays spanning tree information per VLAN and also lists out the port roles and states along with port cost. The *vlan-list* parameter is a list of VLANs or VLAN-ranges separated by commas and with no embedded blank spaces. VLAN ranges are of the form "X-Y" where X and Y are valid VLAN identifiers and X< Y. The *`vlanid`* corresponds to an existing VLAN ID.

Format	`show spanning-tree vlan {`*`vlanid`*`	`*`vlan-list`*`}`
Mode	• Privileged EXEC • User EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) show spanning-tree vlan 1

VLAN    1
          Spanning-tree enabled protocol rpvst
          RootID    Priority        32769
           Address         00:0C:29:D3:80:EA
           Cost            0
           Port            This switch is the root
           Hello Time 2 Sec Max Age 15 sec Forward Delay 15 sec
 BridgeID  Priority        32769 (priority 32768 sys-id-ext 1)
           Address         00:0C:29:D3:80:EA
           Hello Time 2 Sec Max Age 15 sec Forward Delay 15 sec
           Aging Time 300
Interface  Role        Sts            Cost         Prio.Nbr
---------  ----------  -------------  ---------    --------
0/1        Designated  Forwarding     3000        128.1
0/2        Designated  Forwarding     3000        128.2
0/3        Disabled    Disabled       3000        128.3
0/4        Designated  Forwarding     3000        128.4
0/5        Designated  Forwarding     3000        128.5
0/6        Designated  Forwarding     3000        128.6
0/7        Designated  Forwarding     3000        128.7
0/8        Designated  Forwarding     3000        128.8
1/1        Disabled    Disabled       3000        128.1026
1/2        Disabled    Disabled       3000        128.1027
1/3        Disabled    Disabled       3000        128.1028
1/4        Disabled    Disabled       3000        128.1029
1/5        Disabled    Disabled       3000        128.1030
1/6        Disabled    Disabled       3000        128.1031
```

5.3 Loop Protection Commands

This section describes the commands used to configure loop protection. Loop protection detects physical and logical loops between Ethernet ports on a device. Loop protection must be enabled globally before it can be enabled at the interface level.

5.3.1 keepalive (Global Config)

This command enables loop protection for the system.

Default	Disabled
Format	`keepalive`
Mode	Global Config

5.3.1.1 no keepalive

This command disables loop protection for the system. This command also sets the transmit interval and retry count to the default value.

Format	`no keepalive`
Mode	Global Config

5.3.2 keepalive (Interface Config)

This command enables keepalive on a particular interface.

Default	None
Format	`keepalive`
Mode	Interface Config

5.3.2.1 no keepalive

This command disables keepalive on a particular interface.

Format	`keepalive`
Mode	Interface Config

5.3.3 keepalive action

This command configures the action to be taken on a port when a loop is detected.

Default	Disabled.
Format	`keepalive receive-action {log|disable|both}`
Mode	Interface Configuration

Parameter	Description
log	Only logs the message. The log mode only logs the message to buffer logs without bringing the port down.
disable	Shuts down the port. This is the default.
both	Logs and disables the port.

5.3.3.1 no keepalive action

This command returns the command to the default action of disabling a port when a loop is detected.

Format	`no keepalive receive-action {log|disable|both}`
Mode	Interface Configuration

5.3.4 keepalive disable-timer

This command configures the time, in seconds, for which a port is down if a loop is detected. The default time is 0 so that port needs to be re-enabled manually to bring it up.

Default	0
Format	`keep-alive disable-timer` *`value`*
Mode	Global Configuration

Parameter	Description
value	The time, in seconds, for which the port is down if a loop is detected.

5.3.4.1 no keepalive disable-timer

This command removes the disable-timer.

Format	`no keep-alive disable-timer`
Mode	Global Configuration

5.3.5 keepalive retry

This command configures the time in seconds between transmission of keep-alive packets. Retry is an optional parameter that configures the count of keepalive packets received by the switch after which the interface will be error disabled.

Default	5
Format	`keepalive` *`val`* `[retry]`
Mode	Global Configuration

Parameter	Description
val	The time in seconds between transmission of keep-alive packets.
retry	Configures the count of keepalive packets received by the switch after which the switch will be error disabled.

5.3.6 show keepalive

This command displays the global keepalive configuration.

Default	None
Format	`show keepalive`
Mode	Privileged EXEC

Example:

```
(Routing) #show  keepalive

Keepalive         : Enabled
Transmit interval : 5 seconds
Retry count       : 1
```

5.3.7 show keepalive statistics

This command displays the keepalive statistics for each port or a specific port.

Default	None
Format	`show keepalive statistics {`*`port-num`*`	all }`
Mode	Privileged EXEC

Term	Definition
port-num	The port number for which to show statistics.
all	Show statistics for all ports.

Example:

```
(Routing) #show  keepalive statistics all

       Keep      Loop        Loop     Time Since     Rx           Port
Port   Alive     Detected    Count    Last Loop     Action        Status
------ --------- ----------- -------- ------------- ------------- --------
0/1    Yes       Yes         1        85            shut-down     D-Disable
0/3    Yes       No                                 log-shutdown  Enable
```

5.3.8 clear counters keepalive

This command clears keepalive statistics associated with ports (for example, number of transmitted packets, received packets, and loop packets).

Default	None
Format	`clear counters keepalive`
Mode	Privileged EXEC

5.4 VLAN Commands

This section describes the commands you use to configure VLAN settings.

5.4.1 vlan database

This command gives you access to the VLAN Config mode, which allows you to configure VLAN characteristics.

Format	`vlan database`
Mode	Privileged EXEC

5.4.2 network mgmt_vlan

This command configures the Management VLAN ID.

Default	1
Format	`network mgmt_vlan` *1-4093*
Mode	Privileged EXEC

5.4.2.1 no network mgmt_vlan

This command sets the Management VLAN ID to the default.

Format	`no network mgmt_vlan`
Mode	Privileged EXEC

5.4.3 vlan

This command creates a new VLAN and assigns it an ID. The ID is a valid VLAN identification number (ID 1 is reserved for the default VLAN). VLAN range is 2-4093.

Format	`vlan` *2-4093*
Mode	VLAN Config

5.4.3.1 no vlan

This command deletes an existing VLAN. The ID is a valid VLAN identification number (ID 1 is reserved for the default VLAN). The VLAN range is 2-4093.

Format	`no vlan` *`2-4093`*
Mode	VLAN Config

5.4.4 vlan acceptframe

This command sets the frame acceptance mode on an interface or range of interfaces. For VLAN Only mode, untagged frames or priority frames received on this interface are discarded. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. For admituntaggedonly mode, only untagged frames are accepted on this interface; tagged frames are discarded. With any option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Default	all
Format	`vlan acceptframe {admituntaggedonly | vlanonly | all}`
Mode	Interface Config

5.4.4.1 no vlan acceptframe

This command resets the frame acceptance mode for the interface or range of interfaces to the default value.

Format	`no vlan acceptframe`
Mode	Interface Config

5.4.5 vlan ingressfilter

This command enables ingress filtering on an interface or range of interfaces. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Default	disabled
Format	`vlan ingressfilter`
Mode	Interface Config

5.4.5.1 no vlan ingressfilter

This command disables ingress filtering. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Format	`no vlan ingressfilter`
Mode	Interface Config

5.4.6 vlan internal allocation

Use this command to configure which VLAN IDs to use for port-based routing interfaces. When a port-based routing interface is created, an unused VLAN ID is assigned internally.

Format `vlan internal allocation {base vlan-id | policy ascending | policy decending}`

Mode Global Config

Parameter	Description
base *vlan-id*	The first VLAN ID to be assigned to a port-based routing interface.
policy ascending	VLAN IDs assigned to port-based routing interfaces start at the base and increase in value
policy descending	VLAN IDs assigned to port-based routing interfaces start at the base and decrease in value

5.4.7 vlan makestatic

This command changes a dynamically created VLAN (created by GVRP registration) to a static VLAN (one that is permanently configured and defined). The ID is a valid VLAN identification number. VLAN range is 2-4093.

Format `vlan makestatic 2-4093`

Mode VLAN Config

5.4.8 vlan name

This command changes the name of a VLAN. The name is an alphanumeric string of up to 32 characters, and the ID is a valid VLAN identification number. ID range is 1-4093.

Default
- VLAN ID 1 - default
- other VLANS - blank string

Format `vlan name 1-4093 name`

Mode VLAN Config

5.4.8.1 no vlan name

This command sets the name of a VLAN to a blank string.

Format `no vlan name 1-4093`

Mode VLAN Config

5.4.9 vlan participation

This command configures the degree of participation for a specific interface or range of interfaces in a VLAN. The ID is a valid VLAN identification number, and the interface is a valid interface number.

Format `vlan participation {exclude | include | auto} 1-4093`

Mode Interface Config

Participation options are:

Options	Definition
include	The interface is always a member of this VLAN. This is equivalent to registration fixed.
exclude	The interface is never a member of this VLAN. This is equivalent to registration forbidden.
auto	The interface is dynamically registered in this VLAN by GVRP and will not participate in this VLAN unless a join request is received on this interface. This is equivalent to registration normal.

5.4.10 vlan participation all

This command configures the degree of participation for all interfaces in a VLAN. The ID is a valid VLAN identification number.

Format	`vlan participation all {exclude	include	auto}` *`1-4093`*
Mode	Global Config

You can use the following participation options:

Participation Options	Definition
include	The interface is always a member of this VLAN. This is equivalent to registration fixed.
exclude	The interface is never a member of this VLAN. This is equivalent to registration forbidden.
auto	The interface is dynamically registered in this VLAN by GVRP. The interface will not participate in this VLAN unless a join request is received on this interface. This is equivalent to registration normal.

5.4.11 vlan port acceptframe all

This command sets the frame acceptance mode for all interfaces.

Default	all
Format	`vlan port acceptframe all {vlanonly	admituntaggedonly |all}`
Mode	Global Config

The modes are defined as follows:

Mode	Definition
VLAN Only mode	Untagged frames or priority frames received on this interface are discarded.
Admit Untagged Only mode	VLAN-tagged and priority tagged frames received on this interface are discarded.
Admit All mode	Untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port.

With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

5.4.11.1 no vlan port acceptframe all

This command sets the frame acceptance mode for all interfaces to Admit All. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Format	`no vlan port acceptframe all`
Mode	Global Config

5.4.12 vlan port ingressfilter all

This command enables ingress filtering for all ports. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Default	disabled
Format	`vlan port ingressfilter all`
Mode	Global Config

5.4.12.1 no vlan port ingressfilter all

This command disables ingress filtering for all ports. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Format	`no vlan port ingressfilter all`
Mode	Global Config

5.4.13 vlan port pvid all

This command changes the VLAN ID for all interface.

Default	1
Format	`vlan port pvid all` *`1-4093`*
Mode	Global Config

5.4.13.1 no vlan port pvid all

This command sets the VLAN ID for all interfaces to 1.

Format	`no vlan port pvid all`
Mode	Global Config

5.4.14 vlan port tagging all

This command configures the tagging behavior for all interfaces in a VLAN to enabled. If tagging is enabled, traffic is transmitted as tagged frames. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	`vlan port tagging all` *`1-4093`*
Mode	Global Config

5.4.14.1 no vlan port tagging all

This command configures the tagging behavior for all interfaces in a VLAN to disabled. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	`no vlan port tagging all`
Mode	Global Config

5.4.15 vlan protocol group

This command adds protocol-based VLAN groups to the system. The ***groupid*** is a unique number from 1–128 that is used to identify the group in subsequent commands.

Format	`vlan protocol group` *groupid*
Mode	Global Config

5.4.16 vlan protocol group name

This command assigns a name to a protocol-based VLAN groups. The *groupname* variable can be a character string of 0 to 16 characters.

Format	`vlan protocol group name` *groupid groupname*
Mode	Global Config

5.4.16.1 no vlan protocol group name

This command removes the name from the group identified by ***groupid***.

Format	`no vlan protocol group name` *groupid*
Mode	Global Config

5.4.17 vlan protocol group add protocol

This command adds the ***protocol*** to the protocol-based VLAN identified by ***groupid***. A group may have more than one protocol associated with it. Each interface and protocol combination can only be associated with one group. If adding a protocol to a group causes any conflicts with interfaces currently associated with the group, this command fails and the protocol is not added to the group. The possible values for *protocol* are The possible values for *protocol-list* includes the keywords *ip, arp,* and *ipx* and hexadecimal or decimal values ranging from 0x0600 (1536) to 0xFFFF (65535). The protocol list can accept up to 16 protocols separated by a comma.

Default	none
Format	`vlan protocol group add protocol` *groupid ethertype protocol-list*
Mode	Global Config

5.4.17.1 no vlan protocol group add protocol

This command removes the protocols specified in the ***protocol-list*** from this protocol-based VLAN group that is identified by this ***groupid***.

Format `no vlan protocol group add protocol` *`groupid ethertype protocol-list`*

Mode Global Config

5.4.18 protocol group

This command attaches a ***vlanid*** to the protocol-based VLAN identified by ***groupid***. A group may only be associated with one VLAN at a time, however the VLAN association can be changed.

Default none

Format `protocol group` *`groupid vlanid`*

Mode VLAN Config

5.4.18.1 no protocol group

This command removes the ***vlanid*** from this protocol-based VLAN group that is identified by this ***groupid***.

Format `no protocol group` *`groupid vlanid`*

Mode VLAN Config

5.4.19 protocol vlan group

This command adds a physical interface or a range of interfaces to the protocol-based VLAN identified by ***groupid***. You can associate multiple interfaces with a group, but you can only associate each interface and protocol combination with one group. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command fails and the interface(s) are not added to the group.

Default none

Format `protocol vlan group` *`groupid`*

Mode Interface Config

5.4.19.1 no protocol vlan group

This command removes the interface from this protocol-based VLAN group that is identified by this ***groupid***.

Format `no protocol vlan group` *`groupid`*

Mode Interface Config

5.4.20 protocol vlan group all

This command adds all physical interfaces to the protocol-based VLAN identified by ***groupid***. You can associate multiple interfaces with a group, but you can only associate each interface and protocol combination with one group. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command will fail and the interface(s) will not be added to the group.

Default none

Format `protocol vlan group all` *`groupid`*

Mode Global Config

5.4.20.1 no protocol vlan group all

This command removes all interfaces from this protocol-based VLAN group that is identified by this ***groupid***.

Format	`no protocol vlan group all` *`groupid`*
Mode	Global Config

5.4.21 show port protocol

This command displays the Protocol-Based VLAN information for either the entire system, or for the indicated group.

Format	`show port protocol {`*`groupid`*` | all}`
Mode	Privileged EXEC

Term	Definition
Group Name	The group name of an entry in the Protocol-based VLAN table.
Group ID	The group identifier of the protocol group.
VLAN	The VLAN associated with this Protocol Group.
Protocol(s)	The type of protocol(s) for this group.
Interface(s)	Lists the ***slot/port*** interface(s) that are associated with this Protocol Group.

5.4.22 vlan pvid

This command changes the VLAN ID on an interface or range of interfaces.

Default	1
Format	`vlan pvid` *`1-4093`*
Mode	Interface Config Interface Range Config

5.4.22.1 no vlan pvid

This command sets the VLAN ID on an interface or range of interfaces to 1.

Format	`no vlan pvid`
Mode	Interface Config

5.4.23 vlan tagging

This command configures the tagging behavior for a specific interface or range of interfaces in a VLAN to enabled. If tagging is enabled, traffic is transmitted as tagged frames. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	`vlan tagging` *`1-4093`*
Mode	• Interface Config

5.4.23.1 no vlan tagging

This command configures the tagging behavior for a specific interface or range of interfaces in a VLAN to disabled. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	`no vlan tagging` *`1-4093`*
Mode	• Interface Config

5.4.24 vlan association subnet

This command associates a VLAN to a specific IP-subnet.

Format	`vlan association subnet` *`ipaddr netmask vlanid`*
Mode	VLAN Config

5.4.24.1 no vlan association subnet

This command removes association of a specific IP-subnet to a VLAN.

Format	`no vlan association subnet` *`ipaddr netmask`*
Mode	VLAN Config

5.4.25 vlan association mac

This command associates a MAC address to a VLAN.

Format	`vlan association mac` *`macaddr vlanid`*
Mode	VLAN database

5.4.25.1 no vlan association mac

This command removes the association of a MAC address to a VLAN.

Format	`no vlan association mac` *`macaddr`*
Mode	VLAN database

5.4.26 remote-span

This command identifies the VLAN as the RSPAN VLAN.

Default	None
Format	`remote-span`
Mode	VLAN configuration

5.4.27 show vlan

This command displays information about the configured private VLANs, including primary and secondary VLAN IDs, type (community, isolated, or primary) and the ports which belong to a private VLAN.

Format	`show vlan {`*`vlanid`*`|private-vlan [`*`type`*`]}`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Primary	Primary VLAN identifier. The range of the VLAN ID is 1 to 4093.
Secondary	Secondary VLAN identifier.
Type	Secondary VLAN type (community, isolated, or primary).
Ports	Ports which are associated with a private VLAN.
VLAN ID	The VLAN identifier (VID) associated with each VLAN. The range of the VLAN ID is 1 to 4093.
VLAN Name	A string associated with this VLAN as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always has a name of Default. This field is optional.
VLAN Type	Type of VLAN, which can be Default (VLAN ID = 1) or static (one that is configured and permanently defined), or Dynamic. A dynamic VLAN can be created by GVRP registration or during the 802.1X authentication process (DOT1X) if a RADIUS-assigned VLAN does not exist on the switch.
Interface	slot/port. It is possible to set the parameters for all ports by using the selectors on the top line.
Current	The degree of participation of this port in this VLAN. The permissible values are: • Include - This port is always a member of this VLAN. This is equivalent to registration fixed in the IEEE 802.1Q standard. • Exclude - This port is never a member of this VLAN. This is equivalent to registration forbidden in the IEEE 802.1Q standard. • Autodetect - To allow the port to be dynamically registered in this VLAN via GVRP. The port will not participate in this VLAN unless a join request is received on this port. This is equivalent to registration normal in the IEEE 802.1Q standard.
Configured	The configured degree of participation of this port in this VLAN. The permissible values are: • Include - This port is always a member of this VLAN. This is equivalent to registration fixed in the IEEE 802.1Q standard. • Exclude - This port is never a member of this VLAN. This is equivalent to registration forbidden in the IEEE 802.1Q standard. • Autodetect - To allow the port to be dynamically registered in this VLAN via GVRP. The port will not participate in this VLAN unless a join request is received on this port. This is equivalent to registration normal in the IEEE 802.1Q standard.
Tagging	The tagging behavior for this port in this VLAN. • Tagged - Transmit traffic for this VLAN as tagged frames. • Untagged - Transmit traffic for this VLAN as untagged frames.

5.4.28 show vlan internal usage

This command displays information about the VLAN ID allocation on the switch.

Format	`show vlan internal usage`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Base VLAN ID	Identifies the base VLAN ID for Internal allocation of VLANs to the routing interface.
Allocation policy	Identifies whether the system allocates VLAN IDs in ascending or descending order.

5.4.29 show vlan brief

This command displays a list of all configured VLANs.

Format	`show vlan brief`
Mode	• Privileged EXEC • User EXEC

Term	Definition
VLAN ID	There is a VLAN Identifier (vlanid) associated with each VLAN. The range of the VLAN ID is 1 to 4093.
VLAN Name	A string associated with this VLAN as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always has a name of “Default.” This field is optional.
VLAN Type	Type of VLAN, which can be Default (VLAN ID = 1) or static (one that is configured and permanently defined), or a Dynamic (one that is created by GVRP registration).

5.4.30 show vlan port

This command displays VLAN port information.

Format	`show vlan port {`*`slot/port`*`	all}`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	*slot/port* It is possible to set the parameters for all ports by using the selectors on the top line.
Port VLAN ID Configured	The VLAN ID that this port will assign to untagged frames or priority tagged frames received on this port. The value must be for an existing VLAN. The factory default is 1.
Port VLAN ID Current	The current VLAN ID that this port assigns to untagged frames or priority tagged frames received on this port. The factory default is 1.
Acceptable Frame Types	The types of frames that may be received on this port. The options are 'VLAN only' and 'Admit All'. When set to 'VLAN only', untagged frames or priority tagged frames received on this port are discarded. When set to 'Admit All', untagged frames or priority tagged frames received on this port are accepted and assigned the value of the Port VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance to the 802.1Q VLAN specification.
Ingress Filtering Configured	May be enabled or disabled. When enabled, the frame is discarded if this port is not a member of the VLAN with which this frame is associated. In a tagged frame, the VLAN is identified by the VLAN ID in the tag. In an untagged frame, the VLAN is the Port VLAN ID specified for the port that received this frame. When disabled, all frames are forwarded in accordance with the 802.1Q VLAN bridge specification. The factory default is disabled.
Ingress Filtering Current	Shows the current ingress filtering configuration.
GVRP	May be enabled or disabled.
Default Priority	The 802.1p priority assigned to tagged packets arriving on the port.
Protected Port	Specifies if this is a protected port. If False, it is not a protected port; If true, it is.
Switchport mode	The current switchport mode for the port.
Operating parameters	The operating parameters for the port, including the VLAN, name, egress rule, and type.
Static configuration	The static configuration for the port, including the VLAN, name, and egress rule.
Forbidden VLANs	The forbidden VLAN configuration for the port, including the VLAN and name.

5.4.31 show vlan association subnet

This command displays the VLAN associated with a specific configured IP-Address and net mask. If no IP address and net mask are specified, the VLAN associations of all the configured IP-subnets are displayed.

Format	`show vlan association subnet [ipaddr netmask]`
Mode	Privileged EXEC

Term	Definition
IP Address	The IP address assigned to each interface.
Net Mask	The subnet mask.
VLAN ID	There is a VLAN Identifier (VID) associated with each VLAN.

5.4.32 show vlan association mac

This command displays the VLAN associated with a specific configured MAC address. If no MAC address is specified, the VLAN associations of all the configured MAC addresses are displayed.

Format	`show vlan association mac [macaddr]`
Mode	Privileged EXEC

Term	Definition
Mac Address	A MAC address for which the switch has forwarding and or filtering information. The format is 6 or 8 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as 8 bytes.
VLAN ID	There is a VLAN Identifier (VID) associated with each VLAN.

5.5 Double VLAN Commands

This section describes the commands you use to configure double VLAN (DVLAN). Double VLAN tagging is a way to pass VLAN traffic from one customer domain to another through a Metro Core in a simple and cost effective manner. The additional tag on the traffic helps differentiate between customers in the MAN while preserving the VLAN identification of the individual customers when they enter their own IEEE 802.1Q domain.

5.5.1 dvlan-tunnel ethertype (Interface Config)

NOTICE This command is not available on all platforms.

This command configures the ethertype for the specified interface. The two-byte hex ethertype is used as the first 16 bits of the DVLAN tag. The ethertype may have the values of *`802.1Q`*, *`vman`*, or *`custom`*. If the ethertype has an optional value of *`custom`*, then it is a custom tunnel value, and ethertype must be set to a value in the range of 1 to 65535.

Default	vman
Format	`dvlan-tunnel ethertype {802.1Q	vman	custom 1-65535}`
Mode	Global Config

Parameter	Description
802.1Q	Configure the ethertype as 0x8100.
custom	Configure the value of the custom tag in the range from 1to 65535.
vman	Represents the commonly used value of 0x88A8.

5.5.1.1 no dvlan-tunnel ethertype (Interface Config)

NOTICE This command is not available on all platforms.

This command removes the ethertype value for the interface.

Format	`no dvlan-tunnel ethertype`
Mode	Global Config

5.5.2 dvlan-tunnel ethertype primary-tpid

Use this command to create a new TPID and associate it with the next available TPID register. If no TPID registers are empty, the system returns an error to the user. Specifying the optional keyword [primary–tpid] forces the TPID value to be configured as the default TPID at index 0.

Format	`dvlan-tunnel ethertype {802.1Q	vman	custom 1-65535} [primary-tpid]`
Mode	Global Config

Parameter	Description
802.1Q	Configure the ethertype as 0x8100.
custom	Configure the value of the custom tag in the range from 1 to 65535.
vman	Represents the commonly used value of 0x88A8.

5.5.2.1 no dvlan-tunnel ethertype primary–tpid

Use the `no` form of the command to reset the TPID register to 0. (At initialization, all TPID registers will be set to their default values.)

Format	`no dvlan-tunnel ethertype {802.1Q	vman	custom 1-65535} [primary-tpid]`
Mode	Global Config

5.5.3 mode dot1q-tunnel

This command is used to enable Double VLAN Tunneling on the specified interface.

Default	disabled
Format	`mode dot1q-tunnel`
Mode	Interface Config

5.5.3.1 no mode dot1q-tunnel

This command is used to disable Double VLAN Tunneling on the specified interface. By default, Double VLAN Tunneling is disabled.

Format	`no mode dot1q-tunnel`
Mode	Interface Config

5.5.4 mode dvlan-tunnel

Use this command to enable Double VLAN Tunneling on the specified interface.

NOTICE When you use the `mode dvlan-tunnel` command on an interface, it becomes a service provider port. Ports that do not have double VLAN tunneling enabled are customer ports.

Default	disabled
Format	`mode dvlan-tunnel`
Mode	Interface Config

5.5.4.1 no mode dvlan-tunnel

This command is used to disable Double VLAN Tunneling on the specified interface. By default, Double VLAN Tunneling is disabled.

Format	`no mode dvlan-tunnel`
Mode	Interface Config

5.5.5 show dot1q-tunnel

Use this command without the optional parameters to display all interfaces enabled for Double VLAN Tunneling. Use the optional parameters to display detailed information about Double VLAN Tunneling for the specified interface or all interfaces.

Format	`show dot1q-tunnel [interface {`*`slot/port`*`	all}]`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	*slot/port*
Mode	The administrative mode through which Double VLAN Tunneling can be enabled or disabled. The default value for this field is disabled.
EtherType	A 2-byte hex EtherType to be used as the first 16 bits of the DVLAN tunnel. There are three different EtherType tags. The first is 802.1Q, which represents the commonly used value of 0x8100. The second is vMAN, which represents the commonly used value of 0x88A8. If EtherType is not one of these two values, then it is a custom tunnel value, representing any value in the range of 1 to 65535.

5.5.6 show dvlan-tunnel

Use this command without the optional parameters to display all interfaces enabled for Double VLAN Tunneling. Use the optional parameters to display detailed information about Double VLAN Tunneling for the specified interface or all interfaces.

Format	`show dvlan-tunnel [interface {`*`slot/port`*`|all|lag `*`lag-intf-num`*`}]`
Mode	Privileged EXEC User EXEC

Term	Definition
Interface	*slot/port*
LAG	Instead of *slot/port,* `lag lag-intf-num can be used as an alternate way to specify the LAG interface. lag lag-intf-num can also be used to specify the LAG interface where lag-intf-num is the LAG port number.`
Mode	The administrative mode through which Double VLAN Tunneling can be enabled or disabled. The default value for this field is disabled.
EtherType	A 2-byte hex EtherType to be used as the first 16 bits of the DVLAN tunnel. There are three different EtherType tags. The first is 802.1Q, which represents the commonly used value of 0x8100. The second is vMAN, which represents the commonly used value of 0x88A8. If EtherType is not one of these two values, then it is a custom tunnel value, representing any value in the range of 1 to 65535.

Example: The following shows examples of the CLI display output for the commands.

```
(Routing) #show dvlan-tunnel

TPIDs Configured.............................. 0x88a8
Default TPID.................................. 0x88a8
Interfaces Enabled for DVLAN Tunneling........ None

(FASTPATH Routing) #

(switch)#show dvlan-tunnel interface 0/1

Interface Mode    EtherType
--------- ------- ------------
0/1       Disable 0x88a8
```

5.6 Private VLAN Commands

This section describes the commands you use for private VLANs. Private VLANs provides Layer 2 isolation between ports that share the same broadcast domain. In other words, it allows a VLAN broadcast domain to be partitioned into smaller point-to-multipoint subdomains. The ports participating in a private VLAN can be located anywhere in the Layer 2 network.

5.6.1 switchport private-vlan

This command defines a private-VLAN association for an isolated or community port or a mapping for a promiscuous port.

Format	`switchport private-vlan {host-association primary-vlan-id secondary-vlan-id | mapping primary-vlan-id {add | remove} secondary-vlan-list}`
Mode	Interface Config

Parameter	Description
host-association	Defines the VLAN association for community or host ports.
mapping	Defines the private VLAN mapping for promiscuous ports.

Parameter	Description
primary-vlan-id	Primary VLAN ID of a private VLAN.
secondary-vlan-id	Secondary (isolated or community) VLAN ID of a private VLAN.
add	Associates the secondary VLAN with the primary one.
remove	Deletes the secondary VLANs from the primary VLAN association.
secondary-vlan-list	A list of secondary VLANs to be mapped to a primary VLAN.

5.6.1.1 no switchport private-vlan

This command removes the private-VLAN association or mapping from the port.

Format `no switchport private-vlan {host-association|mapping}`

Mode Interface Config

5.6.2 switchport mode private-vlan

This command configures a port as a promiscuous or host private VLAN port. Note that the properties of each mode can be configured even when the switch is not in that mode. However, they will only be applicable once the switch is in that particular mode.

Default `general`

Format `switchport mode private-vlan {host|promiscuous}`

Mode Interface Config

Parameter	Description
host	Configures an interface as a private VLAN host port. It can be either isolated or community port depending on the secondary VLAN it is associated with.
promiscuous	Configures an interface as a private VLAN promiscuous port. The promiscuous ports are members of the primary VLAN.

5.6.2.1 no switchport mode private-vlan

This command removes the private-VLAN association or mapping from the port.

Format `no switchport mode private-vlan`

Mode Interface Config

5.6.3 private-vlan

This command configures the private VLANs and configures the association between the primary private VLAN and secondary VLANs.

Format `private-vlan {association [add|remove] secondary-vlan-list|community|isolated|primary}`

Mode VLAN Config

Parameter	Description
association	Associates the primary and secondary VLAN.
secondary-vlan-list	A list of secondary VLANs to be mapped to a primary VLAN.

Parameter	Description
community	Designates a VLAN as a community VLAN.
isolated	Designates a VLAN as the isolated VLAN.
primary	Designates a VLAN as the primary VLAN.

5.6.3.1 no private-vlan

This command restores normal VLAN configuration.

Format	`no private-vlan {association}`
Mode	VLAN Config

5.7 Switch Ports

This section describes the commands used for switch port mode.

5.7.1 switchport mode

Use this command to configure the mode of a switch port as access, trunk or general.

In Trunk mode, the port becomes a member of all VLANs on switch unless specified in the allowed list in the `switchport trunk allowed vlan` command. The PVID of the port is set to the Native VLAN as specified in the `switchport trunk native vlan` command. It means that trunk ports accept both tagged and untagged packets, where untagged packets are processed on the native VLAN and tagged packets are processed on the VLAN ID contained in the packet. MAC learning is performed on both tagged and untagged packets. Tagged packets received with a VLAN ID of which the port is not a member are discarded and MAC learning is not performed. The Trunk ports always transmit packets untagged on native VLAN.

In Access mode, the port becomes a member of only one VLAN. The port sends and receives untagged traffic. It can also receive tagged traffic.The ingress filtering is enabled on port. It means that when the VLAN ID of received packet is not identical to Access VLAN ID, the packet is discarded.

In General mode, the user can perform custom configuration of VLAN membership, PVID, tagging, ingress filtering etc. This is legacy FASTPATH behavior of switch port configuration. Legacy FASTPATH CLI commands are used to configure port in general mode.

Default	General mode
Format	`switchport mode {access | trunk | general}`
Mode	Interface Config

5.7.1.1 no switchport mode

This command resets the switch port mode to its default value.

Format	`no switchport mode`
Mode	Interface Config

5.7.2 switchport trunk allowed vlan

Use this command to configure the list of allowed VLANs that can receive and send traffic on this interface in tagged format when in trunking mode. The default is all.

The VLANs list can be modified using the add or remove options or replaced with another list using the vlan-list, all, or except options. If all is choosen, all VLANs are added to the list of allowed vlan. The except option provides an exclusion list.

Trunk ports accept tagged packets, where tagged packets are processed on the VLAN ID contained in the packet, if this VLAN is in the allowed VLAN list. Tagged packets received with a VLAN ID to which the port is not a member are discarded and MAC learning is not performed. If a VLAN is added to the system after a port is set to the Trunk mode and it is in the allowed VLAN list, this VLAN is assigned to this port automatically.

Default	All
Format	`switchport trunk allowed vlan {`*`vlan-list`*`	all	{add `*`vlan-list`*`}	{remove `*`vlan-list`*`}	{except `*`vlan-list`*` }}`
Mode	Interface Config

Parameter	Description
all	Specifies all VLANs from 1 to 4093. This keyword is not allowed on commands that do not permit all VLANs in the list to be set at the same time.
add	Adds the defined list of VLANs to those currently set instead of replacing the list.
remove	Removes the defined list of VLANs from those currently set instead of replacing the list. Valid IDs are from 1 to 4093; extended-range VLAN IDs of the form X-Y or X,Y,Z are valid in this command.
except	Lists the VLANs that should be calculated by inverting the defined list of VLANs. (VLANs are added except the ones specified.)
vlan-list	Either a single VLAN number from 1 to 4093 or a continuous range of VLANs described by two VLAN numbers, the lesser one first, separated by a hyphen.

5.7.2.1 no switchport trunk allowed vlan

This command resets the list of allowed VLANs on the trunk port to its default value.

Format	`no switchport trunk allowed vlan`
Mode	Interface Config

5.7.3 switchport trunk native vlan

Use this command to configure the Trunk port Native VLAN (PVID) parameter. Any ingress untagged packets on the port are tagged with the value of Native VLAN. Native VLAN must be in the allowed VLAN list for tagging of received untagged packets. Otherwise, untagged packets are discarded. Packets marked with Native VLAN are transmitted untagged from Trunk port. The default is 1.

Default	1 (Default VLAN)
Format	`switchport trunk native vlan `*`vlan-id`*
Mode	Interface Config

5.7.3.1 no switchport trunk native vlan

Use this command to reset the switch port trunk mode native VLAN to its default value.

Format	`no switchport trunk native vlan`
Mode	Interface Config

5.7.4 switchport access vlan

Use this command to configure the VLAN on the Access port. Only one VLAN can be assigned to the Access port. Access ports are members of VLAN 1 by default. Access ports may be assigned to a VLAN other than VLAN 1. Removing the Access VLAN on the switch makes the Access port a member of VLAN 1. Configuring an Access port to be a member of a VLAN that does not exist results in an error and does not change the configuration.

Default	1 (Default VLAN)
Format	`switchport access vlan` *`vlan-id`*
Mode	Interface Config

5.7.4.1 no switchport access vlan

This command resets the switch port access mode VALN to its default value.

Format	`no switchport access vlan`
Mode	Interface Config

5.7.5 show interfaces switchport

Use this command to display the switchport status for all interfaces or a specified interface.

Format	`show interfaces switchport` *`slot/port`*
Mode	Privileged EXEC

Example:

```
(Routing) #show interfaces switchport 0/1

Port: 0/1
VLAN Membership Mode: General
Access Mode VLAN: 1 (default)
General Mode PVID: 1 (default)
General Mode Ingress Filtering: Disabled
General Mode Acceptable Frame Type: Admit all
General Mode Dynamically Added VLANs:
General Mode Untagged VLANs: 1
General Mode Tagged VLANs:
General Mode Forbidden VLANs:
Trunking Mode Native VLAN: 1 (default)
Trunking Mode Native VLAN tagging: Disable
Trunking Mode VLANs Enabled: All
Protected Port: False


(Routing) #show interfaces switchport

Port: 0/1
VLAN Membership Mode: General
Access Mode VLAN: 1 (default)
General Mode PVID: 1 (default)
General Mode Ingress Filtering: Disabled
General Mode Acceptable Frame Type: Admit all
General Mode Dynamically Added VLANs:
General Mode Untagged VLANs: 1
General Mode Tagged VLANs:
General Mode Forbidden VLANs:
Trunking Mode Native VLAN: 1 (default)
Trunking Mode Native VLAN tagging: Disable
Trunking Mode VLANs Enabled: All
Protected Port: False
```

5.7.6 show interfaces switchport

Use this command to display the Switchport configuration for a selected mode per interface. If the interface is not specified, the configuration for all interfaces is displayed.

Format	`show interfaces switchport {access	trunk	general} [`*`slot/port`*`]`
Mode	Privileged EXEC

Example:

```
Switching) # show interfaces switchport access 0/1

Intf      PVID
--------- ----
0/1        1


(Switching) # show interfaces switchport trunk 0/6

Intf      PVID  Allowed Vlans List
--------- ----- -------------------
0/6       1     All


(Switching) # show interfaces switchport general 0/5

Intf      PVID  Ingress     Acceptable  Untagged  Tagged   Forbidden  Dynamic
                Filtering   Frame Type  Vlans     Vlans    Vlans     Vlans
--------- ----- ---------- ----------  --------- --------- --------- ---------
0/5       1     Enabled    Admit All   7         10-50,55  9,100-200 88,96



(Switching) # show interfaces switchport general

Intf      PVID  Ingress     Acceptable  Untagged  Tagged   Forbidden  Dynamic
                Filtering   Frame Type  Vlans     Vlans    Vlans     Vlans
--------- ----- ---------- ----------  --------- --------- --------- ---------
0/1       1     Enabled    Admit All   1,4-7     30-40,55  3,100-200 88,96
0/2      1     Disabled   Admit All   1         30-40,55  none      none
..
```

5.8 Voice VLAN Commands

This section describes the commands you use for Voice VLAN. Voice VLAN enables switch ports to carry voice traffic with defined priority so as to enable separation of voice and data traffic coming onto the port. The benefits of using Voice VLAN is to ensure that the sound quality of an IP phone could be safeguarded from deteriorating when the data traffic on the port is high.

Also the inherent isolation provided by VLANs ensures that inter-VLAN traffic is under management control and that network- attached clients cannot initiate a direct attack on voice components. QoS-based on IEEE 802.1P class of service (CoS) uses classification and scheduling to sent network traffic from the switch in a predictable manner. The system uses the source MAC of the traffic traveling through the port to identify the IP phone data flow.

5.8.1 voice vlan (Global Config)

Use this command to enable the Voice VLAN capability on the switch.

Default	disabled
Format	`voice vlan`
Mode	Global Config

5.8.1.1 no voice vlan (Global Config)

Use this command to disable the Voice VLAN capability on the switch.

Format	`no voice vlan`
Mode	Global Config

5.8.2 voice vlan (Interface Config)

Use this command to enable the Voice VLAN capability on the interface or range of interfaces.

Default	disabled
Format	`voice vlan {vlanid` *`id`* `| dot1p` ***`priority`*** `| none	untagged}`
Mode	Interface Config

You can configure Voice VLAN in one of four different ways:

Parameter	Description
vlan-id	Configure the IP phone to forward all voice traffic through the specified VLAN. Valid VLAN ID's are from 1 to 4093 (the max supported by the platform).
dot1p	Configure the IP phone to use 802.1p priority tagging for voice traffic and to use the default native VLAN (VLAN 0) to carry all traffic. Valid ***`priority`*** range is 0 to 7.
none	Allow the IP phone to use its own configuration to send untagged voice traffic.
untagged	Configure the phone to send untagged voice traffic.

5.8.2.1 no voice vlan (Interface Config)

Use this command to disable the Voice VLAN capability on the interface.

Format	`no voice vlan`
Mode	Interface Config

5.8.3 voice vlan data priority

Use this command to either trust or untrust the data traffic arriving on the Voice VLAN interface or range of interfaces being configured.

Default	trust
Format	`voice vlan data priority {untrust	trust}`
Mode	Interface Config

5.8.4 show voice vlan

Format	`show voice vlan [interface {slot/port	all}]`
Mode	Privileged EXEC

When the `interface` parameter is not specified, only the global mode of the Voice VLAN is displayed.

Term	Definition
Administrative Mode	The Global Voice VLAN mode.

When the `interface` is specified:

Term	Definition
Voice VLAN Mode	The admin mode of the Voice VLAN on the interface.
Voice VLAN ID	The Voice VLAN ID
Voice VLAN Priority	The do1p priority for the Voice VLAN on the port.
Voice VLAN Untagged	The tagging option for the Voice VLAN traffic.
Voice VLAN CoS Override	The Override option for the voice traffic arriving on the port.
Voice VLAN Status	The operational status of Voice VLAN on the port.

5.9 Provisioning (IEEE 802.1p) Commands

This section describes the commands you use to configure provisioning (IEEE 802.1p,) which allows you to prioritize ports.

5.9.1 vlan port priority all

This command configures the port priority assigned for untagged packets for all ports presently plugged into the device. The range for the priority is 0-7. Any subsequent per port configuration will override this configuration setting.

Format	`vlan port priority all` *`priority`*
Mode	Global Config

5.9.2 vlan priority

This command configures the default 802.1p port priority assigned for untagged packets for a specific interface. The range for the priority is 0–7.

Default	0
Format	`vlan priority` *`priority`*
Mode	Interface Config

5.10 Asymmetric Flow Control

NOTICE Asymmetric Flow Control can only be configured globally for all ports on XGS4 silicon-based switches.

NOTICE Asymmetric Flow Control is not supported on Fast Ethernet platforms.

NOTICE If Asymmetric Flow Control is not supported on the platform, then only symmetric, or no flow control, modes are configurable.

When in asymmetric flow control mode, the switch responds to PAUSE frames received from a peer by stopping packet transmission, but the switch does not initiate MAC control PAUSE frames.

When you configure the switch in asymmetric flow control (or no flow control mode), the device is placed in egress drop mode. Egress drop mode maximizes the throughput of the system at the expense of packet loss in a heavily congested system, and this mode avoids head-of-line blocking.

5.10.1 flowcontrol {symmetric|asymmetric}

NOTICE The flowcontrol {symmetric|asymmetric} command is available if the platform supports the asymmetric flow control feature.

Use this command to enable or disable the symmetric or asymmetric flow control on the switch. Asymmetric here means that Tx Pause can never be enabled. Only Rx Pause can be enabled.

Default	Flow control is disabled.
Format	`flowcontrol {symmetric|asymmetric}`
Mode	Global Config

5.10.1.1 no flowcontrol {symmetric|asymmetric}

Use the no form of this command to disable symmetric or asymmetric flow control.

Format	`no flowcontrol {symmetric|asymmetric}`
Mode	Global Config

5.10.2 flowcontrol

NOTICE This flowcontrol command is available if the platform supports only the symmetric flow control feature.

Use this command to enable or disable the symmetric flow control on the switch.

Default	Flow control is disabled.
Format	`flowcontrol`
Mode	Global Config

5.10.2.1 no flowcontrol

Use the no form of this command to disable the symmetric flow control.

Format	`no flowcontrol`
Mode	Global Config

5.10.3 show flowcontrol

Use this command to display the IEEE 802.3 Annex 31B flow control settings and status for a specific interface or all interfaces. The command also displays 802.3 Tx and Rx pause counts. Priority Flow Control frames counts are not displayed. If the port is enabled for priority flow control, operational flow control status is displayed as Inactive. Operational flow control status for stacking ports is always displayed as N/A.

Format	`show flowcontrol [`*`slot/port`*`]`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching)#show flowcontrol

Admin Flow Control: Symmetric

Port    Flow Control    RxPause    TxPause
        Oper
------  ------------    --------   ---------
0/1     Active          310        611

0/2     Inactive        0           0
```

Example: The following shows example CLI display output for the command.

```
(Switching)#show flowcontrol interface 0/1

Admin Flow Control: Symmetric

Port         Flow Control  RxPause      TxPause
             Oper
---------    -------       --------     -------
0/1          Active        310          611
```

5.11 Protected Ports Commands

This section describes commands you use to configure and view protected ports on a switch. Protected ports do not forward traffic to each other, even if they are on the same VLAN. However, protected ports can forward traffic to all unprotected ports in their group. Unprotected ports can forward traffic to both protected and unprotected ports. Ports are unprotected by default.

If an interface is configured as a protected port, and you add that interface to a Port Channel or Link Aggregation Group (LAG), the protected port status becomes operationally disabled on the interface, and the interface follows the configuration of the LAG port. However, the protected port configuration for the interface remains unchanged. Once the interface is no longer a member of a LAG, the current configuration for that interface automatically becomes effective.

5.11.1 switchport protected (Global Config)

Use this command to create a protected port group. The ***groupid*** parameter identifies the set of protected ports. Use the `name` ***name*** pair to assign a name to the protected port group. The name can be up to 32 alphanumeric characters long, including blanks. The default is blank.

NOTICE Port protection occurs within a single switch. Protected port configuration does not affect traffic between ports on two different switches. No traffic forwarding is possible between two protected ports.

Default	unprotected
Format	`switchport protected` *groupid* `name` *name*
Mode	Global Config

5.11.1.1 no switchport protected (Global Config)

Use this command to remove a protected port group. The ***groupid*** parameter identifies the set of protected ports. The `name` keyword specifies the name to remove from the group.

Format	`no switchport protected` *groupid* `name`
Mode	Global Config

5.11.2 switchport protected (Interface Config)

Use this command to add an interface to a protected port group. The ***groupid*** parameter identifies the set of protected ports to which this interface is assigned. You can only configure an interface as protected in one group.

NOTICE	Port protection occurs within a single switch. Protected port configuration does not affect traffic between ports on two different switches. No traffic forwarding is possible between two protected ports.

Default	unprotected
Format	`switchport protected` *`groupid`*
Mode	Interface Config

5.11.2.1 no switchport protected (Interface Config)

Use this command to configure a port as unprotected. The ***groupid*** parameter identifies the set of protected ports to which this interface is assigned.

Format	`no switchport protected` *`groupid`*
Mode	Interface Config

5.11.3 show switchport protected

This command displays the status of all the interfaces, including protected and unprotected interfaces.

Format	`show switchport protected` *`groupid`*
Mode	• Privileged EXEC • User EXEC

Term	Definition
Group ID	The number that identifies the protected port group.
Name	An optional name of the protected port group. The name can be up to 32 alphanumeric characters long, including blanks. The default is blank.
List of Physical Ports	List of ports, which are configured as protected for the group identified with *groupid*. If no port is configured as protected for this group, this field is blank.

5.11.4 show interfaces switchport

This command displays the status of the interface (protected/unprotected) under the groupid.

Format	`show interfaces switchport` *`slot/port groupid`*
Mode	• Privileged EXEC • User EXEC

Term	Definition
Name	A string associated with this group as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. This field is optional.
Protected	Indicates whether the interface is protected or not. It shows TRUE or FALSE. If the group is a multiple groups then it shows TRUE in Group ***groupid*.**

5.12 GARP Commands

This section describes the commands you use to configure Generic Attribute Registration Protocol (GARP) and view GARP status. The commands in this section affect both GARP VLAN Registration Protocol (GVRP) and GARP Multicast Registration Protocol (GMRP). GARP is a protocol that allows client stations to register with the switch for membership in VLANS (by using GVMP) or multicast groups (by using GVMP).

5.12.1 set garp timer join

This command sets the GVRP join time per GARP for one interface, a range of interfaces, or all interfaces. Join time is the interval between the transmission of GARP Protocol Data Units (PDUs) registering (or reregistering) membership for a VLAN or multicast group. This command has an effect only when GVRP is enabled. The time is from 10 to 100 (centiseconds). The value 20 centiseconds is 0.2 seconds.

Default 20

Format `set garp timer join` *`10-100`*

Mode
- Interface Config
- Global Config

5.12.1.1 no set garp timer join

This command sets the GVRP join time to the default and only has an effect when GVRP is enabled.

Format `no set garp timer join`

Mode
- Interface Config
- Global Config

5.12.2 set garp timer leave

This command sets the GVRP leave time for one interface, a range of interfaces, or all interfaces or all ports and only has an effect when GVRP is enabled. Leave time is the time to wait after receiving an unregister request for a VLAN or a multicast group before deleting the VLAN entry. This can be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. The leave time is 20 to 600 (centiseconds). The value 60 centiseconds is 0.6 seconds. The leave time must be greater than or equal to three times the join time.

Default 60

Format `set garp timer leave` *`20-600`*

Mode
- Interface Config
- Global Config

5.12.2.1 no set garp timer leave

This command sets the GVRP leave time on all ports or a single port to the default and only has an effect when GVRP is enabled.

Format	`no set garp timer leave`
Mode	• Interface Config • Global Config

5.12.3 set garp timer leaveall

This command sets how frequently Leave All PDUs are generated. A Leave All PDU indicates that all registrations will be unregistered. Participants would need to rejoin in order to maintain registration. The value applies per port and per GARP participation. The time may range from 200 to 6000 (centiseconds). The value 1000 centiseconds is 10 seconds. You can use this command on all ports (Global Config mode), or on a single port or a range of ports (Interface Config mode) and it only has an effect only when GVRP is enabled. The leave all time must be greater than the leave time.

Default	1000
Format	`set garp timer leaveall` *`200-6000`*
Mode	• Interface Config • Global Config

5.12.3.1 no set garp timer leaveall

This command sets how frequently Leave All PDUs are generated the default and only has an effect when GVRP is enabled.

Format	`no set garp timer leaveall`
Mode	• Interface Config • Global Config

5.12.4 show garp

This command displays GARP information.

Format	`show garp`
Mode	• Privileged EXEC • User EXEC

Term	Definition
GMRP Admin Mode	The administrative mode of GARP Multicast Registration Protocol (GMRP) for the system.
GVRP Admin Mode	The administrative mode of GARP VLAN Registration Protocol (GVRP) for the system.

5.13 GVRP Commands

This section describes the commands you use to configure and view GARP VLAN Registration Protocol (GVRP) information. GVRP-enabled switches exchange VLAN configuration information, which allows GVRP to provide dynamic VLAN creation on trunk ports and automatic VLAN pruning.

NOTICE If GVRP is disabled, the system does not forward GVRP messages.

5.13.1 set gvrp adminmode

This command enables GVRP on the system.

Default	disabled
Format	`set gvrp adminmode`
Mode	Privileged EXEC

5.13.1.1 no set gvrp adminmode

This command disables GVRP.

Format	`no set gvrp adminmode`
Mode	Privileged EXEC

5.13.2 set gvrp interfacemode

This command enables GVRP on a single port (Interface Config mode), a range of ports (Interface Range mode), or all ports (Global Config mode).

Default	disabled
Format	`set gvrp interfacemode`
Mode	• Interface Config • Interface Range • Global Config

5.13.2.1 no set gvrp interfacemode

This command disables GVRP on a single port (Interface Config mode) or all ports (Global Config mode). If GVRP is disabled, Join Time, Leave Time and Leave All Time have no effect.

Format	`no set gvrp interfacemode`
Mode	• Interface Config • Global Config

5.13.3 show gvrp configuration

This command displays Generic Attributes Registration Protocol (GARP) information for one or all interfaces.

Format	`show gvrp configuration {`*`slot/port`*`	all}`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	*slot/port*
Join Timer	The interval between the transmission of GARP PDUs registering (or reregistering) membership for an attribute. Current attributes are a VLAN or multicast group. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 10 to 100 centiseconds (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). The finest granularity of specification is one centisecond (0.01 seconds).

Term	Definition
Leave Timer	The period of time to wait after receiving an unregister request for an attribute before deleting the attribute. Current attributes are a VLAN or multicast group. This may be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 20 to 600 centiseconds (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds).
LeaveAll Timer	This Leave All Time controls how frequently LeaveAll PDUs are generated. A LeaveAll PDU indicates that all registrations will shortly be deregistered. Participants will need to rejoin in order to maintain registration. There is an instance of this timer on a per-Port, per-GARP participant basis. The Leave All Period Timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. Permissible values are 200 to 6000 centiseconds (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds).
Port GMRP Mode	The GMRP administrative mode for the port, which is enabled or disabled (default). If this parameter is disabled, Join Time, Leave Time and Leave All Time have no effect.

5.14 GMRP Commands

This section describes the commands you use to configure and view GARP Multicast Registration Protocol (GMRP) information. Like IGMP snooping, GMRP helps control the flooding of multicast packets.GMRP-enabled switches dynamically register and de-register group membership information with the MAC networking devices attached to the same segment. GMRP also allows group membership information to propagate across all networking devices in the bridged LAN that support Extended Filtering Services.

NOTICE If GMRP is disabled, the system does not forward GMRP messages.

5.14.1 set gmrp adminmode

This command enables GARP Multicast Registration Protocol (GMRP) on the system.

Default	disabled
Format	`set gmrp adminmode`
Mode	Privileged EXEC

5.14.1.1 no set gmrp adminmode

This command disables GARP Multicast Registration Protocol (GMRP) on the system.

Format	`no set gmrp adminmode`
Mode	Privileged EXEC

5.14.2 set gmrp interfacemode

This command enables GARP Multicast Registration Protocol on a single interface (Interface Config mode), a range of interfaces, or all interfaces (Global Config mode). If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality is disabled on that interface. GARP functionality is subsequently re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Default	disabled
Format	`set gmrp interfacemode`
Mode	• Interface Config • Global Config

5.14.2.1 no set gmrp interfacemode

This command disables GARP Multicast Registration Protocol on a single interface or all interfaces. If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality is disabled. GARP functionality is subsequently re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Format `no set gmrp interfacemode`

Mode
- Interface Config
- Global Config

5.14.3 show gmrp configuration

This command displays Generic Attributes Registration Protocol (GARP) information for one or all interfaces.

Format `show gmrp configuration {`*`slot/port`*` | all}`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
Interface	The *slot/port* of the interface that this row in the table describes.
Join Timer	The interval between the transmission of GARP PDUs registering (or reregistering) membership for an attribute. Current attributes are a VLAN or multicast group. There is an instance of this timer on a per-port, per-GARP participant basis. Permissible values are 10 to 100 centiseconds (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
Leave Timer	The period of time to wait after receiving an unregister request for an attribute before deleting the attribute. Current attributes are a VLAN or multicast group. This may be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 20 to 600 centiseconds (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds).
LeaveAll Timer	This Leave All Time controls how frequently LeaveAll PDUs are generated. A LeaveAll PDU indicates that all registrations will shortly be deregistered. Participants will need to rejoin in order to maintain registration. There is an instance of this timer on a per-Port, per-GARP participant basis. The Leave All Period Timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. Permissible values are 200 to 6000 centiseconds (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds).
Port GMRP Mode	The GMRP administrative mode for the port. It may be enabled or disabled. If this parameter is disabled, Join Time, Leave Time and Leave All Time have no effect.

5.14.4 show mac-address-table gmrp

This command displays the GMRP entries in the Multicast Forwarding Database (MFDB) table.

Format `show mac-address-table gmrp`

Mode Privileged EXEC

Term	Definition
VLAN ID	The VLAN in which the MAC Address is learned.
MAC Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Type	The type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.

Term	Definition
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

5.15 Port-Based Network Access Control Commands

This section describes the commands you use to configure port-based network access control (IEEE 802.1X). Port-based network access control allows you to permit access to network services only to and devices that are authorized and authenticated.

5.15.1 aaa authentication dot1x default

Use this command to configure the authentication method for port-based access to the switch. The additional methods of authentication are used only if the previous method returns an error, not if there is an authentication failure. The possible methods are as follows:

- ias. Uses the internal authentication server users database for authentication. This method can be used in conjunction with any one of the existing methods like local, radius, etc.
- local. Uses the local username database for authentication.
- none. Uses no authentication.
- radius. Uses the list of all RADIUS servers for authentication.

Format	`aaa authentication dot1x default {[ias]|[`*`method1 [method2 [method3]]]}`*
Mode	Global Config

Example: The following is an example of the command.

```
(FASTPATH Routing) #
(FASTPATH Routing) #configure
(FASTPATH Routing) (Config)#aaa authentication dot1x default ias none
(FASTPATH Routing) (Config)#aaa authentication dot1x default ias local radius none
```

5.15.2 clear dot1x statistics

This command resets the 802.1X statistics for the specified port or for all ports.

Format	`clear dot1x statistics {`*`slot/port`*`	all}`
Mode	Privileged EXEC

5.15.3 clear dot1x authentication-history

This command clears the authentication history table captured during successful and unsuccessful authentication on all interface or the specified interface.

Format	`clear dot1x authentication-history [`*`slot/port`*`]`
Mode	Privileged EXEC

5.15.4 clear radius statistics

This command is used to clear all RADIUS statistics.

Format	`clear radius statistics`
Mode	Privileged EXEC

5.15.5 dot1x eapolflood

Use this command to enable EAPOL flood support on the switch.

Default	disabled
Format	`dot1x eapolflood`
Mode	Global Config

5.15.5.1 no dot1x eapolflood

This command disables EAPOL flooding on the switch.

Format	`no dot1x eapolflood`
Mode	Global Config

5.15.6 dot1x dynamic-vlan enable

Use this command to enable the switch to create VLANs dynamically when a RADIUS-assigned VLAN does not exist in the switch.

Default	Disabled
Format	`dot1x dynamic-vlan enable`
Mode	Global Config

5.15.6.1 no dot1x dynamic-vlan enable

Use this command to prevent the switch from creating VLANs when a RADIUS-assigned VLAN does not exist in the switch.

Format	`no dot1x dynamic-vlan enable`
Mode	Global Config

5.15.7 dot1x guest-vlan

This command configures VLAN as guest vlan on an interface or a range of interfaces. The command specifies an active VLAN as an IEEE 802.1X guest VLAN. The range is 1 to the maximum VLAN ID supported by the platform.

Default	disabled
Format	`dot1x guest-vlan` *`vlan-id`*
Mode	Interface Config

5.15.7.1 no dot1x guest-vlan

This command disables Guest VLAN on the interface.

Default	disabled
Format	`no dot1x guest-vlan`
Mode	Interface Config

5.15.8 dot1x initialize

This command begins the initialization sequence on the specified port. This command is only valid if the control mode for the specified port is auto or mac-based. If the control mode is not auto or mac-based, an error will be returned.

Format	`dot1x initialize` *`slot/port`*
Mode	Privileged EXEC

5.15.9 dot1x max-req

This command sets the maximum number of times the authenticator state machine on an interface or range of interfaces will transmit an EAPOL EAP Request/Identity frame before timing out the supplicant. The ***count*** value must be in the range 1 - 10.

Default	2
Format	`dot1x max-req` *`count`*
Mode	Interface Config

5.15.9.1 no dot1x max-req

This command sets the maximum number of times the authenticator state machine on this port will transmit an EAPOL EAP Request/Identity frame before timing out the supplicant.

Format	`no dot1x max-req`
Mode	Interface Config

5.15.10 dot1x max-users

Use this command to set the maximum number of clients supported on an interface or range of interfaces when MAC-based dot1x authentication is enabled on the port. The maximum users supported per port is dependent on the product. The ***count*** value is in the range 1 - 48.

Default	48
Format	`dot1x max-users` *`count`*
Mode	Interface Config

5.15.10.1 no dot1x max-users

This command resets the maximum number of clients allowed per port to its default value.

Format	`no dot1x max-users`
Mode	Interface Config

5.15.11 dot1x port-control

This command sets the authentication mode to use on the specified interface or range of interfaces. Use the `force-unauthorized` parameter to specify that the authenticator PAE unconditionally sets the controlled port to unauthorized. Use the `force-authorized` parameter to specify that the authenticator PAE unconditionally sets the controlled port to authorized. Use the `auto` parameter to specify that the authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator and the authentication server. If the `mac-based` option is specified, then MAC-based dot1x authentication is enabled on the port.

NOTICE MAC-based dot1x authentication is supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Default auto

Format `dot1x port-control {force-unauthorized | force-authorized | auto | mac-based}`

Mode Interface Config

5.15.11.1 no dot1x port-control

This command sets the 802.1X port control mode on the specified port to the default value.

Format `no dot1x port-control`

Mode Interface Config

5.15.12 dot1x port-control all

This command sets the authentication mode to use on all ports. Select `force-unauthorized` to specify that the authenticator PAE unconditionally sets the controlled port to unauthorized. Select `force-authorized` to specify that the authenticator PAE unconditionally sets the controlled port to authorized. Select `auto` to specify that the authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator and the authentication server. If the `mac-based` option is specified, then MAC-based dot1x authentication is enabled on the port.

NOTICE MAC-based dot1x authentication is supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Default auto

Format `dot1x port-control all {force-unauthorized | force-authorized | auto | mac-based}`

Mode Global Config

5.15.12.1 no dot1x port-control all

This command sets the authentication mode on all ports to the default value.

Format `no dot1x port-control all`

Mode Global Config

5.15.13 dot1x mac-auth-bypass

If the 802.1X mode on the interface is mac-based, you can optionally use this command to enable MAC Authentication Bypass (MAB) on an interface. MAB is a supplemental authentication mechanism that allows 802.1X unaware clients – such as printers, fax machines, and some IP phones — to authenticate to the network using the client MAC address as an identifier.

Default	disabled
Format	`dot1x mac-auth-bypass`
Mode	Interface Config

5.15.13.1 no dot1x mac-auth-bypass

This command sets the MAB mode on the ports to the default value.

Format	`no dot1x mac-auth-bypass`
Mode	Interface Config

5.15.14 dot1x re-authenticate

This command begins the reauthentication sequence on the specified port. This command is only valid if the control mode for the specified port is auto or mac-based. If the control mode is not auto or mac-based, an error will be returned.

NOTICE MAC-based dot1x authentication is supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Format	`dot1x re-authenticate` *`slot/port`*
Mode	Privileged EXEC

5.15.15 dot1x re-authentication

This command enables reauthentication of the supplicant for the specified interface or range of interfaces.

Default	disabled
Format	`dot1x re-authentication`
Mode	Interface Config

5.15.15.1 no dot1x re-authentication

This command disables reauthentication of the supplicant for the specified port.

Format	`no dot1x re-authentication`
Mode	Interface Config

5.15.16 dot1x system-auth-control

Use this command to enable the dot1x authentication support on the switch. While disabled, the dot1x configuration is retained and can be changed, but is not activated.

Default	disabled
Format	`dot1x system-auth-control`
Mode	Global Config

5.15.16.1 no dot1x system-auth-control

This command is used to disable the dot1x authentication support on the switch.

Format	`no dot1x system-auth-control`
Mode	Global Config

5.15.17 dot1x system-auth-control monitor

Use this command to enable the 802.1X monitor mode on the switch. The purpose of Monitor mode is to help troubleshoot port-based authentication configuration issues without disrupting network access for hosts connected to the switch. In Monitor mode, a host is granted network access to an 802.1X-enabled port even if it fails the authentication process. The results of the process are logged for diagnostic purposes.

Default	disabled
Format	`dot1x system-auth-control monitor`
Mode	Global Config

5.15.17.1 no dot1x system-auth-control monitor

This command disables the 802.1X Monitor mode on the switch.

Format	`no dot1x system-auth-control monitor`
Mode	Global Config

5.15.18 dot1x timeout

This command sets the value, in seconds, of the timer used by the authenticator state machine on an interface or range of interfaces. Depending on the token used and the value (in seconds) passed, various timeout configurable parameters are set. The following tokens are supported:

Tokens	Definition
guest-vlan-period	The time, in seconds, for which the authenticator waits to see if any EAPOL packets are received on a port before authorizing the port and placing the port in the guest vlan (if configured). The guest vlan timer is only relevant when guest vlan has been configured on that specific port.
reauth-period	The value, in seconds, of the timer used by the authenticator state machine on this port to determine when reauthentication of the supplicant takes place. The reauth-period must be a value in the range 1 - 65535.
quiet-period	The value, in seconds, of the timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. The quiet-period must be a value in the range 0 - 65535.
tx-period	The value, in seconds, of the timer used by the authenticator state machine on this port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant. The quiet-period must be a value in the range 1 - 65535.
supp-timeout	The value, in seconds, of the timer used by the authenticator state machine on this port to timeout the supplicant. The supp-timeout must be a value in the range 1 - 65535.
server-timeout	The value, in seconds, of the timer used by the authenticator state machine on this port to timeout the authentication server. The supp-timeout must be a value in the range 1 - 65535.

Default
- guest-vlan-period: 90 seconds
- reauth-period: 3600 seconds
- quiet-period: 60 seconds
- tx-period: 30 seconds
- supp-timeout: 30 seconds
- server-timeout: 30 seconds

Format
```
dot1x timeout {{guest-vlan-period seconds} |{reauth-period seconds} | {quiet-period
seconds} | {tx-period seconds} | {supp-timeout seconds} | {server-timeout seconds}}
```

Mode Interface Config

5.15.18.1 no dot1x timeout

This command sets the value, in seconds, of the timer used by the authenticator state machine on this port to the default values. Depending on the token used, the corresponding default values are set.

Format
```
no dot1x timeout {guest-vlan-period | reauth-period | quiet-period | tx-period | supp-
timeout | server-timeout}
```

Mode Interface Config

5.15.19 dot1x unauthenticated-vlan

Use this command to configure the unauthenticated VLAN associated with the specified interface or range of interfaces. The unauthenticated VLAN ID can be a valid VLAN ID from 0-Maximum supported VLAN ID (4093 for FASTPATH). The unauthenticated VLAN must be statically configured in the VLAN database to be operational. By default, the unauthenticated VLAN is 0, i.e. invalid and not operational.

Default 0

Format
```
dot1x unauthenticated-vlan vlan id
```

Mode Interface Config

5.15.19.1 no dot1x unauthenticated-vlan

This command resets the unauthenticated-vlan associated with the port to its default value.

Format
```
no dot1x unauthenticated-vlan
```

Mode Interface Config

5.15.20 dot1x user

This command adds the specified user to the list of users with access to the specified port or all ports. The ***user*** parameter must be a configured user.

Format
```
dot1x user user {slot/port | all}
```

Mode Global Config

5.15.20.1 no dot1x user

This command removes the user from the list of users with access to the specified port or all ports.

Format
```
no dot1x user user {slot/port | all}
```

Mode Global Config

5.15.21 authentication enable

This command globally enables the Authentication Manager. Interface configuration takes effect only if the Authentication Manager is enabled with this command.

Default disabled

Format `authentication enable`

Mode Global Config

5.15.21.1 no authentication enable

This command disables the Authentication Manager.

Format `no authentication enable`

Mode Global Config

5.15.22 authentication order

This command sets the order of authentication methods used on a port. The available authentication methods are Dot1x, MAB, and captive portal. Ordering sets the order of methods that the switch attempts when trying to authenticate a new device connected to a port. If one method is unsuccessful or timed out, the next method is attempted.

Each method can only be entered once. Ordering is only possible between 802.1x and MAB. Captive portal can be configured either as a stand-alone method or as the last method in the order.

Format `authentication order {dot1x [mab [captive-portal]  | captive-portal] | mab [dot1x [captive-portal]| captive-portal] | captive-portal}`

Mode Interface Config

5.15.22.1 no authentication order

This command returns the port to the default authentication order.

Format `no authentication order`

Mode Interface Config

5.15.23 authentication priority

This command sets the priority for the authentication methods used on a port. The available authentication methods are Dot1x, MAB, and captive portal. The authentication priority decides if a previously authenticated client is reauthenticated with a higher-priority method when the same is received. Captive portal is always the last method in the list.

Default `authentication order dot1x mab captive portal`

Format `authentication priority {dot1x [mab [captive portal]  | captive portal] | mab [dot1x [captive portal]| captive portal] | captive portal}`

Mode Interface Config

5.15.23.1 no authentication priority

This command returns the port to the default order of priority for the authentication methods.

Format `no authentication priority`

Mode Interface Config

5.15.24 authentication timer restart

This command sets the time, in seconds, after which reauthentication starts. (The default time is 300 seconds.) The timer restarts the authentication only after all the authentication methods fail. At the expiration of this timer, authentication is reinitiated for the port.

Format	`authentication timer restart` *<300-65535>*
Mode	Interface Config

5.15.24.1 no authentication timer restart

This command sets the reauthentication value to the default value of 3600 seconds.

Format	`no authentication timer restart`
Mode	Interface Config

5.15.25 show authentication authentication-history

Use this command to display information about the authentication history for a specified interface.

Format	`show authentication authentication-history` *slot/port*
Mode	Privileged EXEC

Term	Definition
Time Stamp	The time of the authentication.
Interface	The interface.
MAC-Address	The MAC address for the interface.
Auth Status Method	The authentication method and status for the interface.

Example: The following information is shown for the interface.

```
Time Stamp            Interface MAC-Address     Auth Status  Method
--------------------- --------- ----------------- ------ ------------
Jul 21 1919 15:06:15  0/1       00:00:00:00:00:01 Authorized  802.1X
```

5.15.26 show authentication interface

Use this command to display authentication method information either for all interfaces or a specified port.

Format	`show authentication interface {all	` *slot/port* `}`
Mode	Privileged EXEC

The following information is displayed for each interface.

Term	Definition
Interface	The interface for which authentication configuration information is being displayed.
Authentication Restart timer	The time, in seconds, after which reauthentication starts.
Configured method order	The order of authentication methods used on a port.
Enabled method order	The order of authentication methods used on a port.
Configured method priority	The priority for the authentication methods used on a port.
Enabled method priority	The priority for the authentication methods used on a port.

Term	Definition
Number of authenticated clients	The number of authenticated clients.
Logical Interface	The logical interface
Client MAC addr	The MAC address for the client.
Authenticated Method	The current authentication method.
Auth State	If the authentication was successful.
Auth Status	The current authentication status.

Example: The following example displays the authentication interface information for all interfaces.

```
(switch) #show authentication interface all

Interface...................................... 0/1
Authentication Restart timer................... 300
Configured method order........................ dot1x mab captive-portal
Enabled method order........................... dot1x mab undefined
Configured method priority..................... undefined undefined undefined
Enabled method priority........................ undefined undefined undefined
Number of authenticated clients................ 0
Interface...................................... 0/2
Authentication Restart timer................... 300
Configured method order........................ dot1x mab captive-portal
Enabled method order........................... dot1x mab undefined
Configured method priority..................... undefined undefined undefined
Enabled method priority........................ undefined undefined undefined
Number of authenticated clients................ 0
Interface...................................... 0/3
Authentication Restart timer................... 300
Configured method order........................ dot1x mab captive-portal
Enabled method order........................... dot1x mab undefined
Configured method priority..................... undefined undefined undefined
Enabled method priority........................ undefined undefined undefined
Number of authenticated clients................ 0
Interface...................................... 0/4
Authentication Restart timer................... 300
Configured method order........................ dot1x mab captive-portal
Enabled method order........................... dot1x mab undefined
Configured method priority..................... undefined undefined undefined
Enabled method priority........................ undefined undefined undefined
Number of authenticated clients................ 0
```

5.15.27 show authentication methods

Use this command to display information about the authentication methods.

Format	`show authentication methods`
Mode	Privileged EXEC

Term	Definition
Authentication Login List	The authentication login listname.
Method 1	The first method in the specified authentication login list, if any.
Method 2	The second method in the specified authentication login list, if any.
Method 3	The third method in the specified authentication login list, if any.

Example: The following example displays the authentication configuration.

```
(switch)#show authentication methods

Login Authentication Method Lists
---------------------------------
defaultList         :  local
networkList         :  local

Enable Authentication Method Lists
----------------------------------
enableList          :  enable   none
enableNetList       :  enable   deny

Line     Login Method List    Enable Method List
-------  -----------------    ------------------
Console  defaultList          enableList
Telnet   networkList          enableNetList
SSH      networkList          enableNetList

HTTPS       :local
HTTP        :local
DOT1X       :
```

5.15.28 show authentication statistics

Use this command to display the authentication statistics for an interface.

Format	`show authentication statistics` *`slot/port`*
Mode	Privileged EXEC

The following information is displayed for each interface.

Term	Definition
Port	The port for which information is being displayed.
802.1X attempts	The number of Dot1x authentication attempts for the port.
802.1X failed attempts	The number of failed Dot1x authentication attempts for the port.
Mab attempts	The number of MAB (MAC authentication bypass) authentication attempts for the port.
Mab failed attempts	The number of failed MAB authentication attempts for the port.
Captive-portal attempts	The number of captive portal (Web authorization) authentication attempts for the port.
Captive-portal failed attempts	The number of failed captive portal authentication attempts for the port.

Example:

```
(FASTPATH Routing) #show authentication statistics 0/1

Port......................................... 0/1
802.1X attempts.............................. 0
802.1X failed attempts....................... 0
Mab attempts................................. 0
Mab failed attempts.......................... 0
Captive-portal attempts...................... 0
Captive-Portal failed attempts............... 0
```

5.15.29 clear authentication statistics

Use this command to clear the authentication statistics on an interface.

Format	`clear authentication authentication-history {slot/port]	all}`
Mode	Privileged EXEC

5.15.30 clear authentication authentication-history

Use this command to clear the authentication history log for an interface.

Format	`clear authentication authentication-history {slot/port	all}`
Mode	Privileged EXEC

5.15.31 show dot1x

This command is used to show a summary of the global dot1x configuration, summary information of the dot1x configuration for a specified port or all ports, the detailed dot1x configuration for a specified port and the dot1x statistics for a specified port - depending on the tokens used.

Format	`show dot1x [{summary {slot/port	all}	detail slot/port	statistics slot/port]`
Mode	Privileged EXEC

If you do not use the optional parameters slot/port or ***vlanid***, the command displays the global dot1x mode, the VLAN Assignment mode, and the Dynamic VLAN Creation mode.

Term	Definition
Administrative Mode	Indicates whether authentication control on the switch is enabled or disabled.
VLAN Assignment Mode	Indicates whether assignment of an authorized port to a RADIUS-assigned VLAN is allowed (enabled) or not (disabled).
Dynamic VLAN Creation Mode	Indicates whether the switch can dynamically create a RADIUS-assigned VLAN if it does not currently exist on the switch.
Monitor Mode	Indicates whether the Dot1x Monitor mode on the switch is enabled or disabled.

If you use the optional parameter *summary {slot/port* | all}, the dot1x configuration for the specified port or all ports are displayed.

NOTICE MAC-based dot1x authentication is supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Term	Definition
Interface	The interface whose configuration is displayed.
Control Mode	The configured control mode for this port. Possible values are force-unauthorized | force-authorized | auto | mac-based | authorized | unauthorized.
Operating Control Mode	The control mode under which this port is operating. Possible values are authorized | unauthorized.
Reauthentication Enabled	Indicates whether reauthentication is enabled on this port.
Port Status	Indicates whether the port is authorized or unauthorized. Possible values are authorized | unauthorized.

Example: The following shows example CLI display output for the command `show dot1x summary 0/1`.

```
                                   Operating
Interface      Control Mode      Control Mode      Port Status
---------      ------------      ------------      ------------
0/1            auto              auto              Authorized
```

If you use the optional parameter '**`detail`** ***`slot/port`***', the detailed dot1x configuration for the specified port is displayed.

NOTICE MAC-based dot1x authentication is supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Term	Definition
Port	The interface whose configuration is displayed.
Protocol Version	The protocol version associated with this port. The only possible value is 1, corresponding to the first version of the dot1x specification.
PAE Capabilities	The port access entity (PAE) functionality of this port. Possible values are Authenticator or Supplicant.
Control Mode	The configured control mode for this port. Possible values are force-unauthorized | force-authorized | auto | mac-based.
Authenticator PAE State	Current state of the authenticator PAE state machine. Possible values are Initialize, Disconnected, Connecting, Authenticating, Authenticated, Aborting, Held, ForceAuthorized, and ForceUnauthorized. When MAC-based authentication is enabled on the port, this parameter is deprecated.
Backend Authentication State	Current state of the backend authentication state machine. Possible values are Request, Response, Success, Fail, Timeout, Idle, and Initialize. When MAC-based authentication is enabled on the port, this parameter is deprecated.
Quiet Period	The timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. The value is expressed in seconds and will be in the range 0 and 65535.
Transmit Period	The timer used by the authenticator state machine on the specified port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.
Guest-VLAN ID	The guest VLAN identifier configured on the interface.
Guest VLAN Period	The time in seconds for which the authenticator waits before authorizing and placing the port in the Guest VLAN, if no EAPOL packets are detected on that port.
Supplicant Timeout	The timer used by the authenticator state machine on this port to timeout the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.
Server Timeout	The timer used by the authenticator on this port to timeout the authentication server. The value is expressed in seconds and will be in the range of 1 and 65535.
Maximum Requests	The maximum number of times the authenticator state machine on this port will retransmit an EAPOL EAP Request/Identity before timing out the supplicant. The value will be in the range of 1 and 10.
Configured MAB Mode	The administrative mode of the MAC authentication bypass feature on the switch.
Operational MAB Mode	The operational mode of the MAC authentication bypass feature on the switch. MAB might be administratively enabled but not operational if the control mode is not MAC based.
Vlan-ID	The VLAN assigned to the port by the radius server. This is only valid when the port control mode is not Mac-based.
VLAN Assigned Reason	The reason the VLAN identified in the VLAN-assigned field has been assigned to the port. Possible values are RADIUS, Unauthenticated VLAN, Guest VLAN, default, and Not Assigned. When the VLAN Assigned Reason is Not Assigned, it means that the port has not been assigned to any VLAN by dot1x. This only valid when the port control mode is not MAC-based.

Term	Definition
Reauthentication Period	The timer used by the authenticator state machine on this port to determine when reauthentication of the supplicant takes place. The value is expressed in seconds and will be in the range of 1 and 65535.
Reauthentication Enabled	Indicates if reauthentication is enabled on this port. Possible values are 'True" or "False".
Key Transmission Enabled	Indicates if the key is transmitted to the supplicant for the specified port. Possible values are True or False.
EAPOL Flood Mode Enabled	Indicates whether the EAPOL flood support is enabled on the switch. Possible values are True or False.
Control Direction	The control direction for the specified port or ports. Possible values are both or in.
Maximum Users	The maximum number of clients that can get authenticated on the port in the MAC-based dot1x authentication mode. This value is used only when the port control mode is not MAC-based.
Unauthenticated VLAN ID	Indicates the unauthenticated VLAN configured for this port. This value is valid for the port only when the port control mode is not MAC-based.
Session Timeout	Indicates the time for which the given session is valid. The time period in seconds is returned by the RADIUS server on authentication of the port. This value is valid for the port only when the port control mode is not MAC-based.
Session Termination Action	This value indicates the action to be taken once the session timeout expires. Possible values are Default, Radius-Request. If the value is Default, the session is terminated the port goes into unauthorized state. If the value is Radius-Request, then a reauthentication of the client authenticated on the port is performed. This value is valid for the port only when the port control mode is not MAC-based.

Example: The following shows example CLI display output for the command.

```
(switch) #show dot1x detail 0/3

Port......................................... 0/1
Protocol Version............................. 1
PAE Capabilities............................. Authenticator
Control Mode................................. auto
Authenticator PAE State...................... Initialize
Backend Authentication State................. Initialize
Quiet Period (secs).......................... 60
Transmit Period (secs)....................... 30
Guest VLAN ID................................ 0
Guest VLAN Period (secs)..................... 90
Supplicant Timeout (secs).................... 30
Server Timeout (secs)........................ 30
Maximum Requests............................. 2
Configured MAB Mode.......................... Enabled
Operational MAB Mode......................... Disabled
VLAN Id...................................... 0
VLAN Assigned Reason......................... Not Assigned
Reauthentication Period (secs)............... 3600
Reauthentication Enabled..................... FALSE
Key Transmission Enabled..................... FALSE
EAPOL flood Mode Enabled..................... FALSE
Control Direction............................ both
Maximum Users................................ 16
Unauthenticated VLAN ID...................... 0
Session Timeout.............................. 0
Session Termination Action................... Default
```

NOTICE MAC-based dot1x authentication is supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

For each client authenticated on the port, the `show dot1x detail` *`slot/port`* command will display the following MAC-based dot1x parameters if the port-control mode for that specific port is MAC-based.

Term	Definition
Supplicant MAC-Address	The MAC-address of the supplicant.
Authenticator PAE State	Current state of the authenticator PAE state machine. Possible values are Initialize, Disconnected, Connecting, Authenticating, Authenticated, Aborting, Held, ForceAuthorized, and ForceUnauthorized.
Backend Authentication State	Current state of the backend authentication state machine. Possible values are Request, Response, Success, Fail, Timeout, Idle, and Initialize.
VLAN-Assigned	The VLAN assigned to the client by the radius server.
Logical Port	The logical port number associated with the client.

If you use the optional parameter `statistics` *`slot/port`*, the following dot1x statistics for the specified port appear.

Term	Definition
Port	The interface whose statistics are displayed.
EAPOL Frames Received	The number of valid EAPOL frames of any type that have been received by this authenticator.
EAPOL Frames Transmitted	The number of EAPOL frames of any type that have been transmitted by this authenticator.
EAPOL Start Frames Received	The number of EAPOL start frames that have been received by this authenticator.
EAPOL Logoff Frames Received	The number of EAPOL logoff frames that have been received by this authenticator.
Last EAPOL Frame Version	The protocol version number carried in the most recently received EAPOL frame.
Last EAPOL Frame Source	The source MAC address carried in the most recently received EAPOL frame.
EAP Response/Id Frames Received	The number of EAP response/identity frames that have been received by this authenticator.
EAP Response Frames Received	The number of valid EAP response frames (other than resp/id frames) that have been received by this authenticator.
EAP Request/Id Frames Transmitted	The number of EAP request/identity frames that have been transmitted by this authenticator.
EAP Request Frames Transmitted	The number of EAP request frames (other than request/identity frames) that have been transmitted by this authenticator.
Invalid EAPOL Frames Received	The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized.
EAP Length Error Frames Received	The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized.

5.15.32 show dot1x authentication-history

This command displays 802.1X authentication events and information during successful and unsuccessful Dot1x authentication process for all interfaces or the specified interface. Use the optional keywords to display only failure authentication events in summary or in detail.

Format	`show dot1x authentication-history {slot/port	all} [failed-auth-only] [detail]`
Mode	Privileged EXEC

Term	Definition
Time Stamp	The exact time at which the event occurs.
Interface	Physical Port on which the event occurs.
Mac-Address	The supplicant/client MAC address.
VLAN assigned	The VLAN assigned to the client/port on authentication.
VLAN assigned Reason	The type of VLAN ID assigned, which can be Guest VLAN, Unauth, Default, RADIUS Assigned, or Montior Mode VLAN ID.
Auth Status	The authentication status.
Reason	The actual reason behind the successful or failed authentication.

5.15.33 show dot1x clients

This command displays 802.1X client information. This command also displays information about the number of clients that are authenticated using Monitor mode and using 802.1X.

Format	`show dot1x clients {slot/port	all}`
Mode	Privileged EXEC

Term	Definition
Clients Authenticated using Monitor Mode	Indicates the number of the Dot1x clients authenticated using Monitor mode.
Clients Authenticated using Dot1x	Indicates the number of Dot1x clients authenticated using 802.1x authentication process.
Logical Interface	The logical port number associated with a client.
Interface	The physical port to which the supplicant is associated.
User Name	The user name used by the client to authenticate to the server.
Supplicant MAC Address	The supplicant device MAC address.
Session Time	The time since the supplicant is logged on.
Filter ID	Identifies the Filter ID returned by the RADIUS server when the client was authenticated. This is a configured DiffServ policy name on the switch.
VLAN ID	The VLAN assigned to the port.
VLAN Assigned	The reason the VLAN identified in the VLAN ID field has been assigned to the port. Possible values are RADIUS, Unauthenticated VLAN, Monitor Mode, or Default. When the VLAN Assigned reason is Default, it means that the VLAN was assigned to the port because the P-VID of the port was that VLAN ID.
Session Timeout	This value indicates the time for which the given session is valid. The time period in seconds is returned by the RADIUS server on authentication of the port. This value is valid for the port only when the port-control mode is not MAC-based.

Term	Definition
Session Termination Action	This value indicates the action to be taken once the session timeout expires. Possible values are Default and Radius-Request. If the value is Default, the session is terminated and client details are cleared. If the value is Radius-Request, then a reauthentication of the client is performed.

5.15.34 show dot1x users

This command displays 802.1X port security user information for locally configured users.

Format	`show dot1x users` *`slot/port`*
Mode	Privileged EXEC

Term	Definition
Users	Users configured locally to have access to the specified port.

5.16 802.1X Supplicant Commands

FASTPATH supports 802.1X ("dot1x") supplicant functionality on point-to-point ports. The administrator can configure the user name and password used in authentication and capabilities of the supplicant port.

5.16.1 dot1x pae

This command sets the port's dot1x role. The port can serve as either a supplicant or an authenticator.

Format	`dot1x pae {supplicant | authenticator}`
Mode	Interface Config

5.16.2 dot1x supplicant port-control

This command sets the ports authorization state (Authorized or Unauthorized) either manually or by setting the port to auto-authorize upon startup. By default all the ports are authenticators. If the port's attribute needs to be moved from <authenticator to supplicant> or <supplicant to authenticator>, use this command.

Format	`dot1x supplicant port-control {auto | force-authorized | force_unauthorized}`
Mode	Interface Config

Parameter	Description
auto	The port is in the Unauthorized state until it presents its user name and password credentials to an authenticator. If the authenticator authorizes the port, then it is placed in the Authorized state.
force-authorized	Sets the authorization state of the port to Authorized, bypassing the authentication process.
force-unauthorized	Sets the authorization state of the port to Unauthorized, bypassing the authentication process.

5.16.2.1 no dot1x supplicant port-control

This command sets the port-control mode to the default, auto.

Default	auto
Format	`no dot1x supplicant port-control`
Mode	Interface Config

5.16.3 dot1x supplicant max-start

This command configures the number of attempts that the supplicant makes to find the authenticator before the supplicant assumes that there is no authenticator.

Default	3
Format	`dot1x supplicant max-start` *<1-10>*
Mode	Interface Config

5.16.3.1 no dot1x supplicant max-start

This command sets the max-start value to the default.

Format	`no dot1x supplicant max-start`
Mode	Interface Config

5.16.4 dot1x supplicant timeout start-period

This command configures the start period timer interval to wait for the EAP identity request from the authenticator.

Default	30 seconds
Format	`dot1x supplicant timeout start-period` *<1-65535 seconds>*
Mode	Interface Config

5.16.4.1 no dot1x supplicant timeout start-period

This command sets the start-period value to the default.

Format	`no dot1x supplicant timeout start-period`
Mode	Interface Config

5.16.5 dot1x supplicant timeout held-period

This command configures the held period timer interval to wait for the next authentication on previous authentication fail.

Default	60 seconds
Format	`dot1x supplicant timeout held-period` *<1-65535 seconds>*
Mode	Interface Config

5.16.5.1 no dot1x supplicant timeout held-period

This command sets the held-period value to the default value.

Format	`no dot1x supplicant timeout held-period`
Mode	Interface Config

5.16.6 dot1x supplicant timeout auth-period

This command configures the authentication period timer interval to wait for the next EAP request challenge from the authenticator.

Default	30 seconds
Format	`dot1x supplicant timeout auth-period` *<1-65535 seconds>*
Mode	Interface Config

5.16.6.1 no dot1x supplicant timeout auth-period

This command sets the auth-period value to the default value.

Format	`no dot1x supplicant timeout auth-period`
Mode	Interface Config

5.16.7 dot1x supplicant user

Use this command to map the given user to the port.

Format	`dot1x supplicant user`
Mode	Interface Config

5.16.8 show dot1x statistics

This command displays the dot1x port statistics in detail.

Format	`show dot1x statistics` *slot/port*
Mode	• Privileged EXEC • User EXEC

Term	Definition
EAPOL Frames Received	Displays the number of valid EAPOL frames received on the port.
EAPOL Frames Transmitted	Displays the number of EAPOL frames transmitted via the port.
EAPOL Start Frames Transmitted	Displays the number of EAPOL Start frames transmitted via the port.
EAPOL Logoff Frames Received	Displays the number of EAPOL Log off frames that have been received on the port.
EAP Resp/ID Frames Received	Displays the number of EAP Respond ID frames that have been received on the port.
EAP Response Frames Received	Displays the number of valid EAP Respond frames received on the port.
EAP Req/ID Frames Transmitted	Displays the number of EAP Requested ID frames transmitted via the port.
EAP Req Frames Transmitted	Displays the number of EAP Request frames transmitted via the port.
Invalid EAPOL Frames Received	Displays the number of unrecognized EAPOL frames received on this port.
EAP Length Error Frames Received	Displays the number of EAPOL frames with an invalid Packet Body Length received on this port.
Last EAPOL Frames Version	Displays the protocol version number attached to the most recently received EAPOL frame.
Last EAPOL Frames Source	Displays the source MAC Address attached to the most recently received EAPOL frame.

Example: The following shows example CLI display output for the command.

```
(switch) #show dot1x statistics 0/1
Port......................................... 0/1
EAPOL Frames Received........................ 0
EAPOL Frames Transmitted..................... 0
EAPOL Start Frames Transmitted............... 3
EAPOL Logoff Frames Received................. 0
EAP Resp/Id frames transmitted............... 0
EAP Response frames transmitted.............. 0
EAP Req/Id frames transmitted................ 0
EAP Req frames transmitted................... 0
Invalid EAPOL frames received................ 0
EAP length error frames received............. 0
Last EAPOL Frame Version..................... 0
Last EAPOL Frame Source...................... 00:00:00:00:02:01
```

5.17 Storm-Control Commands

This section describes commands you use to configure storm-control and view storm-control configuration information. A traffic storm is a condition that occurs when incoming packets flood the LAN, which creates performance degradation in the network. The Storm-Control feature protects against this condition.

FASTPATH provides broadcast, multicast, and unicast story recovery for individual interfaces. Unicast Storm-Control protects against traffic whose MAC addresses are not known by the system. For broadcast, multicast, and unicast storm-control, if the rate of traffic ingressing on an interface increases beyond the configured threshold for that type, the traffic is dropped.

To configure storm-control, you will enable the feature for all interfaces or for individual interfaces, and you will set the threshold (storm-control level) beyond which the broadcast, multicast, or unicast traffic will be dropped. The Storm-Control feature allows you to limit the rate of specific types of packets through the switch on a per-port, per-type, basis.

Configuring a storm-control level also enables that form of storm-control. Disabling a storm-control level (using the "no" version of the command) sets the storm-control level back to the default value and disables that form of storm-control. Using the "no" version of the "storm-control" command (not stating a "level") disables that form of storm-control but maintains the configured "level" (to be active the next time that form of storm-control is enabled.)

NOTICE

The actual rate of ingress traffic required to activate storm-control is based on the size of incoming packets and the hard-coded average packet size of 512 bytes - used to calculate a packet-per-second (pps) rate - as the forwarding-plane requires pps versus an absolute rate kbps. For example, if the configured limit is 10%, this is converted to ~25000 pps, and this pps limit is set in forwarding plane (hardware). You get the approximate desired output when 512bytes packets are used.

5.17.1 storm-control broadcast

Use this command to enable broadcast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If the mode is enabled, broadcast storm recovery is active and, if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of broadcast traffic will be limited to the configured threshold.

Default	disabled
Format	`storm-control broadcast`
Mode	• Global Config • Interface Config

5.17.1.1 no storm-control broadcast

Use this command to disable broadcast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format `no storm-control broadcast`

Mode
- Global Config
- Interface Config

5.17.2 storm-control broadcast action

This command configures the broadcast storm recovery action to either `shutdown` or `trap` for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If configured to `shutdown`, the interface that receives the broadcast packets at a rate above the threshold is diagnostically disabled. If set to `trap`, the interface sends trap messages approximately every 30 seconds until broadcast storm control recovers.

Default None

Format `storm-control broadcast action {shutdown | trap}`

Mode
- Global Config
- Interface Config

5.17.2.1 no storm-control broadcast action

This command configures the broadcast storm recovery action option to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format `no storm-control broadcast action`

Mode
- Global Config
- Interface Config

5.17.3 storm-control broadcast level

Use this command to configure the broadcast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) as a percentage of link speed and enable broadcast storm recovery. If the mode is enabled, broadcast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of broadcast traffic is limited to the configured threshold.

Default 5

Format `storm-control broadcast level` *`0-100`*

Mode
- Global Config
- Interface Config

5.17.3.1 no storm-control broadcast level

This command sets the broadcast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables broadcast storm recovery.

Format `no storm-control broadcast level`

Mode
- Global Config
- Interface Config

5.17.4 storm-control broadcast rate

Use this command to configure the broadcast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) in packets per second. If the mode is enabled, broadcast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of broadcast traffic is limited to the configured threshold.

Default	0
Format	`storm-control broadcast rate` *`0-33554431`*
Mode	• Global Config • Interface Config

5.17.4.1 no storm-control broadcast rate

This command sets the broadcast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables broadcast storm recovery.

Format	`no storm-control broadcast rate`
Mode	• Global Config • Interface Config

5.17.5 storm-control multicast

This command enables multicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If the mode is enabled, multicast storm recovery is active, and if the rate of L2 multicast traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of multicast traffic will be limited to the configured threshold.

Default	disabled
Format	`storm-control multicast`
Mode	• Global Config • Interface Config

5.17.5.1 no storm-control multicast

This command disables multicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	`no storm-control multicast`
Mode	• Global Config • Interface Config

5.17.6 storm-control multicast action

This command configures the multicast storm recovery action to either `shutdown` or `trap` for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If configured to `shutdown`, the interface that receives multicast packets at a rate above the threshold is diagnostically disabled. The option `trap` sends trap messages approximately every 30 seconds until multicast storm control recovers.

Default	None
Format	`storm-control multicast action {shutdown	trap}`
Mode	• Global Config • Interface Config

5.17.6.1 no storm-control multicast action

This command returns the multicast storm recovery action option to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	`no storm-control multicast action`
Mode	• Global Config • Interface Config

5.17.7 storm-control multicast level

This command configures the multicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) as a percentage of link speed and enables multicast storm recovery mode. If the mode is enabled, multicast storm recovery is active, and if the rate of L2 multicast traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of multicast traffic will be limited to the configured threshold.

Default	5
Format	`storm-control multicast level` *`0-100`*
Mode	• Global Config • Interface Config

5.17.7.1 no storm-control multicast level

This command sets the multicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables multicast storm recovery.

Format	`no storm-control multicast level` *`0-100`*
Mode	• Global Config • Interface Config

5.17.8 storm-control multicast rate

Use this command to configure the multicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) in packets per second. If the mode is enabled, multicast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of multicast traffic is limited to the configured threshold.

Default	0
Format	`storm-control multicast rate` *`0-33554431`*
Mode	• Global Config • Interface Config

5.17.8.1 no storm-control multicast rate

This command sets the multicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables multicast storm recovery.

Format	`no storm-control multicast rate`
Mode	• Global Config • Interface Config

5.17.9 storm-control unicast

This command enables unicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If the mode is enabled, unicast storm recovery is active, and if the rate of unknown L2 unicast (destination lookup failure) traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of unknown unicast traffic will be limited to the configured threshold.

Default	disabled
Format	`storm-control unicast`
Mode	• Global Config • Interface Config

5.17.9.1 no storm-control unicast

This command disables unicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	`no storm-control unicast`
Mode	• Global Config • Interface Config

5.17.10 storm-control unicast action

This command configures the unicast storm recovery action to either `shutdown` or `trap` for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If configured to `shutdown`, the interface that receives unicast packets at a rate above the threshold is diagnostically disabled. The option `trap` sends trap messages approximately every 30 seconds until unicast storm control recovers.

Default	None
Format	`storm-control unicast action {shutdown | trap}`
Mode	• Global Config • Interface Config

5.17.10.1 no storm-control unicast action

This command returns the unicast storm recovery action option to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	`no storm-control unicast action`
Mode	• Global Config • Interface Config

5.17.11 storm-control unicast level

This command configures the unicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) as a percentage of link speed, and enables unicast storm recovery. If the mode is enabled, unicast storm recovery is active, and if the rate of unknown L2 unicast (destination lookup failure) traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of unknown unicast traffic will be limited to the configured threshold.This command also enables unicast storm recovery mode for an interface.

Default 5

Format `storm-control unicast level 0-100`

Mode
- Global Config
- Interface Config

5.17.11.1 no storm-control unicast level

This command sets the unicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables unicast storm recovery.

Format `no storm-control unicast level`

Mode
- Global Config
- Interface Config

5.17.12 storm-control unicast rate

Use this command to configure the unicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) in packets per second. If the mode is enabled, unicast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of unicast traffic is limited to the configured threshold.

Default 0

Format `storm-control unicast rate 0-33554431`

Mode
- Global Config
- Interface Config

5.17.12.1 no storm-control unicast rate

This command sets the unicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables unicast storm recovery.

Format `no storm-control unicast rate`

Mode
- Global Config
- Interface Config

5.17.13 show storm-control

This command displays switch configuration information. If you do not use any of the optional parameters, this command displays global storm control configuration parameters:

- Broadcast Storm Recovery Mode may be enabled or disabled. The factory default is disabled.
- 802.3x Flow Control Mode may be enabled or disabled. The factory default is disabled.

Use the `all` keyword to display the per-port configuration parameters for all interfaces, or specify the *`slot/port`* to display information about a specific interface.

Format `show storm-control [all | slot/port]`

Mode Privileged EXEC

Parameter	Definition
Bcast Mode	Shows whether the broadcast storm control mode is enabled or disabled. The factory default is disabled.
Bcast Level	The broadcast storm control level.
Mcast Mode	Shows whether the multicast storm control mode is enabled or disabled.
Mcast Level	The multicast storm control level.
Ucast Mode	Shows whether the Unknown Unicast or DLF (Destination Lookup Failure) storm control mode is enabled or disabled.
Ucast Level	The Unknown Unicast or DLF (Destination Lookup Failure) storm control level.

Example: The following shows example CLI display output for the command.

```
(Routing) #show storm-control

Broadcast Storm Control Mode................... Disable
Broadcast Storm Control Level.................. 5 percent
Broadcast Storm Control Action................. None
Multicast Storm Control Mode................... Disable
Multicast Storm Control Level.................. 5 percent
Multicast Storm Control Action................. None
Unicast Storm Control Mode..................... Disable
Unicast Storm Control Level.................... 5 percent
Unicast Storm Control Action................... None
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show storm-control 1/0/1

       Bcast   Bcast    Bcast      Mcast   Mcast    Mcast      Ucast   Ucast    Ucast
 Intf  Mode    Level    Action     Mode    Level    Action     Mode    Level    Action
------ ------- -------- ---------- ------- -------- ---------- ------- -------- ----------
1/0/1  Disable 5%       None       Disable 5%       None       Disable 5%       None
```

Example: The following shows an example of part of the CLI display output for the command.

```
(Routing) #show storm-control all

     Bcast   Bcast    Bcast     Mcast   Mcast    Mcast     Ucast   Ucast    Ucast
Intf Mode    Level    Action    Mode    Level    Action    Mode    Level    Action
------ -------   --------   ---------- -------    --------    ----------  -------    -------- ----
------
1/0/1  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/2  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/3  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/4  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/5  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/6  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/7  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/8  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/9  Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/10 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/11 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/12 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/13 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/14 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/15 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/16 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/17 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/18 Enable  50        Trap       Disable 5%       None       Disable 5%       None
1/0/19 Enable  50        Trap       Disable 5%       None       Disable 5%       None
```

5.18 Link Dependency Commands

The following commands configure link dependency. Link dependency allows the link status of specified ports to be dependent on the link status of other ports. Consequently, if a port that is depended on by other ports loses link, the dependent ports are administratively disabled or administratively enabled so that the dependent ports links are brought down or up respectively.

5.18.0.1 no link state track

This command clears link-dependency options for the selected group identifier.

Format	`no link state track` *`group-id`*
Mode	Global Config

5.18.1 link state group

Use this command to indicate if the downstream interfaces of the group should mirror or invert the status of the upstream interfaces. The default configuration for a group is down (that is, the downstream interfaces will mirror the upstream link status by going down when all upstream interfaces are down). The action up option causes the downstream interfaces to be up when no upstream interfaces are down.

Default	Down
Format	`link state group` *`group-id`* `action {up | down}`
Mode	Global Config

5.18.1.1 no link state group

Use this command to restore the link state to down for the group.

Format	`no link state group` *`group-id`* `action`
Mode	Global Config

5.18.2 link state group downstream

Use this command to add interfaces to the downstream interface list. Adding an interface to a downstream list brings the interface down until an upstream interface is added to the group. The link status then follows the interface specified in the upstream command. To avoid bringing down interfaces, enter the upstream command prior to entering the downstream command.

Format	`link state group` *`group-id`* `downstream`
Mode	Interface Config

5.18.2.1 no link state group downstream

Use this command to remove the selected interface from the downstream list.

Format	`no link state group` *`group-id`* `downstream`
Mode	Interface Config

5.18.3 link state group upstream

Use this command to add interfaces to the upstream interface list. Note that an interface that is defined as an upstream interface cannot also be defined as a downstream interface in the same link state group or as a downstream interface in a different link state group, if either configuration creates a circular dependency between groups.

Format	`link state group` *`group-id`* `upstream`
Mode	Interface Config

5.18.3.1 no link state group upstream

Use this command to remove the selected interfaces from upstream list.

Format	`no link state group` *`group-id`* `upstream`
Mode	Interface Config

5.18.4 show link state group

Use this command to display information for all configured link-dependency groups or a specified link-dependency group.

Format	`show link state group` *`group-id`*
Mode	Privileged EXEC

Example: This example displays information for all configured link-dependency groups.

```
(Switching)#show link-state group

GroupId Downstream Interfaces      Upstream Interfaces  Link Action Group State
------- -------------------------- -------------------- ----------- -----------
1       0/3-0/7,0/12-0/17          0/12-0/32,3/5        Link Up     Up
4       0/18,0/27                  0/22-0/33,3/1        Link Up     Down
```

Example: This example displays information for a specified link-dependency groups

```
(Switching)#show link state group 1

GroupId Downstream Interfaces      Upstream Interfaces  Link Action Group State
------- -------------------------- -------------------- ----------- -----------
1       0/3-0/7,0/12-0/17          0/12-0/32,3/5        Link Up     Up
```

5.18.5 show link state group detail

Use this command to display detailed information about the state of upstream and downstream interfaces for a selected link-dependency group. Group Transitions is a count of the number of times the downstream interface has gone into its “action” state as a result of the upstream interfaces link state.

Format	`show link state group` *`group-id`* `detail`
Mode	Privileged EXEC

```
(Switching) # show link state group 1 detail
GroupId:     1
Link Action: Up
Group State: Up

Downstream Interface State:
Link Up:     0/3
Link Down:   0/4-0/7,0/12-0/17

Upstream Interface State:
Link Up:     -
Link Down:  0/12-0/32,3/5

Group Transitions: 0
Last Transition Time: 00:52:35 (UTC+0:00) Jan 1 1970
```

5.19 Link Local Protocol Filtering Commands

Link Local Protocol Filtering (LLPF) allows the switch to filter out multiple proprietary protocol PDUs, such as Port Aggregation Protocol (PAgP), if the problems occur with proprietary protocols running on standards-based switches. If certain protocol PDUs cause unexpected results, LLPF can be enabled to prevent those protocol PDUs from being processed by the switch.

NOTICE LLPF is supported on the BCM56624, BCM56634, BCM56636, BCM56820, and BCM56334 platforms.

5.19.1 llpf

Use this command to block LLPF protocol(s) on a port.

Default	Enabled for the blockudld parameter; disabled for all others.
Format	`llpf {blockisdp | blockvtp | blockdtp | blockudld | blockpagp | blocksstp | blockall}`
Mode	Interface Config

5.19.1.1 no llpf

Use this command to unblock LLPF protocol(s) on a port.

Format	`no llpf {blockisdp | blockvtp | blockdtp | blockudld | blockpagp | blocksstp | blockall }`
Mode	Interface Config

5.19.2 show llpf interface

Use this command to display the status of LLPF rules configured on a particular port or on all ports.

Format	`show llpf interface [all	`*`slot/port`*`]`
Mode	Privileged EXEC

Term	Definition
Block ISDP	Shows whether the port blocks ISDP PDUs.
Block VTP	Shows whether the port blocks VTP PDUs.
Block DTP	Shows whether the port blocks DTP PDUs.
Block UDLD	Shows whether the port blocks UDLD PDUs.
Block PAGP	Shows whether the port blocks PAgP PDUs.

Term	Definition
Block SSTP	Shows whether the port blocks SSTP PDUs.
Block All	Shows whether the port blocks all proprietary PDUs available for the LLDP feature.

5.20 MVR Commands

This section lists the Multicast VLAN Registration (MVR) commands.

5.20.1 mvr

Use this command to enable MVR. This is disabled by default.

Default	Disabled
Format	`mvr`
Mode	Interface Config; Global Config

5.20.1.1 no mvr

Use this command to disable MVR.

Format	`no mvr`
Mode	Interface Config; Global Config

5.20.2 mvr group

Use this command to add an MVR membership group.

Format	`mvr group`
Mode	Global Config

5.20.2.1 no mvr group

Use this command to disable an MVR membership group.

Format	`no mvr group`
Mode	Global Config

5.20.3 mvr immediate

Use this command to enable MVR Immediate Leave mode. If the interface is configured as source port, MVR Immediate Leave mode cannot be enabled. MVR Immediate Leave mode disabled by default.

Default	Disabled
Format	`mvr immediate`
Mode	Interface Config

5.20.3.1 no mvr immediate

Use this command to disable MVR Immediate Leave mode.

Format	`mvrm immediate`
Mode	Interface Config

5.20.4 mvr mode

Use this command to change the MVR mode type. Compatible is the default mode type.

Format	`mvr mode [compatible | dynamic]`
Mode	IGlobal Config

5.20.4.1 no mvr mode

Use this command to set the MVR mode type to the default value of compatible.

Format	`no mvr mode`
Mode	Global Config

5.20.5 mvr querytime

Use this command to set the MVR query response time in units of tenths of a second. The query time is the maximum time to wait for an IGMP membership report on a receiver port before removing the port from the multicast group. The query time only applies to receiver ports and is specified in tenths of a second. The default is 5.

Format	`mvr querytime` ***1-100***
Mode	Global Config

5.20.5.1 no mvr querytime

Use this command to set the MVR query response time to the default value.

Format	`no mvr querytime`
Mode	Global Config

5.20.6 mvr type

Use this command to set the MVR port type. The default is none.

Format	`mvr type [receiver | source]`
Mode	Interface Config

5.20.6.1 no mvr type

Use this command to reset the MVR port type to None.

Format `no mvr type`

Mode Interface Config

5.20.7 mvr vlan

Use this command to set the MVR multicast VLAN.

Default 1

Format `mvr vlan` ***1-4093***

Mode Global Config

5.20.7.1 no mvr vlan

Use this command to set the MVR multicast VLAN to the default value.

Format `no mvr vlan`

Mode Global Config

5.20.8 mvr vlan group

Use this command to make a port participate in a specific MVR group. The default value is None.

Format `mvr vlan` ***mvlan*** `group` ***A.B.C.D.***

Mode Interface Config

5.20.8.1 no mvr vlan group

Use this command to remove port participation in the specific MVR group.

Format `no mvr vlan` ***mvlan*** `group` ***A.B.C.D.***

Mode Interface Config

5.20.9 show mvr

Use this command to display global MVR settings.

Format `show mvr`

Mode Privileged EXEC

Example:

```
(Switching) #  show mvr
MVR Disabled.

(Switching) #  show mvr
MVR Running....................... TRUE
MVR multicast VLAN................ 1
MVR Max Multicast Groups.......... 256
MVR Current multicast groups...... 0
MVR Global query response time.... 5 (tenths of sec)
MVR Mode.......................... compatible
```

5.20.10 show mvr members

Use this command to display the allocated MVR membership groups.

Format `show mvr members [`*`A.B.C.D.`*`]`

Mode Privileged EXEC

Example:

```
(Switching) # show mvr members
MVR Disabled

(Switching) # show mvr members

MVR Group IP        Status              Members
---------------     ---------------     --------------------------------
224.1.1.1           INACTIVE            0/1, 0/2, 0/3

(Switching) # show mvr members 224.1.1.1

MVR Group IP        Status              Members
---------------     ---------------     --------------------------------
224.1.1.1           INACTIVE            0/1, 0/2, 0/3
```

5.20.11 show mvr interface

Use this command to display the configuration of MVR-enabled interfaces.

Format `show mvr interface [`*`interface-id`*` [members [vlan `*`vlan-id`*`]]]`

Mode Privileged EXEC

Example:

```
(Switching) # show mvr interface
Port        Type            Status              Immediate Leave
----------- --------------- ------------------- ---------------
0/9         RECEIVER        ACTIVE/inVLAN       DISABLED

(Switching) # show mvr interface 0/4

Type: NONE   Status: INACTIVE/InVLAN  Immediate Leave: DISABLED

show mvr interface 0/23 members
235.0.0.1 STATIC  ACTIVE

(Switching) # show mvr interface 0/23 members vlan 12
235.0.0.1 STATIC  ACTIVE
235.1.1.1 STATIC  ACTIVE
```

5.20.12 show mvr traffic

Use this command to display global MVR statistics.

Format `show mvr traffic`

Mode Privileged EXEC

Example:

```
(Switching) # show mvr traffic

IGMP Query Received............... 0
IGMP Report V1 Received........... 0
IGMP Report V2 Received........... 0
IGMP Leave Received............... 0
IGMP Query Transmitted............ 0
IGMP Report V1 Transmitted........ 0
IGMP Report V2 Transmitted........ 0
IGMP Leave Transmitted............ 0
IGMP Packet Receive Failures...... 0
IGMP Packet Transmit Failures..... 0
```

5.20.13 debug mvr trace

Use this command to enable MVR debug tracing. The default value is disabled.

Format	`debug mvr trace`
Mode	Privileged EXEC

5.20.13.1 no debug mvr trace

Use this command to disable MVR debug tracing.

Format	`no debug mvr trace`
Mode	Privileged EXEC

5.20.14 debug mvr packet

Use this command to enable MVR receive/transmit packets debug tracing. If it is executed without specifying the arguments, both receive and transmit packets debugging is enabled. The default is enabled.

Format	`debug mvr packet [receive	transmit]`
Mode	Privileged EXEC

5.20.14.1 no debug mvr packet

Use this command to disable MVR receive/transmit packet debug tracing.

Format	`no debug mvr packet [receive	transmit]`
Mode	Privileged EXEC

5.21 Port-Channel/LAG (802.3ad) Commands

This section describes the commands you use to configure port-channels, which is defined in the 802.3ad specification, and that are also known as link aggregation groups (LAGs). Link aggregation allows you to combine multiple full-duplex Ethernet links into a single logical link. Network devices treat the aggregation as if it were a single link, which increases fault tolerance and provides load sharing. The LAG feature initially load shares traffic based upon the source and destination MAC address. Assign the port-channel (LAG) VLAN membership after you create a port-channel. If you do not assign VLAN membership, the port-channel might become a member of the management VLAN which can result in learning and switching issues.

A port-channel (LAG) interface can be either static or dynamic, but not both. All members of a port channel must participate in the same protocols.) A static port-channel interface does not require a partner system to be able to aggregate its member ports.

NOTICE If you configure the maximum number of dynamic port-channels (LAGs) that your platform supports, additional port-channels that you configure are automatically static.

5.21.1 port-channel

This command configures a new port-channel (LAG) and generates a logical *`slot/port`* number for the port-channel. The `name` field is a character string which allows the dash "-" character as well as alphanumeric characters. Use the `show port channel` command to display the `slot/port` number for the logical interface. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

NOTICE Before you include a port in a port-channel, set the port physical mode. For more information, see "speed" on page 289.

Format	`port-channel` *`name`*
Mode	Global Config

5.21.2 addport

This command adds one port to the port-channel (LAG). The first interface is a logical ***`slot/port`*** number of a configured port-channel. You can add a range of ports by specifying the port range when you enter Interface Config mode (for example: **`interface 0/1-0/4`**. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

NOTICE Before adding a port to a port-channel, set the physical mode of the port. For more information, see "speed" on page 289.

Format	`addport` *`logical slot/port`*
Mode	Interface Config

5.21.3 deleteport (Interface Config)

This command deletes a port or a range of ports from the port-channel (LAG). The interface is a logical ***`slot/port`*** number of a configured port-channel (or range of port-channels). Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

Format	`deleteport` *`logical slot/port`*
Mode	Interface Config

5.21.4 deleteport (Global Config)

This command deletes all configured ports from the port-channel (LAG). The interface is a logical ***slot/port*** number of a configured port-channel. Instead of *slot/port*, `lag` *lag-intf-num* can be used as an alternate way to specify the LAG interface. `lag` *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	`deleteport {`*logical slot/port* `| all}`
Mode	Global Config

5.21.5 lacp admin key

Use this command to configure the administrative value of the key for the port-channel. The value range of *key* is 0 to 65535.

This command can be used to configure a single interface or a range of interfaces.

Default	0x8000
Format	`lacp admin key` *key*
Mode	Interface Config

NOTICE This command is applicable only to port-channel interfaces.

5.21.5.1 no lacp admin key

Use this command to configure the default administrative value of the key for the port-channel.

Format	`no lacp admin key`
Mode	Interface Config

5.21.6 lacp collector max-delay

Use this command to configure the port-channel collector max delay. This command can be used to configure a single interface or a range of interfaces.The valid range of ***delay*** is 0-65535.

Default	0x8000
Format	`lacp collector max delay` *delay*
Mode	Interface Config

NOTICE This command is applicable only to port-channel interfaces.

5.21.6.1 no lacp collector max delay

Use this command to configure the default port-channel collector max delay.

Format	`no lacp collector max delay`
Mode	Interface Config

5.21.7 lacp actor admin key

Use this command to configure the administrative value of the LACP actor admin key on an interface or range of interfaces. The valid range for ***key*** is 0-65535.

Default	Internal Interface Number of this Physical Port
Format	`lacp actor admin key` *`key`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.7.1 no lacp actor admin key

Use this command to configure the default administrative value of the key.

Format	`no lacp actor admin key`
Mode	Interface Config

5.21.8 lacp actor admin state individual

Use this command to set LACP actor admin state to individual.

Format	`lacp actor admin state individual`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.8.1 no lacp actor admin state individual

Use this command to set the LACP actor admin state to aggregation.

Format	`no lacp actor admin state individual`
Mode	Interface Config

5.21.9 lacp actor admin state longtimeout

Use this command to set LACP actor admin state to longtimeout.

Format	`lacp actor admin state longtimeout`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.9.1 no lacp actor admin state longtimeout

Use this command to set the LACP actor admin state to short timeout.

Format	`no lacp actor admin state longtimeout`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.10 lacp actor admin state passive

Use this command to set the LACP actor admin state to passive.

Format	`lacp actor admin state passive`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.10.1 no lacp actor admin state passive

Use this command to set the LACP actor admin state to active.

Format	`no lacp actor admin state passive`
Mode	Interface Config

5.21.11 lacp actor admin state

Use this command to configure the administrative value of actor state as transmitted by the Actor in LACPDUs. This command can be used to configure a single interfaces or a range of interfaces.

Default	0x07
Format	`lacp actor admin state {individual|longtimeout|passive}`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.11.1 no lacp actor admin state

Use this command the configure the default administrative values of actor state as transmitted by the Actor in LACPDUs.

NOTICE Both the `no portlacptimeout` and the `no lacp actor admin state` commands set the values back to default, regardless of the command used to configure the ports. Consequently, both commands will display in `show running-config`.

Format	`no lacp actor admin state {individual|longtimeout|passive}`
Mode	Interface Config

5.21.12 lacp actor port priority

Use this command to configure the priority value assigned to the Aggregation Port for an interface or range of interfaces. The valid range for ***`priority`*** is 0 to 65535.

Default	0x80
Format	`lacp actor port priority` *`0-65535`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.12.1 no lacp actor port priority

Use this command to configure the default priority value assigned to the Aggregation Port.

Format	`no lacp actor port priority`
Mode	Interface Config

5.21.13 lacp partner admin key

Use this command to configure the administrative value of the Key for the protocol partner. This command can be used to configure a single interface or a range of interfaces. The valid range for ***`key`*** is 0 to 65535.

Default	0x0
Format	`lacp partner admin key` *`key`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.13.1 no lacp partner admin key

Use this command to set the administrative value of the Key for the protocol partner to the default.

Format	`no lacp partner admin key`
Mode	Interface Config

5.21.14 lacp partner admin state individual

Use this command to set LACP partner admin state to individual.

Format	`lacp partner admin state individual`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.14.1 no lacp partner admin state individual

Use this command to set the LACP partner admin state to aggregation.

Format	`no lacp partner admin state individual`
Mode	Interface Config

5.21.15 lacp partner admin state longtimeout

Use this command to set LACP partner admin state to longtimeout.

Format	`lacp partner admin state longtimeout`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.15.1 no lacp partner admin state longtimeout

Use this command to set the LACP partner admin state to short timeout.

Format	`no lacp partner admin state longtimeout`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.16 lacp partner admin state passive

Use this command to set the LACP partner admin state to passive.

Format	`lacp partner admin state passive`
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.16.1 no lacp partner admin state passive

Use this command to set the LACP partner admin state to active.

Format	`no lacp partner admin state passive`
Mode	Interface Config

5.21.17 lacp partner port id

Use this command to configure the LACP partner port id. This command can be used to configure a single interface or a range of interfaces. The valid range for ***`port-id`*** is 0 to 65535.

Default	0x80
Format	`lacp partner port-id` *`port-id`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.17.1 no lacp partner port id

Use this command to set the LACP partner port id to the default.

Format	`no lacp partner port-id`
Mode	Interface Config

5.21.18 lacp partner port priority

Use this command to configure the LACP partner port priority. This command can be used to configure a single interface or a range of interfaces. The valid range for ***`priority`*** is 0 to 65535.

Default	0x0
Format	`lacp partner port priority` *`priority`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.18.1 no lacp partner port priority

Use this command to configure the default LACP partner port priority.

Format	`no lacp partner port priority`
Mode	Interface Config

5.21.19 lacp partner system-id

Use this command to configure the 6-octet MAC Address value representing the administrative value of the Aggregation Port's protocol Partner's System ID. This command can be used to configure a single interface or a range of interfaces. The valid range of ***`system-id`*** is 00:00:00:00:00:00 - FF:FF:FF:FF:FF.

Default	00:00:00:00:00:00
Format	`lacp partner system-id` *`system-id`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.19.1 no lacp partner system-id

Use this command to configure the default value representing the administrative value of the Aggregation Port's protocol Partner's System ID.

Format	`no lacp partner system-id`
Mode	Interface Config

5.21.20 lacp partner system priority

Use this command to configure the administrative value of the priority associated with the Partner's System ID. This command can be used to configure a single interface or a range of interfaces. The valid range for ***`priority`*** is 0 to 65535.

Default	0x0
Format	`lacp partner system priority` *`0-65535`*
Mode	Interface Config

NOTICE This command is applicable only to physical interfaces.

5.21.20.1 no lacp partner system priority

Use this command to configure the default administrative value of priority associated with the Partner's System ID.

Format	`no lacp partner system priority`
Mode	Interface Config

5.21.21 interface lag

Use this command to enter Interface configuration mode for the specified LAG.

Format	`interface lag` *`lag-interface-number`*
Mode	Global Config

5.21.22 port-channel static

This command enables the static mode on a port-channel (LAG) interface or range of interfaces. By default the static mode for a new port-channel is enabled, which means the port-channel is static. If the maximum number of allowable dynamic port-channels are already present in the system, the static mode for a new port-channel is enabled, which means the port-channel is static. You can only use this command on port-channel interfaces.

Default	enabled
Format	`port-channel static`
Mode	Interface Config

5.21.22.1 no port-channel static

This command sets the static mode on a particular port-channel (LAG) interface to the default value. This command will be executed only for interfaces of type port-channel (LAG).

Format	`no port-channel static`
Mode	Interface Config

5.21.23 port lacpmode

This command enables Link Aggregation Control Protocol (LACP) on a port or range of ports.

Default	enabled
Format	`port lacpmode`
Mode	Interface Config

5.21.23.1 no port lacpmode

This command disables Link Aggregation Control Protocol (LACP) on a port.

Format	`no port lacpmode`
Mode	Interface Config

5.21.24 port lacpmode enable all

This command enables Link Aggregation Control Protocol (LACP) on all ports.

Format	`port lacpmode enable all`
Mode	Global Config

5.21.24.1 no port lacpmode enable all

This command disables Link Aggregation Control Protocol (LACP) on all ports.

Format	`no port lacpmode enable all`
Mode	Global Config

5.21.25 port lacptimeout (Interface Config)

This command sets the timeout on a physical interface or range of interfaces of a particular device type (actor or partner) to either long or short timeout.

Default	long
Format	`port lacptimeout {actor | partner} {long | short}`
Mode	Interface Config

5.21.25.1 no port lacptimeout

This command sets the timeout back to its default value on a physical interface of a particular device type (actor or partner).

Format	`no port lacptimeout {actor	partner}`
Mode	Interface Config

NOTICE Both the `no portlacptimeout` and the `no lacp actor admin state` commands set the values back to default, regardless of the command used to configure the ports. Consequently, both commands will display in `show running-config`.

5.21.26 port lacptimeout (Global Config)

This command sets the timeout for all interfaces of a particular device type (actor or partner) to either long or short timeout.

Default	long
Format	`port lacptimeout {actor	partner} {long	short}`
Mode	Global Config

5.21.26.1 no port lacptimeout

This command sets the timeout for all physical interfaces of a particular device type (actor or partner) back to their default values.

Format	`no port lacptimeout {actor	partner}`
Mode	Global Config

NOTICE Both the `no portlacptimeout` and the `no lacp actor admin state` commands set the values back to default, regardless of the command used to configure the ports. Consequently, both commands will display in `show running-config`.

5.21.27 port-channel adminmode

This command enables all configured port-channels with the same administrative mode setting.

Format	`port-channel adminmode all`
Mode	Global Config

5.21.27.1 no port-channel adminmode

This command disables all configured port-channels with the same administrative mode setting.

Format	`no port-channel adminmode all`
Mode	Global Config

5.21.28 port-channel linktrap

This command enables link trap notifications for the port-channel (LAG). The interface is a logical *slot/port* for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting. Instead of *slot/port*, `lag` *lag-intf-num* can be used as an alternate way to specify the LAG interface. `lag` *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Default	enabled
Format	`port-channel linktrap {`*logical slot/port*` | all}`
Mode	Global Config

5.21.28.1 no port-channel linktrap

This command disables link trap notifications for the port-channel (LAG). The interface is a logical slot and port for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting.

Format	`no port-channel linktrap {`*logical slot/port*` | all}`
Mode	Global Config

5.21.29 port-channel load-balance

This command selects the load-balancing option used on a port-channel (LAG). Traffic is balanced on a port-channel (LAG) by selecting one of the links in the channel over which to transmit specific packets. The link is selected by creating a binary pattern from selected fields in a packet, and associating that pattern with a particular link.

Load-balancing is not supported on every device. The range of options for load-balancing may vary per device.

This command can be configured for a single interface, a range of interfaces, or all interfaces. Instead of *slot/port*, `lag` *lag-intf-num* can be used as an alternate way to specify the LAG interface. `lag` *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Default	3
Format	`port-channel load-balance {1 | 2 | 3 | 4 | 5 | 6 | 7} {`*slot/port*` | all}`
Mode	Interface Config Global Config

Term	Definition
1	Source MAC, VLAN, EtherType, and incoming port associated with the packet
2	Destination MAC, VLAN, EtherType, and incoming port associated with the packet
3	Source/Destination MAC, VLAN, EtherType, and incoming port associated with the packet
4	Source IP and Source TCP/UDP fields of the packet
5	Destination IP and Destination TCP/UDP Port fields of the packet
6	Source/Destination IP and source/destination TCP/UDP Port fields of the packet
7	Enhanced hashing mode
slot/port| all	Global Config Mode only: The interface is a logical slot/port number of a configured port-channel. `All` applies the command to all currently configured port-channels.

5.21.29.1 no port-channel load-balance

This command reverts to the default load balancing configuration.

Format	`no port-channel load-balance {`*`slot/port`*` | all}`
Mode	Interface Config Global Config

Term	Definition
slot/port| **all**	Global Config Mode only: The interface is a logical ***slot/port*** number of a configured port-channel. All applies the command to all currently configured port-channels.

5.21.30 port-channel local-preference

This command enables the local-preference mode on a port-channel (LAG) interface or range of interfaces. By default, the local-preference mode for a port-channel is disabled. This command can be used only on port-channel interfaces.

Default	disable
Format	`port-channel local-preference`
Mode	Interface Config

5.21.30.1 no port-channel local-preference

This command disables the local-preference mode on a port-channel.

Format	`no port-channel local-preference`
Mode	Interface Config

5.21.31 port-channel min-links

This command configures the port-channel's minimum links for lag interfaces.

Default	1
Format	`port-channel min-links` *`1-8`*
Mode	Interface Config

5.21.32 port-channel name

This command defines a name for the port-channel (LAG). The interface is a logical ***slot/port*** for a configured port-channel, and ***name*** is an alphanumeric string up to 15 characters. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

Format	`port-channel name {`*`logical slot/port`*`}` *`name`*
Mode	Global Config

5.21.33 port-channel system priority

Use this command to configure port-channel system priority. The valid range of *priority* is 0-65535.

Default	0x8000
Format	`port-channel system priority` *`priority`*
Mode	Global Config

5.21.33.1 no port-channel system priority

Use this command to configure the default port-channel system priority value.

Format	`no port-channel system priority`
Mode	Global Config

5.21.34 show hashdest

Use this command to predict how packets are forwarded over a LAG or to the next hop device when ECMP is the destination. Given the link aggregation method, ingress physical port and values of various packet fields, this command predicts an egress physical port within the LAG or ECMP for the packet.

Format	`show hashdest {lag` *`lag-id`* `| ecmp` *`prefix/prefix-length`*`} in_port` *`slot/port`* `src-mac` *`macaddr`* `dst-mac` *`macaddr`* `[vlan` *`vlan-id`*`] ethertype` *`0xXXXX`* `[src-ip {`*`ipv4-addr`* `|` *`ipv6-addr`*`} dst-ip {`*`ipv4-addr`* `|` *`ipv6-addr`*`} protocol` *`pid`* `src-l4-port` *`port-num`* `dst-l4-port` *`port-num`*`]`
Mode	Privileged EXEC

Parameter	Definition
lag	The LAG group for which to display the egress physical port.
ecmp	The IP address of the EMC_ group for which to display the egress physical port.
in_port	The incoming physical port for the system.
src-mac	The source MAC address.
dst-mac	The destination MAC address.
vlan	The VLAN ID for VLAN-tagged packets. Do not use this parameter or enter 0 for non-VLAN-tagged packets.
ethertype	The 16-bit EtherType value, in the form *0xXXXX*. For layer 3 packets, hash prediction is only available for IPv4 (0x0800) and and IPv6 (0x86DD).
src-ip	The source IP address, entered as *x.x.x.x* for IPv4 or *x:x:x:x:x:x:x:x* for IPv6 packets.
dst-ip	The destination IP address, entered as *x.x.x.x* for IPv4 or *x:x:x:x:x:x:x:x* for IPv6 packets.
protocol	The protocol ID.
src-l4-port	The layer 4 source port.
dst-l4-port	The layer 4 destination port.

Example: Layer 2 VLAN tagged packet forwarded to a LAG

```
(Routing) #show hashdest lag 1 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac 00:10:18:99:F7:4E vlan
10 ethertype 0x8870

LAG            Destination Port
-----------     ----------------
1                 0/29
```

Example: Layer 2 non-VLAN tagged packet forwarded to a LAG

```
(Routing) # show hashdest lag 1 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac 00:10:18:99:F7:4E
ethertype 0x8870

LAG           Destination Port
-----------     ----------------
1           0/31
```

Example: Non-VLAN tagged IPv4 UDP packet forwarded to a LAG

```
(Routing) #show hashdest lag 1 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac 00:10:18:99:F7:4E
ethertype 0x0800 src-ip 7.0.0.2 dst-ip 3.0.0.2 protocol 17 src-l4-port 63 dst-l4-port 64

LAG            Destination Port
-----------     ----------------
1                 0/32
```

Example: VLAN tagged IPv4 TCP packet forwarded to a LAG

```
(Routing) #show hashdest lag 1 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac 00:10:18:99:F7:4E vlan
10 ethertype 0x0800 src-ip 7.0.0.2 dst-ip 3.0.0.2 protocol 6 src-l4-port 67 dst-l4-port 68

LAG           Destination Port
-----------     ----------------
1                 0/31
```

Example: Non-VLAN tagged IPv4 UDP packet forwarded to an ECMP group

```
(Routing) #show hashdest ecmp  10.0.0.2/16 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac
00:10:18:99:F7:4E vlan 0 ethertype 0x0800 src-ip 7.0.0.2 dst-ip 3.0.0.2 protocol 17 src-l4-port 63
dst-l4-port 64

Egress Port
----------------------------
30.0.0.2 on interface 0/31
```

Example: VLAN tagged IPv4 TCP packet forwarded to an ECMP group

```
(Routing) #show hashdest ecmp 10.0.0.2/16 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac
00:10:18:99:F7:4E vlan 10 ethertype 0x0800 src-ip 7.0.0.2 dst-ip 3.0.0.2 protocol 6 src-l4-port 67
dst-l4-port 68

Egress Port
-----------
0/29
```

Example: Non-VLAN tagged IPv6 UDP packet forwarded to an ECMP group

```
(Routing) #show hashdest ecmp 4001::200/64 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac
00:10:18:99:F7:4E ethertype 0x86dd src-ip 7001:0:0:0:0:0:0:2 dst-ip 3001:0:0:0:0:0:0:2 protocol 17
src-l4-port 63 dst-l4-port 64

Egress Port
----------------------------
6001::200 on interface 0/31
```

Example: Non-VLAN tagged IPv6 TCP packet forwarded to an ECMP group

```
(Routing) #show hashdest ecmp 6001::200/64 in_port 0/3 src-mac 00:00:20:21:AE:8A dst-mac
00:10:18:99:F7:4E ethertype 0x86dd src-ip 7001:0:0:0:0:0:0:2 dst-ip 3001:0:0:0:0:0:0:2 protocol 6
src-l4-port 67 dst-l4-port 68

Egress Port
----------------------------
8001::200 on interface 0/32
```

5.21.35 show lacp actor

Use this command to display LACP actor attributes. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

Format	`show lacp actor {slot/port|all}`
Mode	Global Config

The following output parameters are displayed.

Parameter	Description
System Priority	The administrative value of the Key.
Actor Admin Key	The administrative value of the Key.
Port Priority	The priority value assigned to the Aggregation Port.
Admin State	The administrative values of the actor state as transmitted by the Actor in LACPDUs.

5.21.36 show lacp partner

Use this command to display LACP partner attributes. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

Format	`show lacp actor {slot/port|all}`
Mode	Privileged EXEC

The following output parameters are displayed.

Parameter	Description
System Priority	The administrative value of priority associated with the Partner's System ID.
System-ID	Represents the administrative value of the Aggregation Port's protocol Partner's System ID.
Admin Key	The administrative value of the Key for the protocol Partner.
Port Priority	The administrative value of the Key for protocol Partner.
Port-ID	The administrative value of the port number for the protocol Partner.
Admin State	The administrative values of the actor state for the protocol Partner.

5.21.37 show port-channel brief

This command displays the static capability of all port-channel (LAG) interfaces on the device as well as a summary of individual port-channel interfaces. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

Format	`show port-channel brief`
Mode	• User EXEC

For each port-channel the following information is displayed:

Term	Definition
Logical Interface	The *slot/port* of the logical interface.
Port-channel Name	The name of port-channel (LAG) interface.
Link-State	Shows whether the link is up or down.
Trap Flag	Shows whether trap flags are enabled or disabled.
Type	Shows whether the port-channel is statically or dynamically maintained.
Mbr Ports	The members of this port-channel.
Active Ports	The ports that are actively participating in the port-channel.

5.21.38 show port-channel

This command displays an overview of all port-channels (LAGs) on the switch. Instead of `slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	`show port-channel`
Mode	• Privileged EXEC

Term	Definition
Logical Interface	The valid slot/port number.
Port-Channel Name	The name of this port-channel (LAG). You may enter any string of up to 15 alphanumeric characters.
Link State	Indicates whether the Link is up or down.
Admin Mode	May be enabled or disabled. The factory default is enabled.
Type	The status designating whether a particular port-channel (LAG) is statically or dynamically maintained. • Static - The port-channel is statically maintained. • Dynamic - The port-channel is dynamically maintained.
Load Balance Option	The load balance option associated with this LAG. See “port-channel load-balance” on page 394.
Local Preference Mode	Indicates whether the local preference mode is enabled or disabled.
Mbr Ports	A listing of the ports that are members of this port-channel (LAG), in ***slot/port*** notation. There can be a maximum of eight ports assigned to a given port-channel (LAG).
Device Timeout	For each port, lists the timeout (long or short) for Device Type (actor or partner).
Port Speed	Speed of the port-channel port.
Active Ports	This field lists ports that are actively participating in the port-channel (LAG).

Example: The following shows example CLI display output for the command.

```
(Switch) #show port-channel 3/1


Local Interface................................ 3/1
Channel Name................................... ch1
Link State..................................... Up
Admin Mode..................................... Enabled
Type........................................... Static
Load Balance Option............................ 3
(Src/Dest MAC, VLAN, EType, incoming port)
Local Preference Mode.......................... Enabled
```

```
Mbr    Device/       Port      Port
Ports  Timeout       Speed     Active
------ ------------- --------- -------
0/1    actor/long    Auto      True
       partner/long
0/2    actor/long    Auto      True
       partner/long
0/3    actor/long    Auto      False
       partner/long
0/4    actor/long    Auto      False
       partner/long
```

5.21.39 show port-channel system priority

Use this command to display the port-channel system priority.

Format	`show port-channel system priority`
Mode	Privileged EXEC

5.21.40 show port-channel counters

Use this command to display port-channel counters for the specified port.

Format	`show port-channel` *`slot/port`* `counters`
Mode	Privileged EXEC

Term	Definition
Local Interface	The valid slot/port number.
Channel Name	The name of this port-channel (LAG).
Link State	Indicates whether the Link is up or down.
Admin Mode	May be enabled or disabled. The factory default is enabled.
Port Channel Flap Count	The number of times the port-channel was inactive.
Mbr Ports	The slot/port for the port member.
Mbr Flap Counters	The number of times a port member is inactive, either because the link is down, or the admin state is disabled.

Example: The following shows example CLI display output for the command.

```
(Switch) #show port-channel 3/1 counters

Local Interface................................ 3/1
Channel Name................................... ch1
Link State..................................... Down
Admin Mode..................................... Enabled
Port Channel Flap Count........................ 0

Mbr    Mbr Flap
Ports  Counters
------ ---------
0/1    0
0/2    0
0/3    1
0/4    0
0/5    0
0/6    0
0/7    0
0/8    0
```

5.21.41 clear port-channel counters

Use this command to clear and reset specified port-channel and member flap counters for the specified interface.

Format	`clear port-channel {lag-intf-num | slot/port} counters`
Mode	Privileged EXEC

5.21.42 clear port-channel all counters

Use this command to clear and reset all port-channel and member flap counters for the specified interface.

Format	`clear port-channel all counters`
Mode	Privileged EXEC

5.21.43 set bpdu forwarding

This command configures BPDU forwarding. The default behavior is that received BPDU is sent to the CPU and handled. The BPDU frame is not forwarded/switched. If this feature is enabled the BPDU frame is not longer sent to CPU but forwarded/switched on all ports.

Note, that you have to save the configuration and reboot the system to activate a new setting.

Format	**`set bpdu forwarding`**
Mode	Privileged EXEC

5.21.43.1 no set bpdu forwarding

This command disabled BPDU forwarding.

Note, that you have to save the configuration and reboot the system to activate a new setting.

Format	**`no set bpdu forwarding`**
Mode	Privileged EXEC

5.21.44 show bpdu forwarding

This command displays the BPDU forwarding setting. The values for the current active setting and the value for the configured setting are indicated.

Format	**`show bpdu forwarding`**
Mode	Privileged EXEC

5.22 VPC Commands

VPC (also known as MLAG) enables a LAG to be created across two independent switches, so that some member ports of a VPC can reside on one switch and the other members of a VPC can reside on another switch. The partner device on the remote side can be a VPC-unaware unit. To the unaware unit, the VPC appears to be a single LAG connected to a single switch.

5.22.1 vpc domain

Use this command to enter into VPC configuration mode and creates a VPC domain with the specified domain-id. Only one VPC domain can be created on a given device. The domain-id of the VPC domain should be equal to the one configured on the other VPC peer with which this device wants to form a VPC pair. The configured VPC domain-ids are exchanged during role election and if they are configured differently on the peer devices, the VPC does not become operational.

The administrator needs to ensure that the no two VPC domains can share the same VPC domain-id. Domain-id is used to derive the auto-generated VPC MAC address that is used in the actor ID field in the LACP PDUs and STP BPDUs sent out on VPC interfaces. When two VPC domains have the same domain-id, it leads to the same actor IDs and results in LACP convergence issues and STP convergence issues.

The range of domain id is 1-255.

Format	`vpc domain` *`domain-id`*
Mode	Global Config

5.22.1.1 no vpc domain

Use this command to deletes the VPC domain, disable peer-keepalive, disable peer-detection, and reset the configured parameters (role priority, VPC MAC address and VPC system priority) for the VPC domain.

Format	`no vpc domain` *`domain-id`*
Mode	Global Config

5.22.2 feature vpc

This command enables VPC globally. VPC role election occurs if both VPC and the keepalive state machine are enabled (see “peer-keepalive timeout” on page 404). Peer link also has to be configured for role election to occur.

Format	`feature vpc`
Mode	Global Config

5.22.2.1 no feature vpc

This command disables VPC.

Format	`no feature vpc`
Mode	Global Config

5.22.3 peer detection enable

This command starts the dual control plane detection protocol (DCPDP) on the VPC switch. The peer VPC switch’s IP address must be configured for the DCPDP to start on an VPC switch.

Default	None
Format	`peer detection enable`
Mode	VPC Config

5.22.3.1 no peer detection enable

This command disables the dual control plane (DCPDP) detection protocol on the VPC switch.

Format	`no peer detection enable`
Mode	VPC Config

5.22.4 peer detection interval

Use this command to configure the DCPDP transmission interval and reception timeout.

The configurable transmission interval range is 200 ms–4000 ms. The configurable reception timeout range is 700 ms–14000 ms. The default transmission interval is 1000 ms; the default reception timeout is 3500 ms.

Default	• Transmission interval: 1000 ms • Reception timeout: 3500 ms
Format	`peer detection interval` *msecs* `timeout` *seconds*
Mode	VPC Config

5.22.4.1 no peer detection interval

Use this command to reset the DCPDP transmission interval and reception timeout to default values.

Format	`no peer detection interval` *msecs* `timeout` *seconds*
Mode	VPC Config

5.22.5 peer-keepalive destination

This command configures the IP address of the peer VPC switch, which is the destination IP address of the dual control plane detection protocol (DCPDP) on the peer VPC switch. This configuration is used by the dual control plane detection protocol (DCPDP) on the VPC switches. It also configures the source IP address of the DCPDP message, which is the self IP on the VPC switch. The UDP port on which the VPC switch listens to the DCPDP messages can also be configured with this command.

The configurable range for the UDP port 1 to 65535 (Default is 60000).

Format	`peer-keepalive destination` *ipaddress* `switch` *ipaddress* `[udp-port` *port*`]`
Mode	VPC Config

5.22.5.1 no peer-keepalive destination

This command unconfigures the self IP address, peer IP address, and the UDP port.

Format	`no peer-keepalive destination` *ipaddress* `switch` *ipaddress* `[udp-port` *port*`]`
Mode	VPC Config

5.22.6 peer-keepalive enable

This command starts the keepalive state machine on the VPC device, if VPC is globally enabled.

Default	`Disabled`
Format	`peer-keepalive enable`
Mode	VPC Config

5.22.6.1 no peer-keepalive enable

This command stops the keepalive state machine of the VPC switch.

Format	`no peer-keepalive enable`
Mode	VPC Config

5.22.7 peer-keepalive timeout

This command configures the peer keepalive timeout value (in seconds). If an VPC switch does not receive a keepalive message from the peer for the duration of this timeout value, it transitions its role (if required).

NOTICE The keepalive state machine is not restarted if keepalive priority is modified post election.

The configurable range is 2 to 15 seconds. The default is 5 seconds.

Format	`peer-keepalive timeout` *`value`*
Mode	VPC Config

5.22.7.1 no peer-keepalive timeout

This command resets the keepalive timeout to the default value of 5 seconds.

Format	`no keepalive timeout`
Mode	VPC Config

5.22.8 role priority

This command configures VPC switch priority. This value is used for VPC role election. The priority value is sent to the peer in the VPC keepalive messages. The VPC switch with lower priority becomes the Primary and the switch with higher priority becomes the Secondary. If both VPC peer switches have the same role priority, the device with the lower system MAC address becomes the Primary.

NOTICE The keepalive state machine is not restarted if keepalive priority is modified post election.

The priority can be between 1 and 255 seconds. The default is 100.

Format	`role priority` *`value`*
Mode	VPC Config

5.22.8.1 no role priority

This command resets the keepalive priority and timeout to the default value of 100.

Format	`no role priority`
Mode	VPC Config

5.22.9 system-mac

Use this command to manually configure the MAC address for the VPC domain. The VPC MAC address should be configured same on both the peer devices. The specified MAC address should be a unicast MAC address in <aa:bb:cc:dd:ee:ff> format and cannot be equal to the MAC address of either the primary VPC or secondary VPC device. The configured VPC MAC address is exchanged during role election and, if they are configured differently on the peer devices, VPC does not become operational.

The *mac-address* is used in the LACP PDUs and STP BPDUs that are sent out on VPC member ports, if VPC primary device election takes place after the VPC MAC address is configured. When the VPC MAC address is configured after the VPC primary device is elected, the operational VPC MAC address is used in the LACP PDUs and STP BPDUs instead of the configured VPC MAC address.

Format	`system-mac` *`mac-address`*
Mode	VPC Domain

5.22.9.1 no system-mac

This command unconfigures the manually configured VPC MAC address for the VPC domain.

Format	`no system-mac`
Mode	VPC Domain

5.22.10 system-priority

Use this command to manually configures a system priority for the VPC domain. The *system-priority* should be configured identically on both VPC peers. If the configured VPC system priority is different on VPC peers, the VPC will not come up.

The system-priority is used in the LACP PDUs that are sent out on VPC member ports if VPC primary device election takes place after the VPC system priorities are configured. When the VPC system priority is configured after the VPC primary device is elected, the operational VPC system priority is used in the LACP PDUs instead of the configured VPC system priority.

The configurable range is 1 to 65535. The default is 32767.

Format	`system-priority` *`priority`*
Mode	VPC Domain

5.22.10.1 no system-priority

This command restores the VPC system priority to the default value.

Format	`no system-priority` *`priority`*
Mode	VPC Domain

5.22.11 vpc

This command configures a port-channel (LAG) as part of an VPC. Upon issuing this command, the port-channel is down until the port-channel member information is exchanged and agreed between the VPC peer switches.

The configurable range for the VPC id 1 to (Max number of LAG interfaces (64) -1)

Default	none
Format	`vpc` *`id`*
Mode	LAG Interface

5.22.11.1 no vpc

This command unconfigures a port-channel as VPC.

Format	`no vpc` *id*
Mode	LAG Interface

5.22.12 vpc peer-link

This command configures a port channel as the VPC peer link.

Format	`vpc peer-link`
Mode	LAG Interface

5.22.12.1 no vpc peer-link

This command unconfigures a port channel as the VPC peer link.

Format	`no vpc peer-link`
Mode	LAG Interface

5.22.13 show running-config vpc

Use this command to display running configuration information for virtual port channels (VPC).

Format	`show running-config vpc`
Mode	Privileged EXEC

Example:

```
(Switching) #  show running-config vpc

feature vpc
vpc domain 1
role priority 120
system-mac 00:10:18:82:1A:A0
system-priority 32767
peer-keepalive destination 1.1.1.1 source 1.1.1.2
                        peer detection interval 2000  timeout 6000

interface lag 1
vpc peer-link

interface lag 2
vpc 2
```

5.22.14 show vpc

This command displays information about an VPC. The configuration and operational modes of the VPC are displayed; the VPC is operationally enabled if all the preconditions are met. The port-channel that is configured as an VPC interface is also displayed with the member ports on the current switch and peer switch (with their link status)

Format	`show vpc` *id*
Mode	User EXEC

Example: The following shows an example of the command.

```
(Switching) # show vpc 10
VPC id#10
-----------------
Config mode…………………………..Enabled
Operational mode...……………………Enabled
Port channel……………….……………………3/1
Self member ports Status
----------------- ---------
              0/2 UP
              0/6 DOWN
Peer member ports Status
----------------- ---------
              0/8 UP
```

5.22.15 show vpc brief

This command displays the VPC global status and current VPC operational mode (the VPC is in operational mode if the preconditions are met). The peerlink and keepalive statuses as well as the number of configured and operational VPCs and the system MAC and role are displayed.

Format `show vpc brief`

Mode Privileged EXEC

Example: The following shows an example of the command.

```
(Switching) # show vpc brief
VPC Domain ID...................................1
VPC config Mode................................ Enabled
Keepalive config mode.......................... Enabled
VPC operational Mode........................... Enabled
Self Role...................................... Primary
Peer Role...................................... Secondary
Peer detection................................. Disabled
Operational VPC MAC.............................aa:bb:cc:dd:ee:ff
Operational VPC system priority.................32767

Peer-Link details
-----------------
Interface...................................... 3/2
Peer link status............................... UP
Peer-link STP Mode............................. Disabled
Configured Vlans............................... 1
Egress tagging................................. none

VPC Details
-----------
Number of VPCs configured...................... 1
Number of VPCs operational..................... 1

VPC id# 1
-----------
Interface...................................... 3/1
Configured Vlans............................... 1
VPC Interface State............................ Active

Local MemberPorts       Status
-----------------       ------
             0/19       UP
             0/20       UP
             0/21       UP
             0/22       UP
```

```
Peer MemberPorts        Status
----------------        ------
            0/27        UP
            0/28        UP
            0/29        UP
            0/30        UP
```

5.22.16 show vpc consistency-parameters

Use this command to display global consistency parameters and LAG interface consistency parameters for virtual port channels (VPC) on the switch.

Format	`show vpc consistency-parameters {global	interface lag` *`lag-id`*`}`
Mode	Privileged EXEC

Example:

```
switch # show vpc consistency-parameters global
Parameter
Name                     Value
---------------------  ---------------------------
STP Mode                 Enabled
STP Version              EEE  802.1s
BPDU Filter Mode         Enabled
BPDU Guard Mode          Enabled
MST Instances            1,2,4
FDB Aging Time           300 seconds
VPC system MAC address <AA:BB:CC:DD:EE:FF>
VPC system priority      32767
VPC Domian ID            1
MST VLAN Configuration
Instance       Associated VLANS
-------------  -----------------------------------
7,8,10,20
2                                 4,5,40-50

 4                                 30,32,34-38

switch# show vpc consistency-parameters interface lag 2
Parameter
Name                      Value
----------------          ---------------------------
Port Channel Mode         Enabled
STP Mode                  Enabled
BPDU Filter  Mode         Enabled
BPDU Flood Mode           Enabled
Auto-edge                 FALSE
TCN Guard                 True
Port Cost                 2
Edge Port                 True
Root Guard                True
Loop Guard                True
Hash Mode                 3
Minimum Links             1
Channel Type              Static
Configured VLANs          4,5,7,8
MTU                       1518


Active Port     Speed       Duplex
------------    ---------   --------
0/1                 100        Full
0/2                 100        Full
```

```
MST VLAN Configuration

Instance       Associated VLANS
-------------  -----------------------------------

1                                 7,8

2                            4,5
PV(R)STP Configuration:
STP port-priority             <0-240>

VLAN        port-priority                 cost
-------     -----------------    ---------------------------
<ID>             <0-240>            auto | <1- 200000000>
```

5.22.17 show vpc peer-keepalive

This command displays the peer VPC switch IP address used by the dual control plane detection protocol. The port used for the DCPDP is shown. This command also displays if peer detection is enabled. If enabled, the detection status is displayed. The DCPDP message transmission interval and reception timeout are also displayed.

Format	`show vpc peer-keepalive`
Mode	User EXEC

Example: The following shows an example of the command.

```
(Switching) # show vpc peer-keepalive
Peer IP address............................... 10.130.14.55
Source IP address............................. 10.130.14.54
UDP port...................................... 50000
Peer detection admin status................... Enabled
Peer detection operational status............. Down
Peer is detected.............................. True
Configured Tx interval........................ 1000 milliseconds
Configured Rx timeout......................... 3500 milliseconds
Operational Tx interval....................... 500 milliseconds
Operational Rx timeout........................ 2000 milliseconds
```

5.22.18 show vpc role

This command displays information about the keepalive status and parameters. The role of the VPC switch as well as the system MAC address and priority are displayed.

Format	`show vpc role`
Mode	User EXEC

Example: The following shows an example of the command.

```
(Switching) # show vpc role
Self
----
VPC domain ID..................................1
Keepalive config mode......................... Enabled
Keepalive operational mode.................... Enabled
Role Priority................................. 100
Configured VPC MAC ...........................<AA:BB:CC:DD:EE:FF>
Operational VPC MAC...........................<AA:BB:CC:DD:EE:FF>
Configured VPC system priority.................32767
Operational VPC system priority................32767
Local System MAC.................................... 00:10:18:82:18:63
Timeout....................................... 5
```

```
VPC State...................................... Primary
VPC Role....................................... Primary

Peer
----
VPC Domain ID.................................. 1
Role Priority.................................. 100
Configured VPC MAC..............................<AA:BB:CC:DD:EE:FF>
Operational VPC MAC.............................<AA:BB:CC:DD:EE:FF>
Configured VPC system priority..................32767
Operational VPC system priority.................32767
Role............................................Secondary
Local System MAC................................00:10:18:82:1b:ab
```

5.22.19 show vpc statistics

This command displays counters for the keepalive messages transmitted and received by the VPC switch.

Format `show vpc statistics {peer-keepalive | peer-link}`

Mode User EXEC

Example: The following shows examples of the command.

Example 1

```
(Switching) # show vpc statistics peer-keepalive
Total trasmitted………………………….………. 123
Tx successful……………………….……………. 118
Tx errors…………….......................................... 5
Total received………………………………… 115
Rx successful………………………………….. 108
Rx Errors……………………………………… 7
Timeout counter………………………………. 6
```

Example2 :

```
(Switching) #show vpc statistics peer-link
Peer link control messages trasmitted………... 123
Peer link control messages Tx errors..................... 5
Peer link control messages Tx timeout…….…….. 4
Peer link control messages ACK transmitted……. 34
Peer link control messages ACK Tx erorrs………. 5
Peer link control messages received..……………. 115
Peer link data messages trasmitted………………. 123
Peer link data messages Tx errors........................... 5
Peer link data messages Tx timeout…….………... 4
Peer link data messages ACK transmitted………. 34
Peer link data messages ACK Tx erorrs…………. 5
Peer link data messages received…...……………. 115
Peer link BPDU’s tranmsitted to peer……………. 123
Peer link BPDU’s Tx error……………………….. 9
Peer link BPDU’s received from peer……………. 143
Peer link BPDU’s Rx error……………………….. 1
Peer link LACPDU’s tranmsitted to peer…………. 123
Peer link LACPDU’s Tx error…………………….. 9
Peer link LACPDU’s received from peer…………. 143
Peer link LACPDU’s Rx error…………………….. 1
```

5.22.20 clear vpc statistics

This command clears all the keepalive statistics.

Format	`clear vpc statistics {peer-keepalive | peer-link}`
Mode	User EXEC

Example: The following shows an example of the command.

```
(Switching) # clear vpc statistics peer-keepalive
(Switching) # clear vpc statistics peer-link
```

5.22.21 debug vpc peer-keepalive

This command enables debug traces of the keepalive state machine transitions.

Format	`debug vpc peer-keepalive`
Mode	User EXEC

5.22.22 debug vpc peer-link data-message

This command enables debug traces for the control messages exchanged between the VPC devices on the peer link.

Format	`debug vpc peer-link data-message`
Mode	User EXEC

5.22.23 debug vpc peer-link control-message async

This command enables debug traces for the asynchronous reliable control messages exchanged between the MLAG devices on the peer link. For `error`, only the errors in the communication are traced. For `msg`, the control message contents that are exchanged can be traced. Both transmitted and received control messages contents can be traced.

Format	`debug vpc peer-link control-message async {error | msg [receive | transmit]}`
Mode	User EXEC

5.22.24 debug vpc peer-link control-message bulk

This command enables debug traces for the periodic control messages exchanged between the MLAG devices on the peer link. For `error`, only the errors in the communication are traced. For `msg`, the control message contents that are exchanged can be traced. Both transmitted and received control messages contents can be traced.

Format	`debug vpc peer-link control-message bulk {error | msg [receive | transmit]}`
Mode	User EXEC

5.22.25 debug vpc peer-link control-message ckpt

This command enables debug traces for the checkpointing control messages exchanged between the MLAG devices on the peer link. For `error`, only the errors in the communication are traced. For `msg`, the control message contents that are exchanged can be traced. Both transmitted and received control messages contents can be traced.

Format	`debug vpc peer-link control-message ckpt {error | msg [receive | transmit]}`
Mode	User EXEC

5.22.26 debug vpc peer detection

This command enables debug traces for the dual control plane detection protocol. Traces are seen when the DCPDP transmits or receives detection packets to or from the peer VPC switch.

Format `debug vpc peer detection`

Mode User EXEC

5.23 Port Mirroring Commands

Port mirroring, which is also known as port monitoring, selects network traffic that you can analyze with a network analyzer, such as a SwitchProbe device or other Remote Monitoring (RMON) probe.

5.23.1 monitor session source

This command configures the source interface for a selected monitor session. Use the `source interface` *`slot/port`* parameter to specify the interface to monitor. Use `rx` to monitor only ingress packets, or use *`tx`* to monitor only egress packets. If you do not specify an `{rx | tx}` option, the destination port monitors both ingress and egress packets.

A VLAN can be configured as the source to a session (all member ports of that VLAN are monitored). Remote port mirroring is configured by adding the RSPAN VLAN ID. At the source switch, the destination is configured as the RSPAN VLAN and at the destination switch, the source is configured as the RSPAN VLAN.

NOTICE The source and destination cannot be configured as remote on the same device.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS. Option *rx* is used to monitor only ingress packets. Option *tx* is used to monitor only egress packets. If no option is specified, both ingress and egress packets, RX and TX, are monitored.

A VLAN can also be configured as the source to a session (all the member ports of that VLAN are monitored).

NOTICE If an interface participates in some VLAN and is a LAG member, this VLAN cannot be assigned as a source VLAN for a Monitor session. At the same time, if an interface participates in some VLAN and this VLAN is assigned as a source VLAN for a Monitor session, the interface can be assigned as a LAG member.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

NOTICE On the intermediate switch, RSPAN VLAN should be created, the ports connected towards Source and Destination switch should have the RSPAN VLAN participation. RSPAN VLAN egress tagging should be enabled on the interface on the intermediate switch connected towards the Destination switch.

|

Default None

Format `monitor session` *`session-id`* `source {interface {`*`slot/port`* `| cpu | lag } | vlan` *`vlan-id`* `| remote vlan` *`vlan-id`* `}[{rx | tx}]`

Mode Global Config

5.23.1.1 no monitor session source

This command removes the specified mirrored port from the selected port mirroring session.

Default	None
Format	`no monitor session` *session-id* `source {interface {`*slot/port* `| cpu | lag } | vlan | remote vlan}`
Mode	Global Config

5.23.2 monitor session destination

This command configures the probe interface for a selected monitor session. This command configures a probe port and a monitored port for monitor session (port monitoring). Use `rx` to monitor only ingress packets, or use *tx* to monitor only egress packets. If you do not specify an `{rx | tx}` option, the destination port monitors both ingress and egress packets.

A VLAN can be configured as the source to a session (all member ports of that VLAN are monitored). Remote port mirroring is configured by adding the RSPAN VLAN ID. At the source switch, the destination is configured as the RSPAN VLAN and at the destination switch, the source is configured as the RSPAN VLAN.

NOTICE The source and destination cannot be configured as remote on the same device.

The `reflector-port` is configured at the source switch along with the destination RSPAN VLAN. The `reflector-port` forwards the mirrored traffic towards the destination switch.

NOTICE This port must be configured with RSPAN VLAN membership.

Use the `destination interface` *slot/port* to specify the interface to receive the monitored traffic.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS. Option *rx* is used to monitor only ingress packets. Option *tx* is used to monitor only egress packets. If no option is specified, both ingress and egress packets, RX and TX, are monitored.

A VLAN can also be configured as the source to a session (all the member ports of that VLAN are monitored).

NOTICE If an interface participates in some VLAN and is a LAG member, this VLAN cannot be assigned as a source VLAN for a Monitor session. At the same time, if an interface participates in some VLAN and this VLAN is assigned as a source VLAN for a Monitor session, the interface can be assigned as a LAG member.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

NOTICE On the intermediate switch, RSPAN VLAN should be created, the ports connected towards Source and Destination switch should have the RSPAN VLAN participation. RSPAN VLAN egress tagging should be enabled on the interface on the intermediate switch connected towards the Destination switch.

Default	None
Format	`monitor session` *session-id* `destination {interface` *slot/port* `|remote vlan` *vlan-id* `reflector-port` *slot/port*`}`
Mode	Global Config

5.23.2.1 no monitor session destination

This command removes the specified probe port from the selected port mirroring session.

Format `no monitor session session-id destination {interface slot/port |remote vlan vlan-id reflector-port slot/port}`

Mode Global Config

5.23.3 monitor session filter

This command attaches an IP/MAC ACL to a selected monitor session. This command configures a probe port and a monitored port for monitor session (port monitoring).

An IP/MAC ACL can be attached to a session by giving the access list number/name.

Use the `filter` parameter to filter a specified access group either by IP address or MAC address.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

NOTICE Source and destination cannot be configured as remote on the same device.

NOTICE IP/MAC ACL can be attached to a session by giving the access list number/name. On the platforms that do not support both IP and MAC ACLs to be assigned on the same Monitor session, an error message is thrown when user tries to configure ACLs of both types.

Default None

Format `monitor session session-id filter {ip access-group acl-id/aclname | mac access-group acl-name}`

Mode Global Config

5.23.3.1 no monitor session filter

This command removes the specified IP/MAC ACL from the selected monitoring session.

Format `no smonitor session session-id filter {ip access-group | mac access-group }`

Mode Global Config

5.23.4 monitor session mode

This command enables the selected port mirroring session. This command configures a probe port and a monitored port for monitor session (port monitoring).

A VLAN can be configured as the source to a session (all member ports of that VLAN are monitored). Remote port mirroring is configured by adding the RSPAN VLAN ID. At the source switch, the destination is configured as the RSPAN VLAN and at the destination switch, the source is configured as the RSPAN VLAN.

NOTICE Source and destination cannot be configured as remote on the same device.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS. Option *rx* is used to monitor only ingress packets. Option *tx* is used to monitor only egress packets. If no option is specified, both ingress and egress packets, RX and TX, are monitored.

A VLAN can also be configured as the source to a session (all the member ports of that VLAN are monitored).

NOTICE If an interface participates in some VLAN and is a LAG member, this VLAN cannot be assigned as a source VLAN for a Monitor session. At the same time, if an interface participates in some VLAN and this VLAN is assigned as a source VLAN for a Monitor session, the interface can be assigned as a LAG member.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

NOTICE Source and destination cannot be configured as remote on the same device.

NOTICE On the intermediate switch: RSPAN VLAN should be created, the ports connected towards the Source and Destination switch should have the RSPAN VLAN participation. RSPAN VLAN egress tagging should be enabled on interface on intermediate switch connected towards Destination switch.

Default	None
Format	`monitor session` *`session-id`* `mode`
Mode	Global Config

5.23.4.1 no monitor session mode

This command disables the selected port mirroring session.

Format	`no monitor session` *`session-id`* `mode`
Mode	Global Config

5.23.5 no monitor session

Use this command without optional parameters to remove the monitor session (port monitoring) designation from the source probe port, the destination monitored port and all VLANs. Once the port is removed from the VLAN, you must manually add the port to any desired VLANs. Use the **`source interface`** ***`slot/port`*** parameter or **`destination interface`** to remove the specified interface from the port monitoring session. Use the **`mode`** parameter to disable the administrative mode of the session

Format	`no monitor session` *`session-id`* `{source {interface` *`slot/port`* `| cpu	lag} |vlan| remote vlan}	destination { interface	remote vlan	mode |filter {ip access-group |mac access-group}}]`
Mode	Global Config

5.23.6 no monitor

This command removes all the source ports and a destination port and restores the default value for mirroring session mode for all the configured sessions.

NOTICE This is a stand-alone “no” command. This command does not have a “normal” form.

Default enabled

Format `no monitor`

Mode Global Config

5.23.7 show monitor session

This command displays the Port monitoring information for a particular mirroring session.

NOTICE The *`session-id`* parameter is an integer value used to identify the session. In the current version of the software, the *`session-id`* parameter is always one (1).

Format `show monitor session` *`session-id`*

Mode Privileged EXEC

Term	Definition
Session ID	An integer value used to identify the session. Its value can be anything between 1 and the maximum number of mirroring sessions allowed on the platform.
Admin Mode	Indicates whether the Port Mirroring feature is enabled or disabled for the session identified with *`session-id`*. The possible values are Enabled and Disabled.
Probe Port	Probe port (destination port) for the session identified with *`session-id`*. If probe port is not set then this field is blank.
Src VLAN	All member ports of this VLAN are mirrored. If the source VLAN is not configured, this field is blank.
MIrrored Port	The port that is configured as a mirrored port (source port) for the session identified with *`session-id.`* If no source port is configured for the session, this field is blank.
Ref. Port	This port carries all the mirrored traffic at the source switch.
Src RVLAN	The source VLAN is configured at the destination switch. If the remote VLAN is not configured, this field is blank.
Dst RVLAN	The destination VLAN is configured at the source switch. If the remote VLAN is not configured, this field is blank.
Type	Direction in which source port configured for port mirroring.Types are tx for transmitted packets and rx for receiving packets.
IP ACL	The IP access-list id or name attached to the port mirroring session.
MAC ACL	The MAC access-list name attached to the port mirroring session.

Example: Example 1:

```
(Switch)#show monitor session 1

Session  Admin    Probe    Src      Mirrored Ref      Src      Dst      Type     IP       MAC
ID       Mode     Port     VLAN     Port     Port     RVLAN    RVLAN             ACL      ACL
1        Enable   1/0/8             1/0/10                              Rx,Tx
```

Example: Example 2:

```
(Switch)#show monitor session all

Session  Admin    Probe    Src      Mirrored Ref      Src      Dst      Type     IP       MAC
ID       Mode     Port     VLAN     Port     Port     RVLAN    RVLAN             ACL      ACL
1        Enable   1/0/8             1/0/10                              Rx,Tx
2        Disable           6                 0/4               10                4
3        Disable  1/0/11                              10                                  101
4        Enable   1/0/11            1/0/7                               Tx
```

Example: Example 3:

```
(Switch)#show monitor session all

Session  Admin    Probe    Src      Mirrored Ref      Src      Dst      Type     IP       MAC
ID       Mode     Port     VLAN     Port     Port     RVLAN    RVLAN             ACL      ACL
1        Enable   1/0/8             1/0/10                              Rx
2        Enable            6                                            Rx       4
3        Disable           10                                           Tx                101
4        Disable  1/0/11            1/0/7                               Tx
```

Example: Example 4:

```
(Switch)#show monitor session all

Session  Admin    Probe    Src      Mirrored Ref      Src      Dst      Type     IP       MAC
ID       Mode     Port     VLAN     Port     Port     RVLAN    RVLAN             ACL      ACL
1        Enable                     1/0/15   1/0/4             11       Tx       4
2        Enable   1/0/3             1/0/15                              Tx
3        Enable                     1/0/15   1/0/20            10       Rx
4        Enable   1/0/11            1/0/15                              Rx                10
```

Example: Example 5:

```
(Switch)#show monitor session all

Session  Admin    Probe    Src      Mirrored Ref      Src      Dst      Type     IP       MAC
ID       Mode     Port     VLAN     Port     Port     RVLAN    RVLAN             ACL      ACL
1        Disable
2        Disable
3        Enable   1/0/16   3
4        Enable   1/0/11            1/0/16                              Rx,Tx             10
```

Example: Example 6:

```
(Switch)#show monitor session all

Session  Admin    Probe    Src      Mirrored Ref      Src      Dst      Type     IP       MAC
ID       Mode     Port     VLAN     Port     Port     RVLAN    RVLAN             ACL      ACL
1        Enable            1                 1/0/4             15                4
2        Enable   1/0/15   2
3        Enable            3                 1/0/20            10
4        Enable   1/0/11            1/0/16                              Rx,Tx             10
```

5.23.8 show vlan remote-span

This command displays the configured RSPAN VLAN.

Format `show vlan remote-span`

Mode Privileged EXEC Mode

Example: The following shows example output for the command.

```
(Switch)# show vlan remote-span

Remote SPAN VLAN
------------------------------------------------------------------------
100,102,201,303
```

5.24 Static MAC Filtering Commands

The commands in this section describe how to configure static MAC filtering. Static MAC filtering allows you to configure destination ports for a static multicast MAC filter irrespective of the platform.

5.24.1 macfilter

This command adds a static MAC filter entry for the MAC address ***macaddr*** on the VLAN ***vlanid***. The value of the ***macaddr*** parameter is a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The restricted MAC Addresses are: 00:00:00:00:00:00, 01:80:C2:00:00:00 to 01:80:C2:00:00:0F, 01:80:C2:00:00:20 to 01:80:C2:00:00:21, and FF:FF:FF:FF:FF:FF. The ***vlanid*** parameter must identify a valid VLAN.

The number of static mac filters supported on the system is different for MAC filters where source ports are configured and MAC filters where destination ports are configured.

- For unicast MAC address filters and multicast MAC address filters with source port lists, the maximum number of static MAC filters supported is 20.
- For multicast MAC address filters with destination ports configured, the maximum number of static filters supported is 256.

i.e. For current Broadcom platforms, you can configure the following combinations:

- Unicast MAC and source port (max = 20)
- Multicast MAC and source port (max = 20)
- Multicast MAC and destination port (only) (max = 256)
- Multicast MAC and source ports and destination ports (max = 20)

Format `macfilter` ***`macaddr vlanid`***

Mode Global Config

5.24.1.1 no macfilter

This command removes all filtering restrictions and the static MAC filter entry for the MAC address ***macaddr*** on the VLAN ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The ***vlanid*** parameter must identify a valid VLAN.

Format	`no macfilter` *`macaddr vlanid`*
Mode	Global Config

5.24.2 macfilter adddest

Use this command to add the interface or range of interfaces to the destination filter set for the MAC filter with the given ***macaddr*** and VLAN of ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

NOTICE Configuring a destination port list is only valid for multicast MAC addresses.

Format	`macfilter adddest` *`macaddr`*
Mode	Interface Config

5.24.2.1 no macfilter adddest

This command removes a port from the destination filter set for the MAC filter with the given ***macaddr*** and VLAN of ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

Format	`no macfilter adddest` *`macaddr`*
Mode	Interface Config

5.24.3 macfilter adddest all

This command adds all interfaces to the destination filter set for the MAC filter with the given ***macaddr*** and VLAN of ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

NOTICE Configuring a destination port list is only valid for multicast MAC addresses.

Format	`macfilter adddest all` *`macaddr`*
Mode	Global Config

5.24.3.1 no macfilter adddest all

This command removes all ports from the destination filter set for the MAC filter with the given ***macaddr*** and VLAN of ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

Format	`no macfilter adddest all` *`macaddr`*
Mode	Global Config

5.24.4 macfilter addsrc

This command adds the interface or range of interfaces to the source filter set for the MAC filter with the MAC address of ***macaddr*** and VLAN of ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

Format	`macfilter addsrc` *`macaddr vlanid`*
Mode	Interface Config

5.24.4.1 no macfilter addsrc

This command removes a port from the source filter set for the MAC filter with the MAC address of ***macaddr*** and VLAN of ***vlanid***. The ***macaddr*** parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

Format	`no macfilter addsrc` *`macaddr vlanid`*
Mode	Interface Config

5.24.5 macfilter addsrc all

This command adds all interfaces to the source filter set for the MAC filter with the MAC address of ***macaddr*** and ***vlanid***. You must specify the ***macaddr*** parameter as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The ***vlanid*** parameter must identify a valid VLAN.

Format	`macfilter addsrc all` *`macaddr vlanid`*
Mode	Global Config

5.24.5.1 no macfilter addsrc all

This command removes all interfaces to the source filter set for the MAC filter with the MAC address of ***macaddr*** and VLAN of ***vlanid***. You must specify the ***macaddr*** parameter as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The ***vlanid*** parameter must identify a valid VLAN.

Format	`no macfilter addsrc all` *`macaddr vlanid`*
Mode	Global Config

5.24.6 show mac-address-table static

This command displays the Static MAC Filtering information for all Static MAC Filters. If you specify **`all`**, all the Static MAC Filters in the system are displayed. If you supply a value for ***macaddr***, you must also enter a value for ***vlaid***, and the system displays Static MAC Filter information only for that MAC address and VLAN.

Format	`show mac-address-table static {`*`macaddr vlanid`*`	all}`
Mode	Privileged EXEC

Term	Definition
MAC Address	The MAC Address of the static MAC filter entry.
VLAN ID	The VLAN ID of the static MAC filter entry.
Source Port(s)	The source port filter set's slot and port(s).

NOTICE Only multicast address filters will have destination port lists.

5.24.7 show mac-address-table staticfiltering

This command displays the Static Filtering entries in the Multicast Forwarding Database (MFDB) table.

Format `show mac-address-table staticfiltering`

Mode Privileged EXEC

Term	Definition
VLAN ID	The VLAN in which the MAC Address is learned.
MAC Address	A unicast MAC address for which the switch has forwarding and or filtering information. As the data is gleaned from the MFDB, the address will be a multicast address. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Type	The type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

5.25 DHCP L2 Relay Agent Commands

You can enable the switch to operate as a DHCP Layer 2 relay agent to relay DHCP requests from clients to a Layer 3 relay agent or server. The Circuit ID and Remote ID can be added to DHCP requests relayed from clients to a DHCP server. This information is included in DHCP Option 82, as specified in sections 3.1 and 3.2 of RFC3046.

5.25.1 dhcp l2relay

This command enables the DHCP Layer 2 Relay agent for an interface a range of interfaces in, or all interfaces. The subsequent commands mentioned in this section can only be used when the DHCP L2 relay is enabled.

Format `dhcp l2relay`

Mode
- Global Config
- Interface Config

5.25.1.1 no dhcp l2relay

This command disables DHCP Layer 2 relay agent for an interface or range of interfaces.

Format `no dhcp l2relay`

Mode
- Global Config
- Interface Config

5.25.2 dhcp l2relay circuit-id subscription

This command sets the Option-82 Circuit ID for a given service subscription identified by ***`subscription-string`*** on a given interface. The ***`subscription-string`*** is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. When circuit-id is enabled using this command, all Client DHCP requests that fall under this service subscription are added with Option-82 circuit-id as the incoming interface number.

Default	disabled
Format	`dhcp l2relay circuit-id subscription subscription-string`
Mode	Interface Config

5.25.2.1 no dhcp l2relay circuit-id subscription

This command resets the Option-82 Circuit ID for a given service subscription identified by ***subscription-string*** on a given interface. The ***subscription-string*** is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. When circuit-id is disabled using this command, all Client DHCP requests that fall under this service subscription are no longer added with Option-82 circuit-id.

Format	`no dhcp l2relay circuit-id subscription` *`subscription-string`*
Mode	Interface Config

5.25.3 dhcp l2relay circuit-id vlan

This parameter sets the DHCP Option-82 Circuit ID for a VLAN. When enabled, the interface number is added as the Circuit ID in DHCP option 82.

Format	`dhcp l2relay circuit-id vlan` *`vlan-list`*
Mode	Global Config

Parameter	Description
vlan–list	The VLAN ID. The range is 1–4093. Separate nonconsecutive IDs with a comma (,) no spaces and no zeros in between the range. Use a dash (–) for the range.

5.25.3.1 no dhcp l2relay circuit-id vlan

This parameter clears the DHCP Option-82 Circuit ID for a VLAN.

Format	`no dhcp l2relay circuit-id vlan` *`vlan-list`*
Mode	Global Config

5.25.4 dhcp l2relay remote-id subscription

This command sets the Option-82 Remote-ID string for a given service subscription identified by ***subscription-string*** on a given interface or range of interfaces. The *subscription-string* is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. The *remoteid-string* is a character string. When remote-id string is set using this command, all Client DHCP requests that fall under this service subscription are added with Option-82 Remote-id as the configured remote-id string.

Default	empty string
Format	`dhcp l2relay remote-id` *`remoteid-string`* `subscription-name` *`subscription-string`*
Mode	Interface Config

5.25.4.1 no dhcp l2relay remote-id subscription

This command resets the Option-82 Remote-ID string for a given service subscription identified by *subscription-string* on a given interface. The *subscription-string* is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. When remote-id string is reset using this command, the Client DHCP requests that fall under this service subscription are not added with Option-82 Remote-id.

Format	`no dhcp l2relay remote-id` *`remoteid-string`* `subscription-name` *`subscription-string`*
Mode	Interface Config

5.25.5 dhcp l2relay remote-id vlan

This parameter sets the DHCP Option-82 Remote ID for a VLAN and subscribed service (based on subscription-name).

Format	`dhcp l2relay remote-id` *`remote-id-string`* `vlan` *`vlan-list`*
Mode	Global Config

Parameter	Description
vlan–list	The VLAN ID. The range is 1–4093. Separate nonconsecutive IDs with a comma (,) no spaces and no zeros in between the range. Use a dash (–) for the range.

5.25.5.1 no dhcp l2relay remote-id vlan

This parameter clears the DHCP Option-82 Remote ID for a VLAN and subscribed service (based on subscription-name).

Format	no dhcp l2relay remote-id vlan *vlan-list*
Mode	Global Config

5.25.6 dhcp l2relay subscription

This command enables relaying DHCP packets on an interface or range of interfaces that fall under the specified service subscription. The *subscription-string* is a character string that needs to be matched with configured DOT1AD subscription string for correct operation.

Default	disabled (i.e. no DHCP packets are relayed)
Format	`dhcp l2relay subscription-name` *`subscription-string`*
Mode	Interface Config

5.25.6.1 no dhcp l2relay subscription

This command disables relaying DHCP packets that fall under the specified service subscription. The *subscription-string* is a character string that needs to be matched with configured DOT1AD subscription string for correct operation.

Format	`no dhcp l2relay subscription-name` *`subscription-string`*
Mode	Interface Config

5.25.7 dhcp l2relay trust

Use this command to configure an interface or range of interfaces as trusted for Option-82 reception.

Default	untrusted
Format	`dhcp l2relay trust`
Mode	Interface Config

5.25.7.1 no dhcp l2relay trust

Use this command to configure an interface to the default untrusted for Option-82 reception.

Format	`no dhcp l2relay trust`
Mode	Interface Config

5.25.8 dhcp l2relay vlan

Use this command to enable the DHCP L2 Relay agent for a set of VLANs. All DHCP packets which arrive on interfaces in the configured VLAN are subject to L2 Relay processing.

Default	disable
Format	dhcp l2relay vlan *vlan-list*
Mode	Global Config

Parameter	Description
vlan-list	The VLAN ID. The range is 1–4093. Separate nonconsecutive IDs with a comma (,) no spaces and no zeros in between the range. Use a dash (–) for the range.

5.25.8.1 no dhcp l2relay vlan

Use this command to disable the DHCP L2 Relay agent for a set of VLANs.

Format	no dhcp l2relay vlan *vlan-list*
Mode	Global Config

5.25.9 show dhcp l2relay all

This command displays the summary of DHCP L2 Relay configuration.

Format	`show dhcp l2relay all`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show dhcp l2relay all

DHCP L2 Relay is Enabled.

Interface  L2RelayMode   TrustMode
---------- ----------- --------------
 0/2        Enabled      untrusted
 0/4        Disabled     trusted

VLAN Id    L2 Relay  CircuitId  RemoteId
--------- ---------- ----------- ------------
 3           Disabled    Enabled    --NULL--
5           Enabled     Enabled    --NULL--
 6           Enabled     Enabled    broadcom
 7           Enabled     Disabled   --NULL--
 8           Enabled     Disabled   --NULL--
 9           Enabled     Disabled   --NULL--
 10          Enabled     Disabled   --NULL--
```

5.25.10 show dhcp l2relay circuit-id vlan

This command displays DHCP circuit-id vlan configuration.

Format	`show dhcp l2relay circuit-id vlan` *`vlan-list`*
Mode	Privileged EXEC

Parameter	Description
vlan-list	Enter VLAN IDs in the range 1–4093. Use a dash (–) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.

5.25.11 show dhcp l2relay interface

This command displays DHCP L2 relay configuration specific to interfaces.

Format	`show dhcp l2relay interface {all |` *`interface-num`*`}`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show dhcp l2relay interface all

DHCP L2 Relay is  Enabled.

Interface  L2RelayMode   TrustMode
----------  -----------  --------------
 0/2        Enabled      untrusted
 0/4        Disabled     trusted
```

5.25.12 show dhcp l2relay remote-id vlan

This command displays DHCP Remote-id vlan configuration.

Format	`show dhcp l2relay remote-id vlan` *`vlan-list`*
Mode	Privileged EXEC

Parameter	Description
vlan-list	Enter VLAN IDs in the range 1–4093. Use a dash (–) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.

5.25.13 show dhcp l2relay stats interface

This command displays statistics specific to DHCP L2 Relay configured interface.

Format	`show dhcp l2relay stats interface {all |` *`interface-num`*`}`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show dhcp l2relay stats interface all

DHCP L2 Relay is  Enabled.

Interface  UntrustedServer    UntrustedClient  TrustedServer     TrustedClient
            MsgsWithOpt82    MsgsWithOpt82    MsgsWithoutOpt82  MsgsWithoutOpt82
---------  --------------- -----------------  ----------------- --------------
```

```
 0/1           0                 0                 0                0
 0/2           0                 0                 3                7
 0/3           0                 0                 0                0
 0/4           0                 12                0                0
 0/5           0                 0                 0                0
 0/6           3                 0                 0                      0
 0/7           0                 0                 0                0
 0/8           0                 0                 0                0
 0/9           0                 0                 0                0
```

5.25.14 show dhcp l2relay subscription interface

This command displays DHCP L2 Relay configuration specific to a service subscription on an interface.

Format `show dhcp l2relay subscription interface {all|`*`interface-num`*`}`

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show dhcp l2relay subscription interface all
Interface   SubscriptionName    L2Relay mode  Circuit-Id mode  Remote-Id mode
----------- ----------------    -------------- ---------------  ----------------
  0/1             sub1              Enabled       Disabled         --NULL--
  0/2             sub3              Enabled       Disabled         EnterpriseSwitch
  0/2             sub22             Disabled      Enabled          --NULL--
  0/4             sub4              Enabled       Enabled          --NULL--
```

5.25.15 show dhcp l2relay agent-option vlan

This command displays the DHCP L2 Relay Option-82 configuration specific to VLAN.

Format `show dhcp l2relay agent-option vlan `*`vlan-range`*

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show dhcp l2relay agent-option vlan 5-10

DHCP L2 Relay is  Enabled.

VLAN Id    L2 Relay      CircuitId  RemoteId
--------- ----------  ----------- ------------
5           Enabled     Enabled    --NULL--
6           Enabled     Enabled    broadcom
7           Enabled     Disabled   --NULL--
8           Enabled     Disabled   --NULL--
9           Enabled     Disabled   --NULL--
10          Enabled     Disabled   --NULL--
```

5.25.16 show dhcp l2relay vlan

This command displays DHCP vlan configuration.

Format `show dhcp l2relay vlan `*`vlan-list`*

Mode Privileged EXEC

Parameter	Description
vlan-list	Enter VLAN IDs in the range 1–4093. Use a dash (–) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.

5.25.17 clear dhcp l2relay statistics interface

Use this command to reset the DHCP L2 relay counters to zero. Specify the port with the counters to clear, or use the `all` keyword to clear the counters on all ports.

Format	`clear dhcp l2relay statistics interface {slot/port | all}`
Mode	Privileged EXEC

5.26 DHCP Client Commands

FASTPATH can include vendor and configuration information in DHCP client requests relayed to a DHCP server. This information is included in DHCP Option 60, Vendor Class Identifier. The information is a string of 128 octets.

5.26.1 dhcp client vendor-id-option

This command enables the inclusion of DHCP Option-60, Vendor Class Identifier included in the requests transmitted to the DHCP server by the DHCP client operating in the FASTPATH switch.

Format	`dhcp client vendor-id-option string`
Mode	Global Config

5.26.1.1 no dhcp client vendor-id-option

This command disables the inclusion of DHCP Option-60, Vendor Class Identifier included in the requests transmitted to the DHCP server by the DHCP client operating in the FASTPATH switch.

Format	`no dhcp client vendor-id-option`
Mode	Global Config

5.26.2 dhcp client vendor-id-option-string

This parameter sets the DHCP Vendor Option-60 string to be included in the requests transmitted to the DHCP server by the DHCP client operating in the FASTPATH switch.

Format	`dhcp client vendor-id-option-string string`
Mode	Global Config

5.26.2.1 no dhcp client vendor-id-option-string

This parameter clears the DHCP Vendor Option-60 string.

Format	no dhcp client vendor-id-option-string
Mode	Global Config

5.26.3 show dhcp client vendor-id-option

This command displays the configured administration mode of the vendor-id-option and the vendor-id string to be included in Option-43 in DHCP requests.

Format	show dhcp client vendor-id-option
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show dhcp client vendor-id-option

DHCP Client Vendor Identifier Option is Enabled
DHCP Client Vendor Identifier Option string is FastpathClient.
```

5.26.4 ip dhcp force-client-id

This feature allows the manipulation of DHCP packets related to the receiving port and (optional and only if Layer3-functionality provided) VLAN.

This command enables the manipulation of a DHCP packet. If enabled a new client identifier is added either the specified one or (if not specified) a default identifier, containing the related slot/port. The manipulation can be done independent of the VLAN or for a special VLAN (only if Layer-3 functionality is provided). First VLAN related specifications are used before the general rule is used. Maximal 32 rules can be specified for a port.

Format

```
ip dhcp force-client-id
ip dhcp force-client-id <identifier>
ip dhcp force-client-id vlan <1-4093>
ip dhcp force-client-id vlan <1-4093> <identifier>
```

Mode Interface Config

5.26.4.1 no ip dhcp force-client-id

This command disables the manipulation of a DHCP packet.

Format

```
no ip dhcp force-client-id
no ip dhcp force-client-id vlan <1-4093>
```

Mode Interface Config

5.26.5 show ip dhcp force-client-id

This command displays the mode (enabled/disabled) and the related VLAN and client-identifier for a specified interface (<slot/port>) or for all physical interfaces.

Format `show ip dhcp force-client-id { all | <slot/port>}`

Mode Privileged Exec

5.26.6 clear ip dhcp force-client-id

This command clears all configured manipulation rules for DHSP packets for all interfaces.

Format `clear ip dhcp force-client-id`

Mode Privileged Exec

5.27 DHCP Snooping Configuration Commands

This section describes commands you use to configure DHCP Snooping.

5.27.1 ip dhcp snooping

Use this command to enable DHCP Snooping globally.

Default disabled

Format `ip dhcp snooping`

Mode Global Config

5.27.1.1 no ip dhcp snooping

Use this command to disable DHCP Snooping globally.

Format	`no ip dhcp snooping`
Mode	Global Config

5.27.2 ip dhcp snooping vlan

Use this command to enable DHCP Snooping on a list of comma-separated VLAN ranges.

Default	disabled
Format	`ip dhcp snooping vlan` *`vlan-list`*
Mode	Global Config

5.27.2.1 no ip dhcp snooping vlan

Use this command to disable DHCP Snooping on VLANs.

Format	`no ip dhcp snooping vlan` *`vlan-list`*
Mode	Global Config

5.27.3 ip dhcp snooping verify mac-address

Use this command to enable verification of the source MAC address with the client hardware address in the received DCHP message.

Default	enabled
Format	`ip dhcp snooping verify mac-address`
Mode	Global Config

5.27.3.1 no ip dhcp snooping verify mac-address

Use this command to disable verification of the source MAC address with the client hardware address.

Format	`no ip dhcp snooping verify mac-address`
Mode	Global Config

5.27.4 ip dhcp snooping database

Use this command to configure the persistent location of the DHCP Snooping database. This can be local or a remote file on a given IP machine.

Default	local
Format	`ip dhcp snooping database {local|tftp://hostIP/filename}`
Mode	Global Config

5.27.5 ip dhcp snooping database write-delay

Use this command to configure the interval in seconds at which the DHCP Snooping database will be persisted. The interval value ranges from 15 to 86400 seconds.

Default	300 seconds
Format	`ip dhcp snooping database write-delay in seconds`
Mode	Global Config

5.27.5.1 no ip dhcp snooping database write-delay

Use this command to set the write delay value to the default value.

Format	`no ip dhcp snooping database write-delay`
Mode	Global Config

5.27.6 ip dhcp snooping binding

Use this command to configure static DHCP Snooping binding.

Format	`ip dhcp snooping binding` *`mac-address`* `vlan` *`vlan id ip address`* `interface` *`interface id`*
Mode	Global Config

5.27.6.1 no ip dhcp snooping binding

Use this command to remove the DHCP static entry from the DHCP Snooping database.

Format	`no ip dhcp snooping binding` *`mac-address`*
Mode	Global Config

5.27.7 ip dhcp filtering trust

Use this command to enable trusted mode on the interface if the previously saved configuration or applied script contains this command.

Format	`ip dhcp filtering trust` *`interface id`*
Mode	Global Config

5.27.7.1 no ip dhcp filtering trust

Use this command to disable trusted mode on the interface.

Format	`no ip dhcp filtering trust` *`interface id`*
Mode	Global Config

5.27.8 ip verify binding

Use this command to configure static IP source guard (IPSG) entries.

Format	`ip verify binding` *`mac-address`* `vlan` *`vlan id ip address`* `interface` *`interface id`*
Mode	Global Config

5.27.8.1 no ip verify binding

Use this command to remove the IPSG static entry from the IPSG database.

Format	`no ip verify binding` *`mac-address`* `vlan` *`vlan id ip address`* `interface` *`interface id`*
Mode	Global Config

5.27.9 ip dhcp snooping limit

Use this command to control the rate at which the DHCP Snooping messages come on an interface or range of interfaces. By default, rate limiting is disabled. When enabled, the rate can range from 0 to 300 packets per second. The burst level range is 1 to 15 seconds.

Default	disabled (no limit)
Format	`ip dhcp snooping limit {rate pps [`*`burst interval seconds`*`]}`
Mode	Interface Config

5.27.9.1 no ip dhcp snooping limit

Use this command to set the rate at which the DHCP Snooping messages come, and the burst level, to the defaults.

Format	`no ip dhcp snooping limit`
Mode	Interface Config

5.27.10 ip dhcp snooping log-invalid

Use this command to control the logging DHCP messages filtration by the DHCP Snooping application. This command can be used to configure a single interface or a range of interfaces.

Default	disabled
Format	`ip dhcp snooping log-invalid`
Mode	Interface Config

5.27.10.1 no ip dhcp snooping log-invalid

Use this command to disable the logging DHCP messages filtration by the DHCP Snooping application.

Format	`no ip dhcp snooping log-invalid`
Mode	Interface Config

5.27.11 ip dhcp snooping trust

Use this command to configure an interface or range of interfaces as trusted.

Default	disabled
Format	`ip dhcp snooping trust`
Mode	Interface Config

5.27.11.1 no ip dhcp snooping trust

Use this command to configure the port as untrusted.

Format	`no ip dhcp snooping trust`
Mode	Interface Config

5.27.12 ip verify source

Use this command to configure the IPSG source ID attribute to filter the data traffic in the hardware. Source ID is the combination of IP address and MAC address. Normal command allows data traffic filtration based on the IP address. With the "port-security" option, the data traffic will be filtered based on the IP and MAC addresses.

This command can be used to configure a single interface or a range of interfaces.

Default	`the source ID is the IP address`
Format	`ip verify source {port-security}`
Mode	Interface Config

5.27.12.1 no ip verify source

Use this command to disable the IPSG configuration in the hardware. You cannot disable port-security alone if it is configured.

Format	`no ip verify source`
Mode	Interface Config

5.27.13 show ip dhcp snooping

Use this command to display the DHCP Snooping global configurations and per port configurations.

Format	`show ip dhcp snooping`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	The interface for which data is displayed.
Trusted	If it is enabled, DHCP snooping considers the port as trusted. The factory default is disabled.
Log Invalid Pkts	If it is enabled, DHCP snooping application logs invalid packets on the specified interface.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping

DHCP snooping is Disabled
DHCP snooping source MAC verification is enabled
DHCP snooping is enabled on the following VLANs:
11 - 30, 40

Interface   Trusted    Log Invalid Pkts
---------   --------   ----------------
0/1          Yes             No
0/2          No             Yes
0/3          No             Yes
0/4          No              No
0/6          No              No
```

5.27.14 show ip dhcp snooping binding

Use this command to display the DHCP Snooping binding entries. To restrict the output, use the following options:

- Dynamic: Restrict the output based on DCHP snooping.
- Interface: Restrict the output based on a specific interface.
- Static: Restrict the output based on static entries.
- VLAN: Restrict the output based on VLAN.

Format	`show ip dhcp snooping binding [{static/dynamic}] [interface` *`slot/port`*`] [vlan id]`
Mode	Privileged EXEC User EXEC

Term	Definition
MAC Address	Displays the MAC address for the binding that was added. The MAC address is the key to the binding database.
IP Address	Displays the valid IP address for the binding rule.
VLAN	The VLAN for the binding rule.
Interface	The interface to add a binding into the DHCP snooping interface.
Type	Binding type; statically configured from the CLI or dynamically learned.
Lease (sec)	The remaining lease time for the entry.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping binding

Total number of bindings: 2

MAC Address          IP Address    VLAN  Interface  Type  Lease time (Secs)
------------------  ------------  ----  ---------  ---- ------------------
00:02:B3:06:60:80   210.1.1.3      10   0/1                  86400
00:0F:FE:00:13:04   210.1.1.4      10   0/1                  86400
```

5.27.15 show ip dhcp snooping database

Use this command to display the DHCP Snooping configuration related to the database persistency.

Format	`show ip dhcp snooping database`
Mode	Privileged EXEC User EXEC

Term	Definition
Agent URL	Bindings database agent URL.
Write Delay	The maximum write time to write the database into local or remote.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping database

agent url:  /10.131.13.79:/sai1.txt

write-delay:  5000
```

5.27.16 show ip dhcp snooping interfaces

Use this command to show the DHCP Snooping status of the interfaces.

Format	`show ip dhcp snooping interfaces`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping interfaces

 Interface    Trust State    Rate Limit    Burst Interval
                                (pps)        (seconds)
-----------   ----------   ----------   --------------
   1/g1             No            15                 1
   1/g2             No            15                 1
   1/g3             No            15                 1

(switch) #show ip dhcp snooping interfaces ethernet 1/g15

 Interface    Trust State    Rate Limit    Burst Interval
                                (pps)        (seconds)
-----------   ----------   ----------   --------------
   1/g15            Yes           15                 1
```

5.27.17 show ip dhcp snooping statistics

Use this command to list statistics for DHCP Snooping security violations on untrusted ports.

Format	`show ip dhcp snooping statistics`
Mode	Privileged EXEC User EXEC

Term	Definition
Interface	The IP address of the interface in *`slot/port`* format.
MAC Verify Failures	Represents the number of DHCP messages that were filtered on an untrusted interface because of source MAC address and client HW address mismatch.
Client Ifc Mismatch	Represents the number of DHCP release and Deny messages received on the different ports than learned previously.
DHCP Server Msgs Rec'd	Represents the number of DHCP server messages received on Untrusted ports.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping statistics

 Interface    MAC Verify   Client Ifc   DHCP Server
               Failures     Mismatch    Msgs Rec'd
-----------   ----------   ----------   -----------
0/2                    0            0             0
0/3                    0            0             0
0/4                    0            0             0
0/5                    0            0             0
0/6                    0            0             0
0/7                    0            0             0
0/8                    0            0             0
0/9                    0            0             0
0/10                   0            0             0
0/11                   0            0             0
```

```
0/12                    0            0              0
0/13                    0            0              0
0/14                    0            0              0
0/15                    0            0              0
0/16                    0            0              0
0/17                    0            0              0
0/18                    0            0              0
0/19                    0            0              0
0/20                    0            0              0
```

5.27.18 clear ip dhcp snooping binding

Use this command to clear all DHCP Snooping bindings on all interfaces or on a specific interface.

Format	`clear ip dhcp snooping binding [interface slot/port]`
Mode	Privileged EXEC User EXEC

5.27.19 clear ip dhcp snooping statistics

Use this command to clear all DHCP Snooping statistics.

Format	`clear ip dhcp snooping statistics`
Mode	Privileged EXEC User EXEC

5.27.20 show ip verify source

Use this command to display the IPSG configurations on all ports.

Format	`show ip verify source`
Mode	Privileged EXEC User EXEC

Term	Definition
Interface	Interface address in *slot/port* format.
Filter Type	Is one of two values: • ip-mac: User has configured MAC address filtering on this interface. • ip: Only IP address filtering on this interface.
IP Address	IP address of the interface
MAC Address	If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, then the MAC Address field displays "permit-all."
VLAN	The VLAN for the binding rule.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip verify source

Interface  Filter Type   IP Address       MAC Address       Vlan
---------  -----------  ---------------  -----------------  -----
    0/1     ip-mac       210.1.1.3       00:02:B3:06:60:80     10
    0/1     ip-mac       210.1.1.4       00:0F:FE:00:13:04     10
```

5.27.21 show ip verify interface

Use this command to display the IPSG filter type for a specific interface.

Format	`show ip verify interface slot/port`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	Interface address in *`slot/port`* format.
Filter Type	Is one of two values: • ip-mac: User has configured MAC address filtering on this interface. • ip: Only IP address filtering on this interface.

5.27.22 show ip source binding

Use this command to display the IPSG bindings.

Format	`show ip source binding [{dhcp-snooping|static}] [interface slot/port] [vlan id]`
Mode	• Privileged EXEC • User EXEC

Term	Definition
MAC Address	The MAC address for the entry that is added.
IP Address	The IP address of the entry that is added.
Type	Entry type; statically configured from CLI or dynamically learned from DHCP Snooping.
VLAN	VLAN for the entry.
Interface	IP address of the interface in *`slot/port`* format.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip source binding

MAC Address        IP Address       Type          Vlan     Interface
-----------------  ---------------  -------------  -----  -------------
00:00:00:00:00:08          1.2.3.4  dhcp-snooping     2        0/1
00:00:00:00:00:09          1.2.3.4  dhcp-snooping     3        0/1
00:00:00:00:00:0A          1.2.3.4  dhcp-snooping     4        0/1
```

5.28 Dynamic ARP Inspection Commands

Dynamic ARP Inspection (DAI) is a security feature that rejects invalid and malicious ARP packets. DAI prevents a class of man-in-the-middle attacks, where an unfriendly station intercepts traffic for other stations by poisoning the ARP caches of its unsuspecting neighbors. The miscreant sends ARP requests or responses mapping another station's IP address to its own MAC address.

DAI relies on DHCP snooping. DHCP snooping listens to DHCP message exchanges and builds a binding database of valid {MAC address, IP address, VLAN, and interface} tuples.

When DAI is enabled, the switch drops ARP packets whose sender MAC address and sender IP address do not match an entry in the DHCP snooping bindings database. You can optionally configure additional ARP packet validation.

5.28.1 ip arp inspection vlan

Use this command to enable Dynamic ARP Inspection on a list of comma-separated VLAN ranges.

Default	`disabled`
Format	`ip arp inspection vlan vlan-list`
Mode	Global Config

5.28.1.1 no ip arp inspection vlan

Use this command to disable Dynamic ARP Inspection on a list of comma-separated VLAN ranges.

Format	`no ip arp inspection vlan vlan-list`
Mode	Global Config

5.28.2 ip arp inspection validate

Use this command to enable additional validation checks like source-mac validation, destination-mac validation, and ip address validation on the received ARP packets. Each command overrides the configuration of the previous command. For example, if a command enables src-mac and dst-mac validations, and a second command enables IP validation only, the src-mac and dst-mac validations are disabled as a result of the second command.

Default	`disabled`
Format	`ip arp inspection validate {[src-mac] [dst-mac] [ip]}`
Mode	Global Config

5.28.2.1 no ip arp inspection validate

Use this command to disable the additional validation checks on the received ARP packets.

Format	`no ip arp inspection validate {[src-mac] [dst-mac] [ip]}`
Mode	Global Config

5.28.3 ip arp inspection vlan logging

Use this command to enable logging of invalid ARP packets on a list of comma-separated VLAN ranges.

Default	`enabled`
Format	`ip arp inspection vlan vlan-list logging`
Mode	Global Config

5.28.3.1 no ip arp inspection vlan logging

Use this command to disable logging of invalid ARP packets on a list of comma-separated VLAN ranges.

Format	`no ip arp inspection vlan vlan-list logging`
Mode	Global Config

5.28.4 ip arp inspection trust

Use this command to configure an interface or range of interfaces as trusted for Dynamic ARP Inspection.

Default	`enabled`
Format	`ip arp inspection trust`
Mode	Interface Config

5.28.4.1 no ip arp inspection trust

Use this command to configure an interface as untrusted for Dynamic ARP Inspection.

Format	`no ip arp inspection trust`
Mode	Interface Config

5.28.5 ip arp inspection limit

Use this command to configure the rate limit and burst interval values for an interface or range of interfaces. Configuring `none` for the limit means the interface is not rate limited for Dynamic ARP Inspections. The maximum pps value shown in the range for the rate option might be more than the hardware allowable limit. Therefore you need to understand the switch performance and configure the maximum rate pps accordingly.

NOTICE The user interface will accept a rate limit for a trusted interface, but the limit will not be enforced unless the interface is configured to be untrusted.

Default	`15 pps for rate and 1 second for burst-interval`
Format	`ip arp inspection limit {rate pps [burst interval seconds] | none}`
Mode	Interface Config

5.28.5.1 no ip arp inspection limit

Use this command to set the rate limit and burst interval values for an interface to the default values of 15 pps and 1 second, respectively.

Format	`no ip arp inspection limit`
Mode	Interface Config

5.28.6 ip arp inspection filter

Use this command to configure the ARP ACL used to filter invalid ARP packets on a list of comma-separated VLAN ranges. If the static keyword is given, packets that do not match a permit statement are dropped without consulting the DHCP snooping bindings.

Default	`No ARP ACL is configured on a VLAN`
Format	`ip arp inspection filter acl-name vlan vlan-list [static]`
Mode	Global Config

5.28.6.1 no ip arp inspection filter

Use this command to unconfigure the ARP ACL used to filter invalid ARP packets on a list of comma-separated VLAN ranges.

Format	`no ip arp inspection filter acl-name vlan vlan-list [static]`
Mode	Global Config

5.28.7 arp access-list

Use this command to create an ARP ACL.

Format	`arp access-list acl-name`
Mode	Global Config

5.28.7.1 no arp access-list

Use this command to delete a configured ARP ACL.

Format	`no arp access-list acl-name`
Mode	Global Config

5.28.8 permit ip host mac host

Use this command to configure a rule for a valid IP address and MAC address combination used in ARP packet validation.

Format	`permit ip host sender-ip mac host sender-mac`
Mode	ARP Access-list Config

5.28.8.1 no permit ip host mac host

Use this command to delete a rule for a valid IP and MAC combination.

Format `no permit ip host sender-ip mac host sender-mac`

Mode ARP Access-list Config

5.28.9 show ip arp inspection

Use this command to display the Dynamic ARP Inspection global configuration and configuration on all the VLANs. With the *vlan-list* argument (i.e. comma separated VLAN ranges), the command displays the global configuration and configuration on all the VLANs in the given VLAN list. The global configuration includes the source mac validation, destination mac validation and invalid IP validation information.

Format `show ip arp inspection [vlan vlan-list]`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
Source MAC Validation	Displays whether Source MAC Validation of ARP frame is enabled or disabled.
Destination MAC Validation	Displays whether Destination MAC Validation is enabled or disabled.
IP Address Validation	Displays whether IP Address Validation is enabled or disabled.
VLAN	The VLAN ID for each displayed row.
Configuration	Displays whether DAI is enabled or disabled on the VLAN.
Log Invalid	Displays whether logging of invalid ARP packets is enabled on the VLAN.
ACL Name	The ARP ACL Name, if configured on the VLAN.
Static Flag	If the ARP ACL is configured static on the VLAN.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip arp inspection vlan 10-12

Source Mac Validation      : Disabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan          Configuration    Log Invalid   ACL Name   Static flag
 ----          -------------    -----------   ---------  ----------
   10                Enabled        Enabled   H2         Enabled
   11               Disabled        Enabled
   12               Enabled        Disabled
```

5.28.10 show ip arp inspection statistics

Use this command to display the statistics of the ARP packets processed by Dynamic ARP Inspection. Give the vlan-list argument and the command displays the statistics on all DAI-enabled VLANs in that list. Give the single vlan argument and the command displays the statistics on that VLAN. If no argument is included, the command lists a summary of the forwarded and dropped ARP packets.

Format `show ip arp inspection statistics [vlan vlan-list]`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
VLAN	The VLAN ID for each displayed row.
Forwarded	The total number of valid ARP packets forwarded in this VLAN.
Dropped	The total number of not valid ARP packets dropped in this VLAN.
DHCP Drops	The number of packets dropped due to DHCP snooping binding database match failure.
ACL Drops	The number of packets dropped due to ARP ACL rule match failure.
DHCP Permits	The number of packets permitted due to DHCP snooping binding database match.
ACL Permits	The number of packets permitted due to ARP ACL rule match.
Bad Src MAC	The number of packets dropped due to Source MAC validation failure.
Bad Dest MAC	The number of packets dropped due to Destination MAC validation failure.
Invalid IP	The number of packets dropped due to invalid IP checks.

Example: The following shows example CLI display output for the command show ip arp inspection statistics which lists the summary of forwarded and dropped ARP packets on all DAI-enabled VLANs.

```
VLAN  Forwarded  Dropped
----  ---------  -------
  10         90       14
  20         10        3
```

Example: The following shows example CLI display output for the command `show ip arp inspection statistics vlan` ***`vlan-list`***.

```
VLAN    DHCP      ACL       DHCP       ACL       Bad Src   Bad Dest   Invalid
        Drops     Drops      Permits    Permits      MAC       MAC        IP
----- -------- --------- ----------- --------- ---------- ----------- ---------
10      11         1             65         25            1          1         0
20      1          0              8          2            0          1         1
```

5.28.11 clear ip arp inspection statistics

Use this command to reset the statistics for Dynamic ARP Inspection on all VLANs.

Default	none
Format	`clear ip arp inspection statistics`
Mode	Privileged EXEC

5.28.12 show ip arp inspection interfaces

Use this command to display the Dynamic ARP Inspection configuration on all the DAI-enabled interfaces. An interface is said to be enabled for DAI if at least one VLAN, that the interface is a member of, is enabled for DAI. Given a ***`slot/port`*** interface argument, the command displays the values for that interface whether the interface is enabled for DAI or not.

Format	`show ip arp inspection interfaces [`*`slot/port`*`]`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	The interface ID for each displayed row.
Trust State	Whether the interface is trusted or untrusted for DAI.
Rate Limit	The configured rate limit value in packets per second.
Burst Interval	The configured burst interval value in seconds.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip arp inspection interfaces

 Interface        Trust State   Rate Limit   Burst Interval
                                   (pps)         (seconds)
 ---------------  -----------   ----------  ---------------
 0/1                Untrusted          15                1
 0/2                Untrusted          10               10
```

5.28.13 show arp access-list

Use this command to display the configured ARP ACLs with the rules. Giving an ARP ACL name as the argument will display only the rules in that ARP ACL.

Format	`show arp access-list [acl-name]`
Mode	• Privileged EXEC • User EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show arp access-list

ARP access list H2
    permit ip host 1.1.1.1 mac host 00:01:02:03:04:05
    permit ip host 1.1.1.2 mac host 00:03:04:05:06:07
ARP access list H3
ARP access list H4
    permit ip host 2.1.1.2 mac host 00:03:04:05:06:08
```

5.29 IGMP Snooping Configuration Commands

This section describes the commands you use to configure IGMP snooping. FASTPATH software supports IGMP Versions 1, 2, and 3. The IGMP snooping feature can help conserve bandwidth because it allows the switch to forward IP multicast traffic only to connected hosts that request multicast traffic. IGMPv3 adds source filtering capabilities to IGMP versions 1 and 2.

NOTICE This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

5.29.1 set igmp

This command enables IGMP Snooping on the system (Global Config Mode), an interface, or a range of interfaces. This command also enables IGMP snooping on a particular VLAN (VLAN Config Mode) and can enable IGMP snooping on all interfaces participating in a VLAN.

If an interface has IGMP Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), IGMP Snooping functionality is disabled on that interface. IGMP Snooping functionality is re-enabled if you disable routing or remove port-channel (LAG) membership from an interface that has IGMP Snooping enabled.

The IGMP application supports the following activities:

- Validation of the IP header checksum (as well as the IGMP header checksum) and discarding of the frame upon checksum error.
- Maintenance of the forwarding table entries based on the MAC address versus the IP address.
- Flooding of unregistered multicast data packets to all ports in the VLAN.

Default	disabled
Format	`set igmp [vlan_id]`
Mode	• Global Config • Interface Config • VLAN Config

5.29.1.1 no set igmp

This command disables IGMP Snooping on the system, an interface, a range of interfaces, or a VLAN.

Format	`no set igmp [vlan_id]`
Mode	• Global Config • Interface Config • VLAN Config

5.29.2 set igmp header-validation

This command enables header validation for IGMP messages.

When header validation is enabled, IGMP Snooping checks:

- The time-to-live(TTL) field in the IGMP header and drops packets where TTL is not equal to 1. The TTL field should always be set to 1 in the headers of IGMP reports and queries.
- The presence of the router alert option (9404) in the IP packet header of the IGMPv2 message and drops packets that do not include this option.
- The presence of the router alert option (9404) and ToS Byte = 0xC0 (Internet Control) in the IP packet header of IGMPv3 message and drops packets that do not include these options.

Default	enabled
Format	`set igmp header-validation`
Mode	Global Config

5.29.2.1 no set igmp header-validation

This command disables header validation for IGMP messages.

Format	`no set igmp header-validation`
Mode	Global Config

5.29.3 set igmp interfacemode

This command enables IGMP Snooping on all interfaces. If an interface has IGMP Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), IGMP Snooping functionality is disabled on that interface. IGMP Snooping functionality is re-enabled if you disable routing or remove port-channel (LAG) membership from an interface that has IGMP Snooping enabled.

Default	disabled
Format	`set igmp interfacemode`
Mode	Global Config

5.29.3.1 no set igmp interfacemode

This command disables IGMP Snooping on all interfaces.

Format	`no set igmp interfacemode`
Mode	Global Config

5.29.4 set igmp fast-leave

This command enables or disables IGMP Snooping fast-leave admin mode on a selected interface, a range of interfaces, or a VLAN. Enabling fast-leave allows the switch to immediately remove the layer 2 LAN interface from its forwarding table entry upon receiving an IGMP leave message for that multicast group without first sending out MAC-based general queries to the interface.

You should enable fast-leave admin mode only on VLANs where only one host is connected to each layer 2 LAN port. This prevents the inadvertent dropping of the other hosts that were connected to the same layer 2 LAN port but were still interested in receiving multicast traffic directed to that group. Also, fast-leave processing is supported only with IGMP version 2 hosts.

Default	disabled
Format	`set igmp fast-leave [vlan_id]`
Mode	Interface Config Interface Range VLAN Config

5.29.4.1 no set igmp fast-leave

This command disables IGMP Snooping fast-leave admin mode on a selected interface.

Format	`no set igmp fast-leave [vlan_id]`
Mode	Interface Config Interface Range VLAN Config

5.29.5 set igmp groupmembership-interval

This command sets the IGMP Group Membership Interval time on a VLAN, one interface, a range of interfaces, or all interfaces. The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the IGMPv3 Maximum Response time value. The range is 2 to 3600 seconds.

Default	260 seconds
Format	`set igmp groupmembership-interval [vlan_id] 2-3600`
Mode	• Interface Config • Global Config • VLAN Config

5.29.5.1 no set igmp groupmembership-interval

This command sets the IGMPv3 Group Membership Interval time to the default value.

Format `no set igmp groupmembership-interval [vlan_id]`

Mode

- Interface Config
- Global Config
- VLAN Config

5.29.6 set igmp maxresponse

This command sets the IGMP Maximum Response time for the system, on a particular interface or VLAN, or on a range of interfaces. The Maximum Response time is the amount of time in seconds that a switch will wait after sending a query on an interface because it did not receive a report for a particular group in that interface. This value must be less than the IGMP Query Interval time value. The range is 1 to 25 seconds.

Default 10 seconds

Format `set igmp maxresponse [vlan_id] 1-25`

Mode

- Global Config
- Interface Config
- VLAN Config

5.29.6.1 no set igmp maxresponse

This command sets the max response time (on the interface or VLAN) to the default value.

Format `no set igmp maxresponse [vlan_id]`

Mode

- Global Config
- Interface Config
- VLAN Config

5.29.7 set igmp mcrtrexpiretime

This command sets the Multicast Router Present Expiration time. The time is set for the system, on a particular interface or VLAN, or on a range of interfaces. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 0 to 3600 seconds. A value of 0 indicates an infinite time-out, i.e. no expiration.

Default 0

Format `set igmp mcrtrexpiretime [vlan_id] 0-3600`

Mode

- Global Config
- Interface Config
- VLAN Config

5.29.7.1 no set igmp mcrtrexpiretime

This command sets the Multicast Router Present Expiration time to 0. The time is set for the system, on a particular interface or a VLAN.

Format `no set igmp mcrtrexpiretime [`*`vlan_id`*`]`

Mode
- Global Config
- Interface Config
- VLAN Config

Format `no set igmp mcrtrexpiretime` *`vlan_id`*

Mode VLAN Config

5.29.8 set igmp mrouter

This command configures the VLAN ID (*vlan_id*) that has the multicast router mode enabled.

Format `set igmp mrouter` *`vlan_id`*

Mode Interface Config

5.29.8.1 no set igmp mrouter

This command disables multicast router mode for a particular VLAN ID (*vlan_id*).

Format `no set igmp mrouter` *`vlan_id`*

Mode Interface Config

5.29.9 set igmp mrouter interface

This command configures the interface or range of interfaces as a multicast router interface. When configured as a multicast router interface, the interface is treated as a multicast router interface in all VLANs.

Default disabled

Format `set igmp mrouter interface`

Mode Interface Config

5.29.9.1 no set igmp mrouter interface

This command disables the status of the interface as a statically configured multicast router interface.

Format `no set igmp mrouter interface`

Mode Interface Config

5.29.10 set igmp report-suppression

Use this command to suppress the IGMP reports on a given VLAN ID. In order to optimize the number of reports traversing the network with no added benefits, a Report Suppression mechanism is implemented. When more than one client responds to an MGMD query for the same Multicast Group address within the max-response-time, only the first response is forwarded to the query and others are suppressed at the switch.

Default	Disabled
Format	`set igmp report-suppression` *`vlan-id`*
Mode	VLAN Config

Parameter	Description
vlan-id	A valid VLAN ID. Range is 1 to 4093.

Example: The following shows an example of the command.

```
(FASTPATH Switching) #vlan database
(FASTPATH Switching) (Vlan)#set igmp report-suppression ?

<1-4093>                 Enter VLAN ID.

(FASTPATH Switching) (Vlan)#set igmp report-suppression 1
```

5.29.10.1 no set igmp report-suppression

Use this command to return the system to the default.

Format	`no set igmp report-suppression`
Mode	VLAN Config

5.29.11 show igmpsnooping

This command displays IGMP Snooping information for a given *`slot/port`* or VLAN. Configured information is displayed whether or not IGMP Snooping is enabled.

Format	`show igmpsnooping [`*`slot/port`*`	`*`vlan_id`*`]`
Mode	Privileged EXEC

When the optional arguments *`slot/port`* or *`vlan_id`* are not used, the command displays the following information:

Term	Definition
Admin Mode	Indicates whether or not IGMP Snooping is active on the switch.
Multicast Control Frame Count	The number of multicast control frames that are processed by the CPU.
Interface Enabled for IGMP Snooping	The list of interfaces on which IGMP Snooping is enabled.
VLANS Enabled for IGMP Snooping	The list of VLANS on which IGMP Snooping is enabled.

When you specify the *`slot/port`* values, the following information appears:

Term	Definition
IGMP Snooping Admin Mode	Indicates whether IGMP Snooping is active on the interface.
Fast Leave Mode	Indicates whether IGMP Snooping Fast-leave is active on the interface.

Term	Definition
Group Membership Interval	The amount of time in seconds that a switch will wait for a report from a particular group on a particular interface before deleting the interface from the entry.This value may be configured.
Maximum Response Time	The amount of time the switch waits after it sends a query on an interface because it did not receive a report for a particular group on that interface. This value may be configured.
Multicast Router Expiry Time	The amount of time to wait before removing an interface from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.

When you specify a value for *`vlan_id`*, the following information appears:

Term	Definition
VLAN ID	The VLAN ID.
IGMP Snooping Admin Mode	Indicates whether IGMP Snooping is active on the VLAN.
Fast Leave Mode	Indicates whether IGMP Snooping Fast-leave is active on the VLAN.
Group Membership Interval (secs)	The amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry.This value may be configured.
Maximum Response Time (secs)	The amount of time the switch waits after it sends a query on an interface, participating in the VLAN, because it did not receive a report for a particular group on that interface. This value may be configured.
Multicast Router Expiry Time (secs)	The amount of time to wait before removing an interface that is participating in the VLAN from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.
Report Suppression Mode	Indicates whether IGMP reports (set by the command "set igmp report-suppression" on page 447) in enabled or not.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show igmpsnooping 1

VLAN ID........................................ 1
IGMP Snooping Admin Mode....................... Disabled
Fast Leave Mode................................ Disabled
Group Membership Interval (secs)............... 260
Max Response Time (secs)....................... 10
Multicast Router Expiry Time (secs)............ 0
Report Suppression Mode........................ Enabled
```

5.29.12 show igmpsnooping mrouter interface

This command displays information about statically configured ports.

Format	`show igmpsnooping mrouter interface` *`slot/port`*
Mode	Privileged EXEC

Term	Definition
Interface	The port on which multicast router information is being displayed.
Multicast Router Attached	Indicates whether multicast router is statically enabled on the interface.
VLAN ID	The list of VLANs of which the interface is a member.

5.29.13 show igmpsnooping mrouter vlan

This command displays information about statically configured ports.

Format	`show igmpsnooping mrouter vlan` *slot/port*
Mode	Privileged EXEC

Term	Definition
Interface	The port on which multicast router information is being displayed.
VLAN ID	The list of VLANs of which the interface is a member.

5.29.14 show igmpsnooping ssm

This command displays information about Source Specific Multicasting (SSM) by entry, group, or statistics. SSM delivers multicast packets to receivers that originated from a source address specified by the receiver. SSM is only available with IGMPv3 and MLDv2.

Format	`show igmpsnooping ssm {entries	groups	stats}`
Mode	Privileged EXEC

5.29.15 show mac-address-table igmpsnooping

This command displays the IGMP Snooping entries in the MFDB table.

Format	`show mac-address-table igmpsnooping`
Mode	Privileged EXEC

Term	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A multicast MAC address for which the switch has forwarding or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Type	The type of the entry, which is either static (added by the user) or dynamic (added to the table as a result of a learning process or protocol).
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

5.29.16 ip dhcp force-client-id

This feature allows the manipulation of DHCP packets related to the receiving port and (optional and only if Layer3-functionality provided) VLAN.

This command enables the manipulation of a DHCP packet. If enabled a new client identifier is added either the specified one or (if not specified) a default identifier, containing the related slot/port. The manipulation can be done independent of the VLAN or for a special VLAN (only if Layer-3 functionality is provided). First VLAN related specifications are used before the general rule is used. Maximal 32 rules can be specified for a port.

Format

```
ip dhcp force-client-id
ip dhcp force-client-id <identifier>
ip dhcp force-client-id vlan <1-4093>
ip dhcp force-client-id vlan <1-4093> <identifier>
```

Mode Interface Config

5.29.16.1 no ip dhcp force-client-id

This command disables the manipulation of a DHCP packet.

Format	`no ip dhcp force-client-id` `no ip dhcp force-client-id vlan` *<1-4093>*
Mode	Interface Config

5.29.17 show ip dhcp force-client-id

This command displays the mode (enabled/disabled) and the related VLAN and client-identifier for a specified interface (<slot/port>) or for all physical interfaces.

Format	`show ip dhcp force-client-id { all` | *<slot/port>}*
Mode	Privileged Exec

5.29.18 clear ip dhcp force-client-id

This command clears all configured manipulation rules for DHSP packets for all interfaces.

Format	`clear ip dhcp force-client-id`
Mode	Privileged Exec

5.30 IGMP Snooping Querier Commands

IGMP Snooping requires that one central switch or router periodically query all end-devices on the network to announce their multicast memberships. This central device is the "IGMP Querier". The IGMP query responses, known as IGMP reports, keep the switch updated with the current multicast group membership on a port-by-port basis. If the switch does not receive updated membership information in a timely fashion, it will stop forwarding multicasts to the port where the end device is located.

This section describes commands used to configure and display information on IGMP Snooping Queriers on the network and, separately, on VLANs.

NOTICE This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

5.30.1 set igmp querier

Use this command to enable IGMP Snooping Querier on the system, using Global Config mode, or on a VLAN. Using this command, you can specify the IP Address that the Snooping Querier switch should use as the source address while generating periodic queries.

If a VLAN has IGMP Snooping Querier enabled and IGMP Snooping is operationally disabled on it, IGMP Snooping Querier functionality is disabled on that VLAN. IGMP Snooping functionality is re-enabled if IGMP Snooping is operational on the VLAN.

NOTICE The Querier IP Address assigned for a VLAN takes preference over global configuration.

The IGMP Snooping Querier application supports sending periodic general queries on the VLAN to solicit membership reports.

Default	disabled
Format	`set igmp querier [`*`vlan-id`*`] [address `*`ipv4_address`*`]`
Mode	• Global Config • VLAN Mode

5.30.1.1 no set igmp querier

Use this command to disable IGMP Snooping Querier on the system. Use the optional `address` parameter to reset the querier address to 0.0.0.0.

Format	`no set igmp querier [`*`vlan-id`*`] [address]`
Mode	• Global Config • VLAN Mode

5.30.2 set igmp querier query-interval

Use this command to set the IGMP Querier Query Interval time. It is the amount of time in seconds that the switch waits before sending another general query.

Default	disabled
Format	`set igmp querier query-interval `*`1-1800`*
Mode	Global Config

5.30.2.1 no set igmp querier query-interval

Use this command to set the IGMP Querier Query Interval time to its default value.

Format	`no set igmp querier query-interval`
Mode	Global Config

5.30.3 set igmp querier timer expiry

Use this command to set the IGMP Querier timer expiration period. It is the time period that the switch remains in Non-Querier mode once it has discovered that there is a Multicast Querier in the network.

Default	60 seconds
Format	`set igmp querier timer expiry `*`60-300`*
Mode	Global Config

5.30.3.1 no set igmp querier timer expiry

Use this command to set the IGMP Querier timer expiration period to its default value.

Format	`no set igmp querier timer expiry`
Mode	Global Config

5.30.4 set igmp querier version

Use this command to set the IGMP version of the query that the snooping switch is going to send periodically.

Default	1
Format	`set igmp querier version` *`1-2`*
Mode	Global Config

5.30.4.1 no set igmp querier version

Use this command to set the IGMP Querier version to its default value.

Format	`no set igmp querier version`
Mode	Global Config

5.30.5 set igmp querier election participate

Use this command to enable the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN. When this mode is enabled, if the Snooping Querier finds that the other Querier's source address is better (less) than the Snooping Querier's address, it stops sending periodic queries. If the Snooping Querier wins the election, then it will continue sending periodic queries.

Default	disabled
Format	`set igmp querier election participate`
Mode	VLAN Config

5.30.5.1 no set igmp querier election participate

Use this command to set the Snooping Querier not to participate in querier election but go into non-querier mode as soon as it discovers the presence of another querier in the same VLAN.

Format	`no set igmp querier election participate`
Mode	VLAN Config

5.30.6 show igmpsnooping querier

Use this command to display IGMP Snooping Querier information. Configured information is displayed whether or not IGMP Snooping Querier is enabled.

Format	`show igmpsnooping querier [{detail	vlan` *`vlanid`*`}]`
Mode	Privileged EXEC

When the optional argument *`vlanid`* is not used, the command displays the following information.

Field	Description
Admin Mode	Indicates whether or not IGMP Snooping Querier is active on the switch.
Admin Version	The version of IGMP that will be used while sending out the queries.
Querier Address	The IP Address which will be used in the IPv4 header while sending out IGMP queries. It can be configured using the appropriate command.
Query Interval	The amount of time in seconds that a Snooping Querier waits before sending out the periodic general query.
Querier Timeout	The amount of time to wait in the Non-Querier operational state before moving to a Querier state.

When you specify a value for *`vlanid`*, the following additional information appears.

Field	Description
VLAN Admin Mode	Indicates whether iGMP Snooping Querier is active on the VLAN.
VLAN Operational State	Indicates whether IGMP Snooping Querier is in "Querier" or "Non-Querier" state. When the switch is in *`Querier`* state, it will send out periodic general queries. When in *`Non-Querier`* state, it will wait for moving to Querier state and does not send out any queries.
VLAN Operational Max Response Time	Indicates the time to wait before removing a Leave from a host upon receiving a Leave request. This value is calculated dynamically from the Queries received from the network. If the Snooping Switch is in Querier state, then it is equal to the configured value.
Querier Election Participation	Indicates whether the IGMP Snooping Querier participates in querier election if it discovers the presence of a querier in the VLAN.
Querier VLAN Address	The IP address will be used in the IPv4 header while sending out IGMP queries on this VLAN. It can be configured using the appropriate command.
Operational Version	The version of IPv4 will be used while sending out IGMP queries on this VLAN.
Last Querier Address	Indicates the IP address of the most recent Querier from which a Query was received.
Last Querier Version	Indicates the IGMP version of the most recent Querier from which a Query was received on this VLAN.

When the optional argument `detail` is used, the command shows the global information and the information for all Querier-enabled VLANs.

5.31 MLD Snooping Commands

This section describes commands used for MLD Snooping. In IPv4, Layer 2 switches can use IGMP Snooping to limit the flooding of multicast traffic by dynamically configuring Layer 2 interfaces so that multicast traffic is forwarded only to those interfaces associated with IP multicast addresses. In IPv6, MLD Snooping performs a similar function. With MLD Snooping, IPv6 multicast data is selectively forwarded to a list of ports that want to receive the data, instead of being flooded to all ports in a VLAN. This list is constructed by snooping IPv6 multicast control packets.

NOTICE

This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

5.31.1 set mld

This command enables MLD Snooping on the system (Global Config Mode) or an Interface (Interface Config Mode). This command also enables MLD Snooping on a particular VLAN and enables MLD Snooping on all interfaces participating in a VLAN.

If an interface has MLD Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), MLD Snooping functionality is disabled on that interface. MLD Snooping functionality is re-enabled if you disable routing or remove port channel (LAG) membership from an interface that has MLD Snooping enabled.

MLD Snooping supports the following activities:

- Validation of address version, payload length consistencies and discarding of the frame upon error.
- Maintenance of the forwarding table entries based on the MAC address versus the IPv6 address.
- Flooding of unregistered multicast data packets to all ports in the VLAN.

Default	disabled
Format	`set mld` *`vlanid`*
Mode	• Global Config • Interface Config • VLAN Mode

5.31.1.1 no set mld

Use this command to disable MLD Snooping on the system.

Format	`set mld` *`vlanid`*
Mode	• Global Config • Interface Config • VLAN Mode

5.31.2 set mld interfacemode

Use this command to enable MLD Snooping on all interfaces. If an interface has MLD Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), MLD Snooping functionality is disabled on that interface. MLD Snooping functionality is re-enabled if you disable routing or remove port-channel (LAG) membership from an interface that has MLD Snooping enabled.

Default	disabled
Format	`set mld interfacemode`
Mode	Global Config

5.31.2.1 no set mld interfacemode

Use this command to disable MLD Snooping on all interfaces.

Format	`no set mld interfacemode`
Mode	Global Config

5.31.3 set mld fast-leave

Use this command to enable MLD Snooping fast-leave admin mode on a selected interface or VLAN. Enabling fast-leave allows the switch to immediately remove the Layer 2 LAN interface from its forwarding table entry upon receiving and MLD done message for that multicast group without first sending out MAC-based general queries to the interface.

NOTICE You should enable fast-leave admin mode only on VLANs where only one host is connected to each Layer 2 LAN port. This prevents the inadvertent dropping of the other hosts that were connected to the same layer 2 LAN port but were still interested in receiving multicast traffic directed to that group.

NOTICE Fast-leave processing is supported only with MLD version 1 hosts.

Default	disabled
Format	`set mld fast-leave` *`vlanid`*
Mode	• Interface Config • VLAN Mode

5.31.3.1 no set mld fast-leave

Use this command to disable MLD Snooping fast-leave admin mode on a selected interface.

Format	`no set mld fast-leave` *`vlanid`*
Mode	• Interface Config • VLAN Mode

5.31.4 set mld groupmembership-interval

Use this command to set the MLD Group Membership Interval time on a VLAN, one interface or all interfaces. The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the MLDv2 Maximum Response time value. The range is 2 to 3600 seconds.

Default	260 seconds
Format	`set mld groupmembership-interval` *`vlanid 2-3600`*
Mode	• Interface Config • Global Config • VLAN Mode

5.31.4.1 no set groupmembership-interval

Use this command to set the MLDv2 Group Membership Interval time to the default value.

Format `no set mld groupmembership-interval`

Mode
- Interface Config
- Global Config
- VLAN Mode

5.31.5 set mld maxresponse

Use this command to set the MLD Maximum Response time for the system, on a particular interface or VLAN. The Maximum Response time is the amount of time in seconds that a switch will wait after sending a query on an interface because it did not receive a report for a particular group in that interface. This value must be less than the MLD Query Interval time value. The range is 1 to 65 seconds.

Default 10 seconds

Format `set mld maxresponse 1-65`

Mode
- Global Config
- Interface Config
- VLAN Mode

5.31.5.1 no set mld maxresponse

Use this command to set the max response time (on the interface or VLAN) to the default value.

Format `no set mld maxresponse`

Mode
- Global Config
- Interface Config
- VLAN Mode

5.31.6 set mld mcrtexpiretime

Use this command to set the Multicast Router Present Expiration time. The time is set for the system, on a particular interface or VLAN. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 0 to 3600 seconds. A value of 0 indicates an infinite timeout, i.e. no expiration.

Default 0

Format `set mld mcrtexpiretime vlanid 0-3600`

Mode
- Global Config
- Interface Config

5.31.6.1 no set mld mcrtexpiretime

Use this command to set the Multicast Router Present Expiration time to 0. The time is set for the system, on a particular interface or a VLAN.

Format `no set mld mcrtexpiretime` *vlanid*

Mode
- Global Config
- Interface Config

5.31.7 set mld mrouter

Use this command to configure the VLAN ID for the VLAN that has the multicast router attached mode enabled.

Format `set mld mrouter` *vlanid*

Mode Interface Config

5.31.7.1 no set mld mrouter

Use this command to disable multicast router attached mode for a VLAN with a particular VLAN ID.

Format `no set mld mrouter` *vlanid*

Mode Interface Config

5.31.8 set mld mrouter interface

Use this command to configure the interface as a multicast router-attached interface. When configured as a multicast router interface, the interface is treated as a multicast router-attached interface in all VLANs.

Default disabled

Format `set mld mrouter interface`

Mode Interface Config

5.31.8.1 no set mld mrouter interface

Use this command to disable the status of the interface as a statically configured multicast router-attached interface.

Format `no set mld mrouter interface`

Mode Interface Config

5.31.9 show mldsnooping

Use this command to display MLD Snooping information. Configured information is displayed whether or not MLD Snooping is enabled.

Format `show mldsnooping` *[slot/port | vlanid]*

Mode Privileged EXEC

When the optional arguments slot/port or *vlanid* are not used, the command displays the following information.

Term	Definition
Admin Mode	Indicates whether or not MLD Snooping is active on the switch.
Interfaces Enabled for MLD Snooping	Interfaces on which MLD Snooping is enabled.
MLD Control Frame Count	Displays the number of MLD Control frames that are processed by the CPU.
VLANs Enabled for MLD Snooping	VLANs on which MLD Snooping is enabled.

When you specify the slot/port values, the following information displays.

Term	Definition
MLD Snooping Admin Mode	Indicates whether MLD Snooping is active on the interface.
Fast Leave Mode	Indicates whether MLD Snooping Fast Leave is active on the VLAN.
Group Membership Interval	Shows the amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry. This value may be configured.
Max Response Time	Displays the amount of time the switch waits after it sends a query on an interface, participating in the VLAN, because it did not receive a report for a particular group on that interface. This value may be configured.
Multicast Router Present Expiration Time	Displays the amount of time to wait before removing an interface that is participating in the VLAN from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.

When you specify a value for *vlanid*, the following information appears.

Term	Definition
VLAN Admin Mode	Indicates whether MLD Snooping is active on the VLAN.

5.31.10 show mldsnooping mrouter interface

Use this command to display information about statically configured multicast router attached interfaces.

Format	`show mldsnooping mrouter interface` *slot/port*
Mode	Privileged EXEC

Term	Definition
Interface	Shows the interface on which multicast router information is being displayed.
Multicast Router Attached	Indicates whether multicast router is statically enabled on the interface.
VLAN ID	Displays the list of VLANs of which the interface is a member.

5.31.11 show mldsnooping mrouter vlan

Use this command to display information about statically configured multicast router-attached interfaces.

Format	`show mldsnooping mrouter vlan` *`slot/port`*
Mode	Privileged EXEC

Term	Definition
Interface	Shows the interface on which multicast router information is being displayed.
VLAN ID	Displays the list of VLANs of which the interface is a member.

5.31.12 show mldsnooping ssm entries

Use this command to display the source specific multicast forwarding database built by MLD snooping.

A given {Source, Group, VLAN} combination can have few interfaces in INCLUDE mode and few interfaces in EXCLUDE mode. In such instances, two rows for the same {Source, Group, VLAN} combinations are displayed.

Format	`show mldsnooping ssm entries`
Mode	Privileged EXEC

Term	Definition
VLAN	The VLAN on which the entry is learned.
Group	The IPv6 multicast group address.
Source	The IPv6 source address.
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group.
Interfaces	1)If Source Filter Mode is “Include,” specifies the list of interfaces on which a incoming packet is forwarded. If it's source IP address is equal to the current entry's Source, the destination IP address is equal to the current entry's Group and the VLAN ID on which it arrived is current entry's VLAN. 2) If Source Filter Mode is “Exclude,” specifies the list of interfaces on which a incoming packet is forwarded. If it's source IP address is *not* equal to the current entry's Source, the destination IP address is equal to current entry's Group and VLAN ID on which it arrived is current entry's VLAN.

5.31.13 show mldsnooping ssm stats

Use this command to display the statistics of MLD snooping's SSMFDB. This command takes no options.

Format	`show mldsnooping ssm stats`
Mode	Privileged EXEC

Term	Definition
Total Entries	The total number of entries that can possibly be in the MLD snooping's SSMFDB.
Most SSMFDB Entries Ever Used	The largest number of entries that have been present in the MLD snooping's SSMFDB.
Current Entries	The current number of entries in the MLD snooping's SSMFDB.

5.31.14 show mldsnooping ssm groups

Use this command to display the MLD SSM group membership information.

Format	`show mldsnooping ssm groups`
Mode	Privileged EXEC

Term	Definition
VLAN	VLAN on which the MLD v2 report is received.
Group	The IPv6 multicast group address.
Interface	The interface on which the MLD v2 report is received.
Reporter	The IPv6 address of the host that sent the MLDv2 report.
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group.
Source Address List	List of source IP addresses for which source filtering is requested.

5.31.15 show mac-address-table mldsnooping

Use this command to display the MLD Snooping entries in the Multicast Forwarding Database (MFDB) table.

Format	`show mac-address-table mldsnooping`
Mode	Privileged EXEC

Term	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A multicast MAC address for which the switch has forwarding or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Type	The type of entry, which is either static (added by the user) or dynamic (added to the table as a result of a learning process or protocol.)
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

5.31.16 clear mldsnooping

Use this command to delete all MLD snooping entries from the MFDB table.

Format	`clear mldsnooping`
Mode	Privileged EXEC

5.32 MLD Snooping Querier Commands

In an IPv6 environment, MLD Snooping requires that one central switch or router periodically query all end-devices on the network to announce their multicast memberships. This central device is the MLD Querier. The MLD query responses, known as MLD reports, keep the switch updated with the current multicast group membership on a port-by-port basis. If the switch does not receive updated membership information in a timely fashion, it will stop forwarding multicasts to the port where the end device is located.

This section describes the commands you use to configure and display information on MLD Snooping queries on the network and, separately, on VLANs.

NOTICE This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

5.32.1 set mld querier

Use this command to enable MLD Snooping Querier on the system (Global Config Mode) or on a VLAN. Using this command, you can specify the IP address that the snooping querier switch should use as a source address while generating periodic queries.

If a VLAN has MLD Snooping Querier enabled and MLD Snooping is operationally disabled on it, MLD Snooping Querier functionality is disabled on that VLAN. MLD Snooping functionality is re-enabled if MLD Snooping is operational on the VLAN.

The MLD Snooping Querier sends periodic general queries on the VLAN to solicit membership reports.

Default	disabled
Format	`set mld querier [vlan-id] [address ipv6_address]`
Mode	• Global Config • VLAN Mode

5.32.1.1 no set mld querier

Use this command to disable MLD Snooping Querier on the system. Use the optional parameter `address` to reset the querier address.

Format	`no set mld querier [vlan-id][address]`
Mode	• Global Config • VLAN Mode

5.32.2 set mld querier query_interval

Use this command to set the MLD Querier Query Interval time. It is the amount of time in seconds that the switch waits before sending another general query.

Default	60 seconds
Format	`set mld querier query_interval 1-1800`
Mode	Global Config

5.32.2.1 no set mld querier query_interval

Use this command to set the MLD Querier Query Interval time to its default value.

Format	`no set mld querier query_interval`
Mode	Global Config

5.32.3 set mld querier timer expiry

Use this command to set the MLD Querier timer expiration period. It is the time period that the switch remains in Non-Querier mode once it has discovered that there is a Multicast Querier in the network.

Default	60 seconds
Format	`set mld querier timer expiry` *`60-300`*
Mode	Global Config

5.32.3.1 no set mld querier timer expiry

Use this command to set the MLD Querier timer expiration period to its default value.

Format	`no set mld querier timer expiry`
Mode	Global Config

5.32.4 set mld querier election participate

Use this command to enable the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN. When this mode is enabled, if the Snooping Querier finds that the other Querier's source address is better (less) than the Snooping Querier's address, it stops sending periodic queries. If the Snooping Querier wins the election, then it will continue sending periodic queries.

Default	disabled
Format	`set mld querier election participate`
Mode	VLAN Config

5.32.4.1 no set mld querier election participate

Use this command to set the snooping querier not to participate in querier election but go into a non-querier mode as soon as it discovers the presence of another querier in the same VLAN.

Format	`no set mld querier election participate`
Mode	VLAN Config

5.32.5 show mldsnooping querier

Use this command to display MLD Snooping Querier information. Configured information is displayed whether or not MLD Snooping Querier is enabled.

Format	`show mldsnooping querier [{detail	vlan` *`vlanid`*`}]`
Mode	Privileged EXEC

When the optional arguments ***vlandid*** are not used, the command displays the following information.

Field	Description
Admin Mode	Indicates whether or not MLD Snooping Querier is active on the switch.
Admin Version	Indicates the version of MLD that will be used while sending out the queries. This is defaulted to `MLD v1` and it cannot be changed.
Querier Address	Shows the IP address which will be used in the IPv6 header while sending out MLD queries. It can be configured using the appropriate command.
Query Interval	Shows the amount of time in seconds that a Snooping Querier waits before sending out the periodic general query.
Querier Timeout	Displays the amount of time to wait in the Non-Querier operational state before moving to a Querier state.

When you specify a value for ***vlanid***, the following information appears.

Field	Description
VLAN Admin Mode	Indicates whether MLD Snooping Querier is active on the VLAN.
VLAN Operational State	Indicates whether MLD Snooping Querier is in "***Querier***" or "***Non-Querier***" state. When the switch is in ***Querier*** state, it will send out periodic general queries. When in ***Non-Querier*** state, it will wait for moving to ***Querier*** state and does not send out any queries.
VLAN Operational Max Response Time	Indicates the time to wait before removing a Leave from a host upon receiving a Leave request. This value is calculated dynamically from the Queries received from the network. If the Snooping Switch is in Querier state, then it is equal to the configured value.
Querier Election Participate	Indicates whether the MLD Snooping Querier participates in querier election if it discovers the presence of a querier in the VLAN.
Querier VLAN Address	The IP address will be used in the IPv6 header while sending out MLD queries on this VLAN. It can be configured using the appropriate command.
Operational Version	This version of IPv6 will be used while sending out MLD queriers on this VLAN.
Last Querier Address	Indicates the IP address of the most recent Querier from which a Query was received.
Last Querier Version	Indicates the MLD version of the most recent Querier from which a Query was received on this VLAN.

When the optional argument **`detail`** is used, the command shows the global information and the information for all Querier-enabled VLANs.

5.33 Port Security Commands

This section describes the command you use to configure Port Security on the switch. Port security, which is also known as port MAC locking, allows you to secure the network by locking allowable MAC addresses on a given port. Packets with a matching source MAC address are forwarded normally, and all other packets are discarded.

NOTICE To enable the SNMP trap specific to port security, see "snmp-server enable traps violation" on page 92

5.33.1 port-security

This command enables port locking on an interface, a range of interfaces, or at the system level.

Default	disabled
Format	`port-security`
Mode	• Global Config (to enable port locking globally) • Interface Config (to enable port locking on an interface or range of interfaces)

5.33.1.1 no port-security

This command disables port locking for one (Interface Config) or all (Global Config) ports.

Format `no port-security`

Mode

- Global Config
- Interface Config

5.33.2 port-security max-dynamic

This command sets the maximum number of dynamically locked MAC addresses allowed on a specific port. The valid range is 0–600.

Default 600

Format `port-security max-dynamic` *`maxvalue`*

Mode Interface Config

5.33.2.1 no port-security max-dynamic

This command resets the maximum number of dynamically locked MAC addresses allowed on a specific port to its default value.

Format `no port-security max-dynamic`

Mode Interface Config

5.33.3 port-security max-static

This command sets the maximum number of statically locked MAC addresses allowed on a port. The valid range is 0–20.

Default 1

Format `port-security max-static` *`maxvalue`*

Mode Interface Config

5.33.3.1 no port-security max-static

This command sets maximum number of statically locked MAC addresses to the default value.

Format `no port-security max-static`

Mode Interface Config

5.33.4 port-security mac-address

This command adds a MAC address to the list of statically locked MAC addresses for an interface or range of interfaces. The *`vid`* is the VLAN ID.

Format `port-security mac-address` *`mac-address vid`*

Mode Interface Config

5.33.4.1 no port-security mac-address

This command removes a MAC address from the list of statically locked MAC addresses.

Format	`no port-security mac-address` *`mac-address vid`*
Mode	Interface Config

5.33.5 port-security mac-address move

This command converts dynamically locked MAC addresses to statically locked addresses for an interface or range of interfaces.

Format	`port-security mac-address move`
Mode	Interface Config

5.33.6 port-security mac-address sticky

This command enables sticky mode Port MAC Locking on a port. If accompanied by a MAC address and a VLAN id (for interface config mode only), it adds a sticky MAC address to the list of statically locked MAC addresses. These sticky addresses are converted back to dynamically locked addresses if sticky mode is disabled on the port. The <vid> is the VLAN ID. The Global command applies the "sticky" mode to all valid interfaces (physical and LAG). There is no global sticky mode as such.

Sticky addresses that are dynamically learned will appear in `show running-config` as "port-security mac-address sticky <mac> <vid>" entries. This distinguishes them from static entries.

Format	`port-security mac-address sticky [<mac-address> <vid>]`
Mode	• Global Config • Interface Config

Example: The following shows an example of the command.

```
(Broadcom FASTPATH)(Config)# port-security mac-address sticky
(Broadcom FASTPATH)(Interface)# port-security mac-address sticky
(Broadcom FASTPATH)(Interface)# port-security mac-address sticky
  00:00:00:00:00:01 2
```

5.33.6.1 no port-security mac-address sticky

The no form removes the sticky mode. The sticky MAC address can be deleted by using the command "no port-security mac-address <mac-address> <vid>".

Format	`no port-security mac-address sticky [<mac-address> <vid>]`
Mode	• Global Config • Interface Config

5.33.7 show port-security

This command displays the port-security settings for the port(s). If you do not use a parameter, the command displays the Port Security Administrative mode. Use the optional parameters to display the settings on a specific interface or on all interfaces. Instead of *slot/port*, lag *lag-intf-num* can be used as an alternate way to specify the LAG interface. lag *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	`show port-security [{`*`slot/port`*` | all}]`
Mode	Privileged EXEC

Term	Definition
Admin Mode	Port Locking mode for the entire system. This field displays if you do not supply any parameters.

For each interface, or for the interface you specify, the following information appears:

Term	Definition
Admin Mode	Port Locking mode for the Interface.
Dynamic Limit	Maximum dynamically allocated MAC Addresses.
Static Limit	Maximum statically allocated MAC Addresses.
Violation Trap Mode	Whether violation traps are enabled.
Sticky Mode	The administrative mode of the port security Sticky Mode feature on the interface.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show port-security 0/1

       Admin    Dynamic     Static     Violation  Sticky
Intf   Mode      Limit      Limit      Trap Mode  Mode
------ ------- ---------- ---------  ---------  --------
0/1    Disabled 1          1          Disabled   Enabled
```

5.33.8 show port-security dynamic

This command displays the dynamically locked MAC addresses for the port. Instead of *slot/port*, `lag` *lag-intf-num* can be used as an alternate way to specify the LAG interface. `lag` *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	`show port-security dynamic` *slot/port*
Mode	Privileged EXEC

Term	Definition
MAC Address	MAC Address of dynamically locked MAC.

5.33.9 show port-security static

This command displays the statically locked MAC addresses for port. Instead of *slot/port*, lag *lag-intf-num* can be used as an alternate way to specify the LAG interface. lag *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	`show port-security static` {*slot/port* | `lag` *lag-intf-num*}
Mode	Privileged EXEC

Term	Definition
Statically Configured MAC Address	The statically configured MAC address.
VLAN ID	The ID of the VLAN that includes the host with the specified MAC address.
Sticky	Indicates whether the static MAC address entry is added in sticky mode.

Example: The following shows example CLI display output for the command.

```
(Routing) #show port-security static 0/1

 Number of static MAC addresses configured: 2

 Statically configured MAC Address    VLAN ID    Sticky
 ---------------------------------    -------    ------
 00:00:00:00:00:01                    2            Yes
 00:00:00:00:00:02                    2            No
```

5.33.10 show port-security violation

This command displays the source MAC address of the last packet discarded on a locked port. Instead of *slot/port*, lag *lag-intf-num* can be used as an alternate way to specify the LAG interface. lag *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	`show port-security violation {`*`slot/port`*`	lag `*`lag-id`*`}`
Mode	Privileged EXEC

Term	Definition
MAC Address	The source MAC address of the last frame that was discarded at a locked port.
VLAN ID	The VLAN ID, if applicable, associated with the MAC address of the last frame that was discarded at a locked port.

5.34 LLDP (802.1AB) Commands

This section describes the command you use to configure Link Layer Discovery Protocol (LLDP), which is defined in the IEEE 802.1AB specification. LLDP allows stations on an 802 LAN to advertise major capabilities and physical descriptions. The advertisements allow a network management system (NMS) to access and display this information.

5.34.1 lldp transmit

Use this command to enable the LLDP advertise capability on an interface or a range of interfaces.

Default	disabled
Format	`lldp transmit`
Mode	Interface Config

5.34.1.1 no lldp transmit

Use this command to return the local data transmission capability to the default.

Format	`no lldp transmit`
Mode	Interface Config

5.34.2 lldp receive

Use this command to enable the LLDP receive capability on an interface or a range of interfaces.

Default	disabled
Format	`lldp receive`
Mode	Interface Config

5.34.2.1 no lldp receive

Use this command to return the reception of LLDPDUs to the default value.

Format	`no lldp receive`
Mode	Interface Config

5.34.3 lldp timers

Use this command to set the timing parameters for local data transmission on ports enabled for LLDP. The ***interval-seconds*** determines the number of seconds to wait between transmitting local data LLDPDUs. The range is 1-32768 seconds. The ***hold-value*** is the multiplier on the transmit interval that sets the TTL in local data LLDPDUs. The multiplier range is 2-10. The ***reinit-seconds*** is the delay before reinitialization, and the range is 1-0 seconds.

Default	• interval—30 seconds • hold—4 • reinit—2 seconds
Format	`lldp timers [interval` *`interval-seconds`*`] [hold` *`hold-value`*`] [reinit` *`reinit-seconds`*`]`
Mode	Global Config

5.34.3.1 no lldp timers

Use this command to return any or all timing parameters for local data transmission on ports enabled for LLDP to the default values.

Format	`no lldp timers [interval] [hold] [reinit]`
Mode	Global Config

5.34.4 lldp transmit-tlv

Use this command to specify which optional type length values (TLVs) in the 802.1AB basic management set are transmitted in the LLDPDUs from an interface or range of interfaces. Use ***sys-name*** to transmit the system name TLV. To configure the system name, see “snmp-server” on page 91. Use ***sys-desc*** to transmit the system description TLV. Use ***sys-cap*** to transmit the system capabilities TLV. Use ***port-desc*** to transmit the port description TLV. To configure the port description. See “description” on page 287.

Default	no optional TLVs are included
Format	`lldp transmit-tlv [sys-desc] [sys-name] [sys-cap] [port-desc]`
Mode	Interface Config

5.34.4.1 no lldp transmit-tlv

Use this command to remove an optional TLV from the LLDPDUs. Use the command without parameters to remove all optional TLVs from the LLDPDU.

Format	`no lldp transmit-tlv [sys-desc] [sys-name] [sys-cap] [port-desc]`
Mode	Interface Config

5.34.5 lldp transmit-mgmt

Use this command to include transmission of the local system management address information in the LLDPDUs. This command can be used to configure a single interface or a range of interfaces.

Format	`lldp transmit-mgmt`
Mode	Interface Config

5.34.5.1 no lldp transmit-mgmt

Use this command to include transmission of the local system management address information in the LLDPDUs. Use this command to cancel inclusion of the management information in LLDPDUs.

Format	`no lldp transmit-mgmt`
Mode	Interface Config

5.34.6 lldp notification

Use this command to enable remote data change notifications on an interface or a range of interfaces.

Default	disabled
Format	`lldp notification`
Mode	Interface Config

5.34.6.1 no lldp notification

Use this command to disable notifications.

Default	disabled
Format	`no lldp notification`
Mode	Interface Config

5.34.7 lldp notification-interval

Use this command to configure how frequently the system sends remote data change notifications. The ***interval*** parameter is the number of seconds to wait between sending notifications. The valid interval range is 5-3600 seconds.

Default	5
Format	`lldp notification-interval` *`interval`*
Mode	Global Config

5.34.7.1 no lldp notification-interval

Use this command to return the notification interval to the default value.

Format	`no lldp notification-interval`
Mode	Global Config

5.34.8 clear lldp statistics

Use this command to reset all LLDP statistics, including MED-related information.

Format	`clear lldp statistics`
Mode	Privileged EXEC

5.34.9 clear lldp remote-data

Use this command to delete all information from the LLDP remote data table, including MED-related information.

Format	`clear lldp remote-data`
Mode	Global Config

5.34.10 show lldp

Use this command to display a summary of the current LLDP configuration.

Format	`show lldp`
Mode	Privileged EXEC

Term	Definition
Transmit Interval	How frequently the system transmits local data LLDPDUs, in seconds.
Transmit Hold Multiplier	The multiplier on the transmit interval that sets the TTL in local data LLDPDUs.
Re-initialization Delay	The delay before reinitialization, in seconds.
Notification Interval	How frequently the system sends remote data change notifications, in seconds.

5.34.11 show lldp interface

Use this command to display a summary of the current LLDP configuration for a specific interface or for all interfaces.

Format	`show lldp interface {`*`slot/port`*` | all}`
Mode	Privileged EXEC

Term	Definition
Interface	The interface in a *`slot/port`* format.
Link	Shows whether the link is up or down.
Transmit	Shows whether the interface transmits LLDPDUs.
Receive	Shows whether the interface receives LLDPDUs.
Notify	Shows whether the interface sends remote data change notifications.
TLVs	Shows whether the interface sends optional TLVs in the LLDPDUs. The TLV codes can be 0 (Port Description), 1 (System Name), 2 (System Description), or 3 (System Capability).
Mgmt	Shows whether the interface transmits system management address information in the LLDPDUs.

5.34.12 show lldp statistics

Use this command to display the current LLDP traffic and remote table statistics for a specific interface or for all interfaces.

Format	`show lldp statistics {`*`slot/port`*` | all}`
Mode	Privileged EXEC

Term	Definition
Last Update	The amount of time since the last update to the remote table in days, hours, minutes, and seconds.
Total Inserts	Total number of inserts to the remote data table.
Total Deletes	Total number of deletes from the remote data table.
Total Drops	Total number of times the complete remote data received was not inserted due to insufficient resources.
Total Ageouts	Total number of times a complete remote data entry was deleted because the Time to Live interval expired.

The table contains the following column headings:

Term	Definition
Interface	The interface in *slot/port* format.
TX Total	Total number of LLDP packets transmitted on the port.
RX Total	Total number of LLDP packets received on the port.
Discards	Total number of LLDP frames discarded on the port for any reason.
Errors	The number of invalid LLDP frames received on the port.
Ageouts	Total number of times a complete remote data entry was deleted for the port because the Time to Live interval expired.
TVL Discards	The number of TLVs discarded.
TVL Unknowns	Total number of LLDP TLVs received on the port where the type value is in the reserved range, and not recognized.
TLV MED	The total number of LLDP-MED TLVs received on the interface.
TLV 802.1	The total number of LLDP TLVs received on the interface which are of type 802.1.
TLV 802.3	The total number of LLDP TLVs received on the interface which are of type 802.3.

5.34.13 show lldp remote-device

Use this command to display summary information about remote devices that transmit current LLDP data to the system. You can show information about LLDP remote data received on all ports or on a specific port.

Format	`show lldp remote-device {`*slot/port*`	all}`
Mode	Privileged EXEC

Term	Definition
Local Interface	The interface that received the LLDPDU from the remote device.
RemID	An internal identifier to the switch to mark each remote device to the system.
Chassis ID	The ID that is sent by a remote device as part of the LLDP message, it is usually a MAC address of the device.
Port ID	The port number that transmitted the LLDPDU.
System Name	The system name of the remote device.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show lldp remote-device all

LLDP Remote Device Summary

Local
Interface RemID    Chassis ID           Port ID            System Name
-------  -------   --------------------  ------------------  ------------------
0/1
0/2
0/3
0/4
0/5
0/6
0/7        2       00:FC:E3:90:01:0F     00:FC:E3:90:01:11
0/7        3       00:FC:E3:90:01:0F     00:FC:E3:90:01:12
0/7        4       00:FC:E3:90:01:0F     00:FC:E3:90:01:13
0/7        5       00:FC:E3:90:01:0F     00:FC:E3:90:01:14
0/7        1       00:FC:E3:90:01:0F     00:FC:E3:90:03:11
0/7        6       00:FC:E3:90:01:0F     00:FC:E3:90:04:11
0/8
0/9
```

```
0/10
0/11
0/12
--More-- or (q)uit
```

5.34.14 show lldp remote-device detail

Use this command to display detailed information about remote devices that transmit current LLDP data to an interface on the system.

Format	`show lldp remote-device detail` *`slot/port`*
Mode	Privileged EXEC

Term	Definition
Local Interface	The interface that received the LLDPDU from the remote device.
Remote Identifier	An internal identifier to the switch to mark each remote device to the system.
Chassis ID Subtype	The type of identification used in the Chassis ID field.
Chassis ID	The chassis of the remote device.
Port ID Subtype	The type of port on the remote device.
Port ID	The port number that transmitted the LLDPDU.
System Name	The system name of the remote device.
System Description	Describes the remote system by identifying the system name and versions of hardware, operating system, and networking software supported in the device.
Port Description	Describes the port in an alpha-numeric format. The port description is configurable.
System Capabilities Supported	Indicates the primary function(s) of the device.
System Capabilities Enabled	Shows which of the supported system capabilities are enabled.
Management Address	For each interface on the remote device with an LLDP agent, lists the type of address the remote LLDP agent uses and specifies the address used to obtain information related to the device.
Time To Live	The amount of time (in seconds) the remote device's information received in the LLDPDU should be treated as valid information.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Switching) #show lldp remote-device detail 0/7

LLDP Remote Device Detail

Local Interface: 0/7


Remote Identifier: 2
Chassis ID Subtype: MAC Address
Chassis ID: 00:FC:E3:90:01:0F
Port ID Subtype: MAC Address
Port ID: 00:FC:E3:90:01:11
System Name:
System Description:
Port Description:
System Capabilities Supported:
System Capabilities Enabled:
Time to Live: 24 seconds
```

5.34.15 show lldp local-device

Use this command to display summary information about the advertised LLDP local data. This command can display summary information or detail for each interface.

Format	`show lldp local-device {`*`slot/port`*` | all}`
Mode	Privileged EXEC

Term	Definition
Interface	The interface in a *`slot/port`* format.
Port ID	The port ID associated with this interface.
Port Description	The port description associated with the interface.

5.34.16 show lldp local-device detail

Use this command to display detailed information about the LLDP data a specific interface transmits.

Format	`show lldp local-device detail `*`slot/port`*
Mode	Privileged EXEC

Term	Definition
Interface	The interface that sends the LLDPDU.
Chassis ID Subtype	The type of identification used in the Chassis ID field.
Chassis ID	The chassis of the local device.
Port ID Subtype	The type of port on the local device.
Port ID	The port number that transmitted the LLDPDU.
System Name	The system name of the local device.
System Description	Describes the local system by identifying the system name and versions of hardware, operating system, and networking software supported in the device.
Port Description	Describes the port in an alpha-numeric format.
System Capabilities Supported	Indicates the primary function(s) of the device.
System Capabilities Enabled	Shows which of the supported system capabilities are enabled.
Management Address	The type of address and the specific address the local LLDP agent uses to send and receive information.

5.35 LLDP-MED Commands

Link Layer Discovery Protocol - Media Endpoint Discovery (LLDP-MED) (ANSI-TIA-1057) provides an extension to the LLDP standard. Specifically, LLDP-MED provides extensions for network configuration and policy, device location, Power over Ethernet (PoE) management and inventory management.

5.35.1 lldp med

Use this command to enable MED on an interface or a range of interfaces. By enabling MED, you will be effectively enabling the transmit and receive function of LLDP.

Default	disabled
Format	`lldp med`
Mode	Interface Config

5.35.1.1 no lldp med

Use this command to disable MED.

Format	`no lldp med`
Mode	Interface Config

5.35.2 lldp med confignotification

Use this command to configure an interface or a range of interfaces to send the topology change notification.

Default	disabled
Format	`lldp med confignotification`
Mode	Interface Config

5.35.2.1 no ldp med confignotification

Use this command to disable notifications.

Format	`no lldp med confignotification`
Mode	Interface Config

5.35.3 lldp med transmit-tlv

Use this command to specify which optional Type Length Values (TLVs) in the LLDP MED set will be transmitted in the Link Layer Discovery Protocol Data Units (LLDPDUs) from this interface or a range of interfaces.

Default	By default, the capabilities and network policy TLVs are included.
Format	`lldp med transmit-tlv [capabilities] [ex-pd] [ex-pse] [inventory] [location] [network-policy]`
Mode	Interface Config

Term	Definition
capabilities	Transmit the LLDP capabilities TLV.
ex-pd	Transmit the LLDP extended PD TLV.
ex-pse	Transmit the LLDP extended PSE TLV.
inventory	Transmit the LLDP inventory TLV.
location	Transmit the LLDP location TLV.
network-policy	Transmit the LLDP network policy TLV.

5.35.3.1 no lldp med transmit-tlv

Use this command to remove a TLV.

Format	`no lldp med transmit-tlv [capabilities] [network-policy] [ex-pse] [ex-pd] [location] [inventory]`
Mode	Interface Config

5.35.4 lldp med all

Use this command to configure LLDP-MED on all the ports.

Format	`lldp med all`
Mode	Global Config

5.35.5 lldp med confignotification all

Use this command to configure all the ports to send the topology change notification.

Format	`lldp med confignotification all`
Mode	Global Config

5.35.6 lldp med faststartrepeatcount

Use this command to set the value of the fast start repeat count. *`[count]`* is the number of LLDP PDUs that will be transmitted when the product is enabled. The range is 1 to 10.

Default	3
Format	`lldp med faststartrepeatcount` *`[count]`*
Mode	Global Config

5.35.6.1 no lldp med faststartrepeatcount

Use this command to return to the factory default value.

Format	`no lldp med faststartrepeatcount`
Mode	Global Config

5.35.7 lldp med transmit-tlv all

Use this command to specify which optional Type Length Values (TLVs) in the LLDP MED set will be transmitted in the Link Layer Discovery Protocol Data Units (LLDPDUs).

Default	By default, the capabilities and network policy TLVs are included.
Format	`lldp med transmit-tlv all [capabilities] [ex-pd] [ex-pse] [inventory] [location] [network-policy]`
Mode	Global Config

Term	Definition
capabilities	Transmit the LLDP capabilities TLV.
ex-pd	Transmit the LLDP extended PD TLV.
ex-pse	Transmit the LLDP extended PSE TLV.

Term	Definition
inventory	Transmit the LLDP inventory TLV.
location	Transmit the LLDP location TLV.
network-policy	Transmit the LLDP network policy TLV.

5.35.7.1 no lldp med transmit-tlv

Use this command to remove a TLV.

Format	`no lldp med transmit-tlv [capabilities] [network-policy] [ex-pse] [ex-pd] [location] [inventory]`
Mode	Global Config

5.35.8 show lldp med

Use this command to display a summary of the current LLDP MED configuration.

Format	`show lldp med`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show lldp med
LLDP MED Global Configuration

Fast Start Repeat Count: 3
Device Class: Network Connectivity

(FASTPATH Routing) #
```

5.35.9 show lldp med interface

Use this command to display a summary of the current LLDP MED configuration for a specific interface. slot/port indicates a specific physical interface. *all* indicates all valid LLDP interfaces.

Format	`show lldp med interface {slot/port	all}`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show lldp med interface all

Interface  Link    configMED operMED   ConfigNotify TLVsTx
---------  ------  --------- --------  ------------ -----------
0/1        Down    Disabled  Disabled  Disabled     0,1
0/2        Up      Disabled  Disabled  Disabled     0,1
0/3        Down    Disabled  Disabled  Disabled     0,1
0/4        Down    Disabled  Disabled  Disabled     0,1
0/5        Down    Disabled  Disabled  Disabled     0,1
0/6        Down    Disabled  Disabled  Disabled     0,1
0/7        Down    Disabled  Disabled  Disabled     0,1
0/8        Down    Disabled  Disabled  Disabled     0,1
0/9        Down    Disabled  Disabled  Disabled     0,1
0/10       Down    Disabled  Disabled  Disabled     0,1
0/11       Down    Disabled  Disabled  Disabled     0,1
0/12       Down    Disabled  Disabled  Disabled     0,1
0/13       Down    Disabled  Disabled  Disabled     0,1
0/14       Down    Disabled  Disabled  Disabled     0,1
```

```
TLV Codes: 0- Capabilities,       1- Network Policy
           2- Location,           3- Extended PSE
           4- Extended Pd,        5- Inventory
--More-- or (q)uit
(FASTPATH Routing) #show lldp med interface 0/2

Interface  Link    configMED operMED   ConfigNotify TLVsTx
---------  ------  --------- --------  ------------ -----------
0/2        Up      Disabled  Disabled  Disabled     0,1

TLV Codes: 0- Capabilities,       1- Network Policy
           2- Location,           3- Extended PSE
           4- Extended Pd,        5- Inventory

(FASTPATH Routing) #
```

5.35.10 show lldp med local-device detail

Use this command to display detailed information about the LLDP MED data that a specific interface transmits. ***slot/port*** indicates a specific physical interface.

Format	`show lldp med local-device detail` *slot/port*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show lldp med local-device detail 0/8

LLDP MED Local Device Detail

Interface: 0/8

Network Policies
Media Policy Application Type : voice
Vlan ID: 10
Priority: 5
DSCP: 1
Unknown: False
Tagged: True

Media Policy Application Type : streamingvideo
Vlan ID: 20
Priority: 1
DSCP: 2
Unknown: False
Tagged: True

Inventory
Hardware Rev: xxx xxx xxx
Firmware Rev: xxx xxx xxx
Software Rev: xxx xxx xxx
Serial Num: xxx xxx xxx
Mfg Name: xxx xxx xxx
Model Name: xxx xxx xxx
Asset ID: xxx xxx xxx

Location
Subtype: elin
Info: xxx xxx xxx

Extended POE
Device Type: pseDevice
```

```
Extended POE PSE
Available: 0.3 Watts
Source: primary
Priority: critical

Extended POE PD

Required: 0.2 Watts
Source: local
Priority: low
```

5.35.11 show lldp med remote-device

Use this command to display the summary information about remote devices that transmit current LLDP MED data to the system. You can show information about LLDP MED remote data received on all valid LLDP interfaces or on a specific physical interface.

Format	`show lldp med remote-device {`*slot/port*`	all}`
Mode	Privileged EXEC

Term	Definition
Local Interface	The interface that received the LLDPDU from the remote device.
Remote ID	An internal identifier to the switch to mark each remote device to the system.
Device Class	Device classification of the remote device.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show lldp med remote-device all

LLDP MED Remote Device Summary

Local
Interface  Remote ID  Device Class
---------  ---------  ------------
0/8            1          Class I
0/9            2          Not Defined
0/10           3          Class II
0/11           4          Class III
0/12           5          Network Con
```

5.35.12 show lldp med remote-device detail

Use this command to display detailed information about remote devices that transmit current LLDP MED data to an interface on the system.

Format	`show lldp med remote-device detail `*slot/port*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show lldp med remote-device detail 0/8

LLDP MED Remote Device Detail

Local Interface: 0/8
Remote Identifier: 18
Capabilities
MED Capabilities Supported: capabilities, networkpolicy, location, extendedpse
MED Capabilities Enabled: capabilities, networkpolicy
Device Class: Endpoint Class I

Network Policies
Media Policy Application Type : voice
Vlan ID: 10
Priority: 5
DSCP: 1
Unknown: False
Tagged: True

Media Policy Application Type : streamingvideo
Vlan ID: 20
Priority: 1
DSCP: 2
Unknown: False
Tagged: True


Inventory
Hardware Rev: xxx xxx xxx
Firmware Rev: xxx xxx xxx
Software Rev: xxx xxx xxx
Serial Num: xxx xxx xxx
Mfg Name: xxx xxx xxx
Model Name: xxx xxx xxx
Asset ID: xxx xxx xxx

Location
Subtype: elin
Info: xxx xxx xxx

Extended POE
Device Type: pseDevice

Extended POE PSE
Available: 0.3 Watts
Source: primary
Priority: critical

Extended POE PD

Required: 0.2 Watts
Source: local
Priority: low
```

5.36 Denial of Service Commands

NOTICE Denial of Service (DataPlane) is supported on XGS-III and later platforms only.

This section describes the commands you use to configure Denial of Service (DoS) Control. FASTPATH software provides support for classifying and blocking specific types of Denial of Service attacks. You can configure your system to monitor and block these types of attacks:

- SIP = DIP: Source IP address = Destination IP address.
- First Fragment:TCP Header size smaller then configured value.
- TCP Fragment: Allows the device to drop packets that have a TCP payload where the IP payload length minus the IP header size is less than the minimum allowed TCP header size.
- TCP Flag: TCP Flag SYN set and Source Port < 1024 or TCP Control Flags = 0 and TCP Sequence Number = 0 or TCP Flags FIN, URG, and PSH set and TCP Sequence Number = 0 or TCP Flags SYN and FIN set.
- L4 Port: Source TCP/UDP Port = Destination TCP/UDP Port.
- ICMP: Limiting the size of ICMP Ping packets

.

NOTICE Monitoring and blocking of the types of attacks listed below are only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

- SMAC = DMAC: Source MAC address = Destination MAC address
- TCP Port: Source TCP Port = Destination TCP Port
- UDP Port: Source UDP Port = Destination UDP Port
- TCP Flag & Sequence: TCP Flag SYN set and Source Port < 1024 or TCP Control Flags = 0 and TCP Sequence Number = 0 or TCP Flags FIN, URG, and PSH set and TCP Sequence Number = 0 or TCP Flags SYN and FIN set.
- TCP Offset: Allows the device to drop packets that have a TCP header Offset set to 1.
- TCP SYN: TCP Flag SYN set.
- TCP SYN & FIN: TCP Flags SYN and FIN set.
- TCP FIN & URG & PSH: TCP Flags FIN and URG and PSH set and TCP Sequence Number = 0.
- ICMP V6: Limiting the size of ICMPv6 Ping packets.
- ICMP Fragment: Checks for fragmented ICMP packets.

5.36.1 dos-control all

This command enables Denial of Service protection checks globally.

Default	disabled
Format	`dos-control all`
Mode	Global Config

5.36.1.1 no dos-control all

This command disables Denial of Service prevention checks globally.

Format	`no dos-control all`
Mode	Global Config

5.36.2 dos-control sipdip

This command enables Source IP address = Destination IP address (SIP = DIP) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with SIP = DIP, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control sipdip`
Mode	Global Config

5.36.2.1 no dos-control sipdip

This command disables Source IP address = Destination IP address (SIP = DIP) Denial of Service prevention.

Format	`no dos-control sipdip`
Mode	Global Config

5.36.3 dos-control firstfrag

This command enables Minimum TCP Header Size Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having a TCP Header Size smaller then the configured value, the packets will be dropped if the mode is enabled.The default is ***disabled.*** If you enable dos-control firstfrag, but do not provide a Minimum TCP Header Size, the system sets that value to ***20***.

Default	disabled (20)
Format	`dos-control firstfrag [`*`0-255`*`]`
Mode	Global Config

5.36.3.1 no dos-control firstfrag

This command sets Minimum TCP Header Size Denial of Service protection to the default value of ***disabled***.

Format	`no dos-control firstfrag`
Mode	Global Config

5.36.4 dos-control tcpfrag

This command enables TCP Fragment Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack and packets that have a TCP payload in which the IP payload length minus the IP header size is less than the minimum allowed TCP header size are dropped.

Default	disabled
Format	`dos-control tcpfrag`
Mode	Global Config

5.36.4.1 no dos-control tcpfrag

This command disables TCP Fragment Denial of Service protection.

Format	`no dos-control tcpfrag`
Mode	Global Config

5.36.5 dos-control tcpflag

This command enables TCP Flag Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attacks. If packets ingress having TCP Flag SYN set and a source port less than 1024 or having TCP Control Flags set to 0 and TCP Sequence Number set to 0 or having TCP Flags FIN, URG, and PSH set and TCP Sequence Number set to 0 or having TCP Flags SYN and FIN both set, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpflag`
Mode	Global Config

5.36.5.1 no dos-control tcpflag

This command sets disables TCP Flag Denial of Service protections.

Format	`no dos-control tcpflag`
Mode	Global Config

5.36.6 dos-control l4port

This command enables L4 Port Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having Source TCP/UDP Port Number equal to Destination TCP/UDP Port Number, the packets will be dropped if the mode is enabled

NOTICE Some applications mirror source and destination L4 ports - RIP for example uses 520 for both. If you enable dos-control l4port, applications such as RIP may experience packet loss which would render the application inoperable.

Default	disabled
Format	`dos-control l4port`
Mode	Global Config

5.36.6.1 no dos-control l4port

This command disables L4 Port Denial of Service protections.

Format	`no dos-control l4port`
Mode	Global Config

5.36.7 dos-control smacdmac

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables Source MAC address = Destination MAC address (SMAC = DMAC) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with SMAC = DMAC, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control smacdmac`
Mode	Global Config

5.36.7.1 no dos-control smacdmac

This command disables Source MAC address = Destination MAC address (SMAC = DMAC) DoS protection.

Format	`no dos-control smacdmac`
Mode	Global Config

5.36.8 dos-control tcpport

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP L4 source = destination port number (Source TCP Port = Destination TCP Port) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with Source TCP Port = Destination TCP Port, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpport`
Mode	Global Config

5.36.8.1 no dos-control tcpport

This command disables TCP L4 source = destination port number (Source TCP Port = Destination TCP Port) Denial of Service protection.

Format	`no dos-control tcpport`
Mode	Global Config

5.36.9 dos-control udpport

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables UDP L4 source = destination port number (Source UDP Port = Destination UDP Port) DoS protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with Source UDP Port = Destination UDP Port, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control udpport`
Mode	Global Config

5.36.9.1 no dos-control udpport

This command disables UDP L4 source = destination port number (Source UDP Port = Destination UDP Port) Denial of Service protection.

Format	`no dos-control udpport`
Mode	Global Config

5.36.10 dos-control tcpflagseq

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP Flag and Sequence Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP Flag SYN set and a source port less than 1024 or having TCP Control Flags set to 0 and TCP Sequence Number set to 0 or having TCP Flags FIN, URG, and PSH set and TCP Sequence Number set to 0 or having TCP Flags SYN and FIN both set, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpflagseq`
Mode	Global Config

5.36.10.1 no dos-control tcpflagseq

This command sets disables TCP Flag and Sequence Denial of Service protection.

Format	`no dos-control tcpflagseq`
Mode	Global Config

5.36.11 dos-control tcpoffset

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP Offset Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP Header Offset equal to one (1), the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpoffset`
Mode	Global Config

5.36.11.1 no dos-control tcpoffset

This command disabled TCP Offset Denial of Service protection.

Format	`no dos-control tcpoffset`
Mode	Global Config

5.36.12 dos-control tcpsyn

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP SYN and L4 source = 0-1023 Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP flag SYN set and an L4 source port from 0 to 1023, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpsyn`
Mode	Global Config

5.36.12.1 no dos-control tcpsyn

This command sets disables TCP SYN and L4 source = 0-1023 Denial of Service protection.

Format	`no dos-control tcpsyn`
Mode	Global Config

5.36.13 dos-control tcpsynfin

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP SYN and FIN Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP flags SYN and FIN set, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpsynfin`
Mode	Global Config

5.36.13.1 no dos-control tcpsynfin

This command sets disables TCP SYN & FIN Denial of Service protection.

Format	`no dos-control tcpsynfin`
Mode	Global Config

5.36.14 dos-control tcpfinurgpsh

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP FIN and URG and PSH and SEQ = 0 checking Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP FIN, URG, and PSH all set and TCP Sequence Number set to 0, the packets will be dropped if the mode is enabled.

Default	disabled
Format	`dos-control tcpfinurgpsh`
Mode	Global Config

5.36.14.1 no dos-control tcpfinurgpsh

This command sets disables TCP FIN and URG and PSH and SEQ = 0 checking Denial of Service protections.

Format	`no dos-control tcpfinurgpsh`
Mode	Global Config

5.36.15 dos-control icmpv4

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables Maximum ICMPv4 Packet Size Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If ICMPv4 Echo Request (PING) packets ingress having a size greater than the configured value, the packets will be dropped if the mode is enabled.

Default	disabled (512)
Format	`dos-control icmpv4 [0-16376]`
Mode	Global Config

5.36.15.1 no dos-control icmpv4

This command disables Maximum ICMP Packet Size Denial of Service protections.

Format	`no dos-control icmpv4`
Mode	Global Config

5.36.16 dos-control icmpv6

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables Maximum ICMPv6 Packet Size Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If ICMPv6 Echo Request (PING) packets ingress having a size greater than the configured value, the packets will be dropped if the mode is enabled.

Default disabled (512)

Format `dos-control icmpv6 0-16376`

Mode Global Config

5.36.16.1 no dos-control icmpv6

This command disables Maximum ICMP Packet Size Denial of Service protections.

Format `no dos-control icmpv6`

Mode Global Config

5.36.17 dos-control icmpfrag

NOTICE This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables ICMP Fragment Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having fragmented ICMP packets, the packets will be dropped if the mode is enabled.

Default disabled

Format `dos-control icmpfrag`

Mode Global Config

5.36.17.1 no dos-control icmpfrag

This command disabled ICMP Fragment Denial of Service protection.

Format `no dos-control icmpfrag`

Mode Global Config

5.36.18 show dos-control

This command displays Denial of Service configuration information.

Format `show dos-control`

Mode Privileged EXEC

NOTICE Some of the information below displays only if you are using the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Term	Definition
First Fragment Mode	The administrative mode of First Fragment DoS prevention. When enabled, this causes the switch to drop packets that have a TCP header smaller then the configured Min TCP Hdr Size.
Min TCP Hdr Size	The minimum TCP header size the switch will accept if First Fragment DoS prevention is enabled.
ICMPv4 Mode	The administrative mode of ICMPv4 DoS prevention. When enabled, this causes the switch to drop ICMP packets that have a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv4 Payload Size.
Max ICMPv4 Payload Size	The maximum ICMPv4 payload size to accept when ICMPv4 DoS protection is enabled.
ICMPv6 Mode	The administrative mode of ICMPv6 DoS prevention. When enabled, this causes the switch to drop ICMP packets that have a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv6 Payload Size.
Max ICMPv6 Payload Size	The maximum ICMPv6 payload size to accept when ICMPv6 DoS protection is enabled.
ICMPv4 Fragment Mode	The administrative mode of ICMPv4 Fragment DoS prevention. When enabled, this causes the switch to drop fragmented ICMPv4 packets.
TCP Port Mode	The administrative mode of TCP Port DoS prevention. When enabled, this causes the switch to drop packets that have the TCP source port equal to the TCP destination port.
UDP Port Mode	The administrative mode of UDP Port DoS prevention. When enabled, this causes the switch to drop packets that have the UDP source port equal to the UDP destination port.
SIPDIP Mode	The administrative mode of SIP=DIP DoS prevention. Enabling this causes the switch to drop packets that have a source IP address equal to the destination IP address. The factory default is disabled.
SMACDMAC Mode	The administrative mode of SMAC=DMAC DoS prevention. Enabling this causes the switch to drop packets that have a source MAC address equal to the destination MAC address.
TCP FIN&URG& PSH Mode	The administrative mode of TCP FIN & URG & PSH DoS prevention. Enabling this causes the switch to drop packets that have TCP flags FIN, URG, and PSH set and TCP Sequence Number = 0.
TCP Flag & Sequence Mode	The administrative mode of TCP Flag DoS prevention. Enabling this causes the switch to drop packets that have TCP control flags set to 0 and TCP sequence number set to 0.
TCP SYN Mode	The administrative mode of TCP SYN DoS prevention. Enabling this causes the switch to drop packets that have TCP Flags SYN set.
TCP SYN & FIN Mode	The administrative mode of TCP SYN & FIN DoS prevention. Enabling this causes the switch to drop packets that have TCP Flags SYN and FIN set.
TCP Fragment Mode	The administrative mode of TCP Fragment DoS prevention. Enabling this causes the switch to drop packets that have a TCP payload in which the IP payload length minus the IP header size is less than the minimum allowed TCP header size.
TCP Offset Mode	The administrative mode of TCP Offset DoS prevention. Enabling this causes the switch to drop packets that have a TCP header Offset equal to 1.

5.37 MAC Database Commands

This section describes the commands you use to configure and view information about the MAC databases.

5.37.1 bridge aging-time

This command configures the forwarding database address aging timeout in seconds. The ***seconds*** parameter must be within the range of 10 to 1,000,000 seconds. In an SVL system, the [fdbid/all] parameter is not used and will be ignored if entered. In an SVL system, the [fdbid/all] parameter is not used and will be ignored if entered.

Default	300
Format	`bridge aging-time` *`10-1,000,000`*
Mode	Global Config

5.37.1.1 no bridge aging-time

This command sets the forwarding database address aging timeout to the default value. In an SVL system, the [fdbid/all] parameter is not used and will be ignored if entered.

Format	`no bridge aging-time`
Mode	Global Config

5.37.2 show forwardingdb agetime

This command displays the timeout for address aging.

Default	all
Format	`show forwardingdb agetime`
Mode	Privileged EXEC

Term	Definition
Address Aging Timeout	Displays the system's address aging timeout value in seconds.

5.37.3 show mac-address-table multicast

This command displays the Multicast Forwarding Database (MFDB) information. If you enter the command with no parameter, the entire table is displayed. You can display the table entry for one MAC Address by specifying the MAC address as an optional parameter.

Format	`show mac-address-table multicast` *`macaddr`*
Mode	Privileged EXEC

Term	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A multicast MAC address for which the switch has forwarding or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Source	The component that is responsible for this entry in the Multicast Forwarding Database. The source can be IGMP Snooping, GMRP, and Static Filtering.
Type	The type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.

Term	Definition
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).
Fwd Interface	The resultant forwarding list is derived from combining all the component's forwarding interfaces and removing the interfaces that are listed as the static filtering interfaces.

Example: If one or more entries exist in the multicast forwarding table, the command output looks similar to the following:

```
(Routing) #show mac-address-table multicast


                                                                   Fwd
VLAN ID MAC Address       Source  Type    Description     Interface Interface
------- ----------------- ------- ------- --------------- --------- ---------
1       01:00:5E:01:02:03 Filter  Static  Mgmt Config     Fwd:      Fwd:
                                                          0/1,      0/1,
                                                          0/2,      0/2,
                                                          0/3,      0/3,
                                                          0/4,      0/4,
                                                          0/5,      0/5,
                                                          0/6,      0/6,
                                                          0/7,      0/7,
                                                          0/8,      0/8,
                                                          0/9,      0/9,
                                                          0/10,     0/10,
--More-- or (q)uit
```

5.37.4 show mac-address-table stats

This command displays the Multicast Forwarding Database (MFDB) statistics.

Format	`show mac-address-table stats`
Mode	Privileged EXEC

Term	Definition
Total Entries	The total number of entries that can possibly be in the Multicast Forwarding Database table.
Most MFDB Entries Ever Used	The largest number of entries that have been present in the Multicast Forwarding Database table. This value is also known as the MFDB high-water mark.
Current Entries	The current number of entries in the MFDB.

5.38 ISDP Commands

This section describes the commands you use to configure the industry standard Discovery Protocol (ISDP).

5.38.1 isdp run

This command enables ISDP on the switch.

Default	Enabled
Format	`isdp run`
Mode	Global Config

5.38.1.1 no isdp run

This command disables ISDP on the switch.

Format	`no isdp run`
Mode	Global Config

5.38.2 isdp holdtime

This command configures the hold time for ISDP packets that the switch transmits. The hold time specifies how long a receiving device should store information sent in the ISDP packet before discarding it. The range is given in seconds.

Default	180 seconds
Format	`isdp holdtime` *`10-255`*
Mode	Global Config

5.38.3 isdp timer

This command sets the period of time between sending new ISDP packets. The range is given in seconds.

Default	60 seconds
Format	`isdp timer` *`5-254`*
Mode	Global Config

5.38.4 isdp advertise-v2

This command enables the sending of ISDP version 2 packets from the device.

Default	Enabled
Format	`isdp advertise-v2`
Mode	Global Config

5.38.4.1 no isdp advertise-v2

This command disables the sending of ISDP version 2 packets from the device.

Format	`no isdp advertise-v2`
Mode	Global Config

5.38.5 isdp enable

This command enables ISDP on an interface or range of interfaces.

NOTICE ISDP must be enabled both globally and on the interface in order for the interface to transmit ISDP packets. If ISDP is globally disabled on the switch, the interface will not transmit ISDP packets, regardless of the ISDP status on the interface. To enable ISDP globally, use the command “isdp run” on page 490.

Default	Enabled
Format	`isdp enable`
Mode	Interface Config

5.38.5.1 no isdp enable

This command disables ISDP on the interface.

Format	`no isdp enable`
Mode	Interface Config

5.38.6 clear isdp counters

This command clears ISDP counters.

Format	`clear isdp counters`
Mode	Privileged EXEC

5.38.7 clear isdp table

This command clears entries in the ISDP table.

Format	`clear isdp table`
Mode	Privileged EXEC

5.38.8 show isdp

This command displays global ISDP settings.

Format	`show isdp`
Mode	Privileged EXEC

Term	Definition
Timer	The frequency with which this device sends ISDP packets. This value is given in seconds.
Hold Time	The length of time the receiving device should save information sent by this device. This value is given in seconds.
Version 2 Advertisements	The setting for sending ISDPv2 packets. If disabled, version 1 packets are transmitted.
Neighbors table time since last change	The amount of time that has passed since the ISPD neighbor table changed.
Device ID	The Device ID advertised by this device. The format of this Device ID is characterized by the value of the Device ID Format object.
Device ID Format Capability	Indicates the Device ID format capability of the device. • `serialNumber` indicates that the device uses a serial number as the format for its Device ID. • `macAddress` indicates that the device uses a Layer 2 MAC address as the format for its Device ID. • `other` indicates that the device uses its platform-specific format as the format for its Device ID.
Device ID Format	Indicates the Device ID format of the device. • `serialNumber` indicates that the value is in the form of an ASCII string containing the device serial number. • `macAddress` indicates that the value is in the form of a Layer 2 MAC address. • `other` indicates that the value is in the form of a platform specific ASCII string containing info that identifies the device. For example, ASCII string contains serialNumber appended/prepended with system name.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show isdp

Timer.......................................... 30
Hold Time...................................... 180
Version 2 Advertisements....................... Enabled
Neighbors table time since last change......... 0 days 00:00:00
Device ID...................................... 1114728
Device ID format capability.................... Serial Number, Host Name
Device ID format............................... Serial Number
```

5.38.9 show isdp interface

This command displays ISDP settings for the specified interface.

Format	`show isdp interface {all	`*`slot/port`*`}`
Mode	Privileged EXEC

Term	Definition
Interface	The *slot/port* of the specified interface.
Mode	ISDP mode enabled/disabled status for the interface(s).

Example: The following shows example CLI display output for the command.

```
(Routing) #show isdp interface 0/1

Interface        Mode
---------------  ----------
0/1              Enabled
```

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp interface all

Interface        Mode
---------------  ----------

0/1                 Enabled

0/2                 Enabled

0/3                 Enabled

0/4                 Enabled

0/5                 Enabled

0/6                 Enabled

0/7                 Enabled

0/8                 Enabled
```

5.38.10 show isdp entry

This command displays ISDP entries. If the device id is specified, then only entries for that device are shown.

Format	`show isdp entry {all	deviceid}`
Mode	Privileged EXEC

Term	Definition
Device ID	The device ID associated with the neighbor which advertised the information.
IP Addresses	The IP address(es) associated with the neighbor.
Capability	ISDP Functional Capabilities advertised by the neighbor.
Platform	The hardware platform advertised by the neighbor.
Interface	The interface (slot/port) on which the neighbor's advertisement was received.
Port ID	The port ID of the interface from which the neighbor sent the advertisement.
Hold Time	The hold time advertised by the neighbor.
Version	The software version that the neighbor is running.
Advertisement Version	The version of the advertisement packet received from the neighbor.
Entry Last Changed Time	The time when the entry was last changed.

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp entry Switch

Device ID                         Switch

Address(es):
    IP Address:                   172.20.1.18
    IP Address:                   172.20.1.18
Capability                        Router IGMP

Platform                          cisco WS-C4948

Interface                         0/1

Port ID                           GigabitEthernet1/1

Holdtime                          64

Advertisement Version             2

Entry last changed time           0 days 00:13:50
```

5.38.11 show isdp neighbors

This command displays the list of neighboring devices.

Format	`show isdp neighbors [{`*`slot/port`*`	detail}]`
Mode	Privileged EXEC

Term	Definition
Device ID	The device ID associated with the neighbor which advertised the information.
IP Addresses	The IP addresses associated with the neighbor.

Term	Definition
Capability	ISDP functional capabilities advertised by the neighbor.
Platform	The hardware platform advertised by the neighbor.
Interface	The interface (*slot/port*) on which the neighbor's advertisement was received.
Port ID	The port ID of the interface from which the neighbor sent the advertisement.
Hold Time	The hold time advertised by the neighbor.
Advertisement Version	The version of the advertisement packet received from the neighbor.
Entry Last Changed Time	Time when the entry was last modified.
Version	The software version that the neighbor is running.

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge,

                  S - Switch, H - Host, I - IGMP, r - Repeater

 Device ID           Intf Holdtime  Capability   Platform       Port ID
-------------------- ----- --------- ------------ -------------------- --------------------
Switch               0/1   165       RI               cisco WS-C4948    GigabitEthernet1/1
```

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp neighbors detail

Device ID                        0001f45f1bc0
Address(es):
    IP Address:                  10.27.7.57
Capability                       Router Trans Bridge Switch IGMP
Platform                         SecureStack C2
Interface                        0/48
Port ID                          ge.3.14
Holdtime                         131
Advertisement Version            2
Entry last changed time          0 days 00:01:59
Version:                         05.00.56
```

5.38.12 show isdp traffic

This command displays ISDP statistics.

Format	show isdp traffic
Mode	Privileged EXEC

Term	Definition
ISDP Packets Received	Total number of ISDP packets received
ISDP Packets Transmitted	Total number of ISDP packets transmitted
ISDPv1 Packets Received	Total number of ISDPv1 packets received
ISDPv1 Packets Transmitted	Total number of ISDPv1 packets transmitted
ISDPv2 Packets Received	Total number of ISDPv2 packets received
ISDPv2 Packets Transmitted	Total number of ISDPv2 packets transmitted
ISDP Bad Header	Number of packets received with a bad header
ISDP Checksum Error	Number of packets received with a checksum error
ISDP Transmission Failure	Number of packets which failed to transmit
ISDP Invalid Format	Number of invalid packets received

Term	Definition
ISDP Table Full	Number of times a neighbor entry was not added to the table due to a full database
ISDP IP Address Table Full	Displays the number of times a neighbor entry was added to the table without an IP address.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show isdp traffic

ISDP Packets Received.......................... 4253
ISDP Packets Transmitted....................... 127
ISDPv1 Packets Received........................ 0
ISDPv1 Packets Transmitted..................... 0
ISDPv2 Packets Received........................ 4253
ISDPv2 Packets Transmitted..................... 4351
ISDP Bad Header................................ 0
ISDP Checksum Error............................ 0
ISDP Transmission Failure...................... 0
ISDP Invalid Format............................ 0
ISDP Table Full................................ 392
ISDP IP Address Table Full..................... 737
```

5.38.13 debug isdp packet

This command enables tracing of ISDP packets processed by the switch. ISDP must be enabled on both the device and the interface in order to monitor packets for a particular interface.

Format	`debug isdp packet [{receive	transmit}]`
Mode	Privileged EXEC

5.38.13.1 no debug isdp packet

This command disables tracing of ISDP packets on the receive or the transmit sides or on both sides.

Format	`no debug isdp packet [{receive	transmit}]`
Mode	Privileged EXEC

5.39 Interface Error Disable and Auto Recovery

Interface error disable automatically disables an interface when an error is detected; no traffic is allowed until the interface is either manually re-enabled or, if auto recovery is configured, the configured auto recovery time interval has passed.

For interface error disable and auto recovery, an error condition is detected for an interface, the interface is placed in a diagnostic disabled state by shutting down the interface. The error disabled interface does not allow any traffic until the interface is re-enabled. The error disabled interface can be manually enabled . Alternatively administrator can enable auto recovery feature. FASTPATH Auto Recovery re-enables the interface after the expiry of configured time interval.

5.39.1 errdisable recovery cause

Use this command to enable auto recovery for a specified cause or all causes. When auto recovery is enabled, ports in the diag-disable state are recovered (link up) when the recovery interval expires. If the interface continues to experience errors, the interface may be placed back in the diag-disable state and disabled (link down). Interfaces in the diag-disable state can be manually recovered by entering the `no shutdown` command for the interface.

Default	None
Format	`errdisable recovery cause {all | arp-inspection | bpduguard | dhcp-rate-limit | sfp-mismatch | udld | ucast-storm | bcast-storm | mcast-storm | bpdustorm | keep-alive | mac-locking | denial-of-service | link-flap}`
Mode	Global Config

5.39.1.1 no errdisable recovery cause

Use this command to disable auto recovery for a specific cause. When disabled, auto recovery will not occur for interfaces in a diag-disable state due to that cause.

Format	`no errdisable recovery cause {all | arp-inspection | bpduguard | dhcp-rate-limit | sfp-mismatch | udld | ucast-storm | bcast-storm | mcast-storm | bpdustorm | keep-alive | mac-locking | denial-of-service | link-flap}`
Mode	Global Config

5.39.2 errdisable recovery interval

Use this command to configure the auto recovery time interval. The auto recovery time interval is common for all causes. The time can be any value from 30 to 86400 seconds.When the recovery interval expires, the system attempts to bring interfaces in the diag-disable state back into service (link up).

Default	300
Format	`errdisable recovery interval` *30-86400*
Mode	Global Config

5.39.2.1 no errdisable recovery interval

Use this command to reset the auto recovery interval to the factory default value of 300.

Format	`no errdisable recovery interval`
Mode	Global Config

5.39.3 show errdisable recovery

Use this command to display the errdisable configuration status of all configurable causes.

Format	`show errdisable recovery`
Mode	Privileged EXEC

The following information is displayed.

Parameter	Description
dhcp-rate-limit	Enable/Disable status of dhcp-rate-limit auto recovery.
arp-inspection	Enable/Disable status of arp-inspection auto recovery.
sfp-mismatch	Enable/Disable status of sfp-mismatch auto recovery.
udld	Enable/Disable status of UDLD auto recovery.
bcast-storm	Enable/Disable status of broadcast storm auto recovery.
mcast-storm	Enable/Disable status of multicast storm auto recovery.
ucast-storm	Enable/Disable status of unicast storm auto recovery.
bpdguard	Enable/Disable status of bpduguard auto recovery.

Parameter	Description
bpdustorm	Enable/Disable status of bpdustorm auto recovery.
keepalive	Enable/Disable status of keepalive auto recovery.
mac-locking	Enable/Disable status of MAC locking auto recovery.
denial-of-service	Enable/Disable status of DoS auto recovery.
link-flap	Enable/Disable status of link-flap auto recovery.
time interval	Time interval for auto recovery in seconds.

Example:

```
Errdisable Reason      Auto-recovery Status
------------------     ---------------------
dhcp-rate-limit           Disabled

arp-inspection            Disabled

udld                      Disabled

bcast-storm               Disabled

mcast-storm               Disabled

ucast-storm               Disabled

bpduguard                 Disabled

bpdustorm                 Disabled

sfp-mismatch              Disabled

keepalive                 Disabled

mac-locking               Disabled

denial-of-service         Disabled

link-flap                 Disabled

Timeout for Auto-recovery from D-Disable state  300
```

5.39.4 show interfaces status err-disabled

Use this command to display the interfaces that are error disabled and the amount of time remaining for auto recovery.

Format	`show interfaces status err-disabled`
Mode	Privileged EXEC

The following information is displayed.

Parameter	Description
interface	An interface that is error disabled.
Errdisable Reason	The cause of the interface being error disabled.
Auto-Recovery Time Left	The amount of time left before auto recovery begins.

Example:

```
(Routing) #show interfaces status err-disabled

Interface      Errdisable Reason      Auto-Recovery Time Left(sec)
----------        -----------------   ------------------
0/1             udld                  279
0/2             bpduguard             285
0/3             bpdustorm             291
0/4             keepalive             11
```

5.40 UniDirectional Link Detection Commands

The purpose of the UniDirectional Link Detection (UDLD) feature is to detect and avoid unidirectional links. A unidirectional link is a forwarding anomaly in a Layer 2 communication channel in which a bi-directional link stops passing traffic in one direction. Use the UDLD commands to detect unidirectional links' physical ports. UDLD must be enabled on both sides of the link in order to detect a unidirectional link. The UDLD protocol operates by exchanging packets containing information about neighboring devices.

5.40.1 udld enable (Global Config)

This command enables UDLD globally on the switch.

Default	disable
Format	`udld enable`
Mode	Global Config

5.40.1.1 no udld enable (Global Config)

This command disables udld globally on the switch.

Format	`no udld enable`
Mode	Global Config

5.40.2 udld message time

This command configures the interval between UDLD probe messages on ports that are in the advertisement phase. The range is from 7 to 90 seconds.

Default	15 seconds
Format	`udld message time` *`interval`*
Mode	Global Config

5.40.3 udld timeout interval

This command configures the time interval after which UDLD link is considered to be unidirectional. The range is from 5 to 60 seconds.

Default	5 seconds
Format	`udld timeout interval` *`interval`*
Mode	Global Config

5.40.4 udld reset

This command resets all interfaces that have been shutdown by UDLD.

Default	None
Format	`udld reset`
Mode	Privileged EXEC

5.40.5 udld enable (Interface Config)

This command enables UDLD on the specified interface.

Default	disable
Format	`udld enable`
Mode	Interface Config

5.40.5.1 no udld enable (Interface Config)

This command disables UDLD on the specified interface.

Format	`no udld enable`
Mode	Interface Config

5.40.6 udld port

This command selects the UDLD mode operating on this interface. If the keyword aggressive is not entered, the port operates in normal mode.

Default	normal
Format	`udld port [aggressive]`
Mode	Interface Config

5.40.7 show udld

This command displays the global settings of UDLD.

Format	`show udld`
Mode	User EXEC Privileged EXEC

Parameter	Description
Admin Mode	The global administrative mode of UDLD.
Message Interval	The time period (in seconds) between the transmission of UDLD probe packets.
Timeout Interval	The time period (in seconds) before making a decision that the link is unidirectional.

Example: The following shows example CLI display output for the command after the feature was enabled and nondefault interval values were configured.

```
(FASTPATH Routing) #show udld

Admin Mode..................................... Enabled
Message Interval............................... 13
Timeout Interval............................... 31
```

5.40.8 show udld *slot/port*

This command displays the UDLD settings for the specified slot/port. If the all keyword is entered, it displays information for all ports.

Format	`show udld {slot/port | all}`
Mode	• User EXEC • Privileged EXEC

Parameter	Description
Port	The identifying port of the interface.
Admin Mode	The administrative mode of UDLD configured on this interface. This is either Enabled or Disabled.
UDLD Mode	The UDLD mode configured on this interface. This is either Normal or Aggressive.
UDLD Status	The status of the link as determined by UDLD. The options are: • Undetermined – UDLD has not collected enough information to determine the state of the port. • Not applicable – UDLD is disabled, either globally or on the port. • Shutdown – UDLD has detected a unidirectional link and shutdown the port. That is, the port is in an errDisabled state. • Bidirectional – UDLD has detected a bidirectional link. • Undetermined (Link Down) – The port would transition into this state when the port link physically goes down due to any reasons other than the port been put into D-Disable mode by the UDLD protocol on the switch.

Example: The following shows example CLI display output for the command.

```
(Switching) #show udld 0/1

Port       Admin Mode   UDLD Mode      UDLD Status
-----      ----------   -----------    --------------
0/1        Enabled      Normal         Not Applicable
```

Example: The following shows example CLI display output for the command.

```
(Switching) #show udld all

Port       Admin Mode   UDLD Mode      UDLD Status
-----      ----------   -----------    --------------
0/1        Enabled      Normal         Shutdown
0/2        Enabled      Normal         Undetermined
0/3        Enabled      Normal         Bidirectional
0/4        Enabled      Normal         Not Applicable
0/5        Enabled      Normal         Not Applicable
0/6        Enabled      Normal         Not Applicable
0/7        Enabled      Normal         Not Applicable
0/8        Enabled      Normal         Shutdown
0/9        Enabled      Normal         Not Applicable
0/10       Enabled      Normal         Not Applicable
0/11       Enabled      Normal         Not Applicable
0/12       Enabled      Normal         Undetermined
```

```
0/13       Enabled      Normal         Bidirectional
0/14       Disabled     Normal         Not Applicable
0/15       Disabled     Normal         Not Applicable
0/16       Disabled     Normal         Not Applicable
0/17       Disabled     Normal         Not Applicable
0/18       Disabled     Normal         Not Applicable
0/19       Disabled     Normal         Not Applicable
0/20       Disabled     Normal         Not Applicable
--More-- or (q)uit

(Switching) #
```

5.41 Port Bridging Commands

5.41.1 L2-port-bridge

This command configures layer2 port bridging. L2 port bridging is a feature that allows a packet to be transmitted in egress direction through the same port it was received on.

Format `L2-port-bridge`

Mode Interface Config

5.41.1.1 no L2-port-bridge

This command resets L2 port bridging.

Format `no L2-port-bridge`

Mode Interface Config

5.41.2 show port L2-port-bridge

This command displays the L2 port bridge setting. The command displays for a specified interface or all interfaces the settings. The displayed fields are

- the interface
- enabled/disabled L2 port bridge

Format **`show port L2-port-bridge`** *{<slot/port> | all}*

Mode Priviledged Exec

6/ Data Center Commands

The data center commands allow network operators to deploy lossless Ethernet capabilities in support of a converged network with Fiber Channel and Ethernet data, as specified by the FC-BB-5 working group of ANSI T11. This capability allows operators to deploy networks at a lower cost while still maintaining the same network management operations that exist today.

The Data Center Commands chapter includes the following sections:

- "Data Center Bridging Exchange Protocol Commands" on page 503
- "Enhanced Transmission Selection and Traffic Class Group" on page 508
- "FIP Snooping Commands" on page 512
- "Priority-Based Flow Control Commands" on page 526
- "Quantized Congestion Notification Commands" on page 529

6.1 Data Center Bridging Exchange Protocol Commands

The Data Center Bridging Exchange Protocol (DCBX) is used by DCB devices to exchange configuration information with directly-connected peers. The protocol is also used to detect misconfiguration of the peer DCB devices and, optionally, for configuration of peer DCB devices.

6.1.1 lldp dcbx version

Use the lldp dcbx version command in Global Configuration mode to configure the administrative version for the Data Center Bridging Capability Exchange (DCBX) protocol. This command enables the switch to support a specific version of the DCBX protocol or to detect the peer version and match it. DCBX can be configured to operate in IEEE mode or CEE mode or CIN. In auto mode, version detection is based on the peer device DCBX version. The switch operates in either IEEE or one of the legacy modes on each interface.

In auto mode, the switch will attempt to jump start the exchange by sending an IEEE frame, followed by a CEE frame followed by a CIN frame. The switch will parse the received response and immediately switch to the peer version.

NOTICE CIN is Cisco Intel Nuova DCBX (version 1.0). CEE is converged enhanced ethernet DCBX (version 1.06).

Default	auto
Format	`lldp dcbx version { auto	cin	cee	ieee }`
Mode	Global Config

Parameter	Description
auto	Automatically select the version based on the peer response.
cin	Force the mode to Cisco-Intel-Nuova. (DCBX 1.0)
cee	Force the mode to CEE (DCBX 1.06)
ieee	Force the mode to IEEE 802.1Qaz

Example: The following example configures the switch to use CEE DCBX.

```
s1(config)#lldp dcbx version cee
```

6.1.1.1 no lldp dcbx version

Use the no form of the command to reset the DCBX version to the default value of auto.

Format	`no lldp dcbx version`
Mode	Global Config

6.1.2 lldp tlv-select dcbxp

Use the lldp tlv-select dcbxp command in Interface Configuration or Global Configuration mode to send specific DCBX TLVs if LLDP is enabled to transmit on the given interface. If no parameter is given, all DCBX TLVs are enabled for transmission. The default is all DCBX TLVs are enabled for transmission. If executed in Interface mode, the interface configuration overrides the global configuration on the designated interface. Entering the command with no parameters enables transmission of all TLVs.

Default	Transmission of all TLVs is enabled by default.
Format	*lldp tlv-select dcbxp [ets-config | ets-recommend | pfc | application-priority]*
Mode	• Interface Config • Global Config

Parameter	Description
ets-config	Transmit the ETS configuration TLV.
ets-recommend	Transmit the ETS recommendation TLV.
pfc	Transmit the PFC configuration TLV.
application-priority	Transmit the application priority TLV.

6.1.2.1 no lldp tlv-select dcbxp

Use the no lldp tlv-select dcbxp command to disable LLDP from sending all or individual DCBX TLVs, even if LLDP is enabled for transmission on the given interface.

Format	*no lldp tlv-select dcbxp [ets-config | ets-recommend | pfc | application-priority]*
Mode	• Interface Config • Global Config

Example: The following example configures the port to transmit all TLVs.

```
console(interface-config)#no lldp tlv-select dcbxp
```

6.1.3 lldp dcbx port-role

Use the lldp dcbx port-role command in Interface Configuration mode to configure the port role to manual, auto-upstream, auto-downstream and configuration source. In order to reduce configuration flapping, ports that obtain configuration information from a configuration source port will maintain that configuration for 2x the LLDP timeout, even if the configuration source port becomes operationally disabled.

Default	The default port role is manual.
Format	*lldp dcbx port-role {auto-up |auto-down|manual |configuration-source}*
Mode	Interface Config

Parameter	Description
Manual	Ports operating in the Manual role do not have their configuration affected by peer devices or by internal propagation of configuration. These ports will advertise their configuration to their peer if DCBX is enabled on that port. The willing bit is set to disabled on manual role ports.
Auto-up	Advertises a configuration, but is also willing to accept a configuration from the link-partner and propagate it internally to the auto-downstream ports as well as receive configuration propagated internally by other auto-upstream ports. These ports have the willing bit enabled. These ports should be connected to FCFs.
Auto-down	Advertises a configuration but is not willing to accept one from the link partner. However, the port will accept a configuration propagated internally by the configuration source. These ports have the willing bit set to disabled. Selection of a port based upon compatibility of the received configuration is suppressed. These ports should be connected to a trusted FCF.
Configuration Source	In this role, the port has been manually selected to be the configuration source. Configuration received over this port is propagated to the other auto-configuration ports. Selection of a port based upon compatibility of the received configuration is suppressed. These ports should be connected to a trusted FCF. These ports have the willing bit enabled.

Example: The following example configures an FCF facing port.

```
console(config-if-Te1/1/1)#lldp dcbx port-role auto-up
```

Example: The following example configures an FCoE host facing port:

```
console(config-if-Te1/1/1)#lldp dcbx port-role auto-down
```

6.1.3.1 no lldp dcbx port-role

Use the no lldp dcbx port-role command in Interface Configuration mode to configure the port role to manual.

6.1.4 show lldp tlv-select

Use the show lldp tlv-select command in Privileged EXEC mode to display the per interface TLV configuration.

Format `show lldp tlv-select {interface all | slot/port }`

Mode Privileged EXEC

Parameter	Description
all	All interfaces.
slot/port	A valid physical interface specifier.

Example: The following command shows the TLVs selected for transmission on multiple interfaces.

```
switch(config)# show lldp tlv-select interface all
Interface    ETS Config  ETS Recommend   PFC  App Priority QCN
-------------- ----------  -------------  ---  ------------ ---
te1/0/1Yes         No          Yes  No           Yes
te1/0/2No          No          Yes  No           Yes          4.1.3.2
```

6.1.5 show lldp dcbx interface

Use the show lldp dcbx interface command in Privileged EXEC mode to display the local DCBX control status of an interface.

Format `show lldp dcbx interface all | slot/port <detail>`

Mode Privileged EXEC

Parameter	Description
slot/port	A valid physical interface specifier.
all	All interfaces.
Detail	Display detailed DCBX information.
Status	Displays a status summary.

Example: The following shows DCBX status.

```
(FASTPATH Routing) #show lldp dcbx interface all

Is configuration source selected............... False

                                                DCBX    DCBX  DCBX    unknown
Interface  Status     Role          Version    Tx      Rx     Errors  TLV
---------- ---------- ------------- --------- ------- ----- ------- -------
0/1        Disabled   Manual        Auto      0        0     0       0
0/2        Disabled   Manual        Auto      0        0     0       0
0/3        Disabled   Manual        Auto      0        0     0       0
0/4        Disabled   Manual        Auto      0        0     0       0
0/5        Disabled   Manual        Auto      0        0     0       0
0/6        Disabled   Manual        Auto      0        0     0       0
0/7        Disabled   Manual        Auto      0        0     0       0
0/8        Disabled   Manual        Auto      0        0     0       0
0/9        Disabled   Manual        Auto      0        0     0       0
0/10       Disabled   Manual        Auto      0        0     0       0
0/11       Disabled   Manual        Auto      0        0     0       0
0/12       Disabled   Manual        Auto      0        0     0       0
0/13       Disabled   Manual        Auto      0        0     0       0
0/14       Disabled   Manual        Auto      0        0     0       0
0/15       Disabled   Manual        Auto      0        0     0       0
0/16       Disabled   Manual        Auto      0        0     0       0
0/17       Disabled   Manual        Auto      0        0     0       0
```

Example: In the following example, DCBX is not enabled.

```
switch(config)# show lldp dcbx interface te1/0/1
Interface te1/0/1
 DCBX Admin Status:                     Disabled
 Configured DCBX Version:               Auto
 Peer DCBX Version:
 Peer MAC:
 Peer Description:
 Auto-configuration Port Role:          Manual
 Peer Is Configuration Source:          False

Error Counters:
 ETS Incompatible Configuration: 0
 PFC Incompatible Configuration: 0
 Disappearing Neighbor:          0
 Multiple Neighbors Detected:    0
```

Example: The following example displays DCBX enabled – legacy device (CIN/CEE).

```
switch(config)# show lldp dcbx interface te1/0/1
Interface te1/0/1
 DCBX Admin Status:                     Enabled
 Configured Version:                    Auto
 Peer DCBX Version:                  CIN Version 1.0
 Peer MAC:     00:23:24:A4:21:03
 Peer Description:                      Cisco Nexus 5020 IOS Version 5.00
 Auto-configuration Port Role:          Auto-down
 Peer Is Configuration Source:          False

Local Configuration:
```

```
               Max/Oper
Type  Subtype  Version   En/Will/Adv
PFC(3) 000     000       Y/Y/Y
PG(2)  000     000       Y/Y/Y
APP(4) 000     000       Y/Y/Y

Number of TCs Supported: 3
Priority Group Id:    0:00 1:01 2:02  3:03  4:04  5:05  6:06  7:07
PG Percentage (%):    0:12 1:10 2:12  3:00  4:00  5:66  6:00  7:00
Strict Priority:      0:0  1:2  2:0   3:0   4:0   5:0   6:0   7:0
PFC Enable Vector:    0:0  1:1  2:0   3:0   4:0   5:0   6:0   7:0

Peer Configuration:

Operation version: 00  Max version: 00  Seq no: 23  Ack no: 22

               Max/Oper
Type   Subtype Version   En/Will/Err
PFC(3) 000     000/000   Y/N/N
PG(2)  000     000/000   Y/N/N
APP(4) 000     000/000   Y/N/N

Number of TCs Supported: 3
Priority Group Id:    0:00 1:01 2:02  3:03  4:04  5:05  6:06  7:07
PG Percentage (%):    0:0  1:10 2:12  3:00  4:00  5:78  6:00  7:00
PFC Enable Vector:    0:0  1:1  2:0   3:0   4:0   5:1   6:0   7:0

Application Priority (TX Enabled)
 Type         Application    Priority    Status
 ---------------------------------------------------
 Ethernet     FC0E            3          Enabled
 TCP/SCTP     860             4          Disabled
 TCP/SCTP     3260            4          Disabled

Error Counters:
 ETS Incompatible Configuration: 0
 PFC Incompatible Configuration: 0
 Disappearing Neighbor:          0
 Multiple Neighbors Detected:    0
```

Example: The following example displays DCBX enabled – IEEE device (DCBX Version Forced).

```
switch(config)# show lldp dcbx interface te1/0/1
Interface te1/0/1
 DCBX Admin Status:                   Enabled
 Configured DCBX Version:             CIN 1.0
 Peer DCBX Version:                   CEE 1.6
 Peer MAC:     00:23:24:A4:21:03
 Peer Description:                    Cisco Nexus 5020 IOS Version 5.00
 Auto-configuration Port Role:        Auto-upstream
 Peer Is Configuration Source:        True

Error Counters:
 ETS Incompatible Configuration: 7
 PFC Incompatible Configuration: 0
 Disappearing Neighbor:          0
 Multiple Neighbors Detected:    0
```

Example: The following example displays DCBX enabled – detailed view. Displays the transmitted and received TLV information. The ETS information is documented in IEEE 802.1az D2.4, tables D-2, D-3, and D-4. The PFC Enable Vector information is documented in IEEE 802.1az D2.4, table D-5. The transmitted recommendation TLV is never displayed because it is always the same as the configured TLV. The peer description is obtained from the LLDP System Name.

```
switch(config)# show lldp dcbx interface te1/0/1 detail
Interface te1/0/1
 DCBX Admin Status:                  Enabled
 Configured Version:                 Auto
 Auto-configuration Port Role:       Configuration Source
 Peer Is Configuration Source:       True

PFC Capability (TX Enabled)
 Willing: True     MBC: False  Max PFC classes supported: 3
 PFC Enable Vector:       0:0 1:1 2:0 3:0 4:0 5:1 6:0 7:0
ETS Configuration (TX Enabled)
 Willing: True    Credit Shaper: False  Traffic Classes Supported: 3
 Priority Assignment:          0:0  1:1  2:2  3:3  4:4  5:5  6:6  7:7
 Traffic Class Bandwidth (%):  0:00 1:10 2:12 3:00 4:00 5:78 6:00 7:00
 Traffic Selection Algorithm:  0:0  1:1  2:3  3:0  4:0  5:3  6:0  7:0
ETS Recommendation (TX Enabled)


Peer DCBX Version:             CEE 1.6
Peer Description:              Cisco Nexus 5020 IOS Version 5.00
Peer MAC:                      00:23:24:A4:21:03
Peer PFC Capability:
 Willing: False   MBC: False   Max PFC classes supported: 3
 PFC Enable Vector       0:0 1:1 2:0 3:0 4:0 5:1 6:0 7:0
Peer ETS Configuration:
 Willing: False  Peer ETS Detected: True  Credit Shaper: False
 Traffic Classes Supported:    8
 Priority Assignment:          0:0  1:1  2:1  3:0  4:0  5:1  6:0  7:0
 Traffic Class Bandwidth:      0:00 1:10 2:12 3:00 4:00 5:78 6:00 7:00
 Traffic Selection Algorithm:  0:0  1:1  2:3  3:0  4:0  5:3  6:0  7:0
Peer ETS Recommendation:
 Traffic Class Bandwidth:      0:0  1:1  2:12 3:0  4:0  5:3  6:0  7:0
 Traffic Selection Algorithm:  0:0  1:1  2:3  3:0  4:0  5:3  6:0  7:0

Peer Application Priority
 Type         Application     Priority
 --------------------------------------
 Ethernet     0x8906          3
 TCP/SCTP     3260            4
```

6.2 Enhanced Transmission Selection and Traffic Class Group

6.2.1 classofservice traffic-class-group

Use the `classofservice traffic-class-group` command in Global Config or Interface Config mode to map the internal Traffic Class Group (TCG).

Default	All traffic classes are mapped to TCG 0.
Format	`classofservice traffic-class-group` ***trafficclass traffic class group***
Mode	• Global Config • Interface Config

Parameter	Description
trafficclass	The Traffic Class can range from 0–6, although the actual number of available traffic classes depends on the platform.
traffic class group	The Traffic Class Group can range from 0–6, although the actual number of available traffic classes depends on the platform.

6.2.1.1 no classofservice traffic-class-group

Use the `no classofservice traffic-class-group` command in Global Config or Interface Config mode to restore the default mapping for each of the Traffic Classes.

Format `no classofservice traffic-class-group`

Mode
- Global Config
- Interface Config

6.2.2 traffic-class-group max-bandwidth

Use the `traffic-class-group max-bandwidth` command in Global Config or Interface Config mode to specify the maximum transmission bandwidth limit for each Traffic Class Group (TCG). Also known as rate shaping, this has the effect of smoothing temporary traffic bursts over time so that the transmitted traffic rate is bounded. The total number of TCG supported per interface is platform specific.

Default Max-bandwidth is zero for all TCG.

Format `traffic-class-group max-bandwidth` *`bw-0 bw-1 … bw-n`*

Mode
- Global Config
- Interface Config

This command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The Interface Config mode command is only available on platforms that support independent per-port class of service queue configuration.

Each bw-x value is a percentage that ranges from 0 to 100 in increments of 1. All n bandwidth values must be specified with this command, and each is independent of the others. The number n is platform-dependent and corresponds to the number of supported traffic classes groups. The default maximum bandwidth value for each TCG is 0, meaning no upper limit is enforced, which allows the TCG queue to consume any available nonguaranteed bandwidth of the interface.

If a nonzero value is specified for any bw-x maximum bandwidth parameter, it must not be less than the current minimum bandwidth value for the corresponding queue. A bw-x maximum bandwidth parameter value of 0 may be specified at any time without restriction.

The maximum bandwidth limits may be used with either a weighted or strict priority scheduling scheme.

NOTICE A value of 0 (the default) implies an unrestricted upper transmission limit, which is similar to 100%, although there may be subtle operational differences depending on how the device handles a *no limit* case versus *limit to 100%*.

6.2.2.1 no traffic-class-group max-bandwidth

Use the `no traffic-class-group max-bandwidth` command in Global Config or Interface Config mode to restore the default for each queue's maximum bandwidth value.

Format `no traffic-class-group max-bandwidth`

Mode

- Global Config
- Interface Config

6.2.3 traffic-class-group min-bandwidth

Use the `traffic-class-group min-bandwidth` command in Global Config or Interface Config mode to specify the minimum transmission bandwidth guarantee for each interface TCG. The total number of TCG supported per interface is platform specific.

Default Min-bandwidth is zero for all TCG.

Format `traffic-class-group min-bandwidth` ***bw-0 bw-1 … bw-n***

Mode

- Global Config
- Interface Config

The command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The Interface Config mode command is only available on platforms that support independent per-port class-of-service queue configuration.

Each bw-x value is a percentage that ranges from 0 to 100 in increments of 1. All n bandwidth values must be specified with this command, and their combined sum must not exceed 100%. The number n is platform dependent and corresponds to the number of supported Traffic Class Groups. The default minimum bandwidth value for each TCG is 0, meaning no bandwidth is guaranteed (best effort).

If the value of any bw-x minimum bandwidth parameter is specified as greater than the current maximum bandwidth value for the corresponding TCG, then its corresponding maximum bandwidth automatically increases the maximum to the same value.

6.2.3.1 no traffic-class-group min-bandwidth

Use the `no traffic-class-group min-bandwidth` command in Global Config or Interface Config mode to restore the default for each queue's minimum bandwidth value.

Format `no traffic-class-group min-bandwidth`

Mode

- Global Config
- Interface Config

6.2.4 traffic-class-group strict

Use the `traffic-class-group strict` command in Global Config or Interface Config mode to activate the strict priority scheduler mode for each specified TCG.

Default Weighted scheduler mode is used for all TCG

Format `traffic-class-group strict` ***tcg-id-0*** [***tcg-id-1 … tcg-id-n***]

Mode

- Global Config
- Interface Config

The command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The Interface Config mode command is only available on platforms that support independent per-port class-of-service queue configuration.

At least one, but no more than *n*, tcg-id values are specified with this command. Duplicate tcg-id values are ignored. Each tcg-id value ranges from 0 to (n-1), where n is the total number of TCG supported per interface. The number n is platform dependent and corresponds to the number of supported Traffic Class Groups.

When strict priority scheduling is used for a TCG, the minimum bandwidth setting for the TCG is ignored and packets are scheduled for transmission as soon as they arrive. A maximum bandwidth setting for the queue, if configured, serves to limit the outbound transmission rate of a strict priority TCG queue so that it does not consume the entire capacity of the interface. If multiple TCG on the same interface are configured for strict priority mode, the method of handling their packet transmission is platform specific. One typical scheme is to schedule all strict priority TCG ahead of the weighted queues, giving preference among the strict priority TCG to the one with the highest tcg-id.

6.2.4.1 no traffic-class-group strict

Use the `no traffic-class-group strict` command in Global Config or Interface Config mode to restore the default weighted scheduler mode for each specified TCG.

Format	`no traffic-class-group strict` ***tcg-id-0*** `[`***tcg-id-1 … tcg-id-n***`]`
Mode	• Global Config • Interface Config

6.2.5 traffic-class-group weight

Use the `traffic-class-group weight` command in Global Config or Interface Config mode to specify the weight for each interface TCG. The total number of TCGs supported per interface is platform specific.

Default	For TCG0:TCG1:TCG2, weights are in the ratio 100%:0%:0%
Format	`traffic-class-group weight` ***wp-0 wp-1 … wp-n***
Mode	• Global Config • Interface Config

The command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The Interface Config mode command is only available on platforms that support independent per-port class-of-service queue configuration.

Each wp-x (weight percentage) value is a percentage that ranges from 0 to 100 in increments of 1. All *n* bandwidth values must be specified with this command, and their combined sum must not exceed 100%. The number *n* is platform dependent and corresponds to the number of supported Traffic Class Groups. The default weight percentage value is in the ratio of 1:2:3 for TCG0:TCG1:TCG2, which is calculated as 100%:0%:0%.

The weight percentage is not considered for TCG that are configured for strict scheduling.

6.2.5.1 no traffic-class-group weight

Use the `no traffic-class-group weight` command in Global Config or Interface Config mode to restore the default for each queue's weight percentage value.

Format	`no traffic-class-group weight` ***wp-0 wp-1 … wp-n***
Mode	• Global Config • Interface Config

6.2.6 show classofservice traffic-class-group

Use the `show classofservice traffic-class-group` command in Privileged EXEC mode to display the Traffic Class to Traffic Class Group mapping.

Format	`show classofservice traffic-class-group [`*`slot/port`*`]`
Mode	Privileged EXEC

Parameter	Description
slot/port	Optional and is only valid on platforms that support independent per-port class of service mappings. • If *slot/port* is specified, the TCG mapping table of the interface is displayed. • If *slot/port* is omitted, the global configuration settings are displayed (these may have been subsequently overridden by per-port configuration).
Traffic Class	The traffic class queue identifier.
Traffic Class Group	The traffic class Group identifier.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show classofservice traffic-class-group

 Traffic Class    Traffic Class Group
 -------------    ---------------------
   0                      0
   1                      1
   2                      1
   3                      1
   4                      2
   5                      1
   6                      1
   7                      1
```

6.3 FIP Snooping Commands

The Fibre Channel over Ethernet (FCoE) Initialization Protocol (FIP) is used to perform the functions of FC_BB_E device discovery, initialization and maintenance. FIP uses a separate EtherType from FCoE to enable the distinction of discovery, initialization, and maintenance traffic from other FCoE traffic. FIP frames (with one exception) are the standard Ethernet size (1518 Byte 802.1q frame) whereas FCoE frames are a maximum of 2240 bytes.

This document describes FIP snooping, which is a frame inspection method used by FIP Snooping Bridges to monitor FIP frames and apply policies based upon the L2 header information in those frames, following recommendations in Annex C of FC_BB_5 Rev 2.00. This allows for:

1. Auto-configuration of Ethernet ACLs based on information in the Ethernet headers of FIP frames.
2. Emulation of FC point-to-point links within the DCB Ethernet network.
3. Enhanced FCoE security/robustness by preventing FCoE MAC spoofing.

The FIP Snooping Bridge solution in FASTPATH supports configuration-only of perimeter port role and FCF-facing port roles and is only intended for use at the edge of the switched network.

The role of FIP Snooping-enabled ports on the switch falls under one of the following types:

1. Perimeter or Edge port (connected directly to ENode).
2. FCF facing port (that receives traffic from FCFs targeted to the ENodes).

The default port role in an FCoE enabled VLAN is as a perimeter port. FCF facing ports must be configured by the user.

6.3.1 feature fip-snooping

Use the feature fip-snooping command in Global Configuration mode to globally enable Fibre Channel over Ethernet Initialization Protocol (FIP) snooping on the switch. When FIP snooping is disabled, received FIP frames are forwarded or flooded using the normal multicast rules.

When FIP snooping is enabled, FC-BB-5 Annex D ACLs are installed on the switch and FIP frames are snooped. FIP snooping will not allow FIP or Fiber Channel over Ethernet (FCoE) frames to be forwarded over a port until the port is operationally enabled for PFC. VLAN tagging must be enabled on the interface in order to carry the dot1p values through the network.

Default	disabled
Format	`feature fip-snooping`
Mode	Global Config

Example: The following example enables the FIP snooping feature.

```
s1(config)#feature fip-snooping
```

6.3.1.1 no feature fip-snooping

Use the no form of the command to return the settings to the default values and globally disable FIP snooping. When FIP snooping is globally disabled, received FIP frames are forwarded or flooded using the normal multicast rules. In addition, other FIP snooping commands are not available until the FIP snooping feature is enabled.

Format	`no feature fip-snooping`
Mode	Global Config

Example: The following example disables the FIP snooping feature.

```
s1(config)#no feature fip-snooping
```

6.3.2 fip-snooping enable

Use the fip-snooping command in VLAN Configuration mode to enable snooping of FIP packets on the configured VLANs. FIP snooping is disabled on VLANs by default.

Priority Flow Control (PFC) must be operationally enabled before FIP snooping can operate on an interface. VLAN tagging must be enabled on the interface in order to carry the dot1p value through the network.

This command can only be entered after FIP snooping is enabled using the `priority-flow-control mode` command. Otherwise, it does not appear in the CLI syntax tree.

Default	disabled
Format	`feature fip-snooping`
Mode	VLAN Config

Example: The following example enables FIP snooping on VLANs 2, 3,...8.

```
s1(config)#vlan 2-8
s1(config-vlan)#fip-snooping enable
```

6.3.2.1 no fip-snooping enable

Use the no form of the command to return the mode to the default (off).

Format	`no feature fip-snooping`
Mode	VLAN Config

Example: The following example disables FIP snooping on VLANs range 2 to 8.

```
s1(config)#vlan 2-8
s1(config)(vlan 2-8)#no fip-snooping enable
s1(config)(vlan 2-8)# exit
```

6.3.3 fip-snooping fc-map

Use the fip-snooping fc-map command in VLAN Configuration mode to configure the FP-MAP value on a VLAN. The FC map value is used to help in securing the switch against misconfiguration.

When configured using fabric-provided MAC addresses, FCoE devices transmit frames containing the FC map value in the upper 24 bits. Only frames that match the configured FC map value are passed across the VLAN. Frames with MAC addresses that do not match the FC map value are discarded.

This command can only be entered after FIP snooping is enabled using the `priority-flow-control mode` command. Otherwise, it does not appear in the CLI syntax tree.

Default	The default FC map value is 0x0efc00.
Format	`fip-snooping fc-map` *`0x0 – 0xffffff`*
Mode	VLAN Config

Parameter	Description
map value	Valid FC map values are in the range of 0x0 to 0xffffff.

Example: The following example configures an FC map value of 0x100 on VLAN 208.

```
(config)# vlan 208
(config-vlan)# fip-snooping enable
(config-vlan)# fip-snooping fc-map 0x100
```

Example: The following example configures an FC value of 0xFFCB for VLAN range 2 to 8.

```
(config)# vlan 2-8
(config)(vlan 2-8)# fip-snooping fc-map 0xecffcb
(config)(vlan 2-8)# exit
```

6.3.3.1 no fip-snooping fc-map

The no version of the command sets the FC-MAP value for the VLAN to the default value.

Format	`no fip-snooping fc-map`
Mode	VLAN Config

6.3.4 fip-snooping port-mode

To relay the FIP packets received from the hosts toward the Fibre Channel Fabric (FCF), the switch needs to know the interfaces to which the FCFs are connected. Use the fip-snooping port-mode command in Interface Configuration mode to configure the interface that is connected towards FCF. By default, an interface is configured to be a host-facing interface if it is not configured to be an FCF-facing interface.

It is recommended that FCF-facing ports be placed into auto-upstream mode in order to receive DCBX information and propagate it to the CNAs on the downstream (host-facing) ports.

Interfaces enabled for PFC should be configured in trunk or general mode and must be PFC-operationally enabled before FCoE traffic can pass over the port.

This command can only be entered after FIP snooping is enabled using the `priority-flow-control mode` command. Otherwise, it does not appear in the CLI syntax tree.

Default	Configuration as a host-facing interface.
Format	`fip-snooping port-mode fcf`
Mode	Interface Config

Parameter	Description
fcf	Fibre Channel Fabric

Example: The following example configures an interface to be connected to an FCF switch.

```
(Config)# interface 1/0/1
(Interface 1/0/1)# fip-snooping port-mode fcf
(Interface 1/0/1)# exit
```

6.3.4.1 no fip-snooping port-mode

Use the no form of the command to set the interface to be connected towards the host.

Format	`no fip-snooping port-mode`
Mode	Interface Config

Example: The following example sets the interface to be connected towards the host.

```
(Config)# interface 1/0/1
(Interface 1/0/1)# no fip-snooping port-mode fcf
(Interface 1/0/1)# exit
```

6.3.5 show fip-snooping

Use the show fip-snooping sessions command in User EXEC or Privileged EXEC mode to display information about the global FIP snooping configuration and status.

Format	`show fip-snooping`
Mode	- User EXEC - Privileged EXEC

The following information is displayed.

Parameter	Description
Global Mode	FIP snooping configuration status on the switch. It displays Enable when FIP snooping is enabled on the switch and Disable when FIP snooping is disabled on the switch.
FCoE VLAN List	List of VLAN IDs on which FIP snooping is enabled.
FCFs	Number of FCFs discovered on the switch.

Parameter	Description
ENodes	Number of Enodes discovered on the switch.
Sessions	Total virtual sessions on the switch.
Max VLANs	Maximum number of VLANs that can be enabled for FIP snooping on the switch.
Max FCFs in VLAN	Maximum number of FCFs supported in a VLAN.
Max ENodes	Maximum number of ENodes supported in the switch.
Max Sessions	Maximum number of Sessions supported in the switch.

Example: The following shows example CLI display output for the command.

```
(switch)# show fip-snooping

Global Mode:   Enable
FCoE VLAN List :   2,4,5-8
FCFs    :   2
ENodes  :   2
Sessions:   10
Max VLANs:   8
Max FCFs in VLAN:   4
Max ENodes:   312
Max Sessions:   1024
```

6.3.6 show fip-snooping enode

Use the show fip-snooping enode command in User EXEC or Privileged EXEC mode to display information about the interfaces connected to ENodes.

NOTICE This command can only be entered after FIP snooping is enabled using the feature fip-snooping command. Otherwise, it does not appear in the CLI syntax tree.

Format	`show fip-snooping enode [enode-mac]`
Mode	User EXEC Privileged EXEC

Parameter	Description
enode-mac	MAC address of the enode to display.

The command displays the following information.

Parameter	Description
Interface	Interface to which the ENode is connected.
VLAN	ID number of the VLAN to which the ENode belongs.
NameID	Name of the ENode.
FIP-MAC	MAC address of the ENode.
FCID	Fiber channel ID number of the virtual port that was created by FCF when the ENode logged into the network.
Sessions Established	Number of successful virtual connections established.

The command displays the following additional information when the optional argument is supplied.

Parameter	Description
Sessions Waiting	Number of virtual connections waiting for FCF acceptance.
Sessions Failed	Number of virtual sessions failed.
Max-FCoE-PDU	Maximum FCoE PDU size the ENode MAC intends to use for FCoE traffic. This is equivalent to the maximum Ethernet frame payload the ENode intends to send.
Time elapsed	Time elapsed since first successful login session snooped from the ENode.

Example: The following example displays sample output of the command with no optional argument supplied.

```
(switch)# show fip-snooping enode
Interface  VLAN  Name-ID          ENode-MAC      FCFs   Sessions
-----------------------------------------------------1/0/2     1    00000000    00:0c:29:65:82:bc
1     3
1/0/5      100   00000000     00:0d:31:23:53:11   2     5
```

Example: The sample output of the command below displays with the optional argument supplied.

```
(switch)# show fip-snooping enode 00:0c:29:65:82:bc

Interface      1/0/2
VLAN           1
Name-ID        000000
ENode-MAC      00:0c:29:65:82:bc
FCFs Connected1
Sessions Established3
Sessions Waiting 1
Session Failed 0
Max-FCoE-PDU  2158
Time elapsed   0 days, 1 hours, 20 minutes
```

6.3.7 show fip-snooping fcf

Use the show fip-snooping fcf command in User EXEC or Privileged EXEC mode to display information about the interfaces connected to FCFs.

NOTICE This command can only be entered after FIP snooping is enabled using the feature fip-snooping command. Otherwise, it does not appear in the CLI syntax tree.

Format `show fip-snooping fcf [fcf-mac]`

Mode
- User EXEC
- Privileged EXEC

The following information is displayed when no FCF mac argument is supplied.

Parameter	Description
Interface	Interface to which the FCF is connected.
VLAN	ID number of the VLAN to which the FCF belongs.
No. of ENodes	Total number of ENodes that are connected to the FCF.
FPMA/SPMA	Type of the MAC address for ENode as negotiated by the FCF.
FCMAP	FCMAP value used by the FCF.
FCF-MAC	MAC address of the FCF.
Fabric Name	Name of the FCF.

Below is additional information regarding the FCF that is displayed when the optional FCF MAC address argument is provided.

Parameter	Description
Sessions	Total number of virtual sessions accepted by FCF in the associated VLAN.
D-bit	This reflects the value of the D-bit provided by the most recently received Discovery Advertisement from the FCF. When D-bit value is zero then FIP snooping bridge verifies the periodic VN_Port FIP Keep Alive frames associated with FCF and Discovery Advertisements sent by FCF. When D-bit is set to 1, switch discards snooped VN_Port FIP Keep Alive frames associated with FCF and does not timeout the FCoE sessions established with the FCF based on FKA_VN_PERIOD*5 interval.
Available for Login	This reflects the value of the A bit provided by the most recently received Discovery Advertisement from the FCF. This provides the information that the transmitting FCF is available for FIP FLOGI/FDISC from ENodes. This is informational and shall have no effect on existing logins.
Priority	The Priority returned from the FCF in the Solicited Discovery Advertisement. This indicates the Priority that has been manually assigned to the FCF.
FKA-ADV	FIP keepalive interval (FKA_ADV_PERIOD) in seconds configured on the FCF multiplied by five. For example, if the FKA_ADV period configured on the FCF is 80 seconds, the value of this field is 400.
FCF Expiry Time	This is timer value to monitor the status of the FCF. FCF entry and all its associated virtual sessions will be removed when the value reaches 0. This value is reset to Configured FKA-ADV every time a Discovery Advertisement is received from the FCF-MAC.
Time Elapsed	Time since FCF is Discovered.

Example: The following displays sample output of the command when no optional argument is provided.

```
(config)# show fip-snooping fcf
-------------------------------------------------------------------------------
Interface VLAN ENodes FPMA/ FC-MAP       FCF-MAC       Name-ID     Fabric-Name
                      SPMA
-------------------------------------------------------------------------------1/0/11    1   2
FPMA 0e:fc:00 00:0d:ec:b2:2c:80 20:65:00:0d: 20:65:00:0d:
                                                      ec:b1:9e:81  ec:97:52:c1
3/0/10     1   1      FPMA 0e:fc:00 00:0d:ec:b2:2c:81 00000000     00000000
3/0/15    100  1      FPMA 0e:fc:10 00:0c:ab:2c:eb:12 00000000     00000000
```

Example: The following displays sample output of the command when the optional argument is provided.

```
(switch)# show  fip-snooping   fcf   00:0d:ec:b2:2c:81
Interface      3/0/10
VLAN              1
ENodes         1
FPMA/SPMA      FPMA
FCF-MAC        00:0d:ec:b2:2c:81
FC-MAP            0e:fc:00
Name-ID        20:65:00:0d:ec:b1:9e:81
Fabric-Name    20:65:00:0d:ec:97:52:c1
Sessions       3
D-bit             0
Available for Login1
Priority       2
FKA-ADV(FKA_ADV_PERIOD*5)       250
FCF Expiry Time219
Time Elapsed   0 days, 2 hours, 8 minutes
```

6.3.8 show fip-snooping sessions

Use the `show fip-snooping sessions` command in User EXEC or Privileged EXEC mode to display information about the active FIP snooping sessions.

NOTICE This command can only be entered after FIP snooping is enabled using the `feature fip-snooping` command. Otherwise, it does not appear in the CLI syntax tree.

Format `show fip-snooping sessions [[[vlan vlan-id] | [interface interface-id] | [fcf fcf-mac [enode enode-mac]]]  [detail]]`

Mode

- User EXEC
- Privileged EXEC

Parameter	Description
Interface-id	ID of an interface on which FIP snooping has been enabled.
FCF-MAC	MAC address of the FCF that is part of the session.
ENode-MAC	MAC address of the ENode that is part of the session.
VLAN	ID number of the VLAN that contains the session.
FCoE MAC	Source MAC address of the FCoE packets that are originated by the ENode as part of the session.
FC-ID	Fiber Channel ID of the virtual port that was created by the FCF when the ENode VN_Port did a FLOGI/NPIV/FDISC request.

The command output format is different when the detail option is used. The information below is displayed.

Parameter	Description
VLAN	VLAN to which the session belongs.
FC-MAP	FCMAP value used by the FCF.
FCFs	Number of FCFs discovered.
ENodes	Number of ENodes discovered.
Sessions	Total virtual sessions in FCoE VLAN.
FCF Information	
Interface	Interface on which the FCF is discovered.
MAC	MAC address of the FCF.
ENodes	Total number of ENodes that are connected to the FCF.
Sessions	Total number of virtual sessions accepted by FCF in the associated VLAN.
ENode Information	
Interface	Interface to which the ENode is connected.
MAC	MAC address of the ENode.
Sessions	Total number of virtual sessions originated from ENodes to FCF in the VLAN.
Waiting	Total number of virtual connections waiting for FCF acceptance in the VLAN.
Session Information	
FCoE-MAC	Source MAC address of the FCoE packets that are originated by the ENode as part of the session.
Request (FP, SP)	FIP session request type sent by ENode. This can be FLOGI or FDESC (NPIV FDISC). Whereas FP and SP values are the FP bit and the SP bit values in the FLOGI or NPIV FDISC request respectively.

Parameter	Description
Expiry Time	This is virtual connection/session expiry interval. This is used to monitor the status of the session. Session entry is removed when the value reaches 0. This value is reset to 450 secs (5*90 secs) every time an associated VN_Port FKA is received from the ENode. This is ignored (marked as NA) if the D-bit is set to one in the FCF Discovery Advertisements.
Mode	This is the addressing mode in use by the VN_Port at ENode. In other words, this is the type of MAC address granted (selected and returned) by FCF. This can be one of the addressing modes, i.e. FPMA or SPMA.
State	This is the state of the virtual session. The state is displayed as Tentative during the process of ENode login to FCF (using FLOGI or FDESC). It displays Active after ENode and FCF establish a successful virtual connection.
Session-Time	Time elapsed after this successful virtual session is established by ENode with FCF. The value is displayed in xd, yh, zm format where x represents number of days, y represents hours and z represents minutes elapsed following this successful virtual session. This field has no useful information for waiting sessions.

Example: The following sample command output displays when no arguments are provided.

```
(switch)# show fip-snooping sessions
-----------------------------------------------------------------------------
     FCF-MAC              ENode-MAC      VLAN      FCoE-MAC         FC-ID
-----------------------------------------------------------------------------
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:00  38:0f:db
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:01  38:0f:dc
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:02  38:0f:dd
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:05  38:0f:e1
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:07  38:0f:e3
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:10  38:0f:e6
00:0d:ec:b2:2c:80  00:0c:29:65:82:bc  100   0e:fc:00:ad:00:19  38:0f:ee
00:0e:ad:12:23:53  00:0d:29:12:22:a6  200   0e:fc:11:aa:bb:00  44:23:a4
00:0e:ad:12:23:53  00:0d:29:12:22:a6  200   0e:fc:11:aa:bb:01  44:02:ab
00:0e:ad:12:23:53  00:0d:29:23:14:22  200   0e:fc:11:aa:bb:02  44:35:1b
00:0e:ad:12:23:53  00:0d:29:23:14:22  200   0e:fc:11:aa:bb:03  44:35:2a
00:0e:ad:12:23:53  00:0d:29:23:14:22  200   0e:fc:11:aa:bb:04  44:36:3b
```

Example: The sample command output below displays when the detail option is specified.

```
(switch)# show fip-snooping sessions detail

VLAN: 100   FC-MAP: 0e:fc:00       FCFs:  1   ENodes: 1   Sessions: 7
   <FCF Information>
   Interface: 3/0/15   MAC: 00:0d:ec:b2:2c:80 ENodes: 1   Sessions: 7
      <ENode Information>
      Interface: 2/0/1   MAC: 00:0c:29:65:82:bc Sessions:  7   Waiting: 0
         <Session Information>
         FCoE-MAC           Request    Expiry  Mode State      Session-Time
                            (FP,SP)    Time
         0e:fc:00:ad:00:00  FLOGI(1,1) 200     FPMA ACTIVE     0d, 04h, 20m
         0e:fc:00:ad:00:01  FDESC(1,1) 259     FPMA ACTIVE     0d, 04h, 19m
         0e:fc:00:ad:00:02  FDESC(1,1) 215     FPMA ACTIVE     0d, 04h, 18m
         0e:fc:00:ad:00:05  FDESC(1,1) 231     FPMA ACTIVE     0d, 04h, 10m
         0e:fc:00:ad:00:07  FDESC(1,1) 189     FPMA ACTIVE     0d, 04h, 01m
         0e:fc:00:ad:00:10  FDESC(1,1) 210     FPMA ACTIVE     0d, 02h, 07m
         0e:fc:00:ad:00:19  FDESC(1,1) 222     FPMA ACTIVE     0d, 01h, 20m
------------------------------------------------------------------------------
VLAN: 200   FC-MAP: 0e:fc:11       FCFs:  1   ENodes: 2   Sessions: 5

   <FCF Information>
   Interface: 3/0/11   MAC: 00:0e:ad:12:23:53 ENodes: 2   Sessions: 5
```

```
      <ENode Information>
      Interface: 1/0/10   MAC: 00:0d:29:12:22:a6 Sessions: 2    Waiting: 0
         <Session Information>
         FCoE-MAC          Request    Expiry  Mode State      Session-Time
                           (FP,SP)    Time
         0e:fc:11:ad:00:00 FLOGI(1,1) 242     FPMA ACTIVE     0d, 02h, 30m
         0e:fc:11:ad:00:01 FDESC(1,1) 245     FPMA ACTIVE     0d, 02h, 28m
      <ENode Information>
      Interface: 1/0/11   MAC: 00:0d:29:23:14:22 Sessions: 3    Waiting: 1
         <Session Information>
         FCoE-MAC          Request    Expiry  Mode State      Session-Time
                           (FP,SP)    Time
         0e:fc:11:ad:00:02 FLOGI(1,1) 202     FPMA ACTIVE     0d, 02h, 20m
         0e:fc:11:ad:00:03 FDESC(1,1) 228     FPMA ACTIVE     0d, 01h, 18m
         0e:fc:11:ad:00:03 FDESC(1,1) 232     FPMA ACTIVE     0d, 01h, 02m
         ----------------- FDESC(1,1) ---     FPMA TENTATIVE  ------------
```

Example: The sample command output below displays sessions between specified FCF and ENode.

```
(switch)# show fip-snooping sessions fcf 00:0e:ad:12:23:53 enode 00:0d:29:12:22:a6

------------------------------------------------------------------------------
     FCF-MAC            ENode-MAC     VLAN      FCoE-MAC       FC-ID
------------------------------------------------------------------------------
00:0e:ad:12:23:53  00:0d:29:12:22:a6  200   0e:fc:11:aa:bb:00  44:23:a4
00:0e:ad:12:23:53  00:0d:29:12:22:a6  200   0e:fc:11:aa:bb:01  44:02:ab
```

Example: The sample command output below displays sessions between specified FCF and ENode with the detail option.

```
(switch)# show fip-snooping sessions fcf 00:0e:ad:12:23:53 enode 00:0d:29:12:22:a6 detail

VLAN: 200   FC-MAP: 0e:fc:11        FCFs:  1   ENodes: 2   Sessions: 5

   <FCF Information>
   Interface: 3/0/11   MAC: 00:0e:ad:12:23:53 ENodes: 2   Sessions: 5

      <ENode Information>
      Interface: 1/0/10   MAC: 00:0d:29:12:22:a6 Sessions: 2    Waiting: 0
         <Session Information>
         FCoE-MAC          Request    Expiry  Mode State      Session-Time
                           (FP,SP)    Time
         0e:fc:11:ad:00:00 FLOGI(1,1) 242     FPMA ACTIVE     0d, 02h, 30m
         0e:fc:11:ad:00:01 FDESC(1,1) 245     FPMA ACTIVE     0d, 02h, 28m
```

6.3.9 show fip-snooping statistics

Use the show fip-snooping statistics command in User EXEC or Privileged EXEC mode to display the statistics of the FIP packets snooped in the VLAN or on an interface. If the optional (VLAN or interface) argument is not given, this command displays the statistics for all of the FIP snooping enabled VLANs.

NOTICE This command can only be entered after FIP snooping is enabled using the feature fip-snooping command. Otherwise, it does not appear in the CLI syntax tree.

Format **show fip-snooping statistics [vlan *vlan-id*] | [interface *interface-id*]**

Mode
- User EXEC
- Privileged EXEC

Parameter	Description
vlan-id	A VLAN on which FIP snooping is enabled.
interface-id	An interface belonging to a VLAN on which FIP snooping is enabled.

The following table describes the packet counters per FIP Operation.

Packet Counter	Description
VR	Number of VLAN Request messages received on the VLAN.
VN	Number of VLAN Notification messages received on the VLAN.
MDS	Number of Multicast Discovery Solicitation messages snooped on the VLAN.
UDS	Number of Unicast Discovery Solicitation messages snooped on the VLAN.
FLOGI	Number of Fabric Logins snooped on the VLAN.
FDISC	Number of fabric discovery logins snooped on the VLAN.
LOGO	Number of Fabric Logouts on the VLAN.
VNPort-keep-alive	Number of VN_Port keepalive messages snooped on the VLAN.
MDA	Number of Multicast Discovery Advertisement messages snooped on the VLAN.
UDA	Number of Unicast Discovery Advertisement messages snooped on the VLAN.
FLOGI_ACC	Number of Fabric Logins accepted on the VLAN.
FLOGI_RJT	Number of Fabric Logins rejected on the VLAN.
FDISC_ACC	Number of Fabric Discoveries accepted on the VLAN.
FDISC_RJT	Number of Fabric Discoveries rejected on the VLAN.
LOGO_ACC	Number of Fabric Logouts accepted on the VLAN.
LOGO_RJT	Number of Fabric Logouts rejected on the VLAN.
CVL	Number of Clear Virtual Links actions on the VLAN.

The following table describes the other interface or session-related counters.

Other Counters	Description
Number of Virtual Session Timeouts	Number of Virtual sessions removed due to session timer expiry.
Number of FCF Session Timeouts	Number of ACTIVE sessions timed out due to Discovery Advertisements expiry from FCFs in the VLAN.
Number of Session configuration failures	Number of sessions in the VLAN that failed to be configured in the hardware.
Number of Sessions denied with FCF limit	Number of sessions that are denied to be created for the new FCF as the number of FCFs reached the maximum allowed in the VLAN.
Number of Sessions denied with ENode limit	Number of session create requests that are denied for the new ENode as the number of ENodes reached the maximum allowed in the system.
Number of Sessions denied with System limit	Number of sessions that are denied to be created as the number of sessions reached the maximum allowed in the system.

When an interface is provided as an argument, interface applicable statistics are only displayed. See Example #3 below for applicable statistics on interface.

Example #1

Example: Below is the sample command usage with no optional arguments supplied.

```
(switch)# show fip-snooping statistics
VLAN: 4
---------------------------------
FIP-Operation    Number of Pkts
VR              2
VN              2
MDS              2
UDS              2
FLOGI            2
FDISC            2
LOGO             0
VNPort-keep-alive 200
MDA              25
UDA              2
FLOGI_ACC        2
FLOGI_RJT        0
FDISC_ACC        2
FDISC_RJT        0
LOGO_ACC         0
LOGO_RJT         0
CVL              0
----------------------------------
Number of Virtual Session Timeouts:23
Number of FCF Session Timeouts:    6
Number of Session configuration failures: 10
Number of Sessions denied with FCF limit:  10
Number of Sessions denied with ENode limit:  10
Number of Sessions denied with System limit:   12

VLAN: 200
-------------------------------
FIP-Operation    Number of Pkts
VR              2
VN              2
MDS              5
UDS              4
FLOGI            5
FDISC            5
LOGO             1
VNPort-keep-alive 310
MDA              35
UDA              3
FLOGI_ACC        4
FLOGI_RJT        0
FDISC_ACC        15
FDISC_RJT        0
LOGO_ACC         1
LOGO_RJT         0
CVL              0
--------------------------------

Number of Virtual Session Timeouts:2
Number of FCF Session Timeouts:    0
Number of Session configuration failures: 10
Number of Sessions denied with FCF limit:  0
Number of Sessions denied with ENode limit:  0
Number of Sessions denied with System limit:   21
```

Example #2

Example: Below is the sample command output with optional VLAN argument supplied.

```
(switch)# show fip-snooping statistics vlan 200

VLAN: 200

-------------------------------
FIP-Operation    Number of Pkts
-------------------------------
VR               2
VN               2
MDS               5
UDS               4
FLOGI             5
FDISC             5
LOGO              1
VNPort-keep-alive 310
MDA               35
UDA               3
FLOGI_ACC         4
FLOGI_RJT         0
FDISC_ACC         15
FDISC_RJT         0
LOGO_ACC          1
LOGO_RJT          0
CVL               0
--------------------------------

Number of Virtual Session Timeouts:2
Number of FCF Session Timeouts:    0
Number of Session configuration failures: 10
Number of Sessions denied with FCF limit:  0
Number of Sessions denied with ENode limit:  0
Number of Sessions denied with System limit:   21
```

Example #3

Example: Below is the sample command output with optional interface argument supplied.

```
(switch)# show fip-snooping statistics interface 1/0/5

-------------------------------
FIP-Operation    Number of Pkts
-------------------------------
VR               2
VN               2
MDS               5
UDS               1
FLOGI             2
FDISC             5
LOGO              1
VNPort-keep-alive 310
MDA               35
UDA               3
FLOGI_ACC         4
FLOGI_RJT         0
FDISC_ACC         15
FDISC_RJT         0
LOGO_ACC          1
LOGO_RJT          0
CVL               0
--------------------------------

Number of Virtual Session Timeouts:2
Number of FCF Session Timeouts:    0
Number of Session configuration failures: 10
Number of Sessions denied with FCF limit:  0
Number of Sessions denied with ENode limit:  0
Number of Sessions denied with System limit:   21
```

6.3.10 show fip-snooping vlan

Use the show fip-snooping vlan command in User EXEC or Privileged EXEC mode to display the FCoE VLANs information and, additionally, the FIP snooping port status when optional argument is specified.

NOTICE This command can only be entered after FIP snooping is enabled using the feature fip-snooping command. Otherwise, it does not appear in the CLI syntax tree.

Format `show fip-snooping vlan [`*`vlan-id`*`]`

Mode
- User EXEC
- Privileged EXEC

Parameter	Description
vlan-id	A VLAN enabled for FIP snooping.
VLAN	VLAN in which FIP snooping is enabled/operational.
FC-MAP	FCoE mapped address prefix of the FCoE forwarder for the FCoE VLAN.
FCFs	Number of FCFs discovered.
ENodes	Number of ENodes discovered.
Sessions	Total virtual sessions in FCoE VLAN.

Example: The following shows example CLI display output for the command.

```
(switch)# show fip-snooping

Global Mode:   Enable
FCoE VLAN List :   2,4,5-8
FCFs    :    2
ENodes  :    2
Sessions:    10
Max VLANs:    8
Max FCFs in VLAN:    4
Max ENodes:    312
Max Sessions:    1024
```

6.3.11 clear fip-snooping statistics

Use the clear fip-snooping statistics command in User EXEC or Privileged EXEC mode to clear the FIP Snooping statistics in the supplied VLAN or on a supplied interface. If the optional (VLAN or interface) argument is not given, this command clears the statistics on all FIP snooping-enabled VLANs.

NOTICE This command can only be entered after FIP snooping is enabled using the feature fip-snooping command. Otherwise, it does not appear in the CLI syntax tree.

Format **`clear fip-snooping statistics [vlan`** ***`vlan-id`*** **`] | [interface`** ***`interface-id`*** **`]`**

Mode
- User EXEC
- Privileged EXEC

Parameter	Description
vlan-id	A VLAN on which FIP snooping is enabled.
interface-id	An interface belonging to a VLAN on which FIP snooping is enabled.

6.4 Priority-Based Flow Control Commands

NOTICE Support for this feature is platform-dependent.

Ordinarily, when flow control is enabled on a physical link, it applies to all traffic on the link. When congestion occurs, the hardware sends pause frames that temporarily suspend traffic flow. Pausing traffic helps prevent buffer overflow and dropped frames.

Priority-based flow control (PFC) provides a way to distinguish which traffic on physical link is paused when congestion occurs, based on the priority of the traffic. An interface can be configured to pause only high priority (i.e., loss-sensitive) traffic when necessary prevent dropped frames, while allowing traffic that has greater loss tolerance to continue to flow on the interface.

Priorities are differentiated by the priority field of the IEEE 802.1Q VLAN header, which identifies an IEEE 802.1p priority value. In FASTPATH, these priority values must be mapped to internal class-of-service (CoS) values.

To enable priority-based flow control for a particular CoS value on an interface:

1. Ensure that VLAN tagging is enabled on the interface so that the 802.1p priority values are carried through the network (see “Provisioning (IEEE 802.1p) Commands” on page 341).
2. Ensure that 802.1p priority values are mapped to FASTPATH CoS values (see “classofservice dot1p-mapping” on page 749).

When priority-flow-control is disabled, the interface defaults to the IEEE 802.3x flow control setting for the interface. When priority-based flow control is enabled, the interface will not pause any CoS unless there is at least one no-drop priority.

6.4.1 priority-flow-control mode

Use the priority-flow-control mode on command in Datacenter-Bridging Config mode to enable Priority-Flow-Control (PFC) on the given interface.

PFC must be enabled before FIP snooping can operate over the interface. Use the no form of the command to return the mode to the default (off). VLAN tagging (trunk or general mode) must be enabled on the interface in order to carry the dot1p value through the network. Additionally, the dot1mapping to class-of-service must be set to one-to-one.

When PFC is enabled on an interface, the normal PAUSE control mechanism is operationally disabled.

Default	Priority-flow-control mode is off (disabled) by default.
Format	`priority-flow-control mode { on	off }`
Mode	Datacenter-Bridging Config mode

Parameter	Description
on	Enable PFC on the interface.
off	Disable PFC on the interface.

Example: The following example enables PFC on an interface.

```
s1(config)#interface te1/0/1
s1(config-if-Te1/0/1)#datacenter-bridging
s1(config-if-dcb)#priority-flow-control mode on
```

6.4.1.1 no priority-flow-control mode

Use the no priority-flow-control mode command to return the PFC mode to the default (off).

Format	`no priority-flow-control mode`
Mode	Datacenter-Bridging Config mode

6.4.2 priority-flow-control priority

Use the priority-flow-control priority command in Datacenter-Bridging Config mode to enable the priority group for lossless (no-drop) or lossy (drop) behavior on the selected interface. Up to two lossless priorities can be enabled on an interface. The administrator must configure the same no-drop priorities across the network in order to ensure end-to-end lossless behavior.

The command has no effect on interfaces not enabled for PFC. VLAN tagging needs to be turned on in order to carry the dot1p value through the network. Additionally, the dot1pmapping to class of service must be set to one to one.

Default	The default behavior for all priorities is drop.
Format	**`priority-flow-control priority`** ***`priority-list`*** **`{drop	no-drop}`**
Mode	Datacenter-Bridging Config mode

Parameter	Description
drop	Disable lossless behavior on the selected priorities.
no-drop	Enable lossless behavior on the selected priorities.

Example: The following example sets priority 3 to no drop behavior.

```
s1(config)#interface te1/0/1
s1(config-if-Te1/0/1)#datacenter-bridging
s1(config-if-dcb)#priority-flow-control mode on
s1(config-if-dcb)#priority-flow-control priority 1 no-drop
```

6.4.2.1 no priority-flow-control priority

Use the no priority-flow-control priority command in Datacenter-Bridging Config mode to enable lossy behavior on all priorities on the interface. This has no effect on interfaces not enabled for PFC or with no lossless priorities configured.

Format	**`no priority-flow-control priority`**
Mode	Datacenter-Bridging Config mode

6.4.3 clear priority-flow-control statistics

Use the clear priority-flow-control statistics command to clear all global and interface PFC statistics.

Format	**`clear priority-flow-control statistics`**
Mode	Privileged EXEC

Example: The following shows examples of the commands.

```
console#clear priority-flow-control statistics
```

6.4.4 show interface priority-flow-control

Use the show interface priority-flow-control command in Privileged EXEC mode to display the PFC information of a given interface or all interfaces.

Format	`show interface [slot/port] priority-flow-control`
Mode	Privileged EXEC

Parameter	Description
slot/port	A valid Ethernet port.

When an interface number is not provided, the following information displays for all interfaces.

Parameter	Description
Interface Detail	The port for which data is displayed.
PFC Operational Status	The operational status of the interface.
PFC Configured State	The administrative mode of PFC on the interface.
Configured Drop Priorities	The 802.1p priority values that are configured with a drop priority on the interface. Drop priorities do not participate in pause.
Configured No-Drop Priorities	The 802.1p priority values that are configured with a no-drop priority on the interface. If an 802.1p priority that is designated as no-drop is congested, the priority is paused.
Operational Drop Priorities	The 802.1p priority values that the switch is using with a drop priority. The operational drop priorities might not be the same as the configured priorities if the interface has accepted different priorities from a peer device
Configured No-Drop Priorities	The 802.1p priority values that the switch is using with a no-drop priority. The operational drop priorities might not be the same as the configured priorities if the interface has accepted different priorities from a peer device
Delay Allowance	The operational status of the interface.
Peer Configuration Compatible	Indicates whether the local switch has accepted a compatible configuration from a peer switch.
Compatible Configuration Count	The number of received configurations accepted and processed as valid. This number does not include duplicate configurations.
Incompatible Configuration Count	The number of received configurations that were not accepted from a peer device because they were incompatible.
Priority	The 802.1p priority value.
Received PFC Frames	The number of PFC frames received by the interface with the associated 802.1p priority.
Transmitted PFC Frames	The number of PFC frames transmitted by the interface with the associated 802.1p priority.

Example: The following examples show the priority flow control status and statistics.

Example #1:

```
(switch) #show interface 0/1 priority-flow-control

Interface Detail:                    0/1
PFC Configured State:                Disabled
PFC Operational State:               Enabled
Configured Drop Priorities:          2-7
Operational Drop Priorities:         2-7
Configured No-Drop Priorities:       0-1
Operational No-Drop Priorities:      0-1
Delay Allowance:                     32456 bit times
Peer Configuration Compatible:       True
Compatible Configuration Count:      3
```

```
Incompatible Configuration Count:   1

Priority   Received PFC Frames     Transmitted PFC Frames
-------- --------------------     ---------------------
0        0                        0
1        0                        0
2        0                        0
3        0                        0
4        0                        0
5        0                        0
6        0                        0
7        0                        0
```

Example #2:

```
(switch) #show interface priority-flow-control

Port   Drop       No-Drop        Oper
       Priorities Priorities     State
------ ---------- ----------     -----
1/0/1  1-4,7      5,6            Enabled
1/0/2  1-4,6-7    5              Enabled
….
1/0/48 1-4,7      5,6            Enabled
```

6.5 Quantized Congestion Notification Commands

The Quantized Congestion Notification (QCN) feature is part of the Data Center Package.

6.5.1 qcn enable

Use the `qcn enable` command in Global Configuration mode to enable QCN on all the ports of the system. This command is master enable control. When QCN is enabled, the system recognizes the CN-TAG in received frames, the Congestion algorithm runs on the configured Congestion Points (CP) and Congestion Notification Messages (CNMs) are transmitted if congestion is detected on a CP.

Default	disabled
Format	`qcn enable`
Mode	Global Config

6.5.1.1 no qcn enable

Use the `no qcn enable` command in Global Configuration mode to disable QCN on all the ports of the system. This command is the master disable command. When QCN is disabled, received frames with CN-TAGs are treated as normal data frames and CNMs are never generated.

Format	`no qcn enable`
Mode	Global Config

6.5.2 qcn cnm-transmit-priority

Use the `qcn cnm-transmit-priority` command in Global Configuration mode to globally configure the dot1p priority of congestion notification messages (CNM) that are transmitted by the system. This command configures the dot1p priority value with which the CNM are transmitted. By default, CNMs are transmitted with dot1p priority as zero.

Default	The value is set to 0.
Format	`qcn cnm-transmit-priority dot1p priority`
Mode	Global Config

Parameter	Description
dot1p priority	The range is 0–7.

6.5.2.1 no qcn cnm-transmit-priority

Use the `no qcn cnm-transmit-priority` command in Global Configuration mode to set to the default value the dot1p priority on CNMs that are transmitted by the system.

Format	`no qcn cnm-transmit-priority`
Mode	Global Config

6.5.3 qcn cnpv-priority (datacenter bridging config)

Use the `qcn cnpv-priority` command in Data Center Bridging Configuration mode to globally configure a CP (port-queue) that is mapped to the specified dot1p priority as congestion enabled (interior) or congestion disabled (disable) or edge congestion point (edge) for all ports which have the defense mode configured as component.

Default	All priorities are disabled for QCN.
Format	`qcn cnpv-priority priority {interior	edge	disable}`
Mode	Data Center Bridging Config

Parameter	Description
cnpv-priority	The range is 0–7.
The possible selections for a Congestion Point (CP) are:	
Interior congestion point (ICP)	Used when a flow with the specified dot1p priority needs to be congestion aware. This setting enables detection of congestion of the selected priority.
Edge congestion point (ECP)	Used when the congestion point (CP) is on the edge of the congestion notification domain (CND).
Disabled for QCN	Used when it is desired that the priority be congestion unaware. This setting disables detection of congestion on the priority.

6.5.4 qcn cnpv-priority alternate-priority

Use the `qcn cnpv-priority alternate-priority` command in Global Configuration mode to globally configure the alternate priority for the selected cnpv-priority. When a frame is received with a dot1p priority equal to congestion notification priority value, the priority value in the frame is remarked with the alternate priority. The alternate priority is applied to incoming frames if and only if the incoming frame's dot1p priority is equal to CNPV priority of the CP and CP is configured as Edge.

Use the alternate priority setting to steer away traffic that comes from CN-unaware sources. Traffic from noncongestion aware sources is remarked when entering the CND domain so that the resources assigned to the congestion-enabled queues are not exhausted with traffic from QCN unaware sources. Since the frames are coming from non-QCN sources, they do not have a CN-TAG. If the frames are mapped to the congestion-enabled queue, then they may contribute to the congestion and, in turn, trigger generation of CNMs. This is not useful to sources that are QCN-unaware.

This configuration is applied to all ports whose defense-mode-choice is configured as *component*.

Format	`qcn cnpv-priority cnpv priority alternate-priority non-cnpv priority`
Mode	Global Config

Parameter	Description
cnpv priority	The range is 1–7.
non-cnpv priority	The range of alternate priority is 0–7.

6.5.4.1 no qcn cnpv-priority alternate-priority

Use the `no qcn cnpv-priority alternate-priority` command in Global Configuration mode to reset the alternate priority to the default value.

Format	`no qcn cnpv-priority cnpv priority alternate-priority`
Mode	Global Config

6.5.5 qcn cnpv-priority cp-creation

Use the `qcn cnpv-priority cp-creation` command in Global Configuration mode to globally configure the default scope for the per port-priority defense mode choice when a CP is newly created. The default scope for per-port defense mode choice can be admin or component.

Default	qcn cp-creation is set to enable
Format	`qcn cnpv-priority cnpv-priority cp-creation {enable	disable}`
Mode	Global Config

Parameter	Description
cnpv-priority	The range is 1–7.
admin scope	Is per-priority.
component scope	Is per priority level configuration.
enable	If cp-creation is enabled, the per-port defense mode choice is set to component.
disable	If cp-creation is disabled, the per-port defense mode choice is set to admin.

6.5.6 qcn cnpv-priority defense-mode-choice

Use the `qcn cnpv-priority defense-mode-choice` command in Interface Configuration mode to select the defense-mode as admin or component on an interface, namely whether interior/edge/disable and alternate priorities should use the per-priority configuration or the per-port-priority configuration.

Default	enable
Format	`qcn cnpv-priority cnpv priority defense-mode-choice {admin	component}`
Mode	Interface Config

Parameter	Description
cnpv priority	The range is 1–7.
admin scope	Is per-priority.
component scope	Is per priority level configuration.

6.5.7 qcn cnpv-priority

Use the `qcn cnpv-priority` command in Interface Config mode to configure a CP (port-queue) that is mapped to the specified dot1p priority as congestion enabled (interior) or congestion disabled (disabled) or edge congestion point (edge) for an interface which has the defense mode configured as component and a defense mode of Admin.

This configuration is applied if the defense mode choice is configured as Admin.

Default	By default, QCN is not enabled for any priority.
Format	`qcn cnpv-priority priority {interior	edge	disable}`
Mode	Interface Config

Parameter	Description
cnpv-priority	The range is 0–7.
The possible selections for a Congestion Point (CP) are:	
Interior congestion point (ICP)	Used when a flow with the specified dot1p priority needs to be congestion aware. This setting enables detection of congestion of the selected priority.
Edge congestion point (ECP)	Used when the congestion point (CP) is on the edge of the congestion notification domain (CND).
Disabled for QCN	Used when it is desired that the priority be congestion unaware. This setting disables detection of congestion on the priority.

6.5.8 qcn cnpv-priority alternate-priority

Use the `qcn cnpv-priority alternate-priority` command in Interface Configuration mode to configure the alternate priority on an interface for the specified incoming ICP priority. This alternate-priority overrides the alternate-priority set in the global mode for this incoming ICP priority on this port. This configuration is applied if the defense mode choice is configured as Admin.

Default	`By default, the alternate-priority configured in global is used.`
Format	`qcn alternate-priority incoming priority alternate-priority`
Mode	Interface Config

Parameter	Description
cnpv-priority	The range is 1–7.
alternate-priority	The range is 0–7.

6.5.8.1 no qcn cnpv-priority alternate-priority

Use the `no qcn cnpv-priority alternate-priority` command in Interface Configuration mode to reset the alternate priority of the given port-priority to the default value. If a global alternate priority value is configured, it is used.

Default	`By default, the alternate-priority configured in global is applied.`
Format	`no qcn alternate-priority incoming-priority alternate-priority`
Mode	Interface Config

6.5.9 qcn transmit-tlv enable

Use the `qcn transmit-tlv enable` command in Interface Configuration mode to enable transmission of QCN TLVs via LLDP.

Default	By default, transmission of QCN TLVs is disabled.
Format	`qcn transmit-tlv enable`
Mode	Interface Config

6.5.9.1 no qcn transmit-tlv enable

Use the `no qcn transmit-tlv enable` command in Interface Configuration mode to configure the mode of the QCN TLV transmission to disable. QCN TLVs transmission is propagated using LLDP.

Default	By default, the alternate-priority configured in global gets applied.
Format	`no qcn transmit-tlv enable`
Mode	Interface Config

6.5.10 clear qcn statistics

Use the `clear qcn statistics` command in Privileged EXEC mode to clear the CNM transmitted counters on the CP. If interface and the CP are not mentioned, then this command clears all the CNM counters for all CPs in the system. If only the interface number is specified, then all the CNM transmit counters on that interface are cleared.

Format	`clear qcn statistics [interface slot/port] [cp cp-index]`
Mode	Privileged EXEC

Parameter	Description
slot/port	If only the interface number is specified, then all the CNM transmit counters on that interface are cleared.
cp-index	If only the cp index is specified, then CNM transmit counters for that cp index on all interfaces are cleared.

6.5.11 show qcn priority

Use the `show qcn priority` command in Privileged EXEC mode to display the QCN configuration.

Format	`show qcn  priority [priority ] [interface slot/port| all]`
Mode	Privileged EXEC

Parameter	Description
priority	If only priority is specified, then per-priority configuration is displayed.
all	If all is specified, then per priority information for all dot1p priorities is displayed.
slot/port	If the interface number is also specified, then the command displays the configuration per-port-priority for the given priority.

The following data is displayed as part of this command.

Example: The following shows example CLI display output for the command.

```
show qcn priority 1
```

Global Configuration:

```
QCN status(Master enable) :  Enabled
CNM transmit priority        : 0
```

Per-priority configuration:

```
Defense mode : interior
Alternate priority: 2
cp-creation : disabled
Errored port list:  1/0/1,1/0/8
```

```
LLDP mismatch port list : 1/0/5-8
Configured as CNPV on ports: 1/0/1,1/0/7-12
```

Example: The following shows example CLI display output for the command.

show qcn priority

Global Configuration:

```
QCN status(Master enable) :  Enabled
CNM transmit priority        : 0
```

Per-priority configuration:

0	disabled	–	–	–	–	–
1	interior	0	enable	1/0/1,1/0/8	1/0/5–7	1/0/1–10
2	edge	0	disable	1/0/1	1/0/5–7	1/0/1–10
3	disabled	–	–	–	–	–
4	disabled	–	–	–	–	–
5	disabled	–	–	–	–	–
6	disabled	–	–	–	–	–
7	disabled	–	–	–	–	–

Example: The following shows example CLI display output for the command.

```
Show qcn priority  1 interface 1/0/1
```

Global Configuration:

```
QCN status(Master enable) :  Enabled
CNM transmit priority        : 0
```

Per-port-priority configuration:

```
Defence mode choice : admin
Defense mode : interior
Alternate priority: 2
```

Example: The following shows example CLI display output for the command.

```
Show qcn priority 1 interface all
```

Global Configuration:

```
QCN status(Master enable) :  Enabled
CNM transmit priority        : 0
```

Per-port-priority configuration

Interface Number	Defense-mode Choice	Defense Mode	Alternate Priority
1/0/1	admin	disabled	–
1/0/2	admin	interior	2
1/0/3	admin	edge	–
1/0/4	component	interior	3

6.5.12 show qcn active priority

Use the `show qcn active priority` command in Privileged EXEC mode to display the operational QCN configuration for the specified dot1p priority.

Format	`show qcn active priority 0-7`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
show qcn active priority 1
```

Interface Number	Defense mode	Alternate priority
1/0/1	interior	2
1/0/2	edge	–
1/0/3	interior	0
1/0/4	disabled	–
1/0/5	interior	–

6.5.13 show qcn interface

Use the `show qcn interface` command in Privileged EXEC mode to display Congestion Point information for the specified port.

Format	`show qcn interface slot/port [cp cpindex]`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
show qcn interface 1/0/7 cp 1

Interface : 1/0/7
CP index :  1
MAC address:  00:00:00:00:01:26
CPID             : 00012610071005

                       CNM transmitted priority : 0

Note: CPID can be deciphered  as mentioned below.
000126 : Last 3 bytes of system MAC Address
1  - unit number on which congestion is detected
0  - slot number on which congestion is detected
07 - port number on which congestion is detected
1 - unit number from which CNM is transmitted
0 - slot number from which CNM is transmitted
05- port number on which CNM is transmitted.
```

6.5.14 show qcn statistics

Use the `show qcn statistics` command in Privileged EXEC mode to display the statistics of the CNM and data frames for all the ports or for the specified CP for the given port.

Format `show qcn statistics {all | interface slot/port cp cp index}`

Mode Privileged EXEC

Example: The following data is displayed in tabular format as output for this command.

```
Interface     Cp Index       CNMs transmitted
1/0/1          0             1230
```

7/ Routing Commands

This chapter describes the routing commands available in the FASTPATH CLI.

The Routing Commands chapter contains the following sections:

NOTICE

The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

7.1 Address Resolution Protocol Commands

This section describes the commands you use to configure Address Resolution Protocol (ARP) and to view ARP information on the switch. ARP associates IP addresses with MAC addresses and stores the information as ARP entries in the ARP cache.

7.1.1 arp

This command creates an ARP entry. The value for ***ipaddress*** is the IP address of a device on a subnet attached to an existing routing interface. The parameter ***macaddr*** is a unicast MAC address for that device. The interface parameter specifies the next hop interface.

The format of the MAC address is 6 two-digit hexadecimal numbers that are separated by colons, for example 00:06:29:32:81:40.

Format	`arp ipaddress macaddr interface {slot/port | vlan id}`
Mode	Global Config

7.1.1.1 no arp

This command deletes an ARP entry. The value for ***arpentry*** is the IP address of the interface. The value for ***ipaddress*** is the IP address of a device on a subnet attached to an existing routing interface. The parameter ***macaddr*** is a unicast MAC address for that device. The interface parameter specifies the next hop interface.

Format	`no arp ipaddress macaddr interface slot/port`
Mode	Global Config

7.1.2 ip proxy-arp

This command enables proxy ARP on a router interface or range of interfaces. Without proxy ARP, a device only responds to an ARP request if the target IP address is an address configured on the interface where the ARP request arrived. With proxy ARP, the device may also respond if the target IP address is reachable. The device only responds if all next hops in its route to the destination are through interfaces other than the interface that received the ARP request.

Default	enabled
Format	`ip proxy-arp`
Mode	Interface Config

7.1.2.1 no ip proxy-arp

This command disables proxy ARP on a router interface.

Format	`no ip proxy-arp`
Mode	Interface Config

7.1.3 ip local-proxy-arp

Use this command to allow an interface to respond to ARP requests for IP addresses within the subnet and to forward traffic between hosts in the subnet.

Default	disabled
Format	`ip local-proxy-arp`
Mode	Interface Config

7.1.3.1 no ip local-proxy-arp

This command resets the local proxy ARP mode on the interface to the default value.

Format	`no ip local-proxy-arp`
Mode	Interface Config

7.1.4 arp cachesize

This command configures the ARP cache size. The ARP cache size value is a platform specific integer value. The default size also varies depending on the platform.

Format	`arp cachesize` *`platform specific integer value`*
Mode	Global Config

7.1.4.1 no arp cachesize

This command configures the default ARP cache size.

Format	`no arp cachesize`
Mode	Global Config

7.1.5 arp dynamicrenew

This command enables the ARP component to automatically renew dynamic ARP entries when they age out. When an ARP entry reaches its maximum age, the system must decide whether to retain or delete the entry. If the entry has recently been used to forward data packets, the system will renew the entry by sending an ARP request to the neighbor. If the neighbor responds, the age of the ARP cache entry is reset to 0 without removing the entry from the hardware. Traffic to the host continues to be forwarded in hardware without interruption. If the entry is not being used to forward data packets, then the entry is deleted from the ARP cache, unless the dynamic renew option is enabled. If the dynamic renew option is enabled, the system sends an ARP request to renew the entry. When an entry is not renewed, it is removed from the hardware and subsequent data packets to the host trigger an ARP request. Traffic to the host may be lost until the router receives an ARP reply from the host. Gateway entries, entries for a neighbor router, are always renewed. The dynamic renew option applies only to host entries.

The disadvantage of enabling dynamic renew is that once an ARP cache entry is created, that cache entry continues to take space in the ARP cache as long as the neighbor continues to respond to ARP requests, even if no traffic is being forwarded to the neighbor. In a network where the number of potential neighbors is greater than the ARP cache capacity, enabling dynamic renew could prevent some neighbors from communicating because the ARP cache is full.

Default	disabled
Format	`arp dynamicrenew`
Mode	Privileged EXEC

7.1.5.1 no arp dynamicrenew

This command prevents dynamic ARP entries from renewing when they age out.

Format	`no arp dynamicrenew`
Mode	Privileged EXEC

7.1.6 arp purge

This command causes the specified IP address to be removed from the ARP cache. Only entries of type dynamic or gateway are affected by this command.

Format	`arp purge` *`ipaddress ipaddress interface {slot/port	vlan id}`*
Mode	Privileged EXEC

Parameter	Description
ipaddress	The IP address to remove from the ARP cache.
interface	The interface from which IP addresses will be removed.

7.1.7 arp resptime

This command configures the ARP request response timeout.

The value for ***seconds*** is a valid positive integer, which represents the IP ARP entry response timeout time in seconds. The range for ***seconds*** is between 1-10 seconds.

Default	1
Format	`arp resptime` *`1-10`*
Mode	Global Config

7.1.7.1 no arp resptime

This command configures the default ARP request response timeout.

Format	`no arp resptime`
Mode	Global Config

7.1.8 arp retries

This command configures the ARP count of maximum request for retries.

The value for ***retries*** is an integer, which represents the maximum number of request for retries. The range for ***retries*** is an integer between 0-10 retries.

Default	4
Format	`arp retries` ***0-10***
Mode	Global Config

7.1.8.1 no arp retries

This command configures the default ARP count of maximum request for retries.

Format	`no arp retries`
Mode	Global Config

7.1.9 arp timeout

This command configures the ARP entry ageout time.

The value for ***seconds*** is a valid positive integer, which represents the IP ARP entry ageout time in seconds. The range for ***seconds*** is between 15-21600 seconds.

Default	1200
Format	`arp timeout` ***15-21600***
Mode	Global Config

7.1.9.1 no arp timeout

This command configures the default ARP entry ageout time.

Format	`no arp timeout`
Mode	Global Config

7.1.10 clear arp-cache

This command causes all ARP entries of type dynamic to be removed from the ARP cache . If the *gateway* keyword is specified, the dynamic entries of type gateway are purged as well.

Format	`clear arp-cache [gateway]`
Mode	Privileged EXEC

7.1.11 clear arp-switch

Use this command to clear the contents of the switch's Address Resolution Protocol (ARP) table that contains entries learned through the Management port. To observe whether this command is successful, `ping` from the remote system to the DUT. Issue the `show arp switch` command to see the ARP entries. Then issue the `clear arp-switch` command and check the `show arp switch` entries. There will be no more arp entries.

Format	`clear arp-switch`
Mode	Privileged EXEC

7.1.12 show arp

This command displays the Address Resolution Protocol (ARP) cache. The displayed results are not the total ARP entries. To view the total ARP entries, the operator should view the `show arp` results in conjunction with the `show arp switch` results.

Format	`show arp`
Mode	Privileged EXEC

Term	Definition
Age Time (seconds)	The time it takes for an ARP entry to age out. This is configurable. Age time is measured in seconds.
Response Time (seconds)	The time it takes for an ARP request timeout. This value is configurable. Response time is measured in seconds.
Retries	The maximum number of times an ARP request is retried. This value is configurable.
Cache Size	The maximum number of entries in the ARP table. This value is configurable.
Dynamic Renew Mode	Displays whether the ARP component automatically attempts to renew dynamic ARP entries when they age out.
Total Entry Count Current / Peak	The total entries in the ARP table and the peak entry count in the ARP table.
Static Entry Count Current / Max	The static entry count in the ARP table and maximum static entry count in the ARP table.

The following are displayed for each ARP entry:

Term	Definition
IP Address	The IP address of a device on a subnet attached to an existing routing interface.
MAC Address	The hardware MAC address of that device.
Interface	The routing *`slot/port`* associated with the device ARP entry.
Type	The type that is configurable. The possible values are Local, Gateway, Dynamic and Static.
Age	The current age of the ARP entry since last refresh (in hh:mm:ss format)

7.1.13 show arp brief

This command displays the brief Address Resolution Protocol (ARP) table information.

Format	`show arp brief`
Mode	Privileged EXEC

Term	Definition
Age Time (seconds)	The time it takes for an ARP entry to age out. This value is configurable. Age time is measured in seconds.
Response Time (seconds)	The time it takes for an ARP request timeout. This value is configurable. Response time is measured in seconds.
Retries	The maximum number of times an ARP request is retried. This value is configurable.
Cache Size	The maximum number of entries in the ARP table. This value is configurable.
Dynamic Renew Mode	Displays whether the ARP component automatically attempts to renew dynamic ARP entries when they age out.
Total Entry Count Current / Peak	The total entries in the ARP table and the peak entry count in the ARP table.
Static Entry Count Current / Max	The static entry count in the ARP table and maximum static entry count in the ARP table.

7.1.14 show arp switch

This command displays the contents of the switch's Address Resolution Protocol (ARP) table.

Format	`show arp switch`
Mode	Privileged EXEC

Term	Definition
IP Address	The IP address of a device on a subnet attached to the switch.
MAC Address	The hardware MAC address of that device.
Interface	The routing *`slot/port`* associated with the device's ARP entry.

7.2 IP Routing Commands

This section describes the commands you use to enable and configure IP routing on the switch.

7.2.1 routing

This command enables IPv4 and IPv6 routing for an interface or range of interfaces. You can view the current value for this function with the `show ip brief` command. The value is labeled as "Routing Mode."

Default	disabled
Format	`routing`
Mode	Interface Config

7.2.1.1 no routing

This command disables routing for an interface.

You can view the current value for this function with the `show ip brief` command. The value is labeled as "Routing Mode."

Format	`no routing`
Mode	Interface Config

7.2.2 ip routing

This command enables the IP Router Admin Mode for the master switch.

Format	`ip routing`
Mode	• Global Config • Virtual Router Config

7.2.2.1 no ip routing

This command disables the IP Router Admin Mode for the master switch.

Format	`no ip routing`
Mode	Global Config

7.2.3 ip address

This command configures an IP address on an interface or range of interfaces. You can also use this command to configure one or more secondary IP addresses on the interface. The command supports RFC 3021 and accepts using 31-bit prefixes on IPv4 point-to-point links. This command adds the label IP address in the command "show ip interface" on page 551.

NOTICE The 31-bit subnet mask is only supported on routing interfaces. The feature is not supported on network port and service port interfaces because FASTPATH acts as a host, not a router, on these management interfaces.

Format	`ip address` *`ipaddr`* `{`*`subnetmask`* `|` */`masklen`*`} [secondary]`
Mode	Interface Config

Parameter	Description
ipaddr	The IP address of the interface.
subnetmask	A 4-digit dotted-decimal number which represents the subnet mask of the interface.
masklen	Implements RFC 3021. Using the / notation of the subnet mask, this is an integer that indicates the length of the subnet mask. Range is 5 to 32 bits.

Example: The following example of the command shows the configuration of the subnet mask with an IP address in the dotted decimal format on interface 0/4/1.

```
(router1) #config

(router1) (Config)#interface 0/4/1

(router1) (Interface 0/4/1)#ip address 192.168.10.1 255.255.255.254
```

Example: The next example of the command shows the configuration of the subnet mask with an IP address in the / notation on interface 0/4/1.

```
(router1) #config

(router1) (Config)#interface 0/4/1

(router1) (Interface 0/4/1)#ip address 192.168.10.1 /31
```

7.2.3.1 no ip address

This command deletes an IP address from an interface. The value for ***ipaddr*** is the IP address of the interface in a.b.c.d format where the range for a, b, c, and d is 1-255. The value for ***subnetmask*** is a 4-digit dotted-decimal number which represents the Subnet Mask of the interface. To remove all of the IP addresses (primary and secondary) configured on the interface, enter the command `no ip address`.

Format	`no ip address [{`*`ipaddr subnetmask`*` [secondary]}]`
Mode	Interface Config

7.2.4 ip address dhcp

This command enables the DHCPv4 client on an in-band interface so that it can acquire network information, such as the IP address, subnet mask, and default gateway, from a network DHCP server. When DHCP is enabled on the interface, the system automatically deletes all manually configured IPv4 addresses on the interface.

To enable the DHCPv4 client on an in-band interface and send DHCP client messages with the client identifier option, use the ip address dhcp client-id configuration command in interface configuration mode.

Default	disabled
Format	`ip address dhcp [client-id]`
Mode	Interface Config

Example: In the following example, DHCPv4 is enabled on interface 0/4/1.

```
(router1) #config
(router1) (Config)#interface 0/4/1
(router1) (Interface 0/4/1)#ip address dhcp
```

7.2.4.1 no ip address dhcp

The no ip address dhcp command releases a leased address and disables DHCPv4 on an interface. The no form of the ip address dhcp client-id command removes the client-id option and also disables the DHCP client on the in-band interface.

Format	`no ip address dhcp [client-id]`
Mode	Interface Config

7.2.5 ip default-gateway

This command manually configures a default gateway for the switch. Only one default gateway can be configured. If you invoke this command multiple times, each command replaces the previous value.

When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway. The system installs a default IPv4 route with the gateway address as the next hop address. The route preference is 253. A default gateway configured with this command is more preferred than a default gateway learned from a DHCP server.

Format	`ip default-gateway `*`ipaddr`*
Mode	• Global Config

Parameter	Description
ipaddr	The IPv4 address of an attached router.

Example: The following example sets the default gateway to 10.1.1.1.

```
(router1) #config
(router1) (Config)#ip default-gateway 10.1.1.1
```

7.2.5.1 no ip default-gateway

This command removes the default gateway address from the configuration.

Format	`no ip default-gateway` *`ipaddr`*
Mode	Interface Config

7.2.6 ip load-sharing

This command configures IP ECMP load balancing mode.

Default	6
Format	`ip load-sharing` *`mode`* `{inner	outer}`
Mode	Global Config

Parameter	Description
mode	Configures the load balancing or sharing mode for all EMCP groups. • 1: Based on a hash using the Source IP address of the packet. • 2: Based on a hash using the Destination IP address of the packet. • 3: Based on a hash using the Source and Destination IP addresses of the packet. • 4: Based on a hash using the Source IP address and the Source TCP/UDP Port field of the packet. • 5: Based on a hash using the Destination IP address and the Destination TCP/UDP Port field of the packet. • 6: Based on a hash using the Source and Destination IP address, and the Source and Destination TCP/UDP Port fields of the packet.
inner	Use the inner IP header for tunneled packets.
outer	Use the outer IP header for tunneled packets.

7.2.6.1 no ip load-sharing

Format	`no ip load-sharing`
Mode	Global Config

7.2.7 release dhcp

Use this command to force the DHCPv4 client to release the leased address from the specified interface. The DHCP client sends a DHCP Release message telling the DHCP server that it no longer needs the IP address, and that the IP address can be reassigned to another

7.2.8 renew dhcp

Use this command to force the DHCPv4 client to immediately renew an IPv4 address lease on the specified interface.

NOTICE This command can be used on in-band ports as well as the service or network (out-of-band) port.

Format	`renew dhcp` *`slot/port`*
Mode	Privileged EXEC

7.2.9 renew dhcp network-port

Use this command to renew an IP address on a network port.

Format	`renew dhcp network-port`
Mode	Privileged EXEC

7.2.10 renew dhcp service-port

Use this command to renew an IP address on a service port.

Format	`renew dhcp service-port`
Mode	Privileged EXEC

7.2.11 ip route

This command configures a static route. The ***ipaddr*** parameter is a valid IP address, and ***subnetmask*** is a valid subnet mask. The ***nexthopip*** parameter is a valid IP address of the next hop router. Specifying `Null0` as nexthop parameter adds a static reject route. The optional ***preference*** parameter is an integer (value from 1 to 255) that allows you to specify the preference value (sometimes called "administrative distance") of an individual static route. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. By specifying the preference of a static route, you control whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination. A route with a preference of 255 cannot be used to forward traffic.

For the static routes to be visible, you must perform the following steps:

- Enable ip routing globally.
- Enable ip routing for the interface.
- Confirm that the associated link is also up.

Default	preference—1
Format	`ip route` *`ipaddr subnetmask`* `{` *`slot/port`* `|` `Null0` `|`*`nexthopip`* `[{`*`slot/port`*`|` *`vlan-id`*`}]}` *`[preference]`*
Mode	Global Config

Example:

Subnetwork 9.0.0.0/24 is a connected subnetwork in global table and subnet 56.6.6.0/24 is reachable via a gateway 9.0.0.2 in the global table.

Subnet 8.0.0.0/24 is a connected subnetwork in virtual router *Red*.

Now we leak the 2 routes from global route table into the virtual router *Red* and leak the connected subnet 8.0.0.0/24 from *Red* to global table.

When leaking connected route in the global routing table to a virtual router, the /32 host route for the leaked host is added in the virtual router instance's route table.

Also we add a non-leaked static route for 66.6.6.0/24 subnetwork scoped to the domain of virtual router Red below.

```
(Router) (Config)#ip routing
(Router) (Config)#ip vrf Red
(Router) (Config)#interface 0/27
(Router) (Interface 0/27)#routing
(Router) (Interface 0/27)#ip vrf forwarding Red
(Router) (Interface 0/27)#ip address 8.0.0.1 /24

(Router) (Interface 0/27)#interface 0/26
(Router) (Interface 0/26)#routing
(Router) (Interface 0/26)#ip address 9.0.0.1 /24
(Router) (Interface 0/26)#exit
```

```
(Router) (Config)#ip route 56.6.6.0 /24 9.0.0.2

Routes leaked from global routing table to VRF’s route table are :
(Router) (Config)#ip route vrf Red 9.0.0.2 255.255.255.255 9.0.0.2 0/26
(Router) (Config)#ip route vrf Red 56.6.6.0 255.255.255.0 9.0.0.2 0/26

Route leaked from VRF’s route table to global routing table is :
(Router) (Config)#ip route 8.0.0.2 255.255.255.255 0/27

Route (non-leaked) internal to VRF’s route table is :
(Router) (Config)#ip route vrf Red 66.6.6.0 255.255.255.0 8.0.0.2
```

7.2.11.1 no ip route

This command deletes a single next hop to a destination static route. If you use the ***nexthopip*** parameter, the next hop is deleted. If you use the ***preference*** value, the preference value of the static route is reset to its default.

Format	`no ip route` *ipaddr subnetmask [{nexthopip [preference]* | `Null0`*}]*
Mode	Global Config

7.2.12 ip route default

This command configures the default route. The value for ***nexthopip*** is a valid IP address of the next hop router. The ***preference*** is an integer value from 1 to 255. A route with a preference of 255 cannot be used to forward traffic.

Default	preference—1
Format	`ip route default` *nexthopip [preference]*
Mode	Global Config

7.2.12.1 no ip route default

This command deletes all configured default routes. If the optional ***nexthopip*** parameter is designated, the specific next hop is deleted from the configured default route and if the optional preference value is designated, the preference of the configured default route is reset to its default.

Format	`no ip route default` *[{nexthopip* | *preference}]*
Mode	Global Config

7.2.13 ip route distance

This command sets the default distance (preference) for static routes. Lower route distance values are preferred when determining the best route. The `ip route` and `ip route default` commands allow you to optionally set the distance (preference) of an individual static route. The default distance is used when no distance is specified in these commands. Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance will only be applied to static routes created after invoking the `ip route distance` command.

Default	1
Format	`ip route distance` *1-255*
Mode	Global Config

7.2.13.1 no ip route distance

This command sets the default static route preference value in the router. Lower route preference values are preferred when determining the best route.

Format	`no ip route distance`
Mode	Global Config

7.2.14 ip route net-prototype

This command adds net prototype IPv4 routes to the hardware.

Format	`ip route net-prototype` *`prefix/prefix-length nexthopip num-routes`*
Mode	Global Config

Parameter	Description
prefix/prefix-length	The destination network and mask for the route.
nexthopip	The next-hop ip address, It must belong to an active routing interface, but it does not need to be resolved.
num-routes	The number of routes need to added into hardware starting from the given prefix argument and within the given prefix-length.

7.2.14.1 no ip route net-prototype

This command deletes all the net prototype IPv4 routes added to the hardware.

Format	`ip route net-prototype` *`prefix/prefix-length nexthopip num-routes`*
Mode	Global Config

7.2.15 ip netdirbcast

This command enables the forwarding of network-directed broadcasts on an interface or range of interfaces. When enabled, network directed broadcasts are forwarded. When disabled they are dropped.

Default	disabled
Format	`ip netdirbcast`
Mode	Interface Config

7.2.15.1 no ip netdirbcast

This command disables the forwarding of network-directed broadcasts. When disabled, network directed broadcasts are dropped.

Format	`no ip netdirbcast`
Mode	Interface Config

7.2.16 ip mtu

This command sets the IP Maximum Transmission Unit (MTU) on a routing interface or range of interfaces. The IP MTU is the size of the largest IP packet that can be transmitted on the interface without fragmentation. Forwarded packets are dropped if they exceed the IP MTU of the outgoing interface.

Packets originated on the router, such as OSPF packets, may be fragmented by the IP stack.

OSPF advertises the IP MTU in the Database Description packets it sends to its neighbors during database exchange. If two OSPF neighbors advertise different IP MTUs, they will not form an adjacency. (unless OSPF has been instructed to ignore differences in IP MTU with the **`ip ospf mtu-ignore`** command.)

NOTICE The IP MTU size refers to the maximum size of the IP packet (IP Header + IP payload). It does not include any extra bytes that may be required for Layer-2 headers. To receive and process packets, the Ethernet MTU (see “mtu” on page 287) must take into account the size of the Ethernet header.

For more information about the FASTPATH IP MTU, see the *Maximum Transmission Unit in FASTPATH* Application Note (document number FASTPATH-AN40X-R).

Default	1500 bytes
Format	`ip mtu` *`68-12270`*
Mode	Interface Config

7.2.16.1 no ip mtu

This command resets the ip mtu to the default value.

Format	`no ip mtu`
Mode	Interface Config

7.2.17 encapsulation

This command configures the link layer encapsulation type for the packet on an interface or range of interfaces. The encapsulation type can be `ethernet` or `snap`.

Default	ethernet
Format	`encapsulation {ethernet	snap}`
Mode	Interface Config

NOTICE Routed frames are always ethernet encapsulated when a frame is routed to a VLAN.

7.2.18 show dhcp lease

This command displays a list of IPv4 addresses currently leased from a DHCP server on a specific in-band interface or all in-band interfaces. This command does not apply to service or network ports.

Format	`show dhcp lease [interface` *`slot/port`*`]`
Modes	Privileged EXEC

Term	Definition
IP address, Subnet mask	The IP address and network mask leased from the DHCP server
DHCP Lease server	The IPv4 address of the DHCP server that leased the address.

Term	Definition
State	State of the DHCPv4 Client on this interface
DHCP transaction ID	The transaction ID of the DHCPv4 Client
Lease	The time (in seconds) that the IP address was leased by the server
Renewal	The time (in seconds) when the next DHCP renew Request is sent by DHCPv4 Client to renew the leased IP address
Rebind	The time (in seconds) when the DHCP Rebind process starts
Retry count	Number of times the DHCPv4 client sends a DHCP REQUEST message before the server responds

7.2.19 show ip brief

This command displays the summary information of the IP global configurations, including the ICMP rate limit configuration and the global ICMP Redirect configuration.

Format `show ip brief`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Default Time to Live	The computed TTL (Time to Live) of forwarding a packet from the local router to the final destination.
Routing Mode	Shows whether the routing mode is enabled or disabled.
Maximum Next Hops	The maximum number of next hops the packet can travel.
Maximum Routes	The maximum number of routes the packet can travel.
ICMP Rate Limit Interval	Shows how often the token bucket is initialized with burst-size tokens. *Burst-interval* is from 0 to 2147483647 milliseconds. The default *burst-interval* is 1000 msec.
ICMP Rate Limit Burst Size	Shows the number of ICMPv4 error messages that can be sent during one *burst-interval*. The range is from 1 to 200 messages. The default value is 100 messages.
ICMP Echo Replies	Shows whether ICMP Echo Replies are enabled or disabled.
ICMP Redirects	Shows whether ICMP Redirects are enabled or disabled.
System uRPF Mode	Shows whether unicast Reverse Path Forwarding (uRPF) is enabled.

Example: The following shows example CLI display output for the command.

```
(Switch) #show ip brief

Default Time to Live.......................... 64
Routing Mode.................................. Disabled
Maximum Next Hops............................. 4
Maximum Routes................................ 128
ICMP Rate Limit Interval...................... 1000 msec
ICMP Rate Limit Burst Size.................... 100 messages
ICMP Echo Replies............................. Enabled
ICMP Redirects................................ Enabled
System uRPF Mode.............................. Disabled
```

7.2.20 show ip interface

This command displays all pertinent information about the IP interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format	`show ip interface {slot/port|vlan 1-4093|loopback 0-7}`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Routing Interface Status	Determine the operational status of IPv4 routing Interface. The possible values are Up or Down.
Primary IP Address	The primary IP address and subnet masks for the interface. This value appears only if you configure it.
Method	Shows whether the IP address was configured manually or acquired from a DHCP server.
Secondary IP Address	One or more secondary IP addresses and subnet masks for the interface. This value appears only if you configure it.
Helper IP Address	The helper IP addresses configured by the command "ip helper-address (Interface Config)" on page 605.
Routing Mode	The administrative mode of router interface participation. The possible values are enable or disable. This value is configurable.
Administrative Mode	The administrative mode of the specified interface. The possible values of this field are enable or disable. This value is configurable.
Forward Net Directed Broadcasts	Displays whether forwarding of network-directed broadcasts is enabled or disabled. This value is configurable.
Proxy ARP	Displays whether Proxy ARP is enabled or disabled on the system.
Local Proxy ARP	Displays whether Local Proxy ARP is enabled or disabled on the interface.
Active State	Displays whether the interface is active or inactive. An interface is considered active if its link is up and it is in forwarding state.
Link Speed Data Rate	An integer representing the physical link data rate of the specified interface. This is measured in Megabits per second (Mbps).
MAC Address	The burned in physical address of the specified interface. The format is 6 two-digit hexadecimal numbers that are separated by colons.
Encapsulation Type	The encapsulation type for the specified interface. The types are: Ethernet or SNAP.
IP MTU	The maximum transmission unit (MTU) size of a frame, in bytes.
Bandwidth	Shows the bandwidth of the interface.
Destination Unreachables	Displays whether ICMP Destination Unreachables may be sent (enabled or disabled).
ICMP Redirects	Displays whether ICMP Redirects may be sent (enabled or disabled).
DHCP Client Identifier	The client identifier is displayed in the output of the command only if DHCP is enabled with the client-id option on the in-band interface. See "ip address dhcp" on page 544.
Unicast Reverse Path Forwarding Mode	The uRPF mode on the interface.
Unicast Reverse Path Forwarding Allow-Default	Identifies whether the uRPF `allow-default` parameter has been set.

Example: The following shows example CLI display output for the command.

```
(switch)#show ip interface 0/2

Routing Interface Status...................... Down
Primary IP Address............................ 1.2.3.4/255.255.255.0
Method........................................ Manual
Secondary IP Address(es)...................... 21.2.3.4/255.255.255.0
.............................................. 22.2.3.4/255.255.255.0
Helper IP Address............................. 1.2.3.4
.............................................. 1.2.3.5
Routing Mode.................................. Disable
Administrative Mode........................... Enable
Forward Net Directed Broadcasts............... Disable
Proxy ARP..................................... Enable
Local Proxy ARP............................... Disable
Active State.................................. Inactive
Link Speed Data Rate.......................... Inactive
MAC Address................................... 00:10:18:82:0C:68
Encapsulation Type............................ Ethernet
IP MTU........................................ 1500
Bandwidth..................................... 100000 kbps
Destination Unreachables...................... Enabled
ICMP Redirects................................ Enabled
Unicast Reverse Path Forwarding Mode.......... Disabled
Unicast Reverse Path Forwarding Allow-Default.. False
```

Example: In the following example the DHCP client is enabled on a VLAN routing interface.

```
(Routing) #show ip interface vlan 10

Routing Interface Status................. Up
Method................................... DHCP
Routing Mode............................. Enable
Administrative Mode...................... Enable
Forward Net Directed Broadcasts.......... Disable
Active State............................. Inactive
Link Speed Data Rate..................... 10 Half
MAC address.............................. 00:10:18:82:16:0E
Encapsulation Type....................... Ethernet
IP MTU................................... 1500
Bandwidth................................ 10000 kbps
Destination Unreachables................. Enabled
ICMP Redirects........................... Enabled
Interface Suppress Status................ Unsuppressed
DHCP Client Identifier................... 0fastpath-0010.1882.160E-vl10
```

7.2.21 show ip interface brief

This command displays summary information about IP configuration settings for all ports in the router, and indicates how each IP address was assigned.

Format	`show ip interface brief`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface	slot/port
State	Routing operational state of the interface.
IP Address	The IP address of the routing interface in 32-bit dotted decimal format.

Term	Definition
IP Mask	The IP mask of the routing interface in 32-bit dotted decimal format.
Method	Indicates how each IP address was assigned. The field contains one of the following values: • DHCP - The address is leased from a DHCP server. • Manual - The address is manually configured.

Example: The following shows example CLI display output for the command.

```
(alpha1) #show ip interface brief

Interface     State  IP Address      IP Mask         Method
----------    -----  --------------- --------------- --------
0/17          Up     192.168.75.1    255.255.255.0   DHCP
```

7.2.22 show ip load-sharing

This command displays the currently configured IP ECMP load balancing mode.

Format	`show ip load-sharing`
Mode	Privileged Exec

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip load-sharing

ip load-sharing 6 inner
```

7.2.23 show ip protocols

This command lists a summary of the configuration and status for each unicast routing protocol running in the specified virtual router. The command lists routing protocols which are configured and enabled. If a protocol is selected on the command line, the display will be limited to that protocol.

Format	`show ip protocols [ospf|rip]`
Mode	Privileged EXEC

Parameter	Description
Routing Protocol	OSPFv2.
Router ID	The router ID configured for OSPFv2.
OSPF Admin Mode	Whether OSPF is enabled or disabled globally.
Maximum Paths	The maximum number of next hops in an OSPF route.
Routing for Networks	The address ranges configured with an OSPF network command.
Distance	The administrative distance (or “route preference”) for intra-area, inter-area, and external routes.
Default Route Advertise	Whether OSPF is configured to originate a default route.
Always	Whether default advertisement depends on having a default route in the common routing table.
Metric	The metric configured to be advertised with the default route.
Metric Type	The metric type for the default route.
Redist Source	A type of routes that OSPF is redistributing.
Metric	The metric to advertise for redistributed routes of this type.
Metric Type	The metric type to advertise for redistributed routes of this type.

Parameter	Description
Subnets	Whether OSPF redistributes subnets of classful addresses, or only classful prefixes.
Dist List	A distribute list used to filter routes of this type. Only routes that pass the distribute list are redistributed.
Number of Active Areas	The number of OSPF areas with at least one interface running on this router. Also broken down by area type.
ABR Status	Whether the router is currently an area border router. A router is an area border router if it has interfaces that are up in more than one area.
ASBR Status	Whether the router is an autonomous system boundary router. The router is an ASBR if it is redistributing any routes or originating a default route.
RIP Section	
RIP Admin Mode	Whether RIP is globally enabled.
Split Horizon Mode	Whether RIP advertises routes on the interface where they were received.
Default Metric	The metric assigned to redistributed routes.
Default Route Advertise	Whether this router is originating a default route.
Distance	The administrative distance for RIP routes.
Redistribution	A table showing information for each source protocol (connected, staticand ospf). For each of these source the distribution list and metric are shown. Fields which are not configured are left blank. For ospf, configured ospf match parameters are also shown.
Interface	The interfaces where RIP is enabled and the version sent and accepted on each interface.

Example: The following shows example CLI display output for the command.

```
(Router) #show ip protocols

Routing Protocol.......................... BGP
Router ID................................. 6.6.6.6
Local AS Number........................... 65001
BGP Admin Mode............................ Enable
Maximum Paths............................. Internal 32, External 32
Always compare MED ....................... FALSE
Maximum AS Path Length ................... 75
Fast Internal Failover ....................... Enable
Fast External Failover ....................... Enable

Distance.................................. Ext 20 Int 200 Local 200
  Address         Wildcard        Distance    Pfx List
  -------         --------        --------    --------
  172.20.0.0      0.0.255.255           40        None
  172.21.0.0      0.0.255.255           45           1

Prefix List In............................ PfxList1
Prefix List Out........................... None

Redistributing:
Source        Metric  Dist List               Route Map
--------- ----------  ----------------------- ---------------------------
connected             connected_list
static         32120                          static_routemap
rip            30000                          rip_routemap
ospf                                          ospf_map
  ospf match: int ext1 nssa-ext2


   Networks Originated:
     10.1.1.0 255.255.255.0 (active)
     20.1.1.0 255.255.255.0
```

```
Neighbors:
172.20.1.100
   Filter List In....................... 1
   Filter List Out...................... 2
   Prefix List In....................... PfxList2
   Prefix List Out...................... PfxList3
   Route Map In......................... rmapUp
   Route Map Out........................ rmapDown
172.20.5.1
   Prefix List Out...................... PfxList12


Routing Protocol......................... OSPFv2
Router ID................................ 6.6.6.6
OSPF Admin Mode.......................... Enable
Maximum Paths............................ 32
Routing for Networks..................... 172.24.0.0 0.0.255.255 area 0
                                          10.0.0.0 0.255.255.255 area 1
                                          192.168.75.0 0.0.0.255 area 2
Distance................................. Intra 110 Inter 110 Ext 110

Default Route Advertise.................. Disabled
Always................................... FALSE
Metric................................... Not configured
Metric Type.............................. External Type 2

Redist
Source      Metric       Metric Type     Subnets    Dist List
---------  -------       -----------     -------    ---------
static     default                 2         Yes         None
connected       10                 2         Yes            1

Number of Active Areas................... 3 (3 normal, 0 stub, 0 nssa)
ABR Status............................... Yes
ASBR Status.............................. Yes


Routing Protocol......................... RIP
RIP Admin Mode........................... Enable
Split Horizon Mode....................... Simple
Default Metric........................... Not configured
Default Route Advertise.................. Disable
Distance................................. 120

Redistribution:
Source    Metric Dist List Match
--------- ------ --------- -------------------------------------
connected      6
static        10        15
ospf                    20 int ext1 ext2 nssa-ext1

Interface              Send        Recv
---------              ----        ----
0/25                   RIPv2       RIPv2
```

7.2.24 show ip route

This command displays the routing table. The ***ip-address*** specifies the network for which the route is to be displayed and displays the best matching best-route for the address. The ***mask*** specifies the subnet mask for the given ***ip-address***. When you use the `longer-prefixes` keyword, the ***ip-address*** and ***mask*** pair becomes the prefix, and the command displays the routes to the addresses that match that prefix. Use the `protocol` parameter to specify the protocol that installed the routes. The value for ***protocol*** can be `connected`, `ospf`, `rip`, `static`. Use the `all` parameter to display all routes including best and nonbest routes. If you do not use the `all` parameter, the command displays only the best route.

NOTICE If you use the `connected` keyword for ***protocol***, the `all` option is not available because there are no best or nonbest connected routes.

NOTICE If you use the `static` keyword for ***protocol***, the `description` option is also available, for example: `show ip route` *`ip-address`* `static description`. This command shows the description configured with the specified static route(s).

Format `show ip route [{`*`ip-address`*` [`*`protocol`*`] | {`*`ip-address mask`*` [longer-prefixes] [`*`protocol`*`] | `*`protocol`*`} [all] | all}]`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Route Codes	The key for the routing protocol codes that might appear in the routing table output.

The `show ip route` command displays the routing tables in the following format:

```
Code   IP-Address/Mask [Preference/Metric] via Next-Hop, Route-Timestamp, Interface, Truncated
```

The columns for the routing table display the following information:

Term	Definition
Code	The codes for the routing protocols that created the routes.
Default Gateway	The IP address of the default gateway. When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway.
IP-Address/Mask	The IP-Address and mask of the destination network corresponding to this route.
Preference	The administrative distance associated with this route. Routes with low values are preferred over routes with higher values.
Metric	The cost associated with this route.
via Next-Hop	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination.
Route-Timestamp	The last updated time for dynamic routes. The format of Route-Timestamp will be • Days:Hours:Minutes if days > = 1 • Hours:Minutes:Seconds if days < 1
Interface	The outgoing router interface to use when forwarding traffic to the next destination. For reject routes, the next hop interface would be Null0 interface.
T	A flag appended to a route to indicate that it is an ECMP route, but only one of its next hops has been installed in the forwarding table. The forwarding table may limit the number of ECMP routes or the number of ECMP groups. When an ECMP route cannot be installed because such a limit is reached, the route is installed with a single next hop. Such truncated routes are identified by a T after the interface name.

To administratively control the traffic destined to a particular network and prevent it from being forwarded through the router, you can configure a static reject route on the router. Such traffic would be discarded and the ICMP destination unreachable message is sent back to the source. This is typically used for preventing routing loops. The reject route added in the RTO is of the type OSPF Inter-Area. Reject routes (routes of REJECT type installed by any protocol) are not redistributed by OSPF/RIP. Reject routes are supported in both OSPFv2 and OSPFv3.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ip route

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       L-Leaked Route

Default gateway is 1.1.1.2

C 1.1.1.0/24 [0/1] directly connected, 0/11
C 2.2.2.0/24 [0/1] directly connected, 0/1
C 5.5.5.0/24 [0/1] directly connected, 0/5
S 7.0.0.0/8 [1/0] directly connected, Null0
OIA 10.10.10.0/24 [110/6] via 5.5.5.2,   00h:00m:01s,  0/5
C 11.11.11.0/24 [0/1] directly connected,   0/11
S 12.0.0.0/8 [5/0] directly connected, Null0
S 23.0.0.0/8 [3/0] directly connected, Null0
C 1.1.1.0/24 [0/1] directly connected, 0/11
C 2.2.2.0/24 [0/1] directly connected, 0/1
C 5.5.5.0/24 [0/1] directly connected, 0/5
C 11.11.11.0/24 [0/1] directly connected, 0/11
S 10.3.2.0/24 [1/0] via 1.1.1.2, 0/11
```

Example: The following shows example CLI display output for the command to indicate a truncated route.

```
(router) #show ip route

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       L-Leaked Route

O E1   100.1.161.0/24 [110/10] via 172.20.11.100,   00h:00m:13s,  2/11 T
O E1   100.1.162.0/24 [110/10] via 172.20.11.100,   00h:00m:13s,  2/11 T
O E1   100.1.163.0/24 [110/10] via 172.20.11.100,   00h:00m:13s,  2/11 T
```

Example: The following shows an example of output that displays leaked routes.

Subnetwork 9.0.0.0/24 is a connected subnetwork in global table and subnet 56.6.6.0/24 is reachable via a gateway 9.0.0.2 in the global table. These two routes leak into the virtual router *Red* and leak the connected subnet 8.0.0.0/24 from *Red* to global table.

When leaking connected route in the global routing table to a virtual router, the /32 host route for the leaked host is added in the virtual router instance's route table. Leaking of non /32 connected routes into the virtual router table from global routing table is not supported.

This enables the nodes in subnet 8.0.0.0/24 to access shared services via the global routing table. Also we add a non-leaked static route for 66.6.6.0/24 subnetwork scoped to the domain of virtual router Red.

```
               (Router) (Config)#ip route vrf Red 9.0.0.2 255.255.255.255 9.0.0.2 0/26
(Router) (Config)#ip route vrf Red 56.6.6.0 255.255.255.0 9.0.0.2 0/26
(Router) (Config)#ip route vrf Red 66.6.6.0 255.255.255.0 8.0.0.2
(Router) (Config)#ip route 8.0.0.0 255.255.255.0 0/27

(Router) #show ip route vrf Red

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
```

```
    L – Leaked Route

C      8.0.0.0/24 [0/1] directly connected,   0/27
S L    9.0.0.2/32 [1/1] directly connected,   0/26
S L    56.6.6.0/24 [1/1] via 9.0.0.2,   02d:22h:15m,  0/26
S      66.6.6.0/24 [1/1] via 8.0.0.2,   01d:22h:15m,  0/27
(Router) #show ip route

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
    L – Leaked Route

C      9.0.0.0/24 [0/1] directly connected,   0/26
S L    8.0.0.0/24 [1/1] directly connected,   0/27
```

7.2.25 show ip route ecmp-groups

This command reports all current ECMP groups in the IPv4 routing table. An ECMP group is a set of two or more next hops used in one or more routes. The groups are numbered arbitrarily from 1 to n. The output indicates the number of next hops in the group and the number of routes that use the set of next hops. The output lists the IPv4 address and outgoing interface of each next hop in each group.

Format	`show ip route ecmp-groups`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(router) #show ip route ecmp-groups

ECMP Group 1 with 2 next hops (used by 1 route)
  172.20.33.100 on interface 2/33
  172.20.34.100 on interface 2/34

ECMP Group 2 with 3 next hops (used by 1 route)
  172.20.32.100 on interface 2/32
  172.20.33.100 on interface 2/33
  172.20.34.100 on interface 2/34

ECMP Group 3 with 4 next hops (used by 1 route)
  172.20.31.100 on interface 2/31
  172.20.32.100 on interface 2/32
  172.20.33.100 on interface 2/33
  172.20.34.100 on interface 2/34
```

7.2.26 show ip route hw-failure

Use this command to display the routes that failed to be added to the hardware due to hash errors or a table full condition.

Format	`show ip route hw-failure`
Mode	Privileged EXEC

Example: The following example displays the command output.

```
(Routing) (Config)#ip route net-prototype 66.6.6.0/24 9.0.0.2 4

(Routing) #show ip route connected

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       S U - Unnumbered Peer, L - Leaked Route, K – Kernel
    P – Net Prototype

C      9.0.0.0/24 [0/0] directly connected,   0/1
C      8.0.0.0/24 [0/0] directly connected,   0/2

(Routing) #show ip route hw-failure

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       S U - Unnumbered Peer, L - Leaked Route, K – Kernel
    P – Net Prototype

P      66.6.6.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
P      66.6.7.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
P      66.6.8.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
P      66.6.9.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
```

7.2.27 show ip route net-prototype

This command displays the net-prototype routes. The net-prototype routes are displayed with a P.

Format	`show ip route net-prototype`
Modes	Privileged EXEC

Example:

```
(Routing) #show ip route net-prototype

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       S U - Unnumbered Peer, L - Leaked Route, K – Kernel
       P – Net Prototype

P      56.6.6.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1
P      56.6.7.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1
```

7.2.28 show ip route summary

This command displays a summary of the state of the routing table. When the optional `all` keyword is given, some statistics, such as the number of routes from each source, include counts for alternate routes. An alternate route is a route that is not the most preferred route to its destination and therefore is not installed in the forwarding table. To include only the number of best routes, do not use the optional keyword.

Format	`show ip route summary [all]`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Connected Routes	The total number of connected routes in the routing table.
Static Routes	Total number of static routes in the routing table.
RIP Routes	Total number of routes installed by RIP protocol.
OSPF Routes	Total number of routes installed by OSPF protocol.

Term	Definition
Intra Area Routes	Total number of Intra Area routes installed by OSPF protocol.
Inter Area Routes	Total number of Inter Area routes installed by OSPF protocol.
External Type-1 Routes	Total number of External Type-1 routes installed by OSPF protocol.
External Type-2 Routes	Total number of External Type-2 routes installed by OSPF protocol.
Reject Routes	Total number of reject routes installed by all protocols.
Total Routes	Total number of routes in the routing table.
Best Routes (High)	The number of best routes currently in the routing table. This number only counts the best route to each destination. The value in parentheses indicates the highest count of unique best routes since counters were last cleared.
Alternate Routes	The number of alternate routes currently in the routing table. An alternate route is a route that was not selected as the best route to its destination.
Route Adds	The number of routes that have been added to the routing table.
Route Modifies	The number of routes that have been changed after they were initially added to the routing table.
Route Deletes	The number of routes that have been deleted from the routing table.
Unresolved Route Adds	The number of route adds that failed because none of the route's next hops were on a local subnet. Note that static routes can fail to be added to the routing table at startup because the routing interfaces are not yet up. This counter gets incremented in this case. The static routes are added to the routing table when the routing interfaces come up.
Invalid Route Adds	The number of routes that failed to be added to the routing table because the route was invalid. A log message is written for each of these failures.
Failed Route Adds	The number of routes that failed to be added to the routing table because of a resource limitation in the routing table.
Reserved Locals	The number of routing table entries reserved for a local subnet on a routing interface that is down. Space for local routes is always reserved so that local routes can be installed when a routing interface bounces.
Unique Next Hops (High)	The number of distinct next hops used among all routes currently in the routing table. These include local interfaces for local routes and neighbors for indirect routes. The value in parentheses indicates the highest count of unique next hops since counters were last cleared.
Next Hop Groups (High)	The current number of next hop groups in use by one or more routes. Each next hop group includes one or more next hops. The value in parentheses indicates the highest count of next hop groups since counters were last cleared.
ECMP Groups (High)	The number of next hop groups with multiple next hops. The value in parentheses indicates the highest count of next hop groups since counters were last cleared.
ECMP Groups	The number of next hop groups with multiple next hops.
ECMP Routes	The number of routes with multiple next hops currently in the routing table.
Truncated ECMP Routes	The number of ECMP routes that are currently installed in the forwarding table with just one next hop. The forwarding table may limit the number of ECMP routes or the number of ECMP groups. When an ECMP route cannot be installed because such a limit is reached, the route is installed with a single next hop.
ECMP Retries	The number of ECMP routes that have been installed in the forwarding table after initially being installed with a single next hop.
Routes with n Next Hops	The current number of routes with each number of next hops.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip route summary
Connected Routes.............................. 7
Static Routes................................. 1
RIP Routes.................................... 20
BGP Routes.................................... 10
  External.................................... 0
  Internal.................................... 10
  Local....................................... 0
OSPF Routes................................... 1004
  Intra Area Routes........................... 4
  Inter Area Routes........................... 1000
  External Type-1 Routes...................... 0
  External Type-2 Routes...................... 0
Reject Routes................................. 0
Total routes.................................. 1032

Best Routes (High)............................ 1032 (1032)
Alternate Routes.............................. 0
Route Adds.................................... 1010
Route Modifies................................ 1
Route Deletes................................. 10
Unresolved Route Adds......................... 0
Invalid Route Adds............................ 0
Failed Route Adds............................. 0
Reserved Locals............................... 0

Unique Next Hops (High)....................... 13 (13)
Next Hop Groups (High)........................ 13 (14)
ECMP Groups (High)............................ 2 (3)
ECMP Routes................................... 1001
Truncated ECMP Routes......................... 0
ECMP Retries.................................. 0
Routes with 1 Next Hop........................ 31
Routes with 2 Next Hops....................... 1
Routes with 4 Next Hops....................... 1000
```

7.2.29 clear ip route counters

The command resets to zero the IPv4 routing table counters reported in the command “show ip route summary” on page 559. The command only resets event counters. Counters that report the current state of the routing table, such as the number of routes of each type, are not reset.

Format `clear ip route counters`

Mode Privileged EXEC

7.2.30 show ip route preferences

This command displays detailed information about the route preferences for each type of route. Route preferences are used in determining the best route. Lower router preference values are preferred over higher router preference values. A route with a preference of 255 cannot be used to forward traffic.

Format `show ip route preferences`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Local	The local route preference value.
Static	The static route preference value.

Term	Definition
OSPF Intra	The OSPF Intra route preference value.
OSPF Inter	The OSPF Inter route preference value.
OSPF External	The OSPF External route preference value.
RIP	The RIP route preference value.
Configured Default Gateway	The route preference value of the statically-configured default gateway
DHCP Default Gateway	The route preference value of the default gateway learned from the DHCP server.

Example: The following shows example CLI display output for the command.

```
(alpha-stack) #show ip route preferences

Local......................................... 0
Static........................................ 1
OSPF Intra.................................... 110
OSPF Inter.................................... 110
OSPF External................................. 110
RIP........................................... 120
Configured Default Gateway.................... 253
DHCP Default Gateway.......................... 254
```

7.2.31 show ip stats

This command displays IP statistical information.

Format	`show ip stats`
Modes	• Privileged EXEC • User EXEC

7.2.32 show routing heap summary

This command displays a summary of the memory allocation from the routing heap. The routing heap is a chunk of memory set aside when the system boots for use by the routing applications.

Format	`show routing heap summary`
Mode	Privileged EXEC

Parameter	Description
Heap Size	The amount of memory, in bytes, allocated at startup for the routing heap.
Memory In Use	The number of bytes currently allocated.
Memory on Free List	The number of bytes currently on the free list. When a chunk of memory from the routing heap is freed, it is placed on a free list for future reuse.
Memory Available in Heap	The number of bytes in the original heap that have never been allocated.
In Use High Water Mark	The maximum memory in use since the system last rebooted.

Example: The following shows example CLI display output for the command.

```
(Router) #show routing heap summary

Heap Size...................... 95053184
Memory In Use.................. 56998
Memory on Free List............ 47
Memory Available in Heap....... 94996170
In Use High Water Mark......... 57045
```

7.3 Routing Policy Commands

7.3.1 ip policy route-map

Use this command to identify a route map to use for policy-based routing on an interface specified by *route-map-name*. Policy-based routing is configured on the interface that *receives* the packets, not on the interface from which the packets are sent.

When a route-map applied on the interface is changed, that is, if new statements are added to route-map or match/set terms are added/removed from route-map statement, and also if route-map that is applied on an interface is removed, route-map needs to be removed from interface and added back again in order to have changed route-map configuration to be effective.

NOTICE Route-map and Diffserv cannot work on the same interface.

Format	`ip policy` *`route-map-name`*
Mode	Interface Config

Example: The following is an example of this command.

```
(FASTPATH Routing) (Config)#interface 0/1
(FASTPATH Routing) (Interface 0/1)#
(FASTPATH Switching) (Interface 0/1)# #ip policy route-map equal-access

In order to disable policy based routing from an interface, use no form of this command
no ip policy <route-map-name>
```

7.3.2 ip prefix-list

To create a prefix list or add a prefix list entry, use the ip prefix-list command in Global Configuration mode. Prefix lists allow matching of route prefixes with those specified in the prefix list. Each prefix list includes of a sequence of prefix list entries ordered by their sequence numbers. A router sequentially examines each prefix list entry to determine if the route's prefix matches that of the entry. An empty or nonexistent prefix list permits all prefixes. An implicit deny is assume if a given prefix does not match any entries of a prefix list. Once a match or deny occurs the router does not go through the rest of the list. A prefix list may be used within a route map to match a route's prefix using the command "match ip address" on page 567.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64.

Default	No prefix lists are configured by default. When neither the ge nor the le option is configured, the destination prefix must match the network/length exactly. If the ge option is configured without the le option, any prefix with a network mask greater than or equal to the ge value is considered a match. Similarly, if the le option is configured without the ge option, a prefix with a network mask less than or equal to the le value is considered a match.
Format	`ip prefix-list` *`list-name`* `{[seq` *`number`*`] {permit | deny}` *`network/length`* `[ge` *`length`*`] [le` *`length`*`] | renumber` *`renumber-interval first-statement-number`*`}`
Mode	Global Configuration

Parameter	Description
list-name	The text name of the prefix list. Up to 32 characters.
seq number	(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and applied in that order. If you do not specify a sequence number, the system will automatically select a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The value ranges from 1 to 4,294,967,294.
permit	Permit routes whose destination prefix matches the statement.
deny	Deny routes whose destination prefix matches the statement.
network/length	Specifies the match criteria for routes being compared to the prefix list statement. The network can be any valid IP prefix. The length is any IPv4 prefix length from 0 to 32.
ge length	(Optional) If this option is configured, then a prefix is only considered a match if its network mask length is greater than or equal to this value. This value must be longer than the network length and less than or equal to 32.
le length	(Optional) If this option is configured, then a prefix is only considered a match if its network mask length is less than or equal to this value. This value must be longer than the ge length and less than or equal to 32.
renumber	(Optional) Provides the option to renumber the sequence numbers of the IP prefix list statements with a given interval starting from a particular sequence number. The valid range for *`renumber-interval`* is 1–100, and the valid range for *`first-statement-number`* is 1–1000.

Example: The following example configures a prefix list that allows routes with one of two specific destination prefixes, 172.20.0.0/16 and 192.168.1.0/24:

```
(Routing)(config)# ip prefix-list apple seq 10 permit 172.20.0.0/16
(Routing)(config)# ip prefix-list apple seq 20 permit 192.168.10/24
```

Example: The following example disallows only the default route.

```
(Routing)(config)# ip prefix-list orange deny 0.0.0.0/0
(Routing)(config)# ip prefix-list orange permit 0.0.0.0/0 ge 1
```

7.3.2.1 no ip prefix-list

To delete a prefix list or a statement in a prefix list, use the no form of this command. The command no ip prefix-list list-name deletes the entire prefix list. To remove an individual statement from a prefix list, you must specify the statement exactly, with all its options.

Format	`no ip prefix-list` *`list-name`* `[seq` *`number`*`] { permit | deny }` *`network/length`* `[ge` *`length`*`] [le` *`length`*`]`
Mode	Global Configuration

7.3.3 ip prefix-list description

To apply a text description to a prefix list, use the ip prefix-list description command in Global Configuration mode.

Default	No description is configured by default.
Format	`ip prefix-list` *`list-name`* `description` *`text`*
Mode	Global Configuration

Parameter	Description
list-name	The text name of the prefix list.
description text	Text description of the prefix list. Up to 80 characters.

7.3.3.1 no ip prefix-list description

To remove the text description, use the no form of this command.

Format	`no ip prefix-list` *`list-name`* `description`
Mode	Global Configuration

7.3.4 ipv6 prefix-list

Use this command to create IPv6 prefix lists. An IPv6 prefix list can contain only ipv6 addresses. Prefix lists allow matching of route prefixes with those specified in the prefix list. Each prefix list includes of a sequence of prefix list entries ordered by their sequence numbers. A router sequentially examines each prefix list entry to determine if the route's prefix matches that of the entry. For IPv6 routes, only IPv6 prefix lists are matched. An empty or nonexistent prefix list permits all prefixes. An implicit deny is assumed if a given prefix does not match any entries of a prefix list. Once a match or deny occurs the router does not go through the rest of the list. An IPv6 prefix list may be used within a route map to match a route's prefix using the `match ipv6 address` command. A route map may contain both IPv4 and IPv4 prefix lists. If a route being matched is an IPv6 route, only the IPv6 prefix lists are matched.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64. These numbers indicate only IPv6 prefix lists. IPv4 prefix lists may be configured in appropriate numbers independently.

Default	No prefix lists are configured by default. When neither the ge nor the le option is configured, the destination prefix must match the network/length exactly. If the ge option is configured without the le option, any prefix with a network mask greater than or equal to the ge value is considered a match. Similarly, if the le option is configured without the ge option, a prefix with a network mask less than or equal to the le value is considered a match.
Format	`ipv6 prefix-list` *`list-name`* `[seq` *`seq-number`*`] { {permit/deny}` *`ipv6-prefix/prefix-length`* `[ge` *`ge-value`*`] [le` *`le-value`*`]  | description` *`text`* `| renumber` *`renumber-interval first-statement-number`*`}`
Mode	Global Configuration

Parameter	Description
list-name	The text name of the prefix list. Up to 32 characters.
seq number	(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and applied in that order. If you do not specify a sequence number, the system will automatically select a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The value ranges from 1 to 4,294,967,294.
permit	Permit routes whose destination prefix matches the statement.
deny	Deny routes whose destination prefix matches the statement.
ipv6-prefix/ prefix-length	Specifies the match criteria for routes being compared to the prefix list statement. The ipv6-prefix can be any valid IPv6 prefix where the address is specified in hexadecimal using 16-bit values between colons. The prefix-length is the The length of the IPv6 prefix, given as a decimal value that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must precede the decimal value.
ge length	(Optional) If this option is configured, specifies a prefix length greater than or equal to the ipv6-prefix/prefix-length. It is the lowest value of a range of the length.
le length	(Optional) If this option is configured, specifies a prefix length less than or equal to the ipv6-prefix/prefix-length. It is the highest value of a range of the length.
Description	A description of the prefix list. It can be up to 80 characters in length.
renumber	(Optional) Provides the option to renumber the sequence numbers of the IPv6 prefix list statements with a given interval starting from a particular sequence number.

Example: The following example configures a prefix list that allows routes with one of two specific destination prefixes, `2001::/64 and 5F00::/48:`

```
(R1)(config)# ipv6 prefix-list apple seq 10 permit 2001::/64
(R1)(config)# ipv6 prefix-list apple seq 20 permit 5F00::/48
```

7.3.4.1 no ipv6 prefix-list

Use this command to deletes either the entire prefix list or an individual statement from a prefix list.

Format	`ipv6 prefix-list` *`list-name`*
Mode	Global Configuration

NOTICE The description must be removed using `no ip prefix-list description` before using this command to delete an IPv6 Prefix List.

7.3.5 route-map

To create a route map and enter Route Map Configuration mode, use the route-map command in Global Configuration mode. One use of a route map is to limit the redistribution of routes to a specified range of route prefixes. The redistribution command specifies a route map which refers to a prefix list. The prefix list identifies the prefixes that may be redistributed. FASTPATH accepts up to 64 route maps.

Default	No route maps are configured by default. If no permit or deny tag is given, *permit* is the default.
Format	`route-map` *`map-tag`* `[permit|deny]` `[`*`sequence-number`*`]`
Mode	Global Configuration

Parameter	Description
map-tag	Text name of the route map. Route maps with the same name are grouped together in order of their sequence numbers. A route map name may be up to 32 characters long.
permit	(Optional) Permit routes that match all of the match conditions in the route map.
deny	(Optional) Deny routes that match all of the match conditions in the route map.
sequence-number	(Optional) An integer used to order the set of route maps with the same name. Route maps are ordered from lowest to greatest sequence number, with lower sequence numbers being considered first. If no sequence number is specified, the system assigns a value ten greater than the last statement in the route map. The range is 0 to 65,535.

Example: In the following example, BGP is configured to redistribute the all prefixes within 172.20.0.0 and reject all others.

```
(Routing)(config)# ip prefix-list redist-pl permit 172.20.0.0/16 le 32
(Routing)(config)# route-map redist-rm permit
(Routing)(config-route-map)# match ip address prefix-list redist-pl
(Routing)(config-route-map)# exit
(Routing)(config) router bgp 1
(Routing)(Config-router) redistribute ospf route-map redist-rm
```

7.3.5.1 no route-map

To delete a route map or one of its statements, use the no form of this command.

Format	`no route-map` *`map-tag`* `[permit|deny]` `[`*`sequence-number`*`]`
Mode	Global Configuration

7.3.6 match ip address

To configure a route map to match based on a destination prefix, use the match ip address command in Route Map Configuration mode. If you specify multiple prefix lists in one statement, then a match occurs if a prefix matches any one of the prefix lists. If you configure a match ip address statement within a route map section that already has a match ip address statement, the new prefix lists are added to the existing set of prefix lists, and a match occurs if any prefix list in the combined set matches the prefix.

Default	No match criteria are defined by default.
Format	`match ip address prefix-list` *`prefix-list-name`* `[`*`prefix-list-name...`*`]`
Mode	Route Map Configuration

Parameter	Description
prefix-list-name	The name of a prefix list used to identify the set of matching routes. Up to eight prefix lists may be specified.

7.3.6.1 no match ip address

To delete a match statement from a route map, use the no form of this command.

Format	`no match ip address [prefix-list` *`prefix-list-name`* `[`*`prefix-list-name...`*`]]`
Mode	Route Map Configuration

7.3.7 match ip address <access-list-number | access-list-name>

Use this command to configure a route map in order to match based on the match criteria configured in an IP access-list. Note that an IP ACL must be configured before it is linked to a route-map. Actions present in an IP ACL configuration are applied with other actions involved in route-map. If an IP ACL referenced by a route-map is removed or rules are added or deleted from that ACL, the configuration is rejected.

If there are a list of IP access-lists specified in this command and the packet matches at least one of these access-list match criteria, the corresponding set of actions in route-map are applied to packet.

If there are duplicate IP access-list numbers/names in this command, the duplicate configuration is ignored.

Default	No match criteria are defined by default.
Format	`match ip address` *`access-list-number`* `|` *`access-list-name`* `[...access-list-number | name ]`
Mode	Route Map Configuration

Parameter	Description
Access-list-number	The access-list number that identifies an access-list configured through access-list CLI configuration commands. This number is 1 to 99 for standard access list number. This number is 100 to 199 for extended access list number.
Access-list-name	The access-list name that identifies named IP ACLs. Access-list name can be up to 31 characters in length. A maximum of 16 ACLs can be specified in this 'match' clause.

Example: The following sequence shows creating a route-map with "match" clause on ACL number and applying that route-map on an interface.

```
(FASTPATH Routing) (config)#access-list 1 permit ip 10.1.0.0 0.0.255.255
(FASTPATH Routing) (config)#access-list 2 permit ip 10.2.0.0 0.0.255.255
(FASTPATH Routing) (config)#route-map equal-access permit 10
(FASTPATH Routing) (config-route-map)#match ip address 1
(FASTPATH Routing) (config-route-map)#set ip default next-hop 192.168.6.6
(FASTPATH Routing) (config-route-map)#route-map equal-access permit 20
```

```
(FASTPATH Routing) (config-route-map)#match ip address 2
(FASTPATH Routing) (config-route-map)#set ip default next-hop 172.16.7.7
(FASTPATH Routing) (config)#interface 0/1
(FASTPATH Routing) (Interface 0/1)#ip address 10.1.1.1 255.255.255.0
(FASTPATH Routing) (Interface 0/1)#ip policy route-map equal-access
(FASTPATH Routing) (config)#interface 0/2
(FASTPATH Routing) (Interface 0/2)#ip address 192.168.6.5 255.255.255.0
(FASTPATH Routing) (config)#interface 0/3
(FASTPATH Routing) (Interface 0/3)#ip address 172.16.7.6 255.255.255.0
The ip policy route-map equal-access command is applied to interface 0/1. All packets coming inside
0/1 are policy-routed.
Sequence number 10 in route map equal-access is used to match all packets sourced from any host in
subnet 10.1.0.0. If there is a match, and if the router has no explicit route for the packet’s
destination, it is sent to next-hop address 192.168.6.6 .
Sequence number 20 in route map equal-access is used to match all packets sourced from any host in
subnet 10.2.0.0. If there is a match, and if the router has no explicit route for the packet’s
destination, it is sent to next-hop address 172.16.7.7.
Rest all packets are forwarded as per normal L3 destination-based routing.
```

Example: This example illustrates the scenario where IP ACL referenced by a route-map is removed or rules are added or deleted from that ACL, this is how configuration is rejected:

```
(FASTPATH Routing) #show ip access-lists

Current number of ACLs: 9  Maximum number of ACLs: 100

ACL ID/Name                      Rules  Direction  Interface(s)      VLAN(s)
-------------------------------  -----  ---------  ----------------  ----------
1                                1
2                                1
3                                1
4                                1
5                                1
madan                            1

FASTPATH Routing) #show mac access-lists

Current number of all ACLs: 9  Maximum number of all ACLs: 100

MAC ACL Name                     Rules  Direction  Interface(s)       VLAN(s)
-------------------------------  -----  ---------  ----------------  ----------
madan                            1
mohan                            1
goud                             1

(FASTPATH Routing) #
(FASTPATH Routing) #
(FASTPATH Routing) #configure

(FASTPATH Routing) (Config)#route-map madan

(FASTPATH Routing) (route-map)#match ip address 1 2 3 4 5 madan

(FASTPATH Routing) (route-map)#match mac-list madan mohan goud

(FASTPATH Routing) (route-map)#exit

(FASTPATH Routing) (Config)#exit

(FASTPATH Routing) #show route-map

route-map madan permit 10
     Match clauses:
       ip address (access-lists) : 1 2 3 4 5 madan
       mac-list (access-lists) : madan mohan goud
     Set clauses:
```

```
(FASTPATH Routing) (Config)#access-list 2 permit every

Request denied. Another application using this ACL restricts the number of rules allowed.


(FASTPATH Routing) (Config)#ip access-list madan

(FASTPATH Routing) (Config-ipv4-acl)#permit udp any any

Request denied. Another application using this ACL restricts the number of rules allowed.
```

7.3.7.1 no match ip address

To delete a match statement from a route map, use the no form of this command.

Format	`no match ip address [`*`access-list-number`*`	`*`access-list-name`*`]`
Mode	Route Map Configuration

7.3.8 match ipv6 address

Use this command to configure a route map to match based on a destination prefix. `prefix-list` *prefix-list-name* identifies the name of an IPv6 prefix list used to identify the set of matching routes. Up to eight prefix lists may be specified. If multiple prefix lists are specified, a match occurs if a prefix matches any one of the prefix lists. If you configure a match ipv6 address statement within a route map section that already has a match ipv6 address statement, the new prefix lists are added to the existing set of prefix lists, and a match occurs if any prefix list in the combined set matches the prefix.

Default	No match criteria are defined by default.
Format	`match ipv6 address prefix-list `*`prefix-list-name`*` [`*`prefix-list-name...`*`]`
Mode	Route Map Configuration

Example: In the example below, IPv6 addresses specified by the prefix list apple are matched through the route map abc.

```
Router(config)# route-map abc
Router(config-route-map)# match ipv6 address prefix-list apple
```

7.3.8.1 no match ipv6 address

To delete a match statement from a route map, use the `no` form of this command.

Format	`no match ipv6 address prefix-list `*`prefix-list-name`*` [`*`prefix-list-name...`*`]]`
Mode	Route Map Configuration

7.3.9 match length

Use this command to configure a route map to match based on the Layer 3 packet length between specified minimum and maximum values. *min* specifies the packet's minimum Layer 3 length, inclusive, allowed for a match. *max* specifies the packet's maximum Layer 3 length, inclusive, allowed for a match. Each route-map statement can contain one 'match' statement on packet length range.

Default	No match criteria are defined by default.
Format	`match length `*`min max`*
Mode	Route Map Configuration

Example: The following shows an example of the command.

```
(Routing) (config-route-map)# match length 64 1500
```

7.3.9.1 no match length

Use this command to delete a match statement from a route map.

Format	`no match length`
Mode	Route Map Configuration

7.3.10 match mac-list

Use this command to configure a route map in order to match based on the match criteria configured in an MAC access-list.

A MAC ACL is configured before it is linked to a route-map. Actions present in MAC ACL configuration are applied with other actions involved in route-map. When a MAC ACL referenced by a route-map is removed, the route-map rule is also removed and the corresponding rule is not effective. When a MAC ACL referenced by a route-map is removed or rules are added or deleted from that ACL, the configuration is rejected.

Default	No match criteria are defined by default.
Format	`match mac-list` *`mac-list-name`* `[`*`mac-list-name`*`]`
Mode	Route Map Configuration

Parameter	Description
mac-list-name	The mac-list name that identifies MAC ACLs. MAC Access-list name can be up to 31 characters in length.

Example: The following is an example of the command.

```
(FASTPATH Routing) (config-route-map)# match mac-list MacList1

Example 2:
This example illustrates the scenario where MAC ACL referenced by a route-map is removed or rules
are added or deleted from that ACL, this is how configuration is rejected:

FASTPATH Routing) #show mac access-lists

Current number of all ACLs: 9  Maximum number of all ACLs: 100

MAC ACL Name                      Rules  Direction  Interface(s)      VLAN(s)
-------------------------------   -----  ---------  ----------------  ----------
madan                             1
mohan                             1
goud                              1

(FASTPATH Routing) #
(FASTPATH Routing) #
(FASTPATH Routing) #configure

(FASTPATH Routing) (Config)#route-map madan

(FASTPATH Routing) (route-map)#match mac-list madan mohan goud

(FASTPATH Routing) (route-map)#exit

(FASTPATH Routing) (Config)#exit

(FASTPATH Routing) #show route-map
```

```
route-map madan permit 10
     Match clauses:
       mac-list (access-lists) : madan mohan goud
     Set clauses:

(FASTPATH Routing) (Config)#mac access-list extended madan

(FASTPATH Routing) (Config-mac-access-list)#permit 00:00:00:00:00:01 ff:ff:ff:ff:ff:ff any

Request denied. Another application using this ACL restricts the number of rules allowed.
```

7.3.10.1 no match mac-list

To delete a match statement from a route map, use the no form of this command.

Format	`no match mac-list [...`*`mac-list-name`*`]`
Mode	Route Map Configuration

7.3.11 set interface

If network administrator does not want to revert to normal forwarding but instead want to drop a packet that does not match the specified criteria, a set statement needs to be configured to route the packets to interface null 0 as the last entry in the route-map. `set interface null0` needs to be configured in a separate statement. It should not be added along with any other statement having other match/set terms.

A route-map statement that is used for PBR is configured as permit or deny. If the statement is marked as deny, traditional destination-based routing is performed on the packet meeting the match criteria. If the statement is marked as permit, and if the packet meets all the match criteria, then set commands in the route-map statement are applied. If no match is found in the route-map, the packet is not dropped, instead the packet is forwarded using the routing decision taken by performing destination-based routing.

Format	set interface null0
Mode	Route Map Configuration

7.3.12 set ip next-hop

Use this command to specify the adjacent next-hop router in the path toward the destination to which the packets should be forwarded. If more than one IP address is specified, the first IP address associated with a currently up-connected interface is used to route the packets.

This command affects all incoming packet types and is always used if configured. If configured next-hop is not present in the routing table, an ARP request is sent from the router.

In a route-map statement, ‘set ip next-hop’ and ‘set ip default next-hop’ terms are mutually exclusive. However, a ‘set ip default next-hop’ can be configured in a separate route-map statement.

Format	set ip next-hop ip-address [...*ip-address*]
Mode	Route Map Configuration

Parameter	Description
ip-address	The IP address of the next hop to which packets are output. It must be the address of an adjacent router. A maximum of 16 next-hop IP addresses can be specified in this ‘set’ clause.

7.3.12.1 no set ip next-hop

Use this command to remove a set command from a route map.

Format no set ip next-hop ip-address [...*ip-address*]

Mode Route Map Configuration

7.3.13 set ip default next-hop

Use this command to set a list of default next-hop IP addresses. If more than one IP address is specified, the first next hop specified that appears to be adjacent to the router is used. The optional specified IP addresses are tried in turn.

A packet is routed to the next hop specified by this command only if there is *no* explicit route for the packet's destination address in the routing table. A default route in the routing table is not considered an explicit route for an unknown destination address.

In a route-map statement, 'set ip next-hop' and 'set ip default next-hop' terms are mutually exclusive.However, a 'set ip next-hop' can be configured in a separate route-map statement

Format set ip default next-hop ip-address [...*ip-address*]

Mode Route Map Configuration

Parameter	Description
ip-address	The IP address of the next hop to which packets are output. It must be the address of an adjacent router. A maximum of 16 next-hop IP addresses can be specified in this 'set' clause.

7.3.13.1 no set ip default next-hop

Use this command to remove a set command from a route map.

Format no set ip default next-hop ip-address [...*ip-address*]

Mode Route Map Configuration

7.3.14 set ip precedence

Use this command to set the three IP precedence bits in the IP packet header. With three bits, you have eight possible values for the IP precedence; values 0 through 7 are defined. This command is used when implementing QoS and can be used by other QoS services, such as weighted fair queuing (WFQ) and weighted random early detection (WRED).

Format set ip precedence *0-7*

Mode Route Map Configuration

Parameter	Description
0	Sets the routine precedence
1	Sets the priority precedence
2	Sets the immediate precedence
3	Sets the Flash precedence
4	Sets the Flash override precedence
5	Sets the critical precedence
6	Sets the internetwork control precedence
7	Sets the network control precedence

7.3.14.1 no set ip precedence

Use this command to reset the three IP precedence bits in the IP packet header to the default.

Format	no set ip precedence
Mode	Route Map Configuration

7.3.15 show ip policy

This command lists the route map associated with each interface.

Format	`show ip policy`
Mode	Privileged EXEC

Term	Definition
Interface	The interface.
Route-map	The route map

7.3.16 show ip prefix-list

This command displays configuration and status for a prefix list.

Format	show ip prefix-list [detail | summary] *prefix-list-name* [*network/length*] [seq *sequence-number*] [longer] [first-match]
Mode	Privileged EXEC

Parameter	Description
detail | summary	(Optional) Displays detailed or summarized information about all prefix lists.
prefix-list-name	(Optional) The name of a specific prefix list.
network/length	(Optional) The network number and length (in bits) of the network mask.
seq	(Optional) Applies the sequence number to the prefix list entry.
sequence-number	(Optional) The sequence number of the prefix list entry.
longer	(Optional) Displays all entries of a prefix list that are more specific than the given network/length.
first-match	(Optional) Displays the entry of a prefix list that matches the given network/length.

Acceptable forms of this command are as follows:

show ip prefix-list prefix-list-name network/length first-match

show ip prefix-list prefix-list-name network/length longer

show ip prefix-list prefix-list-name network/length

show ip prefix-list prefix-list-name seq sequence-number

show ip prefix-list prefix-list-name

show ip prefix-list summary

show ip prefix-list summary prefix-list-name

show ip prefix-list detail

show ip prefix-list detail prefix-list-name

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip prefix-list fred

ip prefix-list fred:
   count: 3, range entries: 3, sequences: 5 - 15, refcount: 0
   seq 5 permit 10.10.1.1/20 ge 22
   seq 10 permit 10.10.1.2/20 le 30
   seq 15 permit 10.10.1.2/20 ge 29 le 30
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip prefix-list summary fred

ip prefix-list fred:
   count: 3, range entries: 3, sequences: 5 - 15, refcount: 0
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip prefix-list detail fred

ip prefix-list fred:
   count: 3, range entries: 3, sequences: 5 - 15, refcount: 0
   seq 5 permit 10.10.1.1/20 ge 22 (hitcount: 0)
   seq 10 permit 10.10.1.2/20 le 30 (hitcount: 0)
   seq 15 permit 10.10.1.2/20 ge 29 le 30 (hitcount: 0)
```

7.3.17 show ipv6 prefix-list

This command displays configuration and status for a selected prefix list.

Format	show ipv6 prefix-list [detail | summary] *listname* [*ipv6-prefix/prefix-length*] [seq *sequence-number*] [longer] [first-match]
Mode	Privileged EXEC

Parameter	Description
detail | summary	(Optional) Displays detailed or summarized information about all prefix lists.
list-name	(Optional) The name of a specific prefix list.
ipv6-prefix/prefix-length	(Optional) The network number and length (in bits) of the network mask.
seq	(Optional) Applies the sequence number to the prefix list entry.
sequence-number	(Optional) The sequence number of the prefix list entry.
longer	(Optional) Displays all entries of a prefix list that are more specific than the given network/length.
first-match	(Optional) Displays the entry of a prefix list that matches the given network/length.

Acceptable forms of this command are as follows:

show ipv6 prefix-list listname ipv6-prefix/prefix-length first-match

show ipv6 prefix-list listname ipv6-prefix/prefix-length longer

show ipv6 prefix-list listname ipv6-prefix/prefix-length

show ipv6 prefix-list listname seq sequence-number

show ipv6 prefix-list listname

show ipv6 prefix-list summary

show ipv6 prefix-list summary prefix-list-name

show ipv6 prefix-list detail

show ipv6 prefix-list detail prefix-list-name

The command outputs the following information.

Parameter	Description
count	Number of entries in the prefix list.
range entries	Number of entries that match the input range.
ref count	Number of entries referencing the given prefix list.
seq	Sequence number of the entry in the list.
permit/deny	The action to take.
sequences	Range of sequence numbers for the entries in the list
hit count	Number of matches for the prefix entry

Example: The following shows example CLI display output for the command.

```
(Switch) #show ipv6 prefix-list apple
ipv6 prefix-list apple:
count: 6, range entries: 3, sequences: 5 - 30, refcount: 31
seq 5 deny 5F00::/8 le 128
seq 10 deny ::/0
seq 15 deny ::/1
seq 20 deny ::/2
seq 25 deny ::/3 ge 4
       seq 30 permit ::/0 le 128

(Switch) #show ipv6 prefix-list summary apple
ipv6 prefix-list apple:
count: 6, range entries: 3, sequences: 5 - 30, refcount: 31

(Switch) #show ipv6 prefix-list detail apple
ipv6 prefix-list apple:
count: 6, range entries: 3, sequences: 5 - 30, refcount: 31
seq 5 deny 5F00::/8 le 128 (hit count: 0, refcount: 1)
seq 10 deny ::/0 (hit count: 0, refcount: 1)
seq 15 deny ::/1 (hit count: 0, refcount: 1)
seq 20 deny ::/2 (hit count: 0, refcount: 1)
seq 25 deny ::/3 ge 4 (hit count: 0, refcount: 1)
       seq 30 permit ::/0 le 128 (hit count: 240664, refcount: 0)
```

7.3.18 show route-map

To display a route map, use the show route-map command in Privileged EXEC mode.

Format	show route-map [*map-name*]
Mode	Privileged EXEC

Parameter	Description
map-name	(Optional) Name of a specific route map.

Example: The following shows example CLI display output for the command.

```
(Routing) # show route-map test
route-map test, permit, sequence 10
     Match clauses:
       ip address prefix-lists: orange
         Set clauses:
           set metric 50
```

7.3.19 clear ip prefix-list

To reset IP prefix-list counters, use the clear ip prefix-list command in Privileged EXEC mode. This command is used to clear prefix-list hit counters. The hit count is a value indicating the number of matches to a specific prefix list entry.

Format	clear ip prefix-list [[*prefix-list-name*] [*network/length*]]
Mode	Privileged EXEC

Parameter	Description
prefix-list-name	(Optional) Name of the prefix list from which the hit count is to be cleared.
network/length	(Optional) Network number and length (in bits) of the network mask. If this option is specified, hit counters are only cleared for the matching statement.

Example: The following shows an example of the command.

```
(Routing) # clear ip prefix-list orange 20.0.0.0/8
```

7.3.20 clear ipv6 prefix-list

Use this command to reset and clear IPv6 prefix-list hit counters. The hit count is a value indicating the number of matches to a specific prefix list entry.

Format	clear ipv6 prefix-list [*prefix-list-name*] [ipv6-prefix/*prefix-length*]
Mode	Privileged EXEC

Parameter	Description
list-name	(Optional) Name of the prefix list from which the hit count is to be cleared.
ipv6-prefix/prefix-length	(Optional) IPv6 prefix number and length (in bits) of the network mask. If this option is specified, hit counters are only cleared for the matching statement.

7.4 Router Discovery Protocol Commands

This section describes the commands you use to view and configure Router Discovery Protocol settings on the switch. The Router Discovery Protocol enables a host to discover the IP address of routers on the subnet.

7.4.1 ip irdp

This command enables Router Discovery on an interface or range of interfaces.

Default	disabled
Format	`ip irdp`
Mode	Interface Config

7.4.1.1 no ip irdp

This command disables Router Discovery on an interface.

Format	`no ip irdp`
Mode	Interface Config

7.4.2 ip irdp address

This command configures the address that the interface uses to send the router discovery advertisements. The valid values for ***ipaddr*** are 224.0.0.1, which is the all-hosts IP multicast address, and 255.255.255.255, which is the limited broadcast address.

Default	224.0.0.1
Format	`ip irdp address` *`ipaddr`*
Mode	Interface Config

7.4.2.1 no ip irdp address

This command configures the default address used to advertise the router for the interface.

Format	`no ip irdp address`
Mode	Interface Config

7.4.3 ip irdp holdtime

This command configures the value, in seconds, of the holdtime field of the router advertisement sent from this interface. The holdtime range is the value of 4 to 9000 seconds.

Default	3 * maxinterval
Format	`ip irdp holdtime` *`4-9000`*
Mode	Interface Config

7.4.3.1 no ip irdp holdtime

This command configures the default value, in seconds, of the holdtime field of the router advertisement sent from this interface.

Format	`no ip irdp holdtime`
Mode	Interface Config

7.4.4 ip irdp maxadvertinterval

This command configures the maximum time, in seconds, allowed between sending router advertisements from the interface. The range for maxadvertinterval is 4 to 1800 seconds.

Default	600
Format	`ip irdp maxadvertinterval` *`4-1800`*
Mode	Interface Config

7.4.4.1 no ip irdp maxadvertinterval

This command configures the default maximum time, in seconds.

Format	`no ip irdp maxadvertinterval`
Mode	Interface Config

7.4.5 ip irdp minadvertinterval

This command configures the minimum time, in seconds, allowed between sending router advertisements from the interface. The range for minadvertinterval is 3–1800.

Default	0.75 * maxadvertinterval
Format	`ip irdp minadvertinterval` *`3-1800`*
Mode	Interface Config

7.4.5.1 no ip irdp minadvertinterval

This command sets the default minimum time to the default.

Format	`no ip irdp minadvertinterval`
Mode	Interface Config

7.4.6 ip irdp multicast

This command configures the destination IP address for router advertisements as 224.0.0.1, which is the default address. The *no* form of the command configures the IP address as 255.255.255.255 to instead send router advertisements to the limited broadcast address.

Format	`ip irdp multicast` *`ip address`*
Mode	Interface Config

7.4.6.1 no ip irdp multicast

By default, router advertisements are sent to 224.0.0.1. To instead send router advertisements to the limited broadcast address, 255.255.255.255, use the no form of this command.

Format	`no ip irdp multicast`
Mode	Interface Config

7.4.7 ip irdp preference

This command configures the preferability of the address as a default router address, relative to other router addresses on the same subnet.

Default	0
Format	`ip irdp preference` *`-2147483648 to 2147483647`*
Mode	Interface Config

7.4.7.1 no ip irdp preference

This command configures the default preferability of the address as a default router address, relative to other router addresses on the same subnet.

Format	`no ip irdp preference`
Mode	Interface Config

7.4.8 show ip irdp

This command displays the router discovery information for all interfaces, a specified interface, or specified VLAN. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format	`show ip irdp {slot/port|vlan 1-4093|all}`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface	The ***slot/port*** that corresponds to a physical routing interface or vlan routing interface.
vlan	Use this keyword to specify the VLAN ID of the routing VLAN directly instead of in a ***slot/port*** format.
Ad Mode	The advertise mode, which indicates whether router discovery is enabled or disabled on this interface.
Dest Address	The destination IP address for router advertisements.
Max Int	The maximum advertise interval, which is the maximum time, in seconds, allowed between sending router advertisements from the interface.
Min Int	The minimum advertise interval, which is the minimum time, in seconds, allowed between sending router advertisements from the interface.
Hold Time	The amount of time, in seconds, that a system should keep the router advertisement before discarding it.
Preference	The preference of the address as a default router address, relative to other router addresses on the same subnet.

7.5 Virtual LAN Routing Commands

This section describes the commands you use to view and configure VLAN routing and to view VLAN routing status information.

7.5.1 vlan routing

This command enables routing on a VLAN. The ***vlanid*** value has a range from 1 to 4093. The ***[interface ID]*** value has a range from 1 to 128. Typically, you will not supply the interface ID argument, and the system automatically selects the interface ID. However, if you specify an interface ID, the interface ID becomes the port number in the ***slot/port*** for the VLAN routing interface. If you select an interface ID that is already in use, the CLI displays an error message and does not create the VLAN interface. For products that use text-based configuration, including the interface ID in the vlan routing command for the text configuration ensures that the ***slot/port*** for the VLAN interface stays the same across a restart. Keeping the ***slot/port*** the same ensures that the correct interface configuration is applied to each interface when the system restarts.

Format	`vlan routing vlanid [interface ID]`
Mode	VLAN Config

7.5.1.1 no vlan routing

This command deletes routing on a VLAN.

Format `no vlan routing` *`vlanid`*

Mode VLAN Config

Example: Example 1 shows the command specifying a vlanid value. The interface ID argument is not used.

```
(Switch)(Vlan)#vlan 14
(Switch)(Vlan)#vlan routing 14 ?
<cr>                     Press enter to execute the command.
<1-24>                  Enter interface ID
```

Typically, you press <Enter> without supplying the Interface ID value; the system automatically selects the interface ID.

Example: In Example 2, the command specifies interface ID 51 for VLAN 14 interface. The interface ID becomes the port number in the *`slot/port`* for the VLAN routing interface. In this example, *`slot/port`* is 4/51 for VLAN 14 interface.

```
(Switch)(Vlan)#vlan 14 51
(Switch)(Vlan)#
(Switch)#show ip vlan
MAC Address used by Routing VLANs:   00:11:88:59:47:36

           Logical
VLAN ID   Interface        IP Address       Subnet Mask
-------  --------------  ---------------  ---------------
10       4/1             172.16.10.1      255.255.255.0
11       4/50            172.16.11.1      255.255.255.0
12       4/3             172.16.12.1      255.255.255.0
13       4/4             172.16.13.1      255.255.255.0
14       4/51            0.0.0.0          0.0.0.0  <--u/s/p is 4/51 for VLAN 14 interface
```

Example: In Example 3, you select an interface ID that is already in use. In this case, the CLI displays an error message and does not create the VLAN interface.

```
(Switch) #show ip vlan

MAC Address used by Routing VLANs:   00:11:88:59:47:36

           Logical
VLAN ID   Interface        IP Address       Subnet Mask
-------  --------------  ---------------  ---------------
10       4/1             172.16.10.1      255.255.255.0
11       4/50            172.16.11.1      255.255.255.0
12       4/3             172.16.12.1      255.255.255.0
13       4/4             172.16.13.1      255.255.255.0
14       4/51            0.0.0.0          0.0.0.0

(Switch)#config

(Switch)(Config)#exit

(Switch)#vlan database

(Switch)(Vlan)#vlan 15

(Switch)(Vlan)#vlan routing 15 1

Interface ID 1 is already assigned to another interface
```

Example: The show running configuration command always lists the interface ID for each routing VLAN, as shown in Example 4 below.

```
(Switch) #show running-config
!!Current Configuration:
!
!System Description "Trident 56846 Development System - 48xTenGig + 4 FortyGig , R.7.28.4, Linux
2.6.34.6"
!System Software Version "R.7.28.4"
!System Up Time          "0 days 8 hrs 38 mins 3 secs"
!Cut-through mode is configured as disabled
!Additional Packages    FASTPATH BGP-4,FASTPATH QOS,FASTPATH Multicast,FASTPATH IPv6,FASTPATH IPv6
Management,FASTPATH Metro,FASTPATH Routing,FASTPATH Data Center
!Current SNTP Synchronized Time: SNTP Client Mode Is Disabled
!
vlan database
exit

configure
no logging console
aaa authentication enable "enableNetList" none
line console
serial timeout 0
exit

line telnet
exit

line ssh
exit

!
router rip
exit
router ospf
exit
ipv6 router ospf
exit
exit
```

7.5.2 interface vlan

Use this command to enter Interface configuration mode for the specified VLAN. The vlan-id range is 1 to 4093.

Format	`interface vlan` *`vlan-id`*
Mode	Global Config

7.5.3 show ip vlan

This command displays the VLAN routing information for all VLANs with routing enabled.

Format	`show ip vlan`
Modes	• Privileged EXEC • User EXEC

Term	Definition
MAC Address used by Routing VLANs	The MAC Address associated with the internal bridge-router interface (IBRI). The same MAC Address is used by all VLAN routing interfaces. It will be displayed above the per-VLAN information.
VLAN ID	The identifier of the VLAN.

Term	Definition
Logical Interface	The logical *`slot/port`* associated with the VLAN routing interface.
IP Address	The IP address associated with this VLAN.
Subnet Mask	The subnet mask that is associated with this VLAN.

7.6 Virtual Router Redundancy Protocol Commands

This section describes the commands you use to view and configure Virtual Router Redundancy Protocol (VRRP) and to view VRRP status information. VRRP helps provide failover and load balancing when you configure two devices as a VRRP pair.

7.6.1 ip vrrp (Global Config)

Use this command in Global Config mode to enable the administrative mode of VRRP on the router. This command enables VRRP (v2 or v3, whichever version is the configured version) and makes it operational. For information about how to enable VRRPv3, see “fhrp version vrrp v3” on page 589.

Default	none
Format	`ip vrrp`
Mode	Global Config

7.6.1.1 no ip vrrp

Use this command in Global Config mode to disable the default administrative mode of VRRP on the router.

Format	`no ip vrrp`
Mode	Global Config

7.6.2 ip vrrp (Interface Config)

Use this command in Interface Config mode to create a virtual router associated with the interface or range of interfaces. The parameter ***`vrid`*** is the virtual router ID, which has an integer value range from 1 to 255.

Format	`ip vrrp` *`vrid`*
Mode	Interface Config

7.6.2.1 no ip vrrp

Use this command in Interface Config mode to delete the virtual router associated with the interface. The virtual Router ID, ***`vrid`***, is an integer value that ranges from 1 to 255.

Format	`no ip vrrp` *`vrid`*
Mode	Interface Config

7.6.3 ip vrrp mode

This command enables the virtual router configured on the specified interface. Enabling the status field starts a virtual router. The parameter ***`vrid`*** is the virtual router ID which has an integer value ranging from 1 to 255.

Default	disabled
Format	`ip vrrp` *`vrid`* `mode`
Mode	Interface Config

7.6.3.1 no ip vrrp mode

This command disables the virtual router configured on the specified interface. Disabling the status field stops a virtual router.

Format	`no ip vrrp` *`vrid`* `mode`
Mode	Interface Config

7.6.4 ip vrrp ip

This command sets the virtual router IP address value for an interface or range of interfaces. The value for ***ipaddr*** is the IP address which is to be configured on that interface for VRRP. The parameter ***vrid*** is the virtual router ID which has an integer value range from 1 to 255. You can use the optional *[secondary]* parameter to designate the IP address as a secondary IP address.

Default	none
Format	`ip vrrp` *`vrid`* `ip` *`ipaddr`* `[secondary]`
Mode	Interface Config

7.6.4.1 no ip vrrp ip

Use this command in Interface Config mode to delete a secondary IP address value from the interface. To delete the primary IP address, you must delete the virtual router on the interface.

Format	`no ip vrrp` *`vrid`* *`ipaddress`* `secondary`
Mode	Interface Config

7.6.5 ip vrrp accept-mode

Use this command to allow the VRRP Master to accept ping packets sent to one of the virtual router's IP addresses.

NOTICE VRRP accept-mode allows only ICMP Echo Request packets. No other type of packet is allowed to be delivered to a VRRP address.

Default	disabled
Format	`ip vrrp` *`vrid`* `accept-mode`
Mode	Interface Config

7.6.5.1 no ip vrrp accept-mode

Use this command to prevent the VRRP Master from accepting ping packets sent to one of the virtual router's IP addresses.

Format `no ip vrrp vrid accept-mode`

Mode Interface Config

7.6.6 ip vrrp authentication

This command sets the authorization details value for the virtual router configured on a specified interface or range of interfaces. The parameter ***{none | simple}*** specifies the authorization type for virtual router configured on the specified interface. The parameter ***[key]*** is optional, it is only required when authorization type is simple text password. The parameter ***vrid*** is the virtual router ID which has an integer value ranges from 1 to 255.

Default no authorization

Format `ip vrrp vrid authentication {none | simple key}`

Mode
- Interface Config

7.6.6.1 no ip vrrp authentication

This command sets the default authorization details value for the virtual router configured on a specified interface or range of interfaces.

Format `no ip vrrp vrid authentication`

Mode
- Interface Config

7.6.7 ip vrrp preempt

This command sets the preemption mode value for the virtual router configured on a specified interface or range of interfaces. The parameter ***vrid*** is the virtual router ID, which is an integer from 1 to 255.

Default enabled

Format `ip vrrp vrid preempt`

Mode
- Interface Config

7.6.7.1 no ip vrrp preempt

This command sets the default preemption mode value for the virtual router configured on a specified interface or range of interfaces.

Format `no ip vrrp vrid preempt`

Mode
- Interface Config

7.6.8 ip vrrp priority

This command sets the priority of a router within a VRRP group. It can be used to configure an interface or a range of interfaces. Higher values equal higher priority. The range is from 1 to 254. The parameter ***vrid*** is the virtual router ID, whose range is from 1 to 255.

The router with the highest priority is elected master. If a router is configured with the address used as the address of the virtual router, the router is called the "address owner." The priority of the address owner is always 255 so that the address owner is always master. If the master has a priority less than 255 (it is not the address owner) and you configure the priority of another router in the group higher than the master's priority, the router will take over as master only if preempt mode is enabled.

Default	100 unless the router is the address owner, in which case its priority is automatically set to 255.
Format	`ip vrrp` *`vrid`* `priority` *`1-254`*
Mode	• Interface Config

7.6.8.1 no ip vrrp priority

This command sets the default priority value for the virtual router configured on a specified interface or range of interfaces.

Format	`no ip vrrp` *`vrid`* `priority`
Mode	Interface Config

7.6.9 ip vrrp timers advertise

This command sets the frequency, in seconds, that an interface or range of interfaces on the specified virtual router sends a virtual router advertisement.

Default	1
Format	`ip vrrp` *`vrid`* `timers advertise` *`1-255`*
Mode	Interface Config

7.6.9.1 no ip vrrp timers advertise

This command sets the default virtual router advertisement value for an interface or range of interfaces.

Format	`no ip vrrp` *`vrid`* `timers advertise`
Mode	Interface Config

7.6.10 ip vrrp track interface

Use this command to alter the priority of the VRRP router based on the availability of its interfaces. This command is useful for tracking interfaces that are not configured for VRRP. Only IP interfaces are tracked. A tracked interface is up if the IP on that interface is up. Otherwise, the tracked interface is down. You can use this command to configure a single interface or range of interfaces. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

When the tracked interface is down or the interface has been removed from the router, the priority of the VRRP router will be decremented by the value specified in the ***priority*** argument. When the interface is up for IP protocol, the priority will be incremented by the ***priority*** value.

A VRRP configured interface can track more than one interface. When a tracked interface goes down, then the priority of the router will be decreased by 10 (the default priority decrement) for each downed interface. The default priority decrement is changed using the ***priority*** argument. The default priority of the virtual router is 100, and the default decrement priority is 10. By default, no interfaces are tracked. If you specify just the interface to be tracked, without giving the optional priority, then the default priority will be set. The default priority decrement is 10.

Default	priority: 10
Format	`ip vrrp` *`vrid`* `track interface {`*`slot/port`*`|vlan` *`1-4093`*`} [decrement` *`priority]`*
Mode	Interface Config

7.6.10.1 no ip vrrp track interface

Use this command to remove the interface or range of interfaces from the tracked list or to restore the priority decrement to its default.

Format	`no ip vrrp` *`vrid`* `track interface {`*`slot/port`*`|vlan` *`1-4093`*`} [decrement]`
Mode	Interface Config

7.6.11 ip vrrp track ip route

Use this command to track the route reachability on an interface or range of interfaces. When the tracked route is deleted, the priority of the VRRP router will be decremented by the value specified in the ***priority*** argument. When the tracked route is added, the priority will be incremented by the same.

A VRRP configured interface can track more than one route. When a tracked route goes down, then the priority of the router will be decreased by 10 (the default priority decrement) for each downed route. By default no routes are tracked. If you specify just the route to be tracked, without giving the optional priority, then the default priority will be set. The default priority decrement is 10. The default priority decrement is changed using the ***priority*** argument.

Default	priority: 10
Format	`ip vrrp` *`vrid`* `track ip route` *`ip-address/prefix-length`* `[decrement` *`priority`*`]`
Mode	Interface Config

7.6.11.1 no ip vrrp track ip route

Use this command to remove the route from the tracked list or to restore the priority decrement to its default. When removing a tracked IP route from the tracked list, the priority should be incremented by the decrement value if the route is not reachable.

Format	`no ip vrrp` *`vrid`* `track interface` *`slot/port`* `[decrement]`
Mode	Interface Config

7.6.12 show ip vrrp interface stats

This command displays the statistical information about each virtual router configured on the switch. The argument *`slot/port`* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format	`show ip vrrp interface stats {`*`slot/port`*`|vlan` *`1-4093`*`}` *`vrid`*
Modes	• Privileged EXEC • User EXEC

Term	Definition
Uptime	The time that the virtual router has been up, in days, hours, minutes and seconds.
Protocol	The protocol configured on the interface.
State Transitioned to Master	The total number of times virtual router state has changed to MASTER.

Term	Definition
Advertisement Received	The total number of VRRP advertisements received by this virtual router.
Advertisement Interval Errors	The total number of VRRP advertisements received for which advertisement interval is different than the configured value for this virtual router.
Authentication Failure	The total number of VRRP packets received that don't pass the authentication check.
IP TTL errors	The total number of VRRP packets received by the virtual router with IP TTL (time to live) not equal to 255.
Zero Priority Packets Received	The total number of VRRP packets received by virtual router with a priority of '0'.
Zero Priority Packets Sent	The total number of VRRP packets sent by the virtual router with a priority of '0'.
Invalid Type Packets Received	The total number of VRRP packets received by the virtual router with invalid 'type' field.
Address List Errors	The total number of VRRP packets received for which address list does not match the locally configured list for the virtual router.
Invalid Authentication Type	The total number of VRRP packets received with unknown authentication type.
Authentication Type Mismatch	The total number of VRRP advertisements received for which 'auth type' not equal to locally configured one for this virtual router.
Packet Length Errors	The total number of VRRP packets received with packet length less than length of VRRP header.

7.6.13 show ip vrrp

This command displays whether VRRP functionality is enabled or disabled on the switch. It also displays some global parameters which are required for monitoring. This command takes no options.

Format `show ip vrrp`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
VRRP Admin Mode	The administrative mode for VRRP functionality on the switch.
Router Checksum Errors	The total number of VRRP packets received with an invalid VRRP checksum value.
Router Version Errors	The total number of VRRP packets received with Unknown or unsupported version number.
Router VRID Errors	The total number of VRRP packets received with invalid VRID for this virtual router.

7.6.14 show ip vrrp interface

This command displays all configuration information and VRRP router statistics of a virtual router configured on a specific interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is the VLAN ID of the routing VLAN instead of in a *slot/port* format. Use the output of the command to verify the track interface and track IP route configurations.

Format `show ip vrrp interface {slot/port|vlan 1-4093} vrid`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
IP Address	The configured IP address for the Virtual router.
VMAC address	The VMAC address of the specified router.
Authentication type	The authentication type for the specific virtual router.
Priority	The priority value for the specific virtual router, taking into account any priority decrements for tracked interfaces or routes.
Configured Priority	The priority configured through the `ip vrrp` ***`vrid`*** `priority` ***`1-254`*** command.
Advertisement interval	The advertisement interval in seconds for the specific virtual router.
Pre-Empt Mode	The preemption mode configured on the specified virtual router.
Administrative Mode	The status (Enable or Disable) of the specific router.
Accept Mode	When enabled, the VRRP Master can accept ping packets sent to one of the virtual router's IP addresses.
State	The state (Master/backup) of the virtual router.

Example: The following shows example CLI display output for the command.

```
show ip vrrp interface <u/s/p> vrid

Primary IP Address............................. 1.1.1.5
VMAC Address................................... 00:00:5e:00:01:01
Authentication Type............................ None
Priority....................................... 80
  Configured priority.......................... 100
Advertisement Interval (secs).................. 1
Pre-empt Mode.................................. Enable
Administrative Mode............................ Enable
Accept Mode.................................... Enable
State.......................................... Initialized
Track Interface          State         DecrementPriority
---------------         ------         ------------------

<0/1>                  down                10
TrackRoute   (pfx/len)        State          DecrementPriority
------------------------   ------          ------------------
10.10.10.1/255.255.255.0    down                10
```

7.6.15 show ip vrrp interface brief

This command displays information about each virtual router configured on the switch. This command takes no options. It displays information about each virtual router.

Format	`show ip vrrp interface brief`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface	*slot/port*
VRID	The router ID of the virtual router.
IP Address	The virtual router IP address.
Mode	Indicates whether the virtual router is enabled or disabled.
State	The state (Master/backup) of the virtual router.

7.7 VRRPv3 Commands

VRRPv3 provides address redundancy for both IPv4 and IPv6 router addresses. VRRPv3 support in FASTPATH is similar to VRRP support. The following table provides a summary of the differences.

VRRPv2	VRRPv3
Supports redundancy to IPv4 addresses	Supports redundancy to IPv4 and IPv6 addresses
Supports authentication	Does not support authentication
No concept of link-local address in IPv4 address space	For IPv6 addresses, VRRP IP contains the link-local IPv6 address too.
The interval time used for sending VRRP Advertisement packets is in seconds.	The interval time is in the order of centiseconds.
VRRP MAC address format is 00-00-5E-00-01-{VRID}	VRRP MAC address format for IPv6 VR IP is 00-00-5E-00-02-{VRID}
SNMP MIB RFC according to 2787. The counters are 32-bit ones.	SNMP MIB RFC as per RFC 6527. The counters are 64-bit ones.

NOTICE To enable VRRP on the device, use the `ip vrrp` command. See “ip vrrp (Global Config)” on page 582). This command enables VRRP (v2 or v3, whichever version is the configured version) and makes it operational.

NOTICE A command is available to configure debugging for VRRP packets. For information, see “debug ip vrrp” on page 228

7.7.1 fhrp version vrrp v3

To enable Virtual Router Redundancy Protocol version 3 (VRRPv3) configuration on a device, use the `fhrp version vrrp v3` command in global configuration mode.

When VRRPv3 is in use, VRRP version 2 (VRRPv2) is unavailable. If you invoke `no fhrp version vrrp v3`, VRRPv3 is disabled and VRRPv2 is enabled. Also, operational data is reset, and the VRRPv2 configuration is applied. The same guidelines apply when VRRPv2 is in use and the `no ip vrrp` command is issued.

Defaults	Disabled
Format	`fhrp version vrrp v3`
Mode	Global Config

7.7.2 no fhrp version vrrp v3

Use this command to disable the VRRPv3 and enable VRRPv2 on the device.

Format	`no fhrp version vrrp v3`
Mode	Global Config

7.7.3 snmp-server enable traps vrrp

Use this command to enable the two SNMP traps defined in the VRRPv2 and VRRPv3 MIB standards.

Defaults	Enabled
Format	`snmp-server enable traps vrrp`
Mode	Global Config

7.7.3.1 no snmp-server enable traps vrrp

Use this command to disable the two SNMP traps defined in the VRRPv2 and VRRPv3 MIB standards.

Defaults	Enabled
Format	`no snmp-server enable traps vrrp`
Mode	Global Config

7.7.4 vrrp

Use the `vrrp` command to create a VRRPv3 group and enter VRRPv3 group configuration mode.

Format	`vrrp` *`group-id`* `address-family {ipv4	ipv6}`
Mode	Interface Config

Parameter	Description
group-id	Virtual router group number. The range is from 1 to 255.
address-family	Specifies the address-family for this VRRP group.
ipv4	(Optional) Specifies IPv4 address.
ipv6	(Optional) Specifies IPv6 address.

7.7.4.1 no vrrp

Use the `no vrrp` command to remove the specified VRRPv3 group. Before you can use this command, you must disable Virtual Router using the `shutdown` command in the appropriate VRRP Config mode.

Format	`no vrrp` *`group-id`* `address-family {ipv4	ipv6}`
Mode	Interface Config

7.7.5 preempt

Use this command to configure the device to take over as master virtual router for a VRRP group if it has higher priority than the current master virtual route

Default	Enabled with default delay value of 0
Format	`preempt [delay minimum` *`centiseconds`*`]`
Mode	VRRPv3 Config

Parameter	Description
delay minimum	Number of seconds that the device will delay before issuing an advertisement claiming master ownership. The default delay is 0 centiseconds. The valid range is 0–3600 centiseconds.

7.7.5.1 no preempt

Use this command to prevent device from taking over as master virtual router for a VRRP group if it has higher priority than the current master virtual route.

Format	`no preempt [delay minimum` *`centiseconds`*`]`
Mode	VRRPv3 Config

7.7.6 accept-mode

Use this command to control whether a virtual router in master state will accept packets addressed to the address owner's virtual IP address as its own if it is not the virtual IP address owner.

Default	Disabled
Format	`accept-mode`
Mode	VRRPv3 Config

7.7.6.1 no accept-mode

Use this command to reset the accept mode to the default value.

Format	`no accept-mode`
Mode	VRRPv3 Config

7.7.7 priority

Use this command to set the priority level of the device within a VRRPv3 group. The priority level controls which device becomes the master virtual router.

Default	100
Format	`priority` *`level`*
Mode	VRRPv3 Config

Parameter	Description
level	Priority of the device within the VRRP group. The range is from 1 to 254. The default is 100.

7.7.7.1 no priority

Use this command to reset the priority level of the device to the default value.

Format	`priority`
Mode	VRRPv3 Config

7.7.8 timers advertise

Use this command to configure the interval between successive advertisements by the master virtual router in a VRRP group. To restore the default value, use the no form of this command.

The advertisements being sent by the master virtual router communicate the advertisement interval, state, and priority of the current master virtual router. The VRRP `timers advertise` command configures the time between successive advertisement packets and the time before other routers declare the master router to be down. VRRP backup routers learn timer values from the master router advertisements. The timers configured on the master router always override any other timer settings that are used for calculating the master down time interval on VRRP backup routers.

Default	100
Format	`timers advertise` *centiseconds*
Mode	VRRPv3 Config

Parameter	Description
centiseconds	Time interval between successive advertisements by the master virtual router. The unit of the interval is in centiseconds. The valid range is 1 to 4095 centiseconds.

7.7.8.1 no timers advertise

Use this command to reset the advertisement interval of the device to the default value.

Format	`no timers advertise`
Mode	VRRPv3 Config

7.7.9 shutdown

Use the **shutdown** command to disable the VRRP group configuration.

Format	`shutdown`
Mode	VRRPv3 Config

7.7.9.1 no shutdown

Enter the no shutdown command to update the virtual router state after completing configuration.

Format	`no shutdown`
Mode	VRRPv3 Config

7.7.10 address

Use this command to set the primary or secondary IP address of the device within a VRRPv3 group. To remove the secondary address, use the no form of this command.

If the primary or secondary option is not specified, the specified IP address is set as the primary. The Virtual IPv6 primary address should be a link-local address only. When a global IPv6 address is given as a primary address for the VRRP IP then the config fails with the following error message – "Error! Primary virtual IPv6 address should be a link-local address only." Also the removing of the primary virtual IP (IPv4 or IPv6) is not allowed. The primary virtual IP of a virtual router can only be modified. The secondary virtual IP can be removed using the no form of the this command. Also, VRRPv3 for IPv6 requires that a primary virtual link-local IPv6 address is configured to allow the group to operate. After the primary link-local IPv6 address is established on the group, you can add the secondary global addresses.

Format	`address` *ip-address* `[primary	secondary]`
Mode	VRRPv3 Config

Parameter	Description
ip-address	IPv4 or IPv6 address, it can be specified in one of the following format: *ipv4-address*, *ipv6-link-local-address*, *ipv6-address>/<prefix-len*.
primary	(Optional) Set primary IP address of the VRRPv3 group.
secondary	(Optional) Set additional IP address of the VRRPv3 group.

7.7.10.1 no address

Use this command to remove the configured secondary IP or IPv6 address. The primary address can only be modified, not removed.

Format	`no address` *`ip-address`* `secondary`
Mode	VRRPv3 Config

7.7.11 track interface

Use this command to configure tracking of the interface for the device within a VRRPv3 group. Once interface tracking is configured, the VRRPv3 feature receives notifications when the interface changes state. The `decrement` option can be set to decrease the priority of the device within a VRRPv3 group by the specified value when the interface goes down.

Default	Enabled
Format	`track interface {`*`slot/port`*` | vlan `*`vlan-id`*`} [decrement `*`number`*`]`
Mode	VRRPv3 Config

Parameter	Description
slot/port	The interface to track.
vlan-id	The VLAN to track.
decrement number	(Optional) Specify the VRRP priority decrement for the tracked object. The number is the amount by which priority is decremented. The range is 1–254.

7.7.11.1 no track interface

Use this command to disable tracking of the interface for the device within a VRRPv3 group.

Default	Enabled
Format	`track interface {`*`slot/port`*` | vlan `*`vlan-id`*`} [decrement `*`number`*`]`
Mode	VRRPv3 Config

7.7.12 track ip route

Use this command to configure tracking of the IP route for the device within a Virtual Router Redundancy Protocol (VRRPv3) group. Once IP route tracking is configured, the VRRPv3 feature receives notifications when IP route changes state. The decrement option can be set to decrease the priority of the device within a VRRPv3 group by the specified value when the route becomes unavailable.

Default	Disabled
Format	`track ip route `*`ip-address/prefix-len`*` [decrement `*`number`*`]`
Mode	VRRPv3 Config

Parameter	Description
ip-address/prefix-len	Prefix and prefix length of the route to be tracked.
decrement number	(Optional) Specify the VRRP priority decrement for the tracked route. The number is the amount by which priority is decremented. The range is 1–254.

7.7.12.1 no track ip route

Use this command to disable object tracking.

Format `no track ip route ip-address/prefix-len [decrement number]`

Mode VRRPv3 Config

7.7.13 clear vrrp statistics

Use this command to clear VRRP statistical information for given interface of the device within a VRRPv3 group and IP address family. If this command is issued without the optional arguments then the global statistics and all virtual routers (both IPv4 and IPv6) are reset.

If the optional arguments are specified, the statistics are reset for the virtual router corresponding to the given (IP address family, interface and VR-id) combination.

Format `clear vrrp statistics [{ipv4| ipv6}  {slot/port | vlan vlan-id} vrid]`

Mode Privileged Exec

Parameter	Description
ipv4	(Optional) indicates the Virtual router group belongs to IPv4 address family.
ipv6	(Optional) indicates the Virtual router group belongs to IPv6 address family.
slot/port	(Optional) indicates the interface number to which the Virtual router belongs.
vlan-id	(Optional) indicates the VLAN number to which the Virtual router belongs.
vr-id	(Optional) Virtual router group number. The range is from 1 to 255.

7.7.14 show vrrp

This command displays information for all active VRRPv3 groups (no optional parameters), all active VRRPv3 groups configured in an IPv4 or IPv6 address family, or the active VRRPv3 groups configured in an IPv4 or IPv6 address family for the specified interface.

Format `show vrrp [{ipv4 | ipv6}] [{slot/port | vlan vlan-id} vr-id]`

Mode Privileged Exec

Parameter	Description
ipv4	(Optional) indicates the Virtual router group belongs to IPv4 address family.
ipv6	(Optional) indicates the Virtual router group belongs to IPv6 address family.
slot/port	(Optional) indicates the interface number to which the Virtual router belongs.
vlan-id	(Optional) indicates the VLAN number to which the Virtual router belongs.
vr-id	(Optional) Virtual router group number. The range is from 1 to 255.

Example: This example shows command output when no parameters are specified.

```
(Routing)#show vrrp

Admin Mode..................................... Enable


1/0/2 - VRID 1 - Address-Family IPv4

Virtual IP address............................ 1.1.1.9
Secondary IP Address(es)...................... 1.1.1.4
.............................................. 1.1.1.5
.............................................. 1.1.1.6
Virtual MAC Address........................... 00:00:5e:00:01:01
Priority...................................... 0
Configured Priority........................... 111
Advertisement Interval........................ 120 centisec
Pre-empt Mode................................. Enable
Accept Mode................................... Enable
Administrative Mode........................... Enable
State......................................... Initialized
Master Router IP / Priority................... 1.1.1.3 (local) / 100
Master Advertisement interval................. 120 centisec
Master Down interval.......................... 360 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/9           Down  222

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------   ---------  ------------------
14.14.14.0/24          True       14


1/0/3 - VRID 2 - Address-Family IPv4

Virtual IP address............................ 3.3.2.9
Secondary IP Address(es)...................... 3.3.2.4
.............................................. 3.3.2.5
.............................................. 3.3.2.6
Virtual MAC Address........................... 00:00:5e:00:01:06
Priority...................................... 0
Configured Priority........................... 130
Advertisement Interval........................ 120 centisec
Pre-empt Mode................................. Enable
Accept Mode................................... Enable
Administrative Mode........................... Enable
State......................................... Initialized
Master Router IP / Priority................... 1.1.1.3 (local) / 100
Master Advertisement interval................. 120 centisec
Master Down interval.......................... 360 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/7           Down  125

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------   ---------  ------------------
14.14.14.0/24          True       30


1/0/12 - VRID 3 - Address-Family IPv6

Virtual IP address............................ 4001::2
Secondary IP Address(es)...................... 4001::5
```

```
............................................... 4001::6
............................................... 4001::7
Virtual MAC Address............................ 00:00:5e:00:01:06
Priority....................................... 0
Configured Priority............................ 130
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 4001::3 (local) / 100
Master Advertisement interval.................. 120 centisec
Master Down interval........................... 360 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/2           Down  250

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------   ---------  ------------------
4004::3/32             True       20
```

Example: This example shows command output when the IPv4 parameter is specified.

```
(Routing)#show vrrp ipv4

Admin Mode..................................... Enable

1/0/2 - VRID 1 - Address-Family IPv4

Virtual IP address............................. 1.1.1.9
Secondary IP Address(es)....................... 1.1.1.4
............................................... 1.1.1.5
............................................... 1.1.1.6
Virtual MAC Address............................ 00:00:5e:00:01:01
Priority....................................... 0
Configured Priority............................ 111
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1.1.1.3 (local) / 100
Master Advertisement interval.................. 120 centisec
Master Down interval........................... 360 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/9           Down  222

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------   ---------  ------------------
14.14.14.0/24          True       14


1/0/3 - VRID 2 - Address-Family IPv4

Virtual IP address............................. 3.3.2.9
Secondary IP Address(es)....................... 3.3.2.4
............................................... 3.3.2.5
............................................... 3.3.2.6
Virtual MAC Address............................ 00:00:5e:00:01:06
Priority....................................... 0
Configured Priority............................ 130
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
```

```
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1.1.1.3 (local) / 100
Master Advertisement interval.................. 120 centisecsec
Master Down interval........................... 360

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/7           Down  125

Track Route(pfx/len)   Reachable  DecrementPriority
---------------------  ---------  ------------------
14.14.14.0/24          True       30
```

Example: This example shows command output when the IPv6 parameter is specified.

```
(Routing)#show vrrp ipv6

Admin Mode..................................... Enable


1/0/2 - VRID 1 - Address-Family IPv6

Virtual IP address............................. 1001::8
Secondary IP Address(es)....................... 1001::5
............................................... 1001::6
............................................... 1001::7
Virtual MAC Address............................ 00:00:5e:00:01:01
Priority....................................... 0
Configured Priority............................ 100
Advertisement Interval......................... 100 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1001::1 (local) / 100
Master Advertisement interval.................. 100 centisec
Master Down interval........................... 300 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/9           Down  222

Track Route(pfx/len)   Reachable  DecrementPriority
---------------------  ---------  ------------------
2001::2/32             True       14


1/0/12 - VRID 3 - Address-Family IPv6

Virtual IP address............................. 4001::2
Secondary IP Address(es)....................... 4001::5
............................................... 4001::6
............................................... 4001::7
Virtual MAC Address............................ 00:00:5e:00:01:06
Priority....................................... 130
Configured Priority............................ 130
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Master
Master Router IP / Priority.................... 4001::3 (local) / 130
Master Advertisement interval.................. 120 centisec
Master Down interval.......................... 360 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/24          Down  320

Track Route(pfx/len)   Reachable  DecrementPriority
---------------------  ---------  ------------------
7003::4/32             True       50
```

Example:

```
(Routing)#show vrrp ipv4 1/0/3 1

Virtual IP address............................ 1.1.1.9
Secondary IP Address(es)...................... 1.1.1.4
.............................................. 1.1.1.5
.............................................. 1.1.1.6
Virtual MAC Address........................... 00:00:5e:00:01:01
Priority...................................... 0
Configured Priority........................... 111
Advertisement Interval........................ 222 centisec
Pre-empt Mode................................. Enable
Accept Mode................................... Enable
Administrative Mode........................... Enable
State......................................... Initialized
Master Router IP / Priority................... 1.1.1.3 (local) / 100
Master Advertisement interval................. 1000 centisec
Master Down interval.......................... 3000 centisec


Track Interface State Decrement-Priority
--------------- ----- ------------------
0/9             Down  222

Track Route(pfx/len)   Reachable  Decrement-Priority
---------------------  ---------  ------------------
14.14.14.0/24          True       14
```

7.7.15 show vrrp brief

This command displays brief information for all active VRRPv3 groups.

Format	`show vrrp brief`
Mode	Privileged Exec

Field	Description
Interface	Interface on which VRRP is configured.
VR	ID of the virtual router.
A-F	IP address family type (IPv4 or Ipv6) this Virtual Router belongs to.
Pri	Priority range of the virtual router.
AdvIntvl	Advertisement interval configured for this virtual router.
Pre	Preemption state of the virtual router.
Acc	Accept Mode of the virtual router.
State	VRRP group state. The state can be one of the following: Init, Backup, Master
VR IP address	Virtual IP address for a VRRP group.

Example:

```
(Routing)#show vrrp brief

Interface   VRID A-F  Pri AdvIntvl Pre Acc State  VR IP Address
----------- ---- ---- --- -------- --- --- ------ -------------
0/1         1    IPv4 100 200s      Y   Y  Init   192.0.1.10
0/3         2    IPv4 200 200s      Y   Y  Init   124.0.3.17
0/1         7    IPv6 100 200s      Y   Y  Backup 5002::1
0/5         2    IPV6 20  200s      Y   Y  Master 2001::2
```

7.7.16 show vrrp statistics

This command displays statistical information for a given VRRPv3 group or displays the global statistics. If this command is issued without the optional arguments then the global statistics are displayed.

If the optional arguments are specified, the statistics are displayed for the virtual router corresponding to the given (IP address family, interface and VR-id) combination.

Format	`show vrrp statistics [{ipv4| ipv6} {`*`slot/port`*`	vlan `*`vlan-id`*`} `*`vrid`*`]`
Mode	Privileged Exec

Parameter	Description
ipv4	(Optional) indicates the Virtual router group belongs to IPv4 address family.
ipv6	(Optional) indicates the Virtual router group belongs to IPv6 address family.
slot/port	(Optional) indicates the interface number to which the Virtual router belongs.
vlan-id	(Optional) indicates the VLAN number to which the Virtual router belongs.
vr-id	(Optional) Virtual router group number. The range is from 1 to 255.

Example:

```
(Routing)#show vrrp statistics ipv6 1/0/1 2

Master Transitions............................ 2
New Master Reason............................. Priority
Advertisements Received....................... 64
Advertisements Sent........................... 12
Advertisement Interval Errors................. 0
IP TTL Errors................................. 1
Last Protocol Error Reason.................... Version Error
Zero Priority Packets Received................ 0
Zero Priority Packets Sent.................... 1
Invalid Type Packets Received................. 0
Address List Errors........................... 2
Packet Length Errors.......................... 4
Row Discontinuity Time........................ 0 days 0 hrs 0 mins 0 secs
Refresh Rate (in milliseconds)................ 0


(Routing)#show vrrp statistics

Router Checksum Errors........................ 2
Router Version Errors......................... 3
Router VRID Errors............................ 4
Global Statistics Discontinuity Time.......... 0 days 0 hrs 0 mins 0 secs
```

7.8 DHCP and BOOTP Relay Commands

This section describes the commands you use to configure BootP/DHCP Relay on the switch. A DHCP relay agent operates at Layer 3 and forwards DHCP requests and replies between clients and servers when they are not on the same physical subnet.

7.8.1 bootpdhcprelay cidoptmode

This command enables the circuit ID option mode for BootP/DHCP Relay on the system.

Default	disabled
Format	`bootpdhcprelay cidoptmode`
Mode	• Global Config • Virtual Router Config

7.8.1.1 no bootpdhcprelay cidoptmode

This command disables the circuit ID option mode for BootP/DHCP Relay on the system.

Format	`no bootpdhcprelay cidoptmode`
Mode	• Global Config • Virtual Router Config

7.8.2 bootpdhcprelay maxhopcount

This command configures the maximum allowable relay agent hops for BootP/DHCP Relay on the system. The ***hops*** parameter has a range of 1 to 16.

Default	4
Format	`bootpdhcprelay maxhopcount` ***1-16***
Mode	• Global Config • Virtual Router Config

7.8.2.1 no bootpdhcprelay maxhopcount

This command configures the default maximum allowable relay agent hops for BootP/DHCP Relay on the system.

Format	`no bootpdhcprelay maxhopcount`
Mode	• Global Config • Virtual Router Config

7.8.3 bootpdhcprelay minwaittime

This command configures the minimum wait time in seconds for BootP/DHCP Relay on the system. When the BOOTP relay agent receives a BOOTREQUEST message, it MAY use the seconds-since-client-began-booting field of the request as a factor in deciding whether to relay the request or not. The parameter has a range of 0 to 100 seconds.

Default	0
Format	`bootpdhcprelay minwaittime` ***0-100***
Mode	• Global Config • Virtual Router Config

7.8.3.1 no bootpdhcprelay minwaittime

This command configures the default minimum wait time in seconds for BootP/DHCP Relay on the system.

Format `no bootpdhcprelay minwaittime`

Mode
- Global Config
- Virtual Router Config

7.8.4 bootpdhcprelay serverip

This command configures the server IP address of the BootP/DHCP Relay on the system. The *ipaddr* parameter is the IP address of the server.

Default `0.0.0.0`

Format `bootpdhcprelay serverip` *`ipaddr`*

Mode Global Config

7.8.4.1 no bootpdhcprelay serverip

This command returns the server IP address of the BootP/DHCP Relay on the system to the default value of 0.0.0.0.

Format `no bootpdhcprelay serverip`

Mode Global Config

7.8.5 bootpdhcprelay enable

Use this command to enable the relay of DHCP packets.

Default `disabled`

Format `bootpdhcprelay enable`

Mode Global Config

7.8.5.1 no bootpdhcprelay enable

Use this command to disable the relay of DHCP packets.

Default `disabled`

Format `no bootpdhcprelay enable`

Mode Global Config

7.8.6 show bootpdhcprelay

This command displays the BootP/DHCP Relay information .

Format `show bootpdhcprelay`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Maximum Hop Count	The maximum allowable relay agent hops.
Minimum Wait Time (Seconds)	The minimum wait time.
Admin Mode	Indicates whether relaying of requests is enabled or disabled.

Term	Definition
Circuit Id Option Mode	The DHCP circuit Id option which may be enabled or disabled.

7.8.7 show ip bootpdhcprelay

This command displays BootP/DHCP Relay information.

Format `show ip bootpdhcprelay`

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Maximum Hop Count	The maximum allowable relay agent hops.
Minimum Wait Time (Seconds)	The minimum wait time.
Admin Mode	Indicates whether relaying of requests is enabled or disabled.
Circuit Id Option Mode	The DHCP circuit Id option which may be enabled or disabled.

Example: The following shows an example of the command.

```
(Routing) >show ip bootpdhcprelay

Maximum Hop Count.............................. 4
Minimum Wait Time(Seconds)..................... 0
Admin Mode..................................... Disable
Circuit Id Option Mode......................... Enable
```

7.9 IP Helper Commands

This section describes the commands to configure and monitor the IP Helper agent. IP Helper relays DHCP and other broadcast UDP packets from a local client to one or more servers which are not on the same network at the client.

The IP Helper feature provides a mechanism that allows a router to forward certain configured UDP broadcast packets to a particular IP address. This allows various applications to reach servers on nonlocal subnets, even if the application was designed to assume a server is always on a local subnet and uses broadcast packets (with either the limited broadcast address 255.255.255.255, or a network directed broadcast address) to reach the server.

The network administrator can configure relay entries both globally and on routing interfaces. Each relay entry maps an ingress interface and destination UDP port number to a single IPv4 address (the helper address). The network administrator may configure multiple relay entries for the same interface and UDP port, in which case the relay agent relays matching packets to each server address. Interface configuration takes priority over global configuration. That is, if a packet's destination UDP port matches any entry on the ingress interface, the packet is handled according to the interface configuration. If the packet does not match any entry on the ingress interface, the packet is handled according to the global IP helper configuration.

The network administrator can configure discard relay entries, which direct the system to discard matching packets. Discard entries are used to discard packets received on a specific interface when those packets would otherwise be relayed according to a global relay entry. Discard relay entries may be configured on interfaces, but are not configured globally.

In addition to configuring the server addresses, the network administrator also configures which UDP ports are forwarded. Certain UDP port numbers can be specified by name in the UI as a convenience, but the network administrator can configure a relay entry with any UDP port number. The network administrator may configure relay entries that do not specify a destination UDP port. The relay agent relays assumes these entries match packets with the UDP destination ports listed in Table 10. This is the list of default ports.

Table 10: Default Ports - UDP Port Numbers Implied by Wildcard

Protocol	UDP Port Number
IEN-116 Name Service	42
DNS	53
NetBIOS Name Server	137
NetBIOS Datagram Server	138
TACACS Server	49
Time Service	37
DHCP	67
Trivial File Transfer Protocol (TFTP)	69

The system limits the number of relay entries to four times the maximum number of routing interfaces. The network administrator can allocate the relay entries as he likes. There is no limit to the number of relay entries on an individual interface, and no limit to the number of servers for a given {interface, UDP port} pair.

The relay agent relays DHCP packets in both directions. It relays broadcast packets from the client to one or more DHCP servers, and relays to the client packets that the DHCP server unicasts back to the relay agent. For other protocols, the relay agent only relays broadcast packets from the client to the server. Packets from the server back to the client are assumed to be unicast directly to the client. Because there is no relay in the return direction for protocols other than DHCP, the relay agent retains the source IP address from the original client packet. The relay agent uses a local IP address as the source IP address of relayed DHCP client packets.

When a switch receives a broadcast UDP packet on a routing interface, the relay agent checks if the interface is configured to relay the destination UDP port. If so, the relay agent unicasts the packet to the configured server IP addresses. Otherwise, the relay agent checks if there is a global configuration for the destination UDP port. If so, the relay agent unicasts the packet to the configured server IP addresses. Otherwise the packet is not relayed. Note that if the packet matches a discard relay entry on the ingress interface, then the packet is not forwarded, regardless of the global configuration.

The relay agent only relays packets that meet the following conditions:

- The destination MAC address must be the all-ones broadcast address (FF:FF:FF:FF:FF:FF)
- The destination IP address must be the limited broadcast address (255.255.255.255) or a directed broadcast address for the receive interface.
- The IP time-to-live (TTL) must be greater than 1.
- The protocol field in the IP header must be UDP (17).
- The destination UDP port must match a configured relay entry.

7.9.1 clear ip helper statistics

Use this command to reset to zero the statistics displayed in the `show ip helper statistics` command .

Format	`clear ip helper statistics`
Mode	Privileged EXEC

Example: The following shows an example of the command.

```
(switch) #clear ip helper statistics
```

7.9.2 ip helper-address (Global Config)

Use this command to configure the relay of certain UDP broadcast packets received on any interface. This command can be invoked multiple times, either to specify multiple server addresses for a given UDP port number or to specify multiple UDP port numbers handled by a specific server.

Default	`No helper addresses are configured.`
Format	`ip helper-address server-address [dest-udp-port | dhcp | domain | isakmp | mobile-ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]`
Mode	Global Config Virtual Router Config

Parameter	Description
server-address	The IPv4 unicast or directed broadcast address to which relayed UDP broadcast packets are sent. The server address cannot be an IP address configured on any interface of the local router.
dest-udp-port	A destination UDP port number from 0 to 65535.
port-name	The destination UDP port may be optionally specified by its name. Whether a port is specified by its number or its name has no effect on behavior. The names recognized are as follows: • dhcp (port 67) • domain (port 53) • isakmp (port 500) • mobile-ip (port 434) • nameserver (port 42) • netbios-dgm (port 138) • netbios-ns (port 137) • ntp (port 123) • pim-auto-rp (port 496) • rip (port 520) • tacacs (port 49) • tftp (port 69) • time (port 37) Other ports must be specified by number.

Example: To relay DHCP packets received on any interface to two DHCP servers, 10.1.1.1 and 10.1.2.1, use the following commands:

```
(switch)#config
(switch)(config)#ip helper-address 10.1.1.1 dhcp
(switch)(config)#ip helper-address 10.1.2.1 dhcp
```

Example: To relay UDP packets received on any interface for all default ports to the server at 20.1.1.1, use the following commands:

```
(switch)#config
(switch)(config)#ip helper-address 20.1.1.1
```

7.9.2.1 no ip helper-address (Global Config)

Use the `no` form of the command to delete an IP helper entry. The command `no ip helper-address` with no arguments clears all global IP helper addresses.

Format	`no ip helper-address [server-address [dest-udp-port | dhcp | domain | isakmp | mobile-ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]`
Mode	Global Config

7.9.3 ip helper-address (Interface Config)

Use this command to configure the relay of certain UDP broadcast packets received on a specific interface or range of interfaces. This command can be invoked multiple times on a routing interface, either to specify multiple server addresses for a given port number or to specify multiple port numbers handled by a specific server.

Default	`No helper addresses are configured.`
Format	`ip helper-address {server-address | discard} [dest-udp-port | dhcp | domain | isakmp | mobile ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]`
Mode	Interface Config

Parameter	Description
server-address	The IPv4 unicast or directed broadcast address to which relayed UDP broadcast packets are sent. The server address cannot be in a subnet on the interface where the relay entry is configured, and cannot be an IP address configured on any interface of the local router.
discard	Matching packets should be discarded rather than relayed, even if a global ip helper-address configuration matches the packet.
dest-udp-port	A destination UDP port number from 0 to 65535.
port-name	The destination UDP port may be optionally specified by its name. Whether a port is specified by its number or its name has no effect on behavior. The names recognized are as follows: • dhcp (port 67) • domain (port 53) • isakmp (port 500) • mobile-ip (port 434) • nameserver (port 42) • netbios-dgm (port 138) • netbios-ns (port 137) • ntp (port 123) • pim-auto-rp (port 496) • rip (port 520) • tacacs (port 49) • tftp (port 69) • time (port 37) Other ports must be specified by number.

Example: To relay DHCP packets received on interface 0/ 2 to two DHCP servers, 192.168.10.1 and 192.168.20.1, use the following commands:

```
(switch)#config
(switch)(config)#interface 0/2
(switch)(interface 0/2)#ip helper-address 192.168.10.1 dhcp
(switch)(interface 0/2)#ip helper-address 192.168.20.1 dhcp
```

Example: To relay both DHCP and DNS packets to 192.168.30.1, use the following commands:

```
(switch)#config
(switch)(config)#interface 0/2
(switch)(interface 0/2)#ip helper-address 192.168.30.1 dhcp
(switch)(interface 0/2)#ip helper-address 192.168.30.1 dns
```

Example: This command takes precedence over an ip helper-address command given in global configuration mode. With the following configuration, the relay agent relays DHCP packets received on any interface other than 0/2 and 0/17 to 192.168.40.1, relays DHCP and DNS packets received on 0/2 to 192.168.40.2, relays SNMP traps (port 162) received on interface 0/17 to 192.168.23.1, and drops DHCP packets received on 0/17:

```
(switch)#config
(switch)(config)#ip helper-address 192.168.40.1 dhcp
(switch)(config)#interface 0/2
(switch)(interface 0/2)#ip helper-address 192.168.40.2 dhcp
(switch)(interface 0/2)#ip helper-address 192.168.40.2 domain
(switch)(interface 0/2)#exit
(switch)(config)#interface 0/17
(switch)(interface 0/17)#ip helper-address 192.168.23.1 162
(switch)(interface 0/17)#ip helper-address discard dhcp
```

7.9.3.1 no ip helper-address (Interface Config)

Use this command to delete a relay entry on an interface. The `no` command with no arguments clears all helper addresses on the interface.

Format	`no ip helper-address [server-address | discard ][dest-udp-port | dhcp | domain | isakmp | mobile ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]`
Mode	Interface Config

7.9.4 ip helper enable

Use this command to enable relay of UDP packets. This command can be used to temporarily disable IP helper without deleting all IP helper addresses. This command replaces the `bootpdhcprelay enable` command, but affects not only relay of DHCP packets, but also relay of any other protocols for which an IP helper address has been configured.

Default	`disabled`
Format	`ip helper enable`
Mode	• Global Config • Virtual Router Config

Example: The following shows an example of the command.

```
(switch)(config)#ip helper enable
```

7.9.4.1 no ip helper enable

Use the no form of this command to disable relay of all UDP packets.

Format	`no ip helper enable`
Mode	Global Config

7.9.5 show ip helper-address

Use this command to display the IP helper address configuration. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format	`show ip helper-address [{slot/port|vlan 1-4093}]`
Mode	Privileged EXEC

Parameter	Description
interface	The relay configuration is applied to packets that arrive on this interface. This field is set to `any` for global IP helper entries.
UDP Port	The relay configuration is applied to packets whose destination UDP port is this port. Entries whose UDP port is identified as any are applied to packets with the destination UDP ports listed in Table 4.
Discard	If Yes, packets arriving on the given interface with the given destination UDP port are discarded rather than relayed. Discard entries are used to override global IP helper address entries which otherwise might apply to a packet.
Hit Count	The number of times the IP helper entry has been used to relay or discard a packet.
Server Address	The IPv4 address of the server to which packets are relayed.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip helper-address

IP helper is enabled

   Interface   UDP Port     Discard   Hit Count   Server Address
---------------  -----------  --------  ----------  ---------------
       0/1            dhcp        No          10      10.100.1.254
                                                      10.100.2.254
       0/17            any       Yes           2
           any        dhcp        No           0      10.200.1.254
```

7.9.6 show ip helper statistics

Use this command to display the number of DHCP and other UDP packets processed and relayed by the UDP relay agent

Format	`show ip helper statistics`
Mode	Privileged EXEC

Parameter	Description
DHCP client messages received	The number of valid messages received from a DHCP client. The count is only incremented if IP helper is enabled globally, the ingress routing interface is up, and the packet passes a number of validity checks, such as having a TTL>1 and having valid source and destination IP addresses.
DHCP client messages relayed	The number of DHCP client messages relayed to a server. If a message is relayed to multiple servers, the count is incremented once for each server.
DHCP server messages received	The number of DHCP responses received from the DHCP server. This count only includes messages that the DHCP server unicasts to the relay agent for relay to the client.
DHCP server messages relayed	The number of DHCP server messages relayed to a client.
UDP clients messages received	The number of valid UDP packets received. This count includes DHCP messages and all other protocols relayed. Conditions are similar to those for the first statistic in this table.

Parameter	Description
UDP clients messages relayed	The number of UDP packets relayed. This count includes DHCP messages relayed as well as all other protocols. The count is incremented for each server to which a packet is sent.
DHCP message hop count exceeded max	The number of DHCP client messages received whose hop count is larger than the maximum allowed. The maximum hop count is a configurable value listed in show bootpdhcprelay. A log message is written for each such failure. The DHCP relay agent does not relay these packets.
DHCP message with secs field below min	The number of DHCP client messages received whose secs field is less than the minimum value. The minimum secs value is a configurable value and is displayed in show bootpdhcprelay. A log message is written for each such failure. The DHCP relay agent does not relay these packets.
DHCP message with giaddr set to local address	The number of DHCP client messages received whose gateway address, giaddr, is already set to an IP address configured on one of the relay agent's own IP addresses. In this case, another device is attempting to spoof the relay agent's address. The relay agent does not relay such packets. A log message gives details for each occurrence.
Packets with expired TTL	The number of packets received with TTL of 0 or 1 that might otherwise have been relayed.
Packets that matched a discard entry	The number of packets ignored by the relay agent because they match a discard relay entry.

Example: The following shows example CLI display output for the command.

```
(switch)#show ip helper statistics

DHCP client messages received................. 8
DHCP client messages relayed.................. 2
DHCP server messages received................. 2
DHCP server messages relayed.................. 2
UDP client messages received.................. 8
UDP client messages relayed................... 2
DHCP message hop count exceeded max........... 0
DHCP message with secs field below min........ 0
DHCP message with giaddr set to local address.. 0
Packets with expired TTL...................... 0
Packets that matched a discard entry.......... 0
```

7.10 Open Shortest Path First Commands

This section describes the commands you use to view and configure Open Shortest Path First (OSPF), which is a link-state routing protocol that you use to route traffic within a network. This section contains the following subsections:

- "General OSPF Commands" on page 608
- "OSPF Interface Commands" on page 624
- "IP Event Dampening Commands" on page 629
- "OSPFv2 Stub Router Commands" on page 633
- "OSPF Show Commands" on page 634

General OSPF Commands

7.10.1 router ospf

Use this command to enter Router OSPF mode.

Format	`router ospf`
Mode	Global Config

7.10.2 enable (OSPF)

This command resets the default administrative mode of OSPF in the router (active).

Default	enabled
Format	`enable`
Mode	Router OSPF Config

7.10.2.1 no enable (OSPF)

This command sets the administrative mode of OSPF in the router to inactive.

Format	`no enable`
Mode	Router OSPF Config

7.10.3 network area (OSPF)

Use this command to enable OSPFv2 on an interface and set its area ID if the IP address of an interface is covered by this network command.

Default	disabled
Format	`network` *`ip-address wildcard-mask`* `area` *`area-id`*
Mode	Router OSPF Config

7.10.3.1 no network area (OSPF)

Use this command to disable the OSPFv2 on a interface if the IP address of an interface was earlier covered by this network command.

Format	`no network` *`ip-address wildcard-mask`* `area` *`area-id`*
Mode	Router OSPF Config

7.10.4 1583compatibility

This command enables OSPF 1583 compatibility.

NOTICE 1583 compatibility mode is enabled by default. If all OSPF routers in the routing domain are capable of operating according to RFC 2328, OSPF 1583 compatibility mode should be disabled.

Default	enabled
Format	`1583compatibility`
Mode	Router OSPF Config

7.10.4.1 no 1583compatibility

This command disables OSPF 1583 compatibility.

Format	`no 1583compatibility`
Mode	Router OSPF Config

7.10.5 area default-cost (OSPF)

This command configures the default cost for the stub area. You must specify the area ID and an integer value between 1-16777215.

Format	`area` *`areaid`* `default-cost` *`1-16777215`*
Mode	Router OSPF Config

7.10.6 area nssa (OSPF)

This command configures the specified areaid to function as an NSSA.

Format	`area` *`areaid`* `nssa`
Mode	Router OSPF Config

7.10.6.1 no area nssa

This command disables nssa from the specified area id.

Format	`no area` *`areaid`* `nssa`
Mode	Router OSPF Config

7.10.7 area nssa default-info-originate (OSPF)

This command configures the metric value and type for the default route advertised into the NSSA. The optional metric parameter specifies the metric of the default route and is to be in a range of 1-16777214. If no metric is specified, the default value is ****. The metric type can be comparable (nssa-external 1) or noncomparable (nssa-external 2).

Format	`area` *`areaid`* `nssa default-info-originate [`*`metric`*`] [{comparable	non-comparable}]`
Mode	Router OSPF Config

7.10.7.1 no area nssa default-info-originate (OSPF)

This command disables the default route advertised into the NSSA.

Format	`no area` *`areaid`* `nssa default-info-originate [`*`metric`*`] [{comparable	non-comparable}]`
Mode	Router OSPF Config

7.10.8 area nssa no-redistribute (OSPF)

This command configures the NSSA Area Border router (ABR) so that learned external routes will not be redistributed to the NSSA.

Format	`area` *`areaid`* `nssa no-redistribute`
Mode	Router OSPF Config

7.10.8.1 no area nssa no-redistribute (OSPF)

This command disables the NSSA ABR so that learned external routes are redistributed to the NSSA.

Format	`no area areaid nssa no-redistribute`
Mode	Router OSPF Config

7.10.9 area nssa no-summary (OSPF)

This command configures the NSSA so that summary LSAs are not advertised into the NSSA.

Format	`area areaid nssa no-summary`
Mode	Router OSPF Config

7.10.9.1 no area nssa no-summary (OSPF)

This command disables nssa from the summary LSAs.

Format	`no area areaid nssa no-summary`
Mode	Router OSPF Config

7.10.10 area nssa translator-role (OSPF)

This command configures the translator role of the NSSA. A value of `always` causes the router to assume the role of the translator the instant it becomes a border router and a value of *`candidate`* causes the router to participate in the translator election process when it attains border router status.

Format	`area areaid nssa translator-role {always | candidate}`
Mode	Router OSPF Config

7.10.10.1 no area nssa translator-role (OSPF)

This command disables the nssa translator role from the specified area id.

Format	`no area areaid nssa translator-role {always | candidate}`
Mode	Router OSPF Config

7.10.11 area nssa translator-stab-intv (OSPF)

This command configures the translator *`stabilityinterval`* of the NSSA. The *`stabilityinterval`* is the period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.

Format	`area areaid nssa translator-stab-intv stabilityinterval`
Mode	Router OSPF Config

7.10.11.1 no area nssa translator-stab-intv (OSPF)

This command disables the nssa translator's *`stabilityinterval`* from the specified area id.

Format	`no area areaid nssa translator-stab-intv stabilityinterval`
Mode	Router OSPF Config

7.10.12 area range (OSPF)

Use the area range command in Router Configuration mode to configure a summary prefix that an area border router advertises for a specific area.

Default	No area ranges are configured by default. No cost is configured by default.
Format	`area` *`areaid`* `range` *`ip-address netmask`* `{summarylink	nssaexternallink} [advertise	not-advertise] [cost` *`cost`*`]`
Mode	OSPFv2 Router Configuration

Parameter	Description
area-id	The area identifier for the area whose networks are to be summarized.
prefix netmask	The summary prefix to be advertised when the ABR computes a route to one or more networks within this prefix in this area.
summarylink	When this keyword is given, the area range is used when summarizing prefixes advertised in type 3 summary LSAs.
nssaexternallink	When this keyword is given, the area range is used when translating type 7 LSAs to type 5 LSAs.
advertise	[Optional] When this keyword is given, the summary prefix is advertised when the area range is active. This is the default.
not-advertise	[Optional] When this keyword is given, neither the summary prefix nor the contained prefixes are advertised when the area range is active. When the not-advertise option is given, any static cost previously configured is removed from the system configuration.
cost	[Optional] If an optional cost is given, OSPF sets the metric field in the summary LSA to the configured value rather than setting the metric to the largest cost among the networks covered by the area range. A static cost may only be configured if the area range is configured to advertise the summary. The range is 0 to 16,777,215. If the cost is set to 16,777,215 for type 3 summarization, a type 3 summary LSA is not advertised, but contained networks are suppressed. This behavior is equivalent to specifying the not-advertise option. If the range is configured for type 7 to type 5 translation, a type 5 LSA is sent if the metric is set to 16,777,215; however, other routers will not compute a route from a type 5 LSA with this metric.

7.10.12.1 no area range

The no form of this command deletes a specified area range or reverts an option to its default.

Format	`no area` *`areaid`* `range` *`prefix netmask`* `{summarylink	nssaexternallink} [advertise	not-advertise] [cost]`
Mode	OSPFv2 Router Configuration

Example: The following shows an example of the command.

```
!! Create area range
(Router) (Config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink
!! Delete area range
(Router) (Config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink
```

The no form may be used to revert the [advertise | not-advertise] option to its default without deleting the area range. Deleting and recreating the area range would cause OSPF to temporarily advertise the prefixes contained within the range. Note that using either the advertise or not-advertise keyword reverts the configuration to the default. For example:

```
!! Create area range. Suppress summary.
(Router) (Config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink not-advertise
!! Advertise summary.
(Router) (Config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink not-advertise
```

The no form may be use to remove a static area range cost, so that OSPF sets the cost to the largest cost among the contained routes.

```
!! Create area range with static cost.
(Router) (Config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink cost 1000
!! Remove static cost.
(Router) (Config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink cost
```

7.10.13 area stub (OSPF)

This command creates a stub area for the specified area ID. A stub area is characterized by the fact that AS External LSAs are not propagated into the area. Removing AS External LSAs and Summary LSAs can significantly reduce the link state database of routers within the stub area.

Format	`area` *`areaid`* `stub`
Mode	Router OSPF Config

7.10.13.1 no area stub

This command deletes a stub area for the specified area ID.

Format	`no area` *`areaid`* `stub`
Mode	Router OSPF Config

7.10.14 area stub no-summary (OSPF)

This command configures the Summary LSA mode for the stub area identified by ***areaid***. Use this command to prevent LSA Summaries from being sent.

Default	disabled
Format	`area` *`areaid`* `stub no-summary`
Mode	Router OSPF Config

7.10.14.1 no area stub no-summary

This command configures the default Summary LSA mode for the stub area identified by ***areaid***.

Format	`no area` *`areaid`* `stub no-summary`
Mode	Router OSPF Config

7.10.15 area virtual-link (OSPF)

This command creates the OSPF virtual interface for the specified ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`area` *`areaid`* `virtual-link` *`neighbor`*
Mode	Router OSPF Config

7.10.15.1 no area virtual-link

This command deletes the OSPF virtual interface from the given interface, identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area areaid virtual-link neighbor`
Mode	Router OSPF Config

7.10.16 area virtual-link authentication

This command configures the authentication type and key for the OSPF virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The value for ***type*** is either none, simple, or encrypt. The ***key*** is composed of standard displayable, noncontrol keystrokes from a Standard 101/102-key keyboard. The authentication key must be 8 bytes or less if the authentication type is simple. If the type is encrypt, the key may be up to 16 bytes. Unauthenticated interfaces do not need an authentication key. If the type is encrypt, a key id in the range of 0 and 255 must be specified.The default value for authentication type is none. Neither the default password key nor the default key id are configured.

Default	none
Format	`area areaid virtual-link neighbor authentication {none | {simple key} | {encrypt key keyid}}`
Mode	Router OSPF Config

7.10.16.1 no area virtual-link authentication

This command configures the default authentication type for the OSPF virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area areaid virtual-link neighbor authentication`
Mode	Router OSPF Config

7.10.17 area virtual-link dead-interval (OSPF)

This command configures the dead interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for seconds is 1 to 65535.

Default	40
Format	`area areaid virtual-link neighbor dead-interval seconds`
Mode	Router OSPF Config

7.10.17.1 no area virtual-link dead-interval

This command configures the default dead interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area areaid virtual-link neighbor dead-interval`
Mode	Router OSPF Config

7.10.18 area virtual-link hello-interval (OSPF)

This command configures the hello interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 1 to 65535.

Default	10
Format	`area areaid virtual-link neighbor hello-interval 1-65535`
Mode	Router OSPF Config

7.10.18.1 no area virtual-link hello-interval

This command configures the default hello interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area areaid virtual-link neighbor hello-interval`
Mode	Router OSPF Config

7.10.19 area virtual-link retransmit-interval (OSPF)

This command configures the retransmit interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for seconds is 0 to 3600.

Default	5
Format	`area areaid virtual-link neighbor retransmit-interval seconds`
Mode	Router OSPF Config

7.10.19.1 no area virtual-link retransmit-interval

This command configures the default retransmit interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area areaid virtual-link neighbor retransmit-interval`
Mode	Router OSPF Config

7.10.20 area virtual-link transmit-delay (OSPF)

This command configures the transmit delay for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for seconds is 0 to 3600 (1 hour).

Default	1
Format	`area areaid virtual-link neighbor transmit-delay seconds`
Mode	Router OSPF Config

7.10.20.1 no area virtual-link transmit-delay

This command resets the default transmit delay for the OSPF virtual interface to the default value.

Format	`no area areaid virtual-link neighbor transmit-delay`
Mode	Router OSPF Config

7.10.21 auto-cost (OSPF)

By default, OSPF computes the link cost of each interface from the interface bandwidth. Faster links have lower metrics, making them more attractive in route selection. The configuration parameters in the **`auto-cost reference bandwidth`** and **`bandwidth`** commands give you control over the default link cost. You can configure for OSPF an interface bandwidth that is independent of the actual link speed. A second configuration parameter allows you to control the ratio of interface bandwidth to link cost. The link cost is computed as the ratio of a reference bandwidth to the interface bandwidth (ref_bw / interface bandwidth), where interface bandwidth is defined by the **`bandwidth`** command. Because the default reference bandwidth is 100 Mbps, OSPF uses the same default link cost for all interfaces whose bandwidth is 100 Mbps or greater. Use the **`auto-cost`** command to change the reference bandwidth, specifying the reference bandwidth in megabits per second (Mbps). The reference bandwidth range is 1-4294967 Mbps.

Default	100 Mbps
Format	`auto-cost reference-bandwidth` *1-4294967*
Mode	Router OSPF Config

7.10.21.1 no auto-cost reference-bandwidth (OSPF)

Use this command to set the reference bandwidth to the default value.

Format	`no auto-cost reference-bandwidth`
Mode	Router OSPF Config

7.10.22 capability opaque

Use this command to enable Opaque Capability on the Router. The information contained in Opaque LSAs may be used directly by OSPF or indirectly by an application wishing to distribute information throughout the OSPF domain. FASTPATH supports the storing and flooding of Opaque LSAs of different scopes. The default value of `enabled` means that OSPF will forward opaque LSAs by default. If you want to upgrade from a previous release, where the default was disabled, opaque LSA forwarding will be enabled. If you want to disable opaque LSA forwarding, then you should enter the command no capability opaque in OSPF router configuration mode after the software upgrade.

Default	enabled
Format	`capability opaque`
Mode	Router Config

7.10.22.1 no capability opaque

Use this command to disable opaque capability on the router.

Format	`no capability opaque`
Mode	Router Config

7.10.23 clear ip ospf

Use this command to disable and re-enable OSPF for the specified virtual router. If no virtual router is specified, the default router is disabled and re-enabled.

Format	`clear ip ospf [vrf` *vrf-name*`]`
Mode	Privileged EXEC

7.10.24 clear ip ospf configuration

Use this command to reset the OSPF configuration to factory defaults for the specified virtual router. If no virtual router is specified, the default router is cleared.

Format `clear ip ospf configuration [vrf vrf-name]`

Mode Privileged EXEC

7.10.25 clear ip ospf counters

Use this command to reset global and interface statistics for the specified virtual router. If no virtual router is specified, the global and interface statistics are reset for the default router.

Format `clear ip ospf counters`

Mode Privileged EXEC

7.10.26 clear ip ospf neighbor

Use this command to drop the adjacency with all OSPF neighbors for the specified virtual router. On each neighbor's interface, send a one-way hello. Adjacencies may then be re-established. If no router is specified, adjacency with all OSPF neighbors is dropped for the default router. To drop all adjacencies with a specific router ID, specify the neighbor's Router ID using the optional parameter [*neighbor-id*].

Format `clear ip ospf neighbor [ vrf vrf-name] [neighbor-id]`

Mode Privileged EXEC

7.10.27 clear ip ospf neighbor interface

To drop adjacency with all neighbors on a specific interface, use the optional parameter [`slot/port`]. To drop adjacency with a specific router ID on a specific interface, use the optional parameter [`neighbor-id`].

Format `clear ip ospf neighbor interface [slot/port] [neighbor-id]`

Mode Privileged EXEC

7.10.28 clear ip ospf redistribution

Use this command to flush all self-originated external LSAs for the specified virtual router. If no router is specified, the command is executed for the default router. Reapply the redistribution configuration and reoriginate prefixes as necessary.

Format `clear ip ospf redistribution [vrf vrf-name]`

Mode Privileged EXEC

7.10.29 default-information originate (OSPF)

This command is used to control the advertisement of default routes.

Default
- metric—unspecified
- type—2

Format `default-information originate [always] [metric 0-16777214] [metric-type {1 | 2}]`

Mode Router OSPF Config

7.10.29.1 no default-information originate (OSPF)

This command is used to control the advertisement of default routes.

Format	`no default-information originate` *[metric] [metric-type]*
Mode	Router OSPF Config

7.10.30 default-metric (OSPF)

This command is used to set a default for the metric of distributed routes.

Format	`default-metric` *1-16777214*
Mode	Router OSPF Config

7.10.30.1 no default-metric (OSPF)

This command is used to set a default for the metric of distributed routes.

Format	`no default-metric`
Mode	Router OSPF Config

7.10.31 distance ospf (OSPF)

This command sets the route preference value of OSPF in the router. Lower route preference values are preferred when determining the best route. The type of OSPF route can be *intra, inter*, or *external*. All the external type routes are given the same preference value. The range of ***preference*** value is 1 to 255.

Default	110
Format	`distance ospf {intra-area` *1-255* `| inter-area` *1-255* `| external` *1-255*`}`
Mode	Router OSPF Config

7.10.31.1 no distance ospf

This command sets the default route preference value of OSPF routes in the router. The type of OSPF can be intra, inter, or external. All the external type routes are given the same preference value.

Format	`no distance ospf {`*intra-area* `|` *inter-area* `|` *external*`}`
Mode	Router OSPF Config

7.10.32 distribute-list out (OSPF)

Use this command to specify the access list to filter routes received from the source protocol.

Format	`distribute-list` *1-199* `out {rip | static | connected}`
Mode	Router OSPF Config

7.10.32.1 no distribute-list out

Use this command to specify the access list to filter routes received from the source protocol.

Format	`no distribute-list` *1-199* `out {rip | static | connected}`
Mode	Router OSPF Config

7.10.33 exit-overflow-interval (OSPF)

This command configures the exit overflow interval for OSPF. It describes the number of seconds after entering overflow state that a router will wait before attempting to leave the overflow state. This allows the router to again originate non-default AS-external-LSAs. When set to 0, the router will not leave overflow state until restarted. The range for seconds is 0 to 2147483647 seconds.

Default	0
Format	`exit-overflow-interval` *`seconds`*
Mode	Router OSPF Config

7.10.33.1 no exit-overflow-interval

This command configures the default exit overflow interval for OSPF.

Format	`no exit-overflow-interval`
Mode	Router OSPF Config

7.10.34 external-lsdb-limit (OSPF)

This command configures the external LSDB limit for OSPF. If the value is -1, then there is no limit. When the number of nondefault AS-external-LSAs in a router's link-state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit nondefault AS-external-LSAs in it database. The external LSDB limit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area. The range for limit is -1 to 2147483647.

Default	-1
Format	`external-lsdb-limit` *`limit`*
Mode	Router OSPF Config

7.10.34.1 no external-lsdb-limit

This command configures the default external LSDB limit for OSPF.

Format	`no external-lsdb-limit`
Mode	Router OSPF Config

7.10.35 log-adjacency-changes

To enable logging of OSPFv2 neighbor state changes, use the log-adjacency-changes command in router configuration mode. State changes are logged with INFORMATIONAL severity.

Default	Adjacency state changes are logged, but without the detail option.
Format	`log-adjacency-changes [detail]`
Mode	OSPFv2 Router Configuration

Parameter	Description
detail	(Optional) When this keyword is specified, all adjacency state changes are logged. Otherwise, OSPF only logs transitions to FULL state and when a backwards transition occurs.

7.10.35.1 no log-adjacency-changes

Use the no form of the command to disable state change logging.

Format	`no log-adjacency-changes [detail]`
Mode	OSPFv2 Router Configuration

7.10.36 prefix-suppression (Router OSPF Config)

This command suppresses the advertisement of all the IPv4 prefixes except for prefixes that are associated with secondary IPv4 addresses, loopbacks, and passive interfaces from the OSPFv2 router advertisements.

To suppress a loopback or passive interface, use the `ip ospf prefix-suppression` command in interface configuration mode. Prefixes associated with secondary IPv4 addresses can never be suppressed.

Default	Prefix suppression is disabled.
Format	`prefix-suppression`
Mode	Router OSPF Config

7.10.36.1 no prefix-suppression

This command disables prefix-suppression. No prefixes are suppressed from getting advertised.

Format	`no prefix-suppression`
Mode	Router OSPF Config

7.10.37 prefix-suppression (Router OSPFv3 Config)

This command suppresses the advertisement of all the IPv6 prefixes except for prefixes that are associated with secondary IPv6 addresses, loopbacks, and passive interfaces from the OSPFv3 router advertisements.

To suppress a loopback or passive interface, use the `ipv ospf prefix-suppression` command in interface configuration mode. Prefixes associated with secondary IPv6 addresses can never be suppressed.

Default	Prefix suppression is disabled.
Format	`prefix-suppression`
Mode	Router OSPFv3 Config

7.10.37.1 no prefix-suppression

This command disables prefix-suppression. No prefixes are suppressed from getting advertised.

Format	`no prefix-suppression`
Mode	Router OSPFv3 Config

7.10.38 router-id (OSPF)

This command sets a 4-digit dotted-decimal number uniquely identifying the router ospf id. The ***ipaddress*** is a configured value.

Format	`router-id` *ipaddress*
Mode	Router OSPF Config

7.10.39 redistribute (OSPF)

This command configures OSPF protocol to allow redistribution of routes from the specified source protocol/routers.

Default
- metric—unspecified
- type—2
- tag—0

Format `redistribute {rip | static | connected} [metric` *`0-16777214`*`] [metric-type {1 | 2}] [tag` *`0-4294967295`*`] [subnets]`

Mode Router OSPF Config

7.10.39.1 no redistribute

This command configures OSPF protocol to prohibit redistribution of routes from the specified source protocol/routers.

Format `no redistribute {rip | static | connected} [metric] [metric-type] [tag] [subnets]`

Mode Router OSPF Config

7.10.40 maximum-paths (OSPF)

This command sets the number of paths that OSPF can report for a given destination where ***`maxpaths`*** is platform dependent

Default 4

Format `maximum-paths` *`maxpaths`*

Mode Router OSPF Config

7.10.40.1 no maximum-paths

This command resets the number of paths that OSPF can report for a given destination back to its default value.

Format `no maximum-paths`

Mode Router OSPF Config

7.10.41 passive-interface default (OSPF)

Use this command to enable global passive mode by default for all interfaces. It overrides any interface level passive mode. OSPF will not form adjacencies over a passive interface.

Default disabled

Format `passive-interface default`

Mode Router OSPF Config

7.10.41.1 no passive-interface default

Use this command to disable the global passive mode by default for all interfaces. Any interface previously configured to be passive reverts to nonpassive mode.

Format `no passive-interface default`

Mode Router OSPF Config

7.10.42 passive-interface (OSPF)

Use this command to set the interface as passive. It overrides the global passive mode that is currently effective on the interface. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Default	disabled
Format	`passive-interface {slot/port|vlan 1-4093}`
Mode	Router OSPF Config

7.10.42.1 no passive-interface

Use this command to set the interface as nonpassive. It overrides the global passive mode that is currently effective on the interface.

Format	`no passive-interface {slot/port|vlan 1-4093}`
Mode	Router OSPF Config

7.10.43 timers pacing flood

To adjust the rate at which OSPFv2 sends LS Update packets, use the timers pacing flood command in router OSPFv2 global configuration mode. OSPF distributes routing information in Link State Advertisements (LSAs), which are bundled into Link State Update (LS Update) packets. To reduce the likelihood of sending a neighbor more packets than it can buffer, OSPF rate limits the transmission of LS Update packets. By default, OSPF sends up to 30 updates per second on each interface (1/the pacing interval). Use this command to adjust this packet rate.

Default	`33 milliseconds`
Format	`timers pacing flood milliseconds`
Mode	OSPFv2 Router Configuration

Parameter	Description
milliseconds	The average time between transmission of LS Update packets. The range is from 5 ms to 100 ms. The default is 33 ms.

7.10.43.1 no timers pacing flood

To revert LSA transmit pacing to the default rate, use the no timers pacing flood command.

Format	`no timers pacing flood`
Mode	OSPFv2 Router Configuration

7.10.44 timers pacing lsa-group

To adjust how OSPF groups LSAs for periodic refresh, use the timers pacing lsa-group command in OSPFv2 Router Configuration mode. OSPF refreshes self-originated LSAs approximately once every 30 minutes. When OSPF refreshes LSAs, it considers all self-originated LSAs whose age is from 1800 to 1800 plus the pacing group size. Grouping LSAs for refresh allows OSPF to combine refreshed LSAs into a minimal number of LS Update packets. Minimizing the number of Update packets makes LSA distribution more efficient.

When OSPF originates a new or changed LSA, it selects a random refresh delay for the LSA. When the refresh delay expires, OSPF refreshes the LSA. By selecting a random refresh delay, OSPF avoids refreshing a large number of LSAs at one time, even if a large number of LSAs are originated at one time.

Default	`60 seconds`
Format	`timers pacing lsa-group` ***`seconds`***
Mode	OSPFv2 Router Configuration

Parameter	Description
seconds	Width of the window in which LSAs are refreshed. The range for the pacing group window is from 10 to 1800 seconds.

7.10.45 timers spf

Use this command to configure the SPF delay time and hold time. The valid range for both parameters is 0-65535 seconds.

Default	• delay-time—5 • hold-time—10
Format	**`timers spf`** ***`delay-time hold-time`***
Mode	Router OSPF Config

7.10.46 trapflags (OSPF)

Use this command to enable individual OSPF traps, enable a group of trap flags at a time, or enable all the trap flags at a time. The different groups of trapflags, and each group's specific trapflags to enable or disable, are listed in Table 11.

Table 11: Trapflags Groups

Group	Flags
errors	• authentication-failure • bad-packet • config-error • virt-authentication-failure • virt-bad-packet • virt-config-error
lsa	• lsa-maxage • lsa-originate
overflow	• lsdb-overflow • lsdb-approaching-overflow
retransmit	• packets • virt-packets
state-change	• if-state-change • neighbor-state-change • virtif-state-change • virtneighbor-state-change

- To enable the individual flag, enter the **`group name`** followed by that particular flag.
- To enable all the flags in that group, give the group name followed by **`all`**.
- To enable all the flags, give the command as **`trapflags all`**.

Default disabled

Format

```
trapflags {
all | errors {all | authentication-failure | bad-packet | config-error | virt-authentication-failure | virt-bad-packet | virt-config-error} |
lsa {all | lsa-maxage | lsa-originate} |
overflow {all | lsdb-overflow | lsdb-approaching-overflow} |
retransmit {all | packets | virt-packets} |
state-change {all | if-state-change | neighbor-state-change | virtif-state-change | virtneighbor-state-change}
}
```

Mode Router OSPF Config

7.10.46.1 no trapflags

Use this command to revert to the default reference bandwidth.

- To disable the individual flag, enter the `group name` followed by that particular flag.
- To disable all the flags in that group, give the group name followed by `all`.
- To disable all the flags, give the command as `trapflags all`.

Format

```
no trapflags {
all |
errors {all | authentication-failure | bad-packet | config-error | virt-authentication-failure | virt-bad-packet | virt-config-error} |
lsa {all | lsa-maxage | lsa-originate} |
overflow {all | lsdb-overflow | lsdb-approaching-overflow} |
retransmit {all | packets | virt-packets} |
state-change {all | if-state-change | neighbor-state-change | virtif-state-change | virtneighbor-state-change}
}
```

Mode Router OSPF Config

OSPF Interface Commands

7.10.47 ip ospf area

Use this command to enable OSPFv2 and set the area ID of an interface or range of interfaces. The ***area-id*** is an IP address formatted as a 4-digit dotted-decimal number or a decimal value in the range of 0-4294967295. This command supersedes the effects of the `network area` command. It can also be used to configure the advertiseability of the secondary addresses on this interface into the OSPFv2 domain.

Default disabled

Format `ip ospf area` *`area-id`* `[secondaries none]`

Mode Interface Config

7.10.47.1 no ip ospf area

Use this command to disable OSPF on an interface.

Format `no ip ospf area [secondaries none]`

Mode Interface Config

7.10.48 bandwidth

By default, OSPF computes the link cost of an interface as the ratio of the reference bandwidth to the interface bandwidth. Reference bandwidth is specified with the `auto-cost` command. For the purpose of the OSPF link cost calculation, use the bandwidth command to specify the interface bandwidth. The bandwidth is specified in kilobits per second. If no bandwidth is configured, the bandwidth defaults to the actual interface bandwidth for port-based routing interfaces and to 10 Mbps for VLAN routing interfaces. This command does not affect the actual speed of an interface. You can use this command to configure a single interface or a range of interfaces.

Default	actual interface bandwidth
Format	`bandwidth` *1-10000000*
Mode	Interface Config

7.10.48.1 no bandwidth

Use this command to set the interface bandwidth to its default value.

Format	`no bandwidth`
Mode	Interface Config

7.10.49 ip ospf authentication

This command sets the OSPF Authentication Type and Key for the specified interface or range of interfaces. The value of ***type*** is either none, simple or encrypt. The ***key*** is composed of standard displayable, noncontrol keystrokes from a Standard 101/102-key keyboard. The authentication key must be 8 bytes or less if the authentication type is simple. If the type is encrypt, the key may be up to 16 bytes. If the type is encrypt a ***keyid*** in the range of 0 and 255 must be specified. Unauthenticated interfaces do not need an authentication key or authentication key ID. There is no default value for this command.

Format	`ip ospf authentication {none | {simple` *key*`} | {encrypt` *key keyid*`}}`
Mode	Interface Config

7.10.49.1 no ip ospf authentication

This command sets the default OSPF Authentication Type for the specified interface.

Format	`no ip ospf authentication`
Mode	Interface Config

7.10.50 ip ospf cost

This command configures the cost on an OSPF interface or range of interfaces. The ***cost*** parameter has a range of 1 to 65535.

Default	10
Format	`ip ospf cost` *1-65535*
Mode	Interface Config

7.10.50.1 no ip ospf cost

This command configures the default cost on an OSPF interface.

Format	`no ip ospf cost`
Mode	Interface Config

7.10.51 ip ospf database-filter all out

Use the ip ospf database-filter all out command in Interface Configuration mode to disable OSPFv2 LSA flooding on an interface.

Default	Disabled
Format	`ip ospf database-filter all out`
Mode	Interface Configuration

7.10.51.1 no ip ospf database-filter all out

Use the no ip ospf database-filter all out command in Interface Configuration mode to enable OSPFv2 LSA flooding on an interface.

Default	Disabled
Format	`ip ospf database-filter all out`
Mode	Interface Configuration

7.10.52 ip ospf dead-interval

This command sets the OSPF dead interval for the specified interface or range of interfaces. The value for ***seconds*** (range: 1–65535) is a valid positive integer, which represents the length of time in seconds that a router's Hello packets have not been seen before its neighbor routers declare that the router is down. The value for the length of time must be the same for all routers attached to a common network. This value should be some multiple of the Hello Interval (i.e. 4). Valid values range in seconds from 1 to 65535.

Default	40
Format	`ip ospf dead-interval` *`seconds`*
Mode	Interface Config

7.10.52.1 no ip ospf dead-interval

This command sets the default OSPF dead interval for the specified interface.

Format	`no ip ospf dead-interval`
Mode	Interface Config

7.10.53 ip ospf hello-interval

This command sets the OSPF hello interval for the specified interface or range of interfaces. The value for seconds is a valid positive integer, which represents the length of time in seconds. The value for the length of time must be the same for all routers attached to a network. Valid values range from 1 to 65535.

Default	10
Format	`ip ospf hello-interval` *`seconds`*
Mode	Interface Config

7.10.53.1 no ip ospf hello-interval

This command sets the default OSPF hello interval for the specified interface.

Format `no ip ospf hello-interval`

Mode Interface Config

7.10.54 ip ospf network

Use this command to configure OSPF to treat an interface or range of interfaces as a point-to-point rather than broadcast interface. The **`broadcast`** option sets the OSPF network type to broadcast. The **`point-to-point`** option sets the OSPF network type to point-to-point. OSPF treats interfaces as broadcast interfaces by default. (Loopback interfaces have a special loopback network type, which cannot be changed.) When there are only two routers on the network, OSPF can operate more efficiently by treating the network as a point-to-point network. For point-to-point networks, OSPF does not elect a designated router or generate a network link state advertisement (LSA). Both endpoints of the link must be configured to operate in point-to-point mode.

Default broadcast

Format `ip ospf network {broadcast | point-to-point}`

Mode Interface Config

7.10.54.1 no ip ospf network

Use this command to return the OSPF network type to the default.

Format `no ip ospf network`

Mode Interface Config

7.10.55 ip ospf prefix-suppression

This command suppresses the advertisement of the IPv4 prefixes that are associated with an interface, except for those associated with secondary IPv4 addresses. This command takes precedence over the global configuration. If this configuration is not specified, the global prefix-suppression configuration applies.

prefix-suppression can be disabled at the interface level by using the disable option. The disable option is useful for excluding specific interfaces from performing prefix-suppression when the feature is enabled globally.

Note that the disable option disable is not equivalent to not configuring the interface specific prefix-suppression. If prefix-suppression is not configured at the interface level, the global prefix-suppression configuration is applicable for the IPv4 prefixes associated with the interface.

Default Prefix-suppression is not configured.

Format `ip ospf prefix-suppression [disable]`

Mode Interface Config

7.10.55.1 no ip ospf prefix-suppression

This command removes prefix-suppression configurations at the interface level. When `no ip ospf prefix-suppression` command is used, global prefix-suppression applies to the interface. Not configuring the command is not equal to disabling interface level prefix-suppression.

Format `no ip ospf prefix-suppression`

Mode Interface Config

7.10.56 ip ospf priority

This command sets the OSPF priority for the specified router interface or range of interfaces. The priority of the interface is a priority integer from 0 to 255. A value of 0 indicates that the router is not eligible to become the designated router on this network.

Default	1, which is the highest router priority
Format	`ip ospf priority` *`0-255`*
Mode	Interface Config

7.10.56.1 no ip ospf priority

This command sets the default OSPF priority for the specified router interface.

Format	`no ip ospf priority`
Mode	Interface Config

7.10.57 ip ospf retransmit-interval

This command sets the OSPF retransmit Interval for the specified interface or range of interfaces. The retransmit interval is specified in seconds. The value for ***seconds*** is the number of seconds between link-state advertisement retransmissions for adjacencies belonging to this router interface. This value is also used when retransmitting database description and link-state request packets. Valid values range from 0 to 3600 (1 hour).

Default	5
Format	`ip ospf retransmit-interval` *`0-3600`*
Mode	Interface Config

7.10.57.1 no ip ospf retransmit-interval

This command sets the default OSPF retransmit Interval for the specified interface.

Format	`no ip ospf retransmit-interval`
Mode	Interface Config

7.10.58 ip ospf transmit-delay

This command sets the OSPF Transit Delay for the specified interface or range of interfaces. The transmit delay is specified in seconds. In addition, it sets the estimated number of seconds it takes to transmit a link state update packet over this interface. Valid values for ***seconds*** range from 1 to 3600 (1 hour).

Default	1
Format	`ip ospf transmit-delay` *`1-3600`*
Mode	Interface Config

7.10.58.1 no ip ospf transmit-delay

This command sets the default OSPF Transit Delay for the specified interface.

Format	`no ip ospf transmit-delay`
Mode	Interface Config

7.10.59 ip ospf mtu-ignore

This command disables OSPF maximum transmission unit (MTU) mismatch detection on an interface or range of interfaces. OSPF Database Description packets specify the size of the largest IP packet that can be sent without fragmentation on the interface. When a router receives a Database Description packet, it examines the MTU advertised by the neighbor. By default, if the MTU is larger than the router can accept, the Database Description packet is rejected and the OSPF adjacency is not established.

Default	enabled
Format	`ip ospf mtu-ignore`
Mode	Interface Config

7.10.59.1 no ip ospf mtu-ignore

This command enables the OSPF MTU mismatch detection.

Format	`no ip ospf mtu-ignore`
Mode	Interface Config

IP Event Dampening Commands

7.10.60 dampening

Use this command to enable IP event dampening on a routing interface.

Format	`dampening [`*half-life period*`] [`*reuse-threshold suppress-threshold max-suppress-time*` [restart `*restart-penalty*`]]`
Mode	Interface Config

Parameter	Description
Half-life period	The number of seconds it takes for the penalty to reduce by half. The configurable range is 1-30 seconds. Default value is 5 seconds.
Reuse Threshold	The value of the penalty at which the dampened interface is restored. The configurable range is 1-20,000. Default value is 1000.
Suppress Threshold	The value of the penalty at which the interface is dampened. The configurable range is 1-20,000. Default value is 2000.
Max Suppress Time	The maximum amount of time (in seconds) an interface can be in suppressed state after it stops flapping. The configurable range is 1-255 seconds. The default value is four times of half-life period. If half-period value is allowed to default, the maximum suppress time defaults to 20 seconds.
Restart Penalty	Penalty applied to the interface after the device reloads. The configurable range is 1-20,000. Default value is 2000.

7.10.60.1 no dampening

This command disables IP event dampening on a routing interface.

Format	`no dampening`
Mode	Interface Config

7.10.61 show dampening interface

This command summarizes the number of interfaces configured with dampening and the number of interfaces being suppressed.

Format	`show dampening interface`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Router)# show dampening interface
2 interfaces are configured with dampening.
1 interface is being suppressed.
```

7.10.62 show interface dampening

This command displays the status and configured parameters of the interfaces configured with dampening.

Format	`show interface dampening`
Mode	Privileged EXEC

Parameter	Description
Flaps	The number times the link state of an interface changed from UP to DOWN.
Penalty	Accumulated Penalty.
Supp	Indicates if the interface is suppressed or not.
ReuseTm	Number of seconds until the interface is allowed to come up again.
HalfL	Configured half-life period.
ReuseV	Configured reuse-threshold.
SuppV	Configured suppress threshold.
MaxSTm	Configured maximum suppress time in seconds.
MaxP	Maximum possible penalty.
Restart	Configured restart penalty.

Note:

3. The CLI command “clear counters” on page 175 resets the flap count to zero.
4. The interface CLI command “no shutdown” on page 288 resets the suppressed state to `False`.
5. Any change in the dampening configuration resets the current penalty, reuse time and suppressed state to their default values, meaning `0`, `0`, and `FALSE` respectively.

Example: The following shows example CLI display output for the command.

```
Router# show interface dampening

Interface 0/2
Flaps   Penalty   Supp   ReuseTm   HalfL   ReuseV   SuppV   MaxSTm   MaxP   Restart
   0          0      FALSE      0           5        1000       2000        20        16000      0
Interface 0/3
Flaps   Penalty   Supp   ReuseTm   HalfL   ReuseV   SuppV   MaxSTm   MaxP   Restart
   6       1865    TRUE       18           20      1000       2001        30         2828      1500
```

7.10.63 OSPF Graceful Restart Commands

The OSPF protocol can be configured to participate in the checkpointing service, so that these protocols can execute a "graceful restart" when the management unit fails. In a graceful restart, the hardware to continues forwarding IPv4 packets using OSPF routes while a backup switch takes over management unit responsibility

Graceful restart uses the concept of "helpful neighbors". A fully adjacent router enters helper mode when it receives a link state announcement (LSA) from the restarting management unit indicating its intention of performing a graceful restart. In helper mode, a switch continues to advertise to the rest of the network that they have full adjacencies with the restarting router, thereby avoiding announcement of a topology change and and the potential for flooding of LSAs and shortest-path-first (SPF) runs (which determine OSPF routes). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

Graceful restart can be enabled for either planned or unplanned restarts, or both. A planned restart is initiated by the operator through the management command `initiate failover`. The operator may initiate a failover in order to take the management unit out of service (for example, to address a partial hardware failure), to correct faulty system behavior which cannot be corrected through less severe management actions, or other reasons. An unplanned restart is an unexpected failover caused by a fatal hardware failure of the management unit or a software hang or crash on the management unit.

7.10.64 nsf

Use this command to enable the OSPF graceful restart functionality on an interface. To disable graceful restart, use the no form of the command.

Default	Disabled
Format	`nsf [ietf] [planned-only]`
Modes	OSPF Router Configuration

Parameter	Description
ietf	This keyword is accepted but not required.
planned-only	This optional keyword indicates that OSPF should only perform a graceful restart when the restart is planned (i.e., when the restart is a result of the initiate failover command).

7.10.64.1 no nsf

Use this command to disable graceful restart for all restarts.

7.10.65 nsf restart-interval

Use this command to configure the number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. This is referred to as the grace period. The restarting router includes the grace period in its grace LSAs. For planned restarts (using the `initiate failover` command), the grace LSAs are sent prior to restarting the management unit, whereas for unplanned restarts, they are sent after reboot begins.

The grace period must be set long enough to allow the restarting router to reestablish all of its adjacencies and complete a full database exchange with each of those neighbors.

Default	120 seconds
Format	`nsf [ietf] restart-interval` *`1-1800`*
Modes	OSPF Router Configuration

Parameter	Description
ietf	This keyword is accepted but not required.
seconds	The number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. The range is from 1 to 1800 seconds.

7.10.65.1 no nsfrestart-interval

Use this command to revert the grace period to its default value.

Format	`no [ietf] nsf restart-interval`
Modes	OSPF Router Configuration

7.10.66 nsf helper

Use this command to enable helpful neighbor functionality for the OSPF protocol. You can enable this functionality for planned or unplanned restarts, or both.

Default	OSPF may act as a helpful neighbor for both planned and unplanned restarts
Format	`nsf helper [planned-only]`
Modes	OSPF Router Configuration

Parameter	Description
planned-only	This optional keyword indicates that OSPF should only help a restarting router performing a planned restart.

7.10.66.1 no nsf helper

Use this command to disable helpful neighbor functionality for OSPF.

Format	`no nsf helper`
Modes	OSPF Router Configuration

7.10.67 nsf ietf helper disable

Use this command to disable helpful neighbor functionality for OSPF.

NOTICE

The commands `no nsf helper` and `nsf ietf helper disable` are functionally equivalent. The command `nsf ietf helper disable` is supported solely for compatibility with other network software CLI.

Format	`nsf ietf helper disable`
Modes	OSPF Router Configuration

7.10.68 nsf helper strict-lsa-checking

The restarting router is unable to react to topology changes. In particular, the restarting router will not immediately update its forwarding table; therefore, a topology change may introduce forwarding loops or black holes that persist until the graceful restart completes. By exiting the graceful restart on a topology change, a router tries to eliminate the loops or black holes as quickly as possible by routing around the restarting router. A helpful neighbor considers a link down with the restarting router to be a topology change, regardless of the strict LSA checking configuration.

Use this command to require that an OSPF helpful neighbor exit helper mode whenever a topology change occurs.

Default Enabled.

Format `nsf [ietf] helper strict-lsa-checking`

Modes OSPF Router Configuration

Parameter	Description
ietf	This keyword is accepted but not required.

7.10.68.1 no nsf [ietf] helper strict-lsa-checking

Use this command to allow OSPF to continue as a helpful neighbor in spite of topology changes.

Default Enabled.

Format `nsf [ietf] helper strict-lsa-checking`

Modes OSPF Router Configuration

OSPFv2 Stub Router Commands

7.10.69 max-metric router-lsa

To configure OSPF to enter stub router mode, use this command in Router OSPF Global Configuration mode. When OSPF is in stub router mode, as defined by RFC 3137, OSPF sets the metric in the nonstub links in its router LSA to LsInfinity. Other routers therefore compute very long paths through the stub router, and prefer any alternate path. Doing so eliminates all transit traffic through the stub router, when alternate routes are available. Stub router mode is useful when adding or removing a router from a network or to avoid transient routes when a router reloads.

You can administratively force OSPF into stub router mode. OSPF remains in stub router mode until you take OSPF out of stub router mode. Alternatively, you can configure OSPF to start in stub router mode for a configurable period of time after the router boots up.

If you set the summary LSA metric to 16,777,215, other routers will skip the summary LSA when they compute routes.

If you have configured the router to enter stub router mode on startup (max-metric router-lsa on-startup), and then enter max-metric router lsa, there is no change. If OSPF is administratively in stub router mode (the max-metric router-lsa command has been given), and you configure OSPF to enter stub router mode on startup (max-metric router-lsa on-startup), OSPF exits stub router mode (assuming the startup period has expired) and the configuration is updated.

Default `OSPF is not in stub router mode by default`

Format `max-metric router-lsa [on-startup seconds] [summary-lsa {metric}]`

Mode OSPFv2 Router Configuration

Parameter	Description
on-startup	(Optional) OSPF starts in stub router mode after a reboot.
seconds	(Required if on-startup) The number of seconds that OSPF remains in stub router mode after a reboot. The range is 5 to 86,400 seconds. There is no default value.
summary-lsa	(Optional) Set the metric in type 3 and type 4 summary LSAs to LsInfinity (0xFFFFFF).
metric	(Optional) Metric to send in summary LSAs when in stub router mode. The range is 1 to 16,777,215. The default is 16,711,680 (0xFF0000).

7.10.69.1 no max-metric router-lsa

Use this command in OSPFv2 Router Configuration mode to disable stub router mode. The command clears either type of stub router mode (always or on-startup) and resets the summary-lsa option. If OSPF is configured to enter global configuration mode on startup, and during normal operation you want to immediately place OSPF in stub router mode, issue the command no max-metric router-lsa on-startup. The command no max-metric router-lsa summary-lsa causes OSPF to send summary LSAs with metrics computed using normal procedures defined in RFC 2328.

Format	`no max-metric router-lsa [on-startup] [summary-lsa]`
Mode	OSPFv2 Router Configuration

7.10.70 clear ip ospf stub-router

Use the clear ip ospf stub-router command in Privileged EXEC mode to force OSPF to exit stub router mode for the specified virtual router when it has automatically entered stub router mode because of a resource limitation. OSPF only exits stub router mode if it entered stub router mode because of a resource limitation or it if is in stub router mode at startup. If no virtual router is specified, the command is executed for the default router. This command has no effect if OSPF is configured to be in stub router mode permanently.

Format	`clear ip ospf stub-router [vrf vrf-name]`
Mode	Privileged EXEC

OSPF Show Commands

7.10.71 show ip ospf

This command displays OSPF global configuration information for the specified virtual router. If no router is specified, it displays information for the default router.

Format	`show ip ospf [vrf vrf-name]`
Mode	Privileged EXEC

NOTICE

Some of the information below displays only if you enable OSPF and configure certain features.

Term	Definition
Router ID	A 32-bit integer in dotted decimal format identifying the router, about which information is displayed. This is a configured value.
OSPF Admin Mode	Shows whether the administrative mode of OSPF in the router is enabled or disabled. This is a configured value.
RFC 1583 Compatibility	Indicates whether 1583 compatibility is enabled or disabled. This is a configured value.
External LSDB Limit	The maximum number of nondefault AS-external-LSA (link state advertisement) entries that can be stored in the link-state database.
Exit Overflow Interval	The number of seconds that, after entering overflow state, a router will attempt to leave overflow state.
Spf Delay Time	The number of seconds between two subsequent changes of LSAs, during which time the routing table calculation is delayed.
Spf Hold Time	The number of seconds between two consecutive spf calculations.
Flood Pacing Interval	The average time, in milliseconds, between LS Update packet transmissions on an interface. This is the value configured with the command “timers pacing flood” on page 622.

Term	Definition
LSA Refresh Group Pacing Time	The size in seconds of the LSA refresh group window. This is the value configured with the command “timers pacing lsa-group” on page 622.
Opaque Capability	Shows whether the router is capable of sending Opaque LSAs. This is a configured value.
Autocost Ref BW	Shows the value of auto-cost reference bandwidth configured on the router.
Default Passive Setting	Shows whether the interfaces are passive by default.
Maximum Paths	The maximum number of paths that OSPF can report for a given destination.
Default Metric	Default value for redistributed routes.
Stub Router Configuration	When OSPF runs out of resources to store the entire link state database, or any other state information, OSPF goes into stub router mode. As a stub router, OSPF reoriginates its own router LSAs, setting the cost of all nonstub interfaces to infinity. Use this field to set stub router configuration to one of Always, Startup, None.
Stub Router Startup Time	Configured value in seconds. This row is only listed if OSPF is configured to be a stub router at startup.
Summary LSA Metric Override	One of Enabled (*met*), Disabled, where *met* is the metric to be sent in summary LSAs when in stub router mode.
Default Route Advertise	Indicates whether the default routes received from other source protocols are advertised or not.
Always	Shows whether default routes are always advertised.
Metric	The metric of the routes being redistributed. If the metric is not configured, this field is blank.
Metric Type	Shows whether the routes are External Type 1 or External Type 2.
Number of Active Areas	The number of active OSPF areas. An “active” OSPF area is an area with at least one interface up.
ABR Status	Shows whether the router is an OSPF Area Border Router.
ASBR Status	Reflects whether the ASBR mode is enabled or disabled. Enable implies that the router is an autonomous system border router. The router automatically becomes an ASBR when it is configured to redistribute routes learnt from other protocols. The possible values for the ASBR status is enabled (if the router is configured to redistribute routes learned by other protocols) or disabled (if the router is not configured for the same).
Stub Router Status	One of Active, Inactive.
Stub Router Reason	One of Configured, Startup, Resource Limitation. ***Note:*** The row is only listed if stub router is active.
Stub Router Startup Time Remaining	The remaining time, in seconds, until OSPF exits stub router mode. This row is only listed if OSPF is in startup stub router mode.
Stub Router Duration	The time elapsed since the router last entered the stub router mode. The row is only listed if stub router is active and the router entered stub mode because of a resource limitation. The duration is displayed in DD:HH:MM:SS format.
External LSDB Overflow	When the number of nondefault external LSAs exceeds the configured limit, External LSDB Limit, OSPF goes into LSDB overflow state. In this state, OSPF withdraws all of its self-originated nondefault external LSAs. After the Exit Overflow Interval, OSPF leaves the overflow state, if the number of external LSAs has been reduced.
External LSA Count	The number of external (LS type 5) link-state advertisements in the link-state database.
External LSA Checksum	The sum of the LS checksums of external link-state advertisements contained in the link-state database.
AS_OPAQUE LSA Count	Shows the number of AS Opaque LSAs in the link-state database.
AS_OPAQUE LSA Checksum	Shows the sum of the LS Checksums of AS Opaque LSAs contained in the link-state database.

Term	Definition
New LSAs Originated	The number of new link-state advertisements that have been originated.
LSAs Received	The number of link-state advertisements received determined to be new instantiations.
LSA Count	The total number of link state advertisements currently in the link state database.
Maximum Number of LSAs	The maximum number of LSAs that OSPF can store.
LSA High Water Mark	The maximum size of the link state database since the system started.
AS Scope LSA Flood List Length	The number of LSAs currently in the global flood queue waiting to be flooded through the OSPF domain. LSAs with AS flooding scope, such as type 5 external LSAs and type 11 Opaque LSAs.
Retransmit List Entries	The total number of LSAs waiting to be acknowledged by all neighbors. An LSA may be pending acknowledgment from more than one neighbor.
Maximum Number of Retransmit Entries	The maximum number of LSAs that can be waiting for acknowledgment at any given time.
Retransmit Entries High Water Mark	The maximum number of LSAs on all neighbors' retransmit lists at any given time.
NSF Support	Indicates whether nonstop forwarding (NSF) is enabled for the OSPF protocol for planned restarts, unplanned restarts or both ("Always").
NSF Restart Interval	The user-configurable grace period during which a neighboring router will be in the helper state after receiving notice that the management unit is performing a graceful restart.
NSF Restart Status	The current graceful restart status of the router. • Not Restarting • Planned Restart • Unplanned Restart
NSF Restart Age	Number of seconds until the graceful restart grace period expires.
NSF Restart Exit Reason	Indicates why the router last exited the last restart: • None—Graceful restart has not been attempted. • In Progress—Restart is in progress. • Completed—The previous graceful restart completed successfully. • Timed Out—The previous graceful restart timed out. • Topology Changed—The previous graceful restart terminated prematurely because of a topology change.
NSF Help Support	Indicates whether helpful neighbor functionality has been enabled for OSPF for planned restarts, unplanned restarts, or both (Always).
NSF help Strict LSA checking	Indicates whether strict LSA checking has been enabled. If enabled, then an OSPF helpful neighbor will exit helper mode whenever a topology change occurs. If disabled, an OSPF neighbor will continue as a helpful neighbor in spite of topology changes.
Prefix-suppression	Displays whether prefix-suppression is enabled or disabled.

Example: The following shows example CLI display output for the command.

```
(alpha3) #show ip ospf

Router ID.................................... 3.3.3.3
OSPF Admin Mode.............................. Enable
RFC 1583 Compatibility....................... Enable
External LSDB Limit.......................... No Limit
Exit Overflow Interval....................... 0
Spf Delay Time............................... 5
Spf Hold Time................................ 10
Flood Pacing Interval........................ 33 ms
LSA Refresh Group Pacing Time................ 60 sec
Opaque Capability............................ Enable
AutoCost Ref BW.............................. 100 Mbps
Default Passive Setting...................... Disabled
Maximum Paths................................ 4
Default Metric............................... Not configured
Stub Router Configuration.................... <val>
Stub Router Startup Time..................... <val> seconds
Summary LSA Metric Override.................. Enabled (<met>)

Default Route Advertise...................... Disabled
Always....................................... FALSE
Metric....................................... Not configured
Metric Type.................................. External Type 2


Number of Active Areas....................... 1 (1 normal, 0 stub, 0 nssa)
ABR Status................................... Disable
ASBR Status.................................. Disable
Stub Router.................................. FALSE
Stub Router Status........................... Inactive
Stub Router Reason........................... <reason>
Stub Router Startup Time Remaining........... <duration> seconds
Stub Router Duration......................... <duration>
External LSDB Overflow....................... FALSE
External LSA Count........................... 0
External LSA Checksum........................ 0
AS_OPAQUE LSA Count.......................... 0
AS_OPAQUE LSA Checksum....................... 0
New LSAs Originated.......................... 55
LSAs Received................................ 82
LSA Count.................................... 1
Maximum Number of LSAs....................... 24200
LSA High Water Mark.......................... 9
AS Scope LSA Flood List Length............... 0
Retransmit List Entries...................... 0
Maximum Number of Retransmit Entries......... 96800
Retransmit Entries High Water Mark........... 1
NSF Helper Support........................... Always
NSF Helper Strict LSA Checking............... Enabled
Prefix-suppression........................... Disabled
```

7.10.72 show ip ospf abr

This command displays the internal OSPF routing table entries to Area Border Routers (ABR) for the specified virtual router. If no router is specified, it displays information for the default router.

Format	`show ip ospf abr [vrf` *`vrf-name`*`]`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Type	The type of the route to the destination. It can be either: • intra — Intra-area route • inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

7.10.73 show ip ospf area

This command displays information about the area for the specified virtual router. If no router is specified, it displays information for the default router. The ***areaid*** identifies the OSPF area that is being displayed.

Format	`show ip ospf area` *`areaid`* `[vrf` *`vrf-name`*`]`
Modes	• Privileged EXEC • User EXEC

Term	Definition
AreaID	The area id of the requested OSPF area.
External Routing	A number representing the external routing capabilities for this area.
Spf Runs	The number of times that the intra-area route table has been calculated using this area's link-state database.
Area Border Router Count	The total number of area border routers reachable within this area.
Area LSA Count	Total number of link-state advertisements in this area's link-state database, excluding AS External LSA's.
Area LSA Checksum	A number representing the Area LSA Checksum for the specified AreaID excluding the external (LS type 5) link-state advertisements.
Flood List Length	The number of LSAs waiting to be flooded within the area.
Import Summary LSAs	Shows whether to import summary LSAs.
OSPF Stub Metric Value	The metric value of the stub area. This field displays only if the area is a configured as a stub area.

The following OSPF NSSA specific information displays only if the area is configured as an NSSA:

Term	Definition
Import Summary LSAs	Shows whether to import summary LSAs into the NSSA.
Redistribute into NSSA	Shows whether to redistribute information into the NSSA.
Default Information Originate	Shows whether to advertise a default route into the NSSA.
Default Metric	The metric value for the default route advertised into the NSSA.
Default Metric Type	The metric type for the default route advertised into the NSSA.
Translator Role	The NSSA translator role of the ABR, which is always or candidate.
Translator Stability Interval	The amount of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.
Translator State	Shows whether the ABR translator state is disabled, always, or elected.

Example: The following shows example CLI display output for the command.

```
(R1) #show ip ospf area 1


AreaID........................................ 0.0.0.1
External Routing.............................. Import External LSAs
Spf Runs...................................... 10
Area Border Router Count...................... 0
Area LSA Count................................ 3004
Area LSA Checksum............................. 0x5e0abed
Flood List Length............................. 0
Import Summary LSAs........................... Enable
```

7.10.74 show ip ospf asbr

This command displays the internal OSPF routing table entries to Autonomous System Boundary Routers (ASBR) for the specified virtual router. If no router is specified, it displays information for the default router.

Format	`show ip ospf asbr [vrf` *`vrf-name`*`]`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Type	The type of the route to the destination. It can be one of the following values: intra — Intra-area route inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

7.10.75 show ip ospf database

This command displays information about the link state database when OSPF is enabled for the specified virtual router. If no router is specified, it displays information for the default router. If you do not enter any parameters, the command displays the LSA headers for all areas. Use the optional ***areaid*** parameter to display database information about a specific area. Use the optional parameters to specify the type of link state advertisements to display.

Parameter	Description
vrf-name	Specifies the virtual router for which to display information.
asbr-summary	Use *asbr-summary* to show the autonomous system boundary router (ASBR) summary LSAs.
external	Use *external* to display the external LSAs.
network	Use *network* to display the network LSAs.
nssa-external	Use *nssa-external* to display NSSA external LSAs.
opaque-area	Use *opaque-area* to display area opaque LSAs.
opaque-as	Use *opaque-as* to display AS opaque LSAs.
opaque-link	Use *opaque-link* to display link opaque LSAs.
router	Use *router* to display router LSAs.
summary	Use *summary* to show the LSA database summary information.
lsid	Use *lsid* to specify the link state ID (LSID). The value of *lsid* can be an IP address or an integer in the range of 0-4294967295.
adv-router	Use *adv-router* to show the LSAs that are restricted by the advertising router.
self-originate	Use *self-originate* to display the LSAs in that are self originated. The information below is only displayed if OSPF is enabled

The information below is only displayed if OSPF is enabled.

Format

```
show ip ospf [areaid] database [vrf vrf-name] [{database-summary | [{asbr-summary |
external | network | nssa-external | opaque-area | opaque-as | opaque-link | router
| summary}] [lsid] [{adv-router [ipaddr] | self-originate}]}]
```

Mode

- Privileged EXEC
- User EXEC

For each link-type and area, the following information is displayed:

Term	Definition
Link Id	A number that uniquely identifies an LSA that a router originates from all other self originated LSAs of the same LS type.
Adv Router	The Advertising Router. Is a 32-bit dotted decimal number representing the LSDB interface.
Age	A number representing the age of the link state advertisement in seconds.
Sequence	A number that represents which LSA is more recent.
Checksum	The total number LSA checksum.
Options	This is an integer. It indicates that the LSA receives special handling during routing calculations.
Rtr Opt	Router Options are valid for router links only.

7.10.76 show ip ospf database database-summary

Use this command to display the number of each type of LSA in the database for each area and for the router. The command also displays the total number of LSAs in the database.

Format	`show ip ospf database database-summary`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Router	Total number of router LSAs in the OSPF link state database.
Network	Total number of network LSAs in the OSPF link state database.
Summary Net	Total number of summary network LSAs in the database.
Summary ASBR	Number of summary ASBR LSAs in the database.
Type-7 Ext	Total number of Type-7 external LSAs in the database.
Self-Originated Type-7	Total number of self originated AS external LSAs in the OSPF link state database.
Opaque Link	Number of opaque link LSAs in the database.
Opaque Area	Number of opaque area LSAs in the database.
Subtotal	Number of entries for the identified area.
Opaque AS	Number of opaque AS LSAs in the database.
Total	Number of entries for all areas.

7.10.77 show ip ospf interface

This command displays the information for the IFO object or virtual interface tables. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format	`show ip ospf interface {slot/port|vlan 1-4093| loopback loopback-id}`
Mode	• Privileged EXEC • User EXEC

Term	Definition
IP Address	The IP address for the specified interface.
Subnet Mask	A mask of the network and host portion of the IP address for the OSPF interface.
Secondary IP Address(es)	The secondary IP addresses if any are configured on the interface.
OSPF Admin Mode	States whether OSPF is enabled or disabled on a router interface.
OSPF Area ID	The OSPF Area ID for the specified interface.
OSPF Network Type	The type of network on this interface that the OSPF is running on.
Router Priority	A number representing the OSPF Priority for the specified interface.
Retransmit Interval	A number representing the OSPF Retransmit Interval for the specified interface.
Hello Interval	A number representing the OSPF Hello Interval for the specified interface.
Dead Interval	A number representing the OSPF Dead Interval for the specified interface.
LSA Ack Interval	A number representing the OSPF LSA Acknowledgment Interval for the specified interface.
Transmit Delay	A number representing the OSPF Transmit Delay Interval for the specified interface.

Term	Definition
Authentication Type	The OSPF Authentication Type for the specified interface are: none, simple, and encrypt.
Metric Cost	The cost of the OSPF interface.
Passive Status	Shows whether the interface is passive or not.
OSPF MTU-ignore	Indicates whether to ignore MTU mismatches in database descriptor packets sent from neighboring routers.
Flood Blocking	Indicates whether flood blocking is enabled on the interface.

The information below will only be displayed if OSPF is enabled.

Term	Definition
OSPF Interface Type	Broadcast LANs, such as Ethernet and IEEE 802.5, take the value ***broadcast***. The OSPF Interface Type will be 'broadcast'.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router.
Designated Router	The router ID representing the designated router.
Backup Designated Router	The router ID representing the backup designated router.
Number of Link Events	The number of link events.
Local Link LSAs	The number of Link Local Opaque LSAs in the link-state database.
Local Link LSA Checksum	The sum of LS Checksums of Link Local Opaque LSAs in the link-state database.
Prefix-suppression	Displays whether prefix-suppression is enabled, disabled, or unconfigured on the given interface.

Example: The following shows example CLI display output for the command when the OSPF Admin Mode is disabled.

```
(FASTPATH Routing) >show ip ospf interface 0/1

IP Address.................................... 0.0.0.0
Subnet Mask................................... 0.0.0.0
Secondary IP Address(es)......................
OSPF Admin Mode............................... Disable
OSPF Area ID.................................. 0.0.0.0
OSPF Network Type............................. Broadcast
Router Priority............................... 1
Retransmit Interval........................... 5
Hello Interval................................ 10
Dead Interval................................. 40
LSA Ack Interval.............................. 1
Transmit Delay................................ 1
Authentication Type........................... None
Metric Cost................................... 1  (computed)
Passive Status................................ Non-passive interface
OSPF Mtu-ignore............................... Disable
Flood Blocking................................ Disable

OSPF is not enabled on this interface.

(FASTPATH Routing) #
```

7.10.78 show ip ospf interface brief

This command displays brief information for the IFO object or virtual interface tables for the specified virtual router. If no router is specified, it displays information for the default router.

Format	`show ip ospf interface brief [vrf` *`vrf-name`*`]`
Mode	- Privileged EXEC - User EXEC

Term	Definition
Interface	*slot/port*
OSPF Admin Mode	States whether OSPF is enabled or disabled on a router interface.
OSPF Area ID	The OSPF Area Id for the specified interface.
Router Priority	A number representing the OSPF Priority for the specified interface.
Cost	The metric cost of the OSPF interface.
Hello Interval	A number representing the OSPF Hello Interval for the specified interface.
Dead Interval	A number representing the OSPF Dead Interval for the specified interface.
Retransmit Interval	A number representing the OSPF Retransmit Interval for the specified interface.
Interface Transmit Delay	A number representing the OSPF Transmit Delay for the specified interface.
LSA Ack Interval	A number representing the OSPF LSA Acknowledgment Interval for the specified interface.

7.10.79 show ip ospf interface stats

This command displays the statistics for a specific interface. The information below will only be displayed if OSPF is enabled. The argument *`slot/port`* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format	`show ip ospf interface stats {`*`slot/port`*`|vlan` *`1-4093`*`}`
Modes	- Privileged EXEC - User EXEC

Term	Definition
OSPF Area ID	The area id of this OSPF interface.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
AS Border Router Count	The total number of Autonomous System border routers reachable within this area.
Area LSA Count	The total number of link-state advertisements in this area's link-state database, excluding AS External LSAs.
IP Address	The IP address associated with this OSPF interface.
OSPF Interface Events	The number of times the specified OSPF interface has changed its state, or an error has occurred.
Virtual Events	The number of state changes or errors that occurred on this virtual link.
Neighbor Events	The number of times this neighbor relationship has changed state, or an error has occurred.
Sent Packets	The number of OSPF packets transmitted on the interface.
Received Packets	The number of valid OSPF packets received on the interface.
Discards	The number of received OSPF packets discarded because of an error in the packet or an error in processing the packet.

Term	Definition
Bad Version	The number of received OSPF packets whose version field in the OSPF header does not match the version of the OSPF process handling the packet.
Source Not On Local Subnet	The number of received packets discarded because the source IP address is not within a subnet configured on a local interface. ***Note:*** This field applies only to OSPFv2.
Virtual Link Not Found	The number of received OSPF packets discarded where the ingress interface is in a non-backbone area and the OSPF header identifies the packet as belonging to the backbone, but OSPF does not have a virtual link to the packet's sender.
Area Mismatch	The number of OSPF packets discarded because the area ID in the OSPF header is not the area ID configured on the ingress interface.
Invalid Destination Address	The number of OSPF packets discarded because the packet's destination IP address is not the address of the ingress interface and is not the AllDrRouters or AllSpfRouters multicast addresses.
Wrong Authentication Type	The number of packets discarded because the authentication type specified in the OSPF header does not match the authentication type configured on the ingress interface. ***Note:*** This field applies only to OSPFv2.
Authentication Failure	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor. ***Note:*** This field applies only to OSPFv2.
No Neighbor at Source Address	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor. ***Note:*** Does not apply to Hellos.
Invalid OSPF Packet Type	The number of OSPF packets discarded because the packet type field in the OSPF header is not a known type.
Hellos Ignored	The number of received Hello packets that were ignored by this router from the new neighbors after the limit has been reached for the number of neighbors on an interface or on the system as a whole.

Table 12 lists the number of OSPF packets of each type sent and received on the interface.

Table 12: Type of OSPF Packets Sent and Received on the Interface

Packet Type	Sent	Received
Hello	6960	6960
Database Description	3	3
LS Request	1	1
LS Update	141	42
LS Acknowledgment	40	135

7.10.80 show ip ospf lsa-group

This command displays the number of self-originated LSAs within each LSA group for the specified virtual router. If no router is specified, it displays information for the default router.

Format `show ip ospf lsa-group [vrf vrf-name]`

Modes
- Privileged EXEC
- User EXEC

Field	Description
Total self-originated LSAs	The number of LSAs the router is currently originating.
Average LSAs per group	The number of self-originated LSAs divided by the number of LSA groups. The number of LSA groups is the refresh interval (1800 seconds) divided by the pacing interval (configured with timers pacing lsa-group) plus two.
Pacing group limit	The maximum number of self-originated LSAs in one LSA group. If the number of LSAs in a group exceeds this limit, OSPF redistributes LSAs throughout the refresh interval to achieve better balance.
Groups	For each LSA pacing group, the output shows the range of LSA ages in the group and the number of LSAs in the group.

7.10.81 show ip ospf neighbor

This command displays information about OSPF neighbors for the specified virtual router. If no router is specified, it displays information for the default router. If you do not specify a neighbor IP address, the output displays summary information in a table. If you specify an interface or tunnel, only the information for that interface or tunnel displays, if the interface is a physical routing interface and vlan format if the interface is a routing vlan. The ***ip-address*** is the IP address of the neighbor, and when you specify this, detailed information about the neighbor displays. The information below only displays if OSPF is enabled and the interface has a neighbor.

Format `show ip ospf neighbor [vrf vrf-name][interface {slot/port|vlan 1-4093}] [ip-address]`

Modes
- Privileged EXEC
- User EXEC

If you do not specify an IP address, a table with the following columns displays for all neighbors or the neighbor associated with the interface that you specify:

Term	Definition
Router ID	The 4-digit dotted-decimal number of the neighbor router.
Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of '0' indicates that the router is not eligible to become the designated router on this network.
IP Address	The IP address of the neighbor.
Interface	The interface of the local router in *slot/port* format.

Term	Definition
State	The state of the neighboring routers. Possible values are: • Down—Initial state of the neighbor conversation; no recent information has been received from the neighbor. • Attempt—No recent information has been received from the neighbor but a more concerted effort should be made to contact the neighbor. • Init—An Hello packet has recently been seen from the neighbor, but bidirectional communication has not yet been established. • 2 way—Communication between the two routers is bidirectional. • Exchange start—The first step in creating an adjacency between the two neighboring routers, the goal is to decide which router is the master and to decide upon the initial DD sequence number. • Exchange—The router is describing its entire link state database by sending Database Description packets to the neighbor. • Loading—Link State Request packets are sent to the neighbor asking for the more recent LSAs that have been discovered (but not yet received) in the Exchange state. • Full—The neighboring routers are fully adjacent and they will now appear in router-LSAs and network-LSAs.
Dead Time	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.

If you specify an IP address for the neighbor router, the following fields display:

Term	Definition
Interface	*slot/port*
Neighbor IP Address	The IP address of the neighbor router.
Interface Index	The interface ID of the neighbor router.
Area ID	The area ID of the OSPF area associated with the interface.
Options	An integer value that indicates the optional OSPF capabilities supported by the neighbor. The neighbor's optional OSPF capabilities are also listed in its Hello packets. This enables received Hello Packets to be rejected (i.e., neighbor relationships will not even start to form) if there is a mismatch in certain crucial OSPF capabilities.
Router Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of '0' indicates that the router is not eligible to become the designated router on this network.
Dead Timer Due	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.
Up Time	Neighbor uptime; how long since the adjacency last reached the Full state.
State	The state of the neighboring routers.
Events	The number of times this neighbor relationship has changed state, or an error has occurred.
Retransmitted LSAs	The number of LSAs retransmitted to this neighbor.
Retransmission Queue Length	An integer representing the current length of the retransmission queue of the specified neighbor router Id of the specified interface.
Restart Helper Status	Indicates the status of this router as a helper during a graceful restart of the router specified in the command line: • Helping—This router is acting as a helpful neighbor to this neighbor. A helpful neighbor does not report an adjacency change during graceful restart, but continues to advertise the restarting router as a FULL adjacency. A helpful neighbor continues to forward data packets to the restarting router, trusting that the restarting router's forwarding table is maintained during the restart. • Not Helping—This router is not a helpful neighbor at this time.

Term	Definition
Restart Reason	When this router is in helpful neighbor mode, this indicates the reason for the restart as provided by the restarting router: • Unknown (0) • Software restart (1) • Software reload/upgrade (2) • Switch to redundant control processor (3) • Unrecognized - a value not defined in RFC 3623 When FASTPATH sends a grace LSA, it sets the Restart Reason to Software Restart on a planned warm restart (when the `initiate failover` command is invoked), and to Unknown on an unplanned warm restart.
Remaining Grace Time	The number of seconds remaining the in current graceful restart interval. This is displayed only when this router is currently acting as a helpful neighbor for the router specified in the command.
Restart Helper Exit Reason	Indicates the reason that the specified router last exited a graceful restart. • None—Graceful restart has not been attempted • In Progress—Restart is in progress • Completed—The previous graceful restart completed successfully • Timed Out—The previous graceful restart timed out • Topology Changed—The previous graceful restart terminated prematurely because of a topology change

Example: The following shows example CLI display output for the command.

```
(alpha1) #show ip ospf neighbor 170.1.1.50

Interface.....................................0/17
Neighbor IP Address...........................170.1.1.50
Interface Index...............................17
Area Id.......................................0.0.0.2
Options.......................................0x2
Router Priority...............................1
Dead timer due in (secs)......................15
Up Time.......................................0 days 2 hrs 8 mins 46 secs
State.........................................Full/BACKUP-DR
Events........................................4
Retransmitted LSAs............................32
Retransmission Queue Length...................0
Restart Helper Status........................ Helping
Restart Reason............................... Software Restart (1)
Remaining Grace Time......................... 10 sec
Restart Helper Exit Reason................... In Progress
```

7.10.82 show ip ospf range

This command displays the set of OSPFv2 area ranges configured for a given area for the specified virtual router. If no router is specified, it displays information for the default router. .

Format	`show ip ospf range` *`areaid`* `[vrf` *`vrf-name`*`]`
Modes	Privileged EXEC

Term	Definition
Prefix	The summary prefix.
Subnet Mask	The subnetwork mask of the summary prefix.
Type	S (Summary Link) or E (External Link)

Term	Definition
Action	Advertise or Suppress
Cost	Metric to be advertised when the range is active. If a static cost is not configured, the field displays Auto. If the action is Suppress, the field displays N/A.
Active	Whether the range is currently active. Y or N.

Example: The following shows example CLI display output for the command.

```
(R1) #show ip ospf range 0

          Prefix       Subnet Mask    Type     Action       Cost   Active
        10.1.0.0       255.255.0.0       S  Advertise       Auto        N
      172.20.0.0       255.255.0.0       S  Advertise        500        Y
```

7.10.83 show ip ospf statistics

This command displays information about recent Shortest Path First (SPF) calculations for the specified virtual router. If no router is specified, it displays information for the default router. The SPF is the OSPF routing table calculation. The output lists the number of times the SPF has run for each OSPF area. A table follows this information. For each of the 15 most recent SPF runs, the command shows statistics for how long ago the SPF ran, how long the SPF took, the reasons why the SPF was scheduled, the individual components of the routing table calculation time and to show the RIB update time. The most recent statistics are displayed at the end of the table.

Format	`show ip ospf statistics [vrf` *`vrf-name`*`]`
Modes	Privileged EXEC

Term	Definition
Delta T	The time since the routing table was computed. The time is in the format hours, minutes, and seconds (hh:mm:ss).
Intra	The time taken to compute intra-area routes, in milliseconds.
Summ	The time taken to compute inter-area routes, in milliseconds.
Ext	The time taken to compute external routes, in milliseconds.
SPF Total	The total time to compute routes, in milliseconds. The total may exceed the sum of the Intra, Summ, and Ext times.
RIB Update	The time from the completion of the routing table calculation until all changes have been made in the common routing table [the Routing Information Base (RIB)], in milliseconds.
Reason	The event or events that triggered the SPF. Reason codes are as follows: • R - new router LSA • N - new network LSA • SN - new network summary LSA • SA - new ASBR summary LSA • X - new external LSA

Example: The following shows example CLI display output for the command.

```
(Router) #show ip ospf statistics

 Area 0.0.0.0: SPF algorithm executed 15 times

Delta T          Intra        Summ        Ext     SPF Total    RIB Update   Reason

00:05:33             0           0          0             0             0   R
00:05:30             0           0          0             0             0   R
00:05:19             0           0          0             0             0   N, SN
00:05:15             0          10          0            10             0   R, N, SN
00:05:11             0           0          0             0             0   R
00:04:50             0          60          0            60           460   R, N
```

```
00:04:46          0        90         0         100         60  R, N
00:03:42          0        70        10          90        160  R
00:03:39          0        70        40         120        240  X
00:03:36          0        60        60         130        160  X
00:01:28          0        60        50         130        240  X
00:01:25          0        30        50         110        310  SN
00:01:22          0         0        40          50        260  SN
00:01:19          0         0        20          20        190  X
00:01:16          0         0         0           0        110  R, X
```

7.10.84 show ip ospf stub table

This command displays the OSPF stub table for the virtual router. If no router is specified, the information for the default router will be displayed. The information below will only be displayed if OSPF is initialized on the switch.

Format `show ip ospf stub table [vrf vrf-name]`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Area ID	A 32-bit identifier for the created stub area.
Type of Service	The type of service associated with the stub metric. FASTPATH only supports Normal TOS.
Metric Val	The metric value is applied based on the TOS. It defaults to the least metric of the type of service among the interfaces to other areas. The OSPF cost for a route is a function of the metric value.
Import Summary LSA	Controls the import of summary LSAs into stub areas.

7.10.85 show ip ospf traffic

This command displays OSPFv2 packet and LSA statistics and OSPFv2 message queue statistics for the virtual router. If no router is specified, the information for the default router will be displayed. Packet statistics count packets and LSAs since OSPFv2 counters were last cleared (using the command “clear ip ospf counters” on page 617).

NOTICE The `clear ip ospf counters` command does not clear the message queue high water marks.

Format `show ip ospf traffic [vrf vrf-name]`

Modes Privileged EXEC

Parameter	Description
OSPFv2 Packet Statistics	The number of packets of each type sent and received since OSPF counters were last cleared.
LSAs Retransmitted	The number of LSAs retransmitted by this router since OSPF counters were last cleared.
LS Update Max Receive Rate	The maximum rate of LS Update packets received during any 5-second interval since OSPF counters were last cleared. The rate is in packets per second.
LS Update Max Send Rate	The maximum rate of LS Update packets transmitted during any 5-second interval since OSPF counters were last cleared. The rate is in packets per second.
Number of LSAs Received	The number of LSAs of each type received since OSPF counters were last cleared.

Parameter	Description
OSPFv2 Queue Statistics	For each OSPFv2 message queue, the current count, the high water mark, the number of packets that failed to be enqueued, and the queue limit. The high water marks are not cleared when OSPF counters are cleared.

Example: The following shows example CLI display output for the command.

```
(Router) #show ip ospf traffic

Time Since Counters Cleared:  4000 seconds

OSPFv2 Packet Statistics

         Hello  Database Desc  LS Request  LS Update  LS ACK  Total
Recd:      500             10          20         50      20    600
Sent:      400              8          16         40      16    480

LSAs Retransmitted................0
LS Update Max Receive Rate........20 pps
LS Update Max Send Rate...........10 pps

Number of LSAs Received

T1 (Router).......................10
T2 (Network)......................0
T3 (Net Summary)..................300
T4 (ASBR Summary).................15
T5 (External).....................20
T7 (NSSA External)................0
T9 (Link Opaque)..................0
T10 (Area Opaque).................0
T11 (AS Opaque)...................0
Total.............................345

OSPFv2 Queue Statistics

             Current       Max     Drops   Limit
Hello              0        10         0     500
ACK                2        12         0    1680
Data              24        47         0     500
Event              1         8         0    1000
```

7.10.86 show ip ospf virtual-link

This command displays the OSPF Virtual Interface information for a specific area and neighbor for the virtual router. If no router is specified, the information for the default router will be displayed. The ***areaid*** parameter identifies the area and the ***neighbor*** parameter identifies the neighbor's Router ID.

Format	`show ip ospf virtual-link [vrf` *`vrf-name`*`]` *`areaid neighbor`*
Modes	• Privileged EXEC • User EXEC

Term	Definition
Area ID	The area id of the requested OSPF area.
Neighbor Router ID	The input neighbor Router ID.
Hello Interval	The configured hello interval for the OSPF virtual interface.
Dead Interval	The configured dead interval for the OSPF virtual interface.

Term	Definition
Interface Transmit Delay	The configured transmit delay for the OSPF virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPF virtual interface.
Authentication Type	The configured authentication type of the OSPF virtual interface.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router. This is the state of the OSPF interface.
Neighbor State	The neighbor state.

7.10.87 show ip ospf virtual-link brief

This command displays the OSPF Virtual Interface information for all areas in the system.

Format `show ip ospf virtual-link brief`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Area ID	The area id of the requested OSPF area.
Neighbor	The neighbor interface of the OSPF virtual interface.
Hello Interval	The configured hello interval for the OSPF virtual interface.
Dead Interval	The configured dead interval for the OSPF virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPF virtual interface.
Transmit Delay	The configured transmit delay for the OSPF virtual interface.

7.11 Routing Information Protocol Commands

This section describes the commands you use to view and configure Routing Information Protocol (RIP), which is a distance-vector routing protocol that you use to route traffic within a small network.

7.11.1 router rip

Use this command to enter Router RIP mode.

Format `router rip`

Mode Global Config

7.11.2 enable (RIP)

This command resets the default administrative mode of RIP in the router (active).

Default enabled

Format `enable`

Mode Router RIP Config

7.11.2.1 no enable (RIP)

This command sets the administrative mode of RIP in the router to inactive.

Format	`no enable`
Mode	Router RIP Config

7.11.3 ip rip

This command enables RIP on a router interface or range of interfaces.

Default	disabled
Format	`ip rip`
Mode	Interface Config

7.11.3.1 no ip rip

This command disables RIP on a router interface.

Format	`no ip rip`
Mode	Interface Config

7.11.4 auto-summary

This command enables the RIP auto-summarization mode.

Default	disabled
Format	`auto-summary`
Mode	Router RIP Config

7.11.4.1 no auto-summary

This command disables the RIP auto-summarization mode.

Format	`no auto-summary`
Mode	Router RIP Config

7.11.5 default-information originate (RIP)

This command is used to control the advertisement of default routes.

Format	`default-information originate`
Mode	Router RIP Config

7.11.5.1 no default-information originate (RIP)

This command is used to control the advertisement of default routes.

Format	`no default-information originate`
Mode	Router RIP Config

7.11.6 default-metric (RIP)

This command is used to set a default for the metric of distributed routes.

Format	`default-metric` *`0-15`*
Mode	Router RIP Config

7.11.6.1 no default-metric (RIP)

This command is used to reset the default metric of distributed routes to its default value.

Format	`no default-metric`
Mode	Router RIP Config

7.11.7 distance rip

This command sets the route preference value of RIP in the router. Lower route preference values are preferred when determining the best route. A route with a preference of 255 cannot be used to forward traffic.

Default	15
Format	`distance rip` *`1-255`*
Mode	Router RIP Config

7.11.7.1 no distance rip

This command sets the default route preference value of RIP in the router.

Format	`no distance rip`
Mode	Router RIP Config

7.11.8 distribute-list out (RIP)

This command is used to specify the access list to filter routes received from the source protocol.

Default	0
Format	`distribute-list` *`1-199`* `out {ospf | static | connected}`
Mode	Router RIP Config

7.11.8.1 no distribute-list out

This command is used to specify the access list to filter routes received from the source protocol.

Format	`no distribute-list` *`1-199`* `out {ospf | static | connected}`
Mode	Router RIP Config

7.11.9 ip rip authentication

This command sets the RIP Version 2 Authentication Type and Key for the specified interface or range of interfaces. The value of *`type`* is either *`none`*, *`simple`*, or *`encrypt`*. The value for authentication key *`[key]`* must be 16 bytes or less. The *`[key]`* is composed of standard displayable, noncontrol keystrokes from a Standard 101/102-key keyboard. If the value of *`type`* is *`encrypt`*, a keyid in the range of 0 and 255 must be specified. Unauthenticated interfaces do not need an authentication key or authentication key ID.

Default	none
Format	`ip rip authentication {none	{simple key}	{encrypt key keyid}}`
Mode	Interface Config

7.11.9.1 no ip rip authentication

This command sets the default RIP Version 2 Authentication Type for an interface.

Format	`no ip rip authentication`
Mode	Interface Config

7.11.10 ip rip receive version

This command configures an interface or range of interfaces to allow RIP control packets of the specified version(s) to be received.

The value for *`mode`* is one of: *`rip1`* to receive only RIP version 1 formatted packets, *`rip2`* for RIP version 2, *`both`* to receive packets from either format, or *`none`* to not allow any RIP control packets to be received.

Default	both
Format	`ip rip receive version {rip1	rip2	both	none}`
Mode	Interface Config

7.11.10.1 no ip rip receive version

This command configures the interface to allow RIP control packets of the default version(s) to be received.

Format	`no ip rip receive version`
Mode	Interface Config

7.11.11 ip rip send version

This command configures an interface or range of interfaces to allow RIP control packets of the specified version to be sent. The value for *`mode`* is one of: *`rip1`* to broadcast RIP version 1 formatted packets, *`rip1c`* (RIP version 1 compatibility mode) which sends RIP version 2 formatted packets via broadcast, *`rip2`* for sending RIP version 2 using multicast, or *`none`* to not allow any RIP control packets to be sent.

Default	rip2
Format	`ip rip send version {rip1	rip1c	rip2	none}`
Mode	Interface Config

7.11.11.1 no ip rip send version

This command configures the interface to allow RIP control packets of the default version to be sent.

Format	`no ip rip send version`
Mode	Interface Config

7.11.12 hostroutesaccept

This command enables the RIP hostroutesaccept mode.

Default	enabled
Format	`hostroutesaccept`
Mode	Router RIP Config

7.11.12.1 no hostroutesaccept

This command disables the RIP hostroutesaccept mode.

Format	`no hostroutesaccept`
Mode	Router RIP Config

7.11.13 split-horizon

This command sets the RIP split horizon mode. Split horizon is a technique for avoiding problems caused by including routes in updates sent to the router from which the route was originally learned. The options are: None - no special processing for this case. Simple - a route will not be included in updates sent to the router from which it was learned. Poisoned reverse - a route will be included in updates sent to the router from which it was learned, but the metric will be set to infinity.

Default	simple
Format	`split-horizon {none | simple | poison}`
Mode	Router RIP Config

7.11.13.1 no split-horizon

This command sets the default RIP split horizon mode.

Format	`no split-horizon`
Mode	Router RIP Config

7.11.14 redistribute (RIP)

This command configures RIP protocol to redistribute routes from the specified source protocol/routers. There are five possible match options. When you submit the command redistribute ospf match *match-type* the match-type or types specified are added to any match types presently being redistributed. Internal routes are redistributed by default.

Default	• metric—not-configured • match—internal
Format for OSPF as source protocol	redistribute ospf [metric *0-15*] [match [*internal*] [*external 1*] [*external 2*] [*nssa-external 1*] [*nssa-external-2*]]
Format for other source protocol	redistribute {static | connected} [metric *0-15*]
Mode	Router RIP Config

7.11.14.1 no redistribute

This command de-configures RIP protocol to redistribute routes from the specified source protocol/routers.

Format `no redistribute {ospf | static | connected} [metric] [match [internal] [external 1] [external 2] [nssa-external 1] [nssa-external-2]]`

Mode Router RIP Config

7.11.15 show ip rip

This command displays information relevant to the RIP router.

Format `show ip rip`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
RIP Admin Mode	Enable or disable.
Split Horizon Mode	None, simple or poison reverse.
Auto Summary Mode	Enable or disable. If enabled, groups of adjacent routes are summarized into single entries, in order to reduce the total number of entries The default is enable.
Host Routes Accept Mode	Enable or disable. If enabled the router accepts host routes. The default is enable.
Global Route Changes	The number of route changes made to the IP Route Database by RIP. This does not include the refresh of a route's age.
Global queries	The number of responses sent to RIP queries from other systems.
Default Metric	The default metric of redistributed routes if one has already been set, or blank if not configured earlier. The valid values are 1 to 15.
Default Route Advertise	The default route.

7.11.16 show ip rip interface brief

This command displays general information for each RIP interface. For this command to display successful results routing must be enabled per interface (i.e., ip rip).

Format `show ip rip interface brief`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port*
IP Address	The IP source address used by the specified RIP interface.
Send Version	The RIP version(s) used when sending updates on the specified interface. The types are none, RIP-1, RIP-1c, RIP-2
Receive Version	The RIP version(s) allowed when receiving updates from the specified interface. The types are none, RIP-1, RIP-2, Both
RIP Mode	The administrative mode of router RIP operation (enabled or disabled).
Link State	The mode of the interface (up or down).

7.11.17 show ip rip interface

This command displays information related to a particular RIP interface. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format `show ip rip interface {slot/port|vlan 1-4093}`

Modes

- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port* This is a configured value.
IP Address	The IP source address used by the specified RIP interface. This is a configured value.
Send Version	The RIP version(s) used when sending updates on the specified interface. The types are none, RIP-1, RIP-1c, RIP-2. This is a configured value.
Receive Version	The RIP version(s) allowed when receiving updates from the specified interface. The types are none, RIP-1, RIP-2, Both. This is a configured value.
RIP Admin Mode	RIP administrative mode of router RIP operation; enable activates, disable de-activates it. This is a configured value.
Link State	Indicates whether the RIP interface is up or down. This is a configured value.
Authentication Type	The RIP Authentication Type for the specified interface. The types are none, simple, and encrypt. This is a configured value.

The following information will be invalid if the link state is down.

Term	Definition
Bad Packets Received	The number of RIP response packets received by the RIP process which were subsequently discarded for any reason.
Bad Routes Received	The number of routes contained in valid RIP packets that were ignored for any reason.
Updates Sent	The number of triggered RIP updates actually sent on this interface.

7.12 ICMP Throttling Commands

This section describes the commands you use to configure options for the transmission of various types of ICMP messages.

7.12.1 ip unreachables

Use this command to enable the generation of ICMP Destination Unreachable messages on an interface or range of interfaces. By default, the generation of ICMP Destination Unreachable messages is enabled.

Default enable

Format `ip unreachables`

Mode Interface Config

7.12.1.1 no ip unreachables

Use this command to prevent the generation of ICMP Destination Unreachable messages.

Format `no ip unreachables`

Mode Interface Config

7.12.2 ip redirects

Use this command to enable the generation of ICMP Redirect messages by the router. By default, the generation of ICMP Redirect messages is enabled. You can use this command to configure an interface, a range of interfaces, or all interfaces.

Default enable

Format `ip redirects`

Mode
- Global Config
- Interface Config
- Virtual Router Config

7.12.2.1 no ip redirects

Use this command to prevent the generation of ICMP Redirect messages by the router.

Format `no ip redirects`

Mode
- Global Config
- Interface Config

7.12.3 ipv6 redirects

Use this command to enable the generation of ICMPv6 Redirect messages by the router. By default, the generation of ICMP Redirect messages is enabled. You can use this command to configure an interface, a range of interfaces, or all interfaces.

Default enable

Format `ipv6 redirects`

Mode Interface Config

7.12.3.1 no ipv6 redirects

Use this command to prevent the generation of ICMPv6 Redirect messages by the router.

Format `no ipv6 redirects`

Mode Interface Config

7.12.4 ip icmp echo-reply

Use this command to enable the generation of ICMP Echo Reply messages by the router. By default, the generation of ICMP Echo Reply messages is enabled.

Default enable

Format `ip icmp echo-reply`

Mode
- Global Config
- Virtual Router Config

7.12.4.1 no ip icmp echo-reply

Use this command to prevent the generation of ICMP Echo Reply messages by the router.

Format `no ip icmp echo-reply`

Mode Global Config

7.12.5 ip icmp error-interval

Use this command to limit the rate at which IPv4 ICMP error messages are sent. The rate limit is configured as a token bucket, with two configurable parameters, *burst-size* and *burst-interval*.

The *burst-interval* specifies how often the token bucket is initialized with *burst-size* tokens. *burst-interval* is from 0 to 2147483647 milliseconds (msec). The *burst-size* is the number of ICMP error messages that can be sent during one *burst-interval*. The range is from 1 to 200 messages. To disable ICMP rate limiting, set *burst-interval* to zero (0).

Default	• *burst-interval* of 1000 msec. • *burst-size* of 100 messages
Format	`ip icmp error-interval` ***burst-interval [burst-size]***
Mode	• Global Config • Virtual Router Config

7.12.5.1 no ip icmp error-interval

Use the no form of the command to return *burst-interval* and *burst-size* to their default values.

Format	`no ip icmp error-interval`
Mode	Global Config

7.13 Bidirectional Forwarding Detection Commands

Bidirectional Forwarding Detection (BFD) verifies bidirectional connectivity between forwarding engines, which can be a single or multi-hop away. The protocol works over any underlying transmission mechanism and protocol layer with a wide range of detection times, especially in scenarios where fast failure detection is required in data plane level for multiple concurrent sessions.

Use the following commands to configure Bidirectional Forwarding Detection commands (BFD).

7.13.1 bfd

This command enables BFD on all interfaces associated with the OSPF process.

Default	Disabled
Format	*bfd*
Mode	Router OSPF Config

Example: Do the following to trigger BFD processing through OSPF on all the interfaces that are associated with it.

```
(Router) (Config)# router ospf
(Router) (Config-router)# bfd
(Router) (Config-router)# exit
```

7.13.1.1 no bfd

This command disables BFD on all interfaces associated with the OSPF process.

Format	*no bfd*
Mode	Router OSPF Config

7.13.2 feature bfd

This command enables BFD on the device. Note that BFD must be enabled in order to configure other protocol and interface parameters.

Default	Disabled
Format	*`feature bfd`*
Mode	Global Config

7.13.2.1 no feature bfd

Disables BFD globally and removes runtime session data. Static configurations are retained.

Format	*`no feature bfd`*
Mode	Global Config

Example:

```
(Router)# configure
(Router) (Config)# feature bfd
(Router) (Config)# exit
```

7.13.3 bfd echo

This command enables BFD echo mode on an IP interface.

Default	Disabled
Format	`bfd echo`
Mode	Interface Config

Example:

```
(Router) (Config)# interface 0/1
(Router) (Interface 0/1)# no bfd echo
(Router) (Interface 0/1)# exit
```

7.13.3.1 no bfd echo

This command diables BFD echo mode on an IP interface.

Format	`no bfd echo`
Mode	Interface Config

7.13.4 bfd interval

This command configures the BFD session parameters for all available interfaces on the device (Global Config mode) or IP interface (Interface Config mode). It overwrites any BFD configurations present on individual interfaces (Global Config mode) or globally configured BFD session parameters (Interface Config).

Default	None
Format	`bfd interval` *`transmit-interval`* `min_rx` *`minimum-receive-interval`* `multiplier` *`detection-time-multiplier`*
Mode	• Global Config • Interface Config

Parameters	Description
transmit-interval	The desired minimum transmit interval, which is the minimum interval that the user wants to use while transmitting BFD control packets. It is represented in milliseconds. Its range is 100 ms to 1000 ms (with a change granularity of 100) a with default value of 100 ms.
minimum-receive-interval	The required minimum receive interval, which is the minimum interval at which the system can receive BFD control packets. It is represented in milliseconds. Its range is 100 ms to 1000 ms (with a change granularity of 100) with a default value of 100 ms.
detection-time-multiplier	The number of BFD control packets that must be missed in a row to declare a session down. Its range is 1 to 50 with default value of 3.

Example: The following steps configure BFD session parameters on the device, in Privileged EXEC mode.

```
(Router)# configure
(Router) (Config)# bfd interval 100 min_rx 200 multiplier 5
(Router) (Config)# exit
```

Example: The following steps configure BFD session parameters on an interface (for example, 0/1).

```
(Router) (Config)# interface 0/1
(Router) (Interface 0/1)# bfd interval 100 min_rx 200 multiplier 5
(Router) (Interface 0/0/1)# exit
```

7.13.4.1 no bfd interval

In Global Config mode, this command resets the BFD session parameters for all available interfaces on the device to their default values. In Interface Config mode, this command resets the BFD session parameters for all sessions on an IP interface to their default values.

Format	`no bfd interval`
Mode	• Global Config • Interface Config

7.13.5 bfd slow-timer

This command sets up the required echo receive interval preference value. This value determines the interval the asynchronous sessions use for BFD control packets the when echo function is enabled. The slow-timer value is used as the new control packet interval, while the echo packets use the configured BFD intervals.

Default	2000
Format	`bfd slow-timer` *`echo-receive-interval`*
Mode	Global Config

Parameters	Description
echo-receive-interval	The value is represented in milliseconds. Its range is 1000 ms to 30000 ms (with a change granularity of 100) with default value of 2000 ms.

Example:

```
(Router)# configure
(Router) (Config)# bfd slow-timer 10000
(Router) (Config)# exit
```

7.13.5.1 no bfd slow-timer

This command resets the BFD slow-timer preference value to its default.

Format	`no bfd slow-timer`
Mode	Global Config

7.13.6 ip ospf bfd

This command enables BFD on interfaces associated with the OSPF process.

Default	Disabled
Format	`ip ospf bfd`
Mode	Interface Config

7.13.6.1 no ip ospf bfd

This command disables BFD on interfaces associated with the OSPF process.

Default	Disabled
Format	`no ip ospf bfd`
Mode	Interface Config

7.13.7 debug bfd event

This command displays BFD state transition information.

Format	`debug bfd event`
Mode	Privileged EXEC

7.13.8 debug bfd packet

This command displays BFD control packet debugging information.

Format	`debug bfd packet`
Mode	Privileged EXEC

8/ IPv6 Management Commands

This chapter describes the IPv6 commands available in the FASTPATH CLI.

This chapter contains the following sections:

NOTICE

The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

8.1 IPv6 Management Commands

IPv6 Management commands allow a device to be managed via an IPv6 address in a switch or IPv4 routing (i.e., independent from the IPv6 Routing package). For Routing/IPv6 builds of FASTPATH dual IPv4/IPv6 operation over the service port is enabled. FASTPATH has capabilities such as:

- Static assignment of IPv6 addresses and gateways for the service/network ports.
- The ability to ping an IPv6 link-local address over the service/network port.
- Using IPv6 Management commands, you can send SNMP traps and queries via the service/network port.
- The user can manage a device via the network port (in addition to a Routing Interface or the Service port).

8.1.1 serviceport ipv6 enable

Use this command to enable IPv6 operation on the service port. By default, IPv6 operation is enabled on the service port.

Default	enabled
Format	`serviceport ipv6 enable`
Mode	Privileged EXEC

8.1.1.1 no serviceport ipv6 enable

Use this command to disable IPv6 operation on the service port.

Format	`no serviceport ipv6 enable`
Mode	Privileged EXEC

8.1.2 network ipv6 enable

Use this command to enable IPv6 operation on the network port. By default, IPv6 operation is enabled on the network port.

Default	enabled
Format	`network ipv6 enable`
Mode	Privileged EXEC

8.1.2.1 no network ipv6 enable

Use this command to disable IPv6 operation on the network port.

Format	`no network ipv6 enable`
Mode	Privileged EXEC

8.1.3 serviceport ipv6 address

Use the options of this command to manually configure IPv6 global address, enable/disable stateless global address autoconfiguration and to enable/disable dhcpv6 client protocol information on the service port.

NOTICE Multiple IPv6 prefixes can be configured on the service port.

Format	`serviceport ipv6 address {`*`address/prefix-length`*` [eui64]|autoconfig|dhcp}`
Mode	Privileged EXEC

Parameter	Description
address	IPv6 prefix in IPv6 global address format.
prefix-length	IPv6 prefix length value.
eui64	Formulate IPv6 address in eui64 address format.
autoconfig	Configure stateless global address autoconfiguration capability.
dhcp	Configure dhcpv6 client protocol.

8.1.3.1 no serviceport ipv6 address

Use the command `no serviceport ipv6 address` to remove all configured IPv6 prefixes on the service port interface.

Use the command with the address option to remove the manually configured IPv6 global address on the network port interface.

Use the command with the autoconfig option to disable the stateless global address autoconfiguration on the service port.

Use the command with the dhcp option to disable the dhcpv6 client protocol on the service port.

Format	`no serviceport ipv6 address {`*`address/prefix-length`*` [eui64]	autoconfig	dhcp}`
Mode	Privileged EXEC

8.1.4 serviceport ipv6 gateway

Use this command to configure IPv6 gateway (i.e. Default routers) information for the service port.

NOTICE Only a single IPv6 gateway address can be configured for the service port. There may be a combination of IPv6 prefixes and gateways that are explicitly configured and those that are set through auto-address configuration with a connected IPv6 router on their service port interface.

Format	`serviceport ipv6 gateway `*`gateway-address`*
Mode	Privileged EXEC

Parameter	Description
gateway-address	Gateway address in IPv6 global or link-local address format.

8.1.4.1 no serviceport ipv6 gateway

Use this command to remove IPv6 gateways on the service port interface.

Format `no serviceport ipv6 gateway`

Mode Privileged EXEC

8.1.5 serviceport ipv6 neighbor

Use this command to manually add IPv6 neighbors to the IPv6 neighbor table for the service port. If an IPv6 neighbor already exists in the neighbor table, the entry is automatically converted to a static entry. Static entries are not modified by the neighbor discovery process. They are, however, treated the same for IPv6 forwarding. Static IPv6 neighbor entries are applied to the kernel stack and to the hardware when the corresponding interface is operationally active.

Format `serviceport ipv6 neighbor` *`ipv6-address macaddr`*

Mode Privileged EXEC

Parameter	Description
ipv6-address	The IPv6 address of the neighbor or interface.
macaddr	The link-layer address.

8.1.5.1 no serviceport ipv6 neighbor

Use this command to remove IPv6 neighbors from the IPv6 neighbor table for the service port.

Format `no serviceport ipv6 neighbor` *`ipv6-address macaddr`*

Mode Privileged EXEC

8.1.6 network ipv6 address

Use the options of this command to manually configure IPv6 global address, enable/disable stateless global address autoconfiguration and to enable/disable dhcpv6 client protocol information for the network port. Multiple IPv6 addresses can be configured on the network port.

Format `network ipv6 address {`*`address/prefix-length`*` [eui64] | autoconfig | dhcp}`

Mode Privileged EXEC

Parameter	Description
address	IPv6 prefix in IPv6 global address format.
prefix-length	IPv6 prefix length value.
eui64	Formulate IPv6 address in eui64 format.
autoconfig	Configure stateless global address autoconfiguration capability.
dhcp	Configure dhcpv6 client protocol.

8.1.6.1 no network ipv6 address

The command `no network ipv6 address` removes all configured IPv6 prefixes.

Use this command with the address option to remove the manually configured IPv6 global address on the network port interface.

Use this command with the autoconfig option to disable the stateless global address autoconfiguration on the network port.

Use this command with the dhcp option disables the dhcpv6 client protocol on the network port.

Format	`no network ipv6 address {`*`address/prefix-length`*` [eui64]	autoconfig	dhcp}`
Mode	Privileged EXEC

8.1.7 network ipv6 gateway

Use this command to configure IPv6 gateway (i.e. default routers) information for the network port.

Format	`network ipv6 gateway `*`gateway-address`*
Mode	Privileged EXEC

Parameter	Description
gateway-address	Gateway address in IPv6 global or link-local address format.

8.1.7.1 no network ipv6 gateway

Use this command to remove IPv6 gateways on the network port interface.

Format	`no network ipv6 gateway`
Mode	Privileged EXEC

8.1.8 network ipv6 neighbor

Use this command to manually add IPv6 neighbors to the IPv6 neighbor table for this network port. If an IPv6 neighbor already exists in the neighbor table, the entry is automatically converted to a static entry. Static entries are not modified by the neighbor discovery process. They are, however, treated the same for IPv6 forwarding. Static IPv6 neighbor entries are applied to the kernel stack and to the hardware when the corresponding interface is operationally active.

Format	`network ipv6 neighbor `*`ipv6-address macaddr`*
Mode	Privileged EXEC

Parameter	Description
ipv6-address	The IPv6 address of the neighbor or interface.
macaddr	The link-layer address.

8.1.8.1 no network ipv6 neighbor

Use this command to remove IPv6 neighbors from the neighbor table.

Format	`no network ipv6 neighbor `*`ipv6-address macaddr`*
Mode	Privileged EXEC

8.1.9 show network ipv6 neighbors

Use this command to display the information about the IPv6 neighbor entries cached on the network port. The information is updated to show the type of the entry.

Default	None
Format	`show network ipv6 neighbors`
Mode	• Privileged EXEC

Field	Description
IPv6 Address	The IPv6 address of the neighbor.
MAC Address	The MAC Address of the neighbor.
isRtr	Shows if the neighbor is a router. If TRUE, the neighbor is a router; FALSE it is not a router.
Neighbor State	The state of the neighbor cache entry. Possible values are: Incomplete, Reachable, Stale, Delay, Probe, and Unknown
Age	The time in seconds that has elapsed since an entry was added to the cache.
Last Updated	The time in seconds that has elapsed since an entry was added to the cache.
Type	The type of neighbor entry. The type is Static if the entry is manually configured and Dynamic if dynamically resolved.

Example: The following is an example of the command.

```
(FASTPATH Routing) #show network ipv6 neighbors

                                                 Neighbor  Age
IPv6 Address             MAC Address       isRtr State     (Secs)      Type
------------------------ ----------------- ----- --------- ------      ------
FE80::5E26:AFF:FEBD:852C 5c:26:0a:bd:85:2c FALSE Reachable 0           Static
```

8.1.10 show serviceport ipv6 neighbors

Use this command to displays information about the IPv6 neighbor entries cached on the service port. The information is updated to show the type of the entry.

Default	None
Format	`show serviceport ipv6 neighbors`
Mode	Privileged EXEC

Field	Description
IPv6 Address	The IPv6 address of the neighbor.
MAC Address	The MAC Address of the neighbor.
isRtr	Shows if the neighbor is a router. If TRUE, the neighbor is a router; if FALSE, it is not a router.
Neighbor State	The state of the neighbor cache entry. The possible values are: Incomplete, Reachable, Stale, Delay, Probe, and Unknown.
Age	The time in seconds that has elapsed since an entry was added to the cache.
Type	The type of neighbor entry. The type is Static if the entry is manually configured and Dynamic if dynamically resolved.

Example: The following is an example of the command.

```
(FASTPATH Routing) #show serviceport ipv6 neighbors

                                                                        Neighbor  Age
IPv6 Address                            MAC Address       isRtr State     (Secs)   Type
---------------------------------------- ----------------- ----- --------- ------   --------
FE80::5E26:AFF:FEBD:852C                5c:26:0a:bd:85:2c FALSE Reachable 0        Dynamic
```

8.1.11 ping ipv6

Use this command to determine whether another computer is on the network. Ping provides a synchronous response when initiated from the CLI and Web interfaces. To use the command, configure the switch for network (in-band) connection. The source and target devices must have the ping utility enabled and running on top of TCP/IP. The switch can be pinged from any IP workstation with which the switch is connected through the default VLAN (VLAN 1), as long as there is a physical path between the switch and the workstation. The terminal interface sends three pings to the target station. Use the ***ipv6-address|hostname*** parameter to ping an interface by using the global IPv6 address of the interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. Use the optional ***size*** keyword to specify the size of the ping packet.

You can utilize the ping or traceroute facilities over the service/network ports when using an IPv6 global address ***ipv6-global-address|hostname***. Any IPv6 global address or gateway assignments to these interfaces will cause IPv6 routes to be installed within the IP stack such that the ping or traceroute request is routed out the service/network port properly. When referencing an IPv6 link-local address, you must also specify the service or network port interface by using the ***serviceport*** or ***network*** parameter.

Default	• The default count is 1. • The default interval is 3 seconds. • The default size is 0 bytes.
Format	ping ipv6 {*ipv6-global-address*|*hostname* | {interface {*slot/port*|vlan *1-4093*| serviceport | network} *link-local-address*} [size *datagram-size*]}
Mode	• Privileged EXEC • User EXEC

8.1.12 ping ipv6 interface

Use this command to determine whether another computer is on the network. To use the command, configure the switch for network (in-band) connection. The source and target devices must have the ping utility enabled and running on top of TCP/IP. The switch can be pinged from any IP workstation with which the switch is connected through the default VLAN (VLAN 1), as long as there is a physical path between the switch and the workstation. The terminal interface sends three pings to the target station. You can use a loopback, network port, service port, tunnel, vlan, or physical interface as the source. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format	ping ipv6 interface {*slot/port*|vlan *1-4093*|loopback *loopback-id*|network |serviceport|tunnel *tunnel-id* } {link-local-address *link-local-address* | *ipv6-address*} [size *datagram-size*]
Modes	• Privileged EXEC • User EXEC

Keyword	Description
interface	Use the ***interface*** keyword to ping an interface by using the link-local address or the global IPv6 address of the interface.
size	Use the optional ***size*** keyword to specify the size of the ping packet.
ipv6-address	The link local IPv6 address of the device you want to query.

8.2 Tunnel Interface Commands

The commands in this section describe how to create, delete, and manage tunnel interfaces.Several different types of tunnels provide functionality to facilitate the transition of IPv4 networks to IPv6 networks. These tunnels are divided into two classes: configured and automatic. The distinction is that configured tunnels are explicitly configured with a destination or endpoint of the tunnel. Automatic tunnels, in contrast, infer the endpoint of the tunnel from the destination address of packets routed into the tunnel. To assign an IP address to the tunnel interface, see “ip address” on page 543. To assign an IPv6 address to the tunnel interface, see “ipv6 address” on page 672.

8.2.1 interface tunnel

Use this command to enter the Interface Config mode for a tunnel interface. The ***tunnel-id*** range is 0 to 7.

Format	`interface tunnel tunnel-id`
Mode	Global Config

8.2.1.1 no interface tunnel

This command removes the tunnel interface and associated configuration parameters for the specified tunnel interface.

Format	`no interface tunnel tunnel-id`
Mode	Global Config

8.2.2 tunnel source

This command specifies the source transport address of the tunnel, either explicitly or by reference to an interface.

Format	`tunnel source {ipv4-address | ethernet slot/port}`
Mode	Interface Config

8.2.3 tunnel destination

This command specifies the destination transport address of the tunnel.

Format	`tunnel destination {ipv4-address}`
Mode	Interface Config

8.2.4 tunnel mode ipv6ip

This command specifies the mode of the tunnel. With the optional 6to4 argument, the tunnel mode is set to 6to4 automatic. Without the optional 6to4 argument, the tunnel mode is configured.

Format	`tunnel mode ipv6ip [6to4]`
Mode	Interface Config

8.2.5 show interface tunnel

This command displays the parameters related to tunnel such as tunnel mode, tunnel source address and tunnel destination address.

Format	`show interface tunnel [tunnel-id]`
Mode	Privileged EXEC

If you do not specify a tunnel ID, the command shows the following information for each configured tunnel:

Term	Definition
Tunnel ID	The tunnel identification number.
Interface	The name of the tunnel interface.
Tunnel Mode	The tunnel mode.
Source Address	The source transport address of the tunnel.
Destination Address	The destination transport address of the tunnel.

If you specify a tunnel ID, the command shows the following information for the tunnel:

Term	Definition
Interface Link Status	Shows whether the link is up or down.
MTU Size	The maximum transmission unit for packets on the interface.
IPv6 Address/ Length	If you enable IPv6 on the interface and assign an address, the IPv6 address and prefix display.

8.3 Loopback Interface Commands

The commands in this section describe how to create, delete, and manage loopback interfaces. A loopback interface is always expected to be up. This interface can provide the source address for sent packets and can receive both local and remote packets. The loopback interface is typically used by routing protocols.

To assign an IP address to the loopback interface, see “ip address” on page 543. To assign an IPv6 address to the loopback interface, see “ipv6 address” on page 672.

8.3.1 interface loopback

Use this command to enter the Interface Config mode for a loopback interface. The range of the loopback ID is 0 to 7.

Format	`interface loopback` *`loopback-id`*
Mode	Global Config

8.3.1.1 no interface loopback

This command removes the loopback interface and associated configuration parameters for the specified loopback interface.

Format	`no interface loopback` *`loopback-id`*
Mode	Global Config

8.3.2 show interface loopback

This command displays information about configured loopback interfaces.

Format	`show interface loopback [`*`loopback-id`*`]`
Mode	Privileged EXEC

If you do not specify a loopback ID, the following information appears for each loopback interface on the system:

Term	Definition
Loopback ID	The loopback ID associated with the rest of the information in the row.
Interface	The interface name.
IP Address	The IPv4 address of the interface.

If you specify a loopback ID, the following information appears:

Term	Definition
Interface Link Status	Shows whether the link is up or down.
IP Address	The IPv4 address of the interface.
MTU size	The maximum transmission size for packets on this interface, in bytes.

8.4 IPv6 Routing Commands

This section describes the IPv6 commands you use to configure IPv6 on the system and on the interfaces. This section also describes IPv6 management commands and show commands.

8.4.1 ipv6 hop-limit

This command defines the unicast hop count used in ipv6 packets originated by the node. The value is also included in router advertisements. Valid values for ***hops*** are 1-255 inclusive. The default “not configured” means that a value of zero is sent in router advertisements and a value of 64 is sent in packets originated by the node. Note that this is not the same as configuring a value of 64.

Default	not configured
Format	`ipv6 hop-limit` *`hops`*
Mode	Global Config

8.4.1.1 no ipv6 hop-limit

This command returns the unicast hop count to the default.

Format	`no ipv6 hop-limit`
Mode	Global Config

8.4.2 ipv6 unicast-routing

Use this command to enable the forwarding of IPv6 unicast datagrams.

Default	disabled
Format	`ipv6 unicast-routing`
Mode	Global Config

8.4.2.1 no ipv6 unicast-routing

Use this command to disable the forwarding of IPv6 unicast datagrams.

Format	`no ipv6 unicast-routing`
Mode	Global Config

8.4.3 ipv6 enable

Use this command to enable IPv6 routing on an interface or range of interfaces, including tunnel and loopback interfaces, that has not been configured with an explicit IPv6 address. When you use this command, the interface is automatically configured with a link-local address. You do not need to use this command if you configured an IPv6 global address on the interface.

Default	disabled
Format	`ipv6 enable`
Mode	Interface Config

8.4.3.1 no ipv6 enable

Use this command to disable IPv6 routing on an interface.

Format	`no ipv6 enable`
Mode	Interface Config

8.4.4 ipv6 address

Use this command to configure an IPv6 address on an interface or range of interfaces, including tunnel and loopback interfaces, and to enable IPv6 processing on this interface. You can assign multiple globally reachable addresses to an interface by using this command. You do not need to assign a link-local address by using this command since one is automatically created. The ***prefix*** field consists of the bits of the address to be configured. The ***prefix_length*** designates how many of the high-order contiguous bits of the address make up the prefix.

You can express IPv6 addresses in eight blocks. Also of note is that instead of a period, a colon now separates each block. For simplification, leading zeros of each 16 bit block can be omitted. One sequence of 16 bit blocks containing only zeros can be replaced with a double colon "::", but not more than one at a time (otherwise it is no longer a unique representation).

- Dropping zeros: `3ffe:ffff:100:f101:0:0:0:1` becomes `3ffe:ffff:100:f101::1`
- Local host: `0000:0000:0000:0000:0000:0000:0000:0001` becomes `::1`
- Any host: `0000:0000:0000:0000:0000:0000:0000:0000` becomes `::`

The hexadecimal letters in the IPv6 addresses are not case-sensitive. An example of an IPv6 prefix and prefix length is `3ffe:1::1234/64`.

The optional [eui-64] field designates that IPv6 processing on the interfaces was enabled using an EUI-64 interface ID in the low order 64 bits of the address. If you use this option, the value of ***prefix_length*** must be 64 bits.

Format	`ipv6 address` *prefix/prefix_length* `[eui64]`
Mode	Interface Config

8.4.4.1 no ipv6 address

Use this command to remove all IPv6 addresses on an interface or specified IPv6 address. The ***prefix*** parameter consists of the bits of the address to be configured. The ***prefix_length*** designates how many of the high-order contiguous bits of the address comprise the prefix.The optional ***[eui-64]*** field designates that IPv6 processing on the interfaces was enabled using an EUI-64 interface ID in the low order 64 bits of the address.

If you do not supply any parameters, the command deletes all the IPv6 addresses on an interface.

Format	`no ipv6 address [`*prefix/prefix_length*`] [eui64]`
Mode	Interface Config

8.4.5 ipv6 address autoconfig

Use this command to allow an in-band interface to acquire an IPv6 address through IPv6 Neighbor Discovery Protocol (NDP) and through the use of Router Advertisement messages.

Default	disabled
Format	`ipv6 address autoconfig`
Mode	Interface Config

8.4.5.1 no ipv6 address autoconfig

This command the IPv6 autoconfiguration status on an interface to the default value.

Format	`no ipv6 address autoconfig`
Mode	Interface Config

8.4.6 ipv6 address dhcp

This command enables the DHCPv6 client on an in-band interface so that it can acquire network information, such as the IPv6 address, from a network DHCP server.

Default	disabled
Format	`ipv6 address dhcp`
Mode	Interface Config

8.4.6.1 no ipv6 address dhcp

This command releases a leased address and disables DHCPv6 on an interface.

Format	`no ipv6 address dhcp`
Mode	Interface Config

8.4.7 ipv6 route

Use this command to configure an IPv6 static route. The ***ipv6-prefix*** is the IPv6 network that is the destination of the static route. The ***prefix_length*** is the length of the IPv6 prefix — a decimal value (usually 0-64) that shows how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must precede the ***prefix_length***. The ***next-hop-address*** is the IPv6 address of the next hop that can be used to reach the specified network. Specifying `Null0` as nexthop parameter adds a static reject route. The ***preference*** parameter is a value the router uses to compare this route with routes from other route sources that have the same destination. The range for ***preference*** is 1–255, and the default value is 1. The argument *`slot/port`* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. You can specify a ***slot/port*** or *`vlan id`* or ***tunnel tunnel_id*** interface to identify direct static routes from point-to-point and broadcast interfaces. The interface must be specified when using a link-local address as the next hop. A route with a preference of 255 cannot be used to forward traffic.

Default	disabled
Format	`ipv6 route ipv6-prefix/prefix_length {next-hop-address | Null0 | interface {slot/port|vlan 1-4093|tunnel tunnel_id} next-hop-address} [preference]`
Mode	Global Config

8.4.7.1 no ipv6 route

Use this command to delete an IPv6 static route. Use the command without the optional parameters to delete all static routes to the specified destination. Use the ***preference*** parameter to revert the preference of a route to the default preference.

Format	`no ipv6 route` *`ipv6-prefix/prefix_length`* `[{`*`next-hop-address`* `| Null0 | interface {`*`slot/port`*`|vlan` *`1-4093`*`|tunnel` *`tunnel_id`*`}` *`next-hop-address`* `|` *`preference`*`}]`
Mode	Global Config

8.4.8 ipv6 route distance

This command sets the default distance (preference) for IPv6 static routes. Lower route distance values are preferred when determining the best route. The **`ipv6 route`** command allows you to optionally set the distance (preference) of an individual static route. The default distance is used when no distance is specified in this command.

Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance will only be applied to static routes created after invoking the **`ipv6 route distance`** command.

Default	1
Format	`ipv6 route distance` *`1-255`*
Mode	Global Config

8.4.8.1 no ipv6 route distance

This command resets the default static route preference value in the router to the original default preference. Lower route preference values are preferred when determining the best route.

Format	`no ipv6 route distance`
Mode	Global Config

8.4.9 ipv6 route net-prototype

This command adds net prototype IPv6 routes to the hardware.

Format	`ip route net-prototype` *`prefix/prefix-length nexthopip num-routes`*
Mode	Global Config

Parameter	Description
prefix/prefix-length	The destination network and mask for the route.
nexthopip	The next-hop ip address, It must belong to an active routing interface, but it does not need to be resolved.
num-routes	The number of routes need to added into hardware starting from the given prefix argument and within the given prefix-length.

8.4.9.1 no ipv6 route net-prototype

This command deletes all the net prototype IPv6 routes added to the hardware.

Format	`ip route net-prototype` *`prefix/prefix-length nexthopip num-routes`*
Mode	Global Config

8.4.10 ipv6 mtu

This command sets the maximum transmission unit (MTU) size, in bytes, of IPv6 packets on an interface or range of interfaces. This command replaces the default or link MTU with a new MTU value.

NOTICE The default MTU value for a tunnel interface is 1480. You cannot change this value.

Default	0 or link speed (MTU value (1500))
Format	`ipv6 mtu` *`1280-1500`*
Mode	Interface Config

8.4.10.1 no ipv6 mtu

This command resets maximum transmission unit value to default value.

Format	`no ipv6 mtu`
Mode	Interface Config

8.4.11 ipv6 nd dad attempts

This command sets the number of duplicate address detection probes transmitted on an interface or range of interfaces. Duplicate address detection verifies that an IPv6 address on an interface is unique.

Default	1
Format	`ipv6 nd dad attempts` *`0 - 600`*
Mode	Interface Config

8.4.11.1 no ipv6 nd dad attempts

This command resets to number of duplicate address detection value to default value.

Format	`no ipv6 nd dad attempts`
Mode	Interface Config

8.4.12 ipv6 nd managed-config-flag

This command sets the “managed address configuration” flag in router advertisements on the interface or range of interfaces. When the value is true, end nodes use DHCPv6. When the value is false, end nodes automatically configure addresses.

Default	false
Format	`ipv6 nd managed-config-flag`
Mode	Interface Config

8.4.12.1 no ipv6 nd managed-config-flag

This command resets the “managed address configuration” flag in router advertisements to the default value.

Format `no ipv6 nd managed-config-flag`

Mode Interface Config

8.4.13 ipv6 nd ns-interval

This command sets the interval between router advertisements for advertised neighbor solicitations, in milliseconds. An advertised value of 0 means the interval is unspecified. This command can configure a single interface or a range of interfaces.

Default 0

Format `ipv6 nd ns-interval {1000-4294967295 | 0}`

Mode Interface Config

8.4.13.1 no ipv6 nd ns-interval

This command resets the neighbor solicit retransmission interval of the specified interface to the default value.

Format `no ipv6 nd ns-interval`

Mode Interface Config

8.4.14 ipv6 nd other-config-flag

This command sets the “other stateful configuration” flag in router advertisements sent from the interface.

Default false

Format `ipv6 nd other-config-flag`

Mode Interface Config

8.4.14.1 no ipv6 nd other-config-flag

This command resets the “other stateful configuration” flag back to its default value in router advertisements sent from the interface.

Format `no ipv6 nd other-config-flag`

Mode Interface Config

8.4.15 fipv6 nd ra-interval

This command sets the transmission interval between router advertisements on the interface or range of interfaces.

Default 600

Format `ipv6 nd ra-interval-max 4- 1800`

Mode Interface Config

8.4.15.1 no ipv6 nd ra-interval

This command sets router advertisement interval to the default.

Format	`no ipv6 nd ra-interval-max`
Mode	Interface Config

8.4.16 ipv6 nd ra-lifetime

This command sets the value, in seconds, that is placed in the Router Lifetime field of the router advertisements sent from the interface or range of interfaces. The ***lifetime*** value must be zero, or it must be an integer between the value of the router advertisement transmission interval and 9000. A value of zero means this router is not to be used as the default router.

Default	1800
Format	`ipv6 nd ra-lifetime` *lifetime*
Mode	Interface Config

8.4.16.1 no ipv6 nd ra-lifetime

This command resets router lifetime to the default value.

Format	`no ipv6 nd ra-lifetime`
Mode	Interface Config

8.4.17 ipv6 nd ra hop-limit unspecified

This command configures the router to send Router Advertisements on an interface with an unspecified (0) Current Hop Limit value. This tells the hosts on that link to ignore the Hop Limit from this Router.

Default	Disable
Format	`ipv6 nd ra hop-limit unspecified`
Mode	Interface Config

8.4.17.1 no ipv6 nd ra hop-limit unspecified

This command configures the router to send Router Advertisements on an interface with the global configured Hop Limit value.

Format	`no ipv6 nd ra hop-limit unspecified`
Mode	Interface Config

8.4.18 ipv6 nd reachable-time

This command sets the router advertisement time to consider a neighbor reachable after neighbor discovery confirmation. Reachable time is specified in milliseconds. A value of zero means the time is unspecified by the router. This command can configure a single interface or a range of interfaces.

Default	0
Format	`ipv6 nd reachable-time` *0-4294967295*
Mode	Interface Config

8.4.18.1 no ipv6 nd reachable-time

This command means reachable time is unspecified for the router.

Format	`no ipv6 nd reachable-time`
Mode	Interface Config

8.4.19 ipv6 nd router-preference

Use this command to configure default router preferences that the interface advertises in router advertisement messages.

Default	medium
Format	`ipv6 nd router-preference { low | medium | high}`
Mode	Interface Config

8.4.19.1 no ipv6 nd router-preference

This command resets the router preference advertised by the interface to the default value.

Format	`no ipv6 nd router-preference`
Mode	Interface Config

8.4.20 ipv6 nd suppress-ra

This command suppresses router advertisement transmission on an interface or range of interfaces.

Default	disabled
Format	`ipv6 nd suppress-ra`
Mode	Interface Config

8.4.20.1 no ipv6 nd suppress-ra

This command enables router transmission on an interface.

Format	`no ipv6 nd suppress-ra`
Mode	Interface Config

8.4.21 ipv6 nd prefix

Use the `ipv6 nd prefix` command to configure parameters associated with prefixes the router advertises in its router advertisements. The first optional parameter is the valid lifetime of the router, in seconds. You can specify a value or indicate that the lifetime value is infinite. The second optional parameter is the preferred lifetime of the router.

This command can be used to configure a single interface or a range of interfaces.

The router advertises its global IPv6 prefixes in its router advertisements (RAs). An RA only includes the prefixes of the IPv6 addresses configured on the interface where the RA is transmitted. Addresses are configured using the **`ipv6 address`** interface configuration command. Each prefix advertisement includes information about the prefix, such as its lifetime values and whether hosts should use the prefix for on-link determination or address auto-configuration. Use the `ipv6 nd prefix` command to configure these values.

The `ipv6 nd prefix` command allows you to preconfigure RA prefix values before you configure the associated interface address. In order for the prefix to be included in RAs, you must configure an address that matches the prefix using the `ipv6 address` command. Prefixes specified using `ipv6 nd prefix` without associated interface address will not be included in RAs and will not be committed to the device configuration.

Default
- valid-lifetime—2592000
- preferred-lifetime— 604800
- autoconfig—enabled
- on-link—enabled

Format `ipv6 nd prefix` *`prefix/prefix_length [{0-4294967295`* `| infinite}` *`{0-4294967295`* `| infinite}] [no-autoconfig off-link]`

Mode Interface Config

8.4.21.1 no ipv6 nd prefix

This command sets prefix configuration to default values.

Format `no ipv6 nd prefix` *`prefix/prefix_length`*

Mode Interface Config

8.4.22 ipv6 neighbor

Configures a static IPv6 neighbor with the given IPv6 address and MAC address on a routing or host interface.

Format `ipv6 neighbor` *`ipv6address`* `{`*`slot/port`*`|vlan` *`1-4093`*`}` *`macaddr`*

Mode Global Config

Term	Definition
ipv6address	The IPv6 address of the neighbor.
slot/port	The *slot/port* for the interface.
vlan	The VLAN for the interface.
macaddr	The MAC address for the neighbor.

8.4.22.1 no ipv6 neighbor

Removes a static IPv6 neighbor with the given IPv6 address on a routing or host interface.

Format `no ipv6 neighbor` *`ipv6address`* `{`*`slot/port`*`|vlan` *`1-4093`*`}`

Mode Global Config

8.4.23 ipv6 neighbors dynamicrenew

Use this command to automatically renew the IPv6 neighbor entries. Enables/disables the periodic NUD (neighbor unreachability detection) to be run on the existing IPv6 neighbor entries based on the activity of the entries in the hardware. If the setting is disabled, only those entries that are actively used in the hardware are triggered for NUD at the end of STALE timeout of 1200 seconds. If the setting is enabled, periodically every 40 seconds a set of 300 entries are triggered for NUD irrespective of their usage in the hardware.

Default `Disabled`

Format `ipv6 neighbors dynamicrenew`

Mode Global Config

8.4.23.1 no ipv6 neighbors dynamicrenew

Disables automatic renewing of IPv6 neighbor entries.

Format	`no ipv6 neighbors dynamicrenew`
Mode	Global Config

8.4.24 ipv6 nud

Use this command to configure Neighbor Unreachability Detection (NUD). NUD verifies that communication with a neighbor exists.

Format	`ipv6 nud {backoff-multiple | max-multicast-solicits | max-unicast-solicits}`
Mode	Global Config

Term	Definition
backoff-multiple	Sets the exponential backoff multiple to calculate time outs in NS transmissions during NUD. The value ranges from 1 to 5. 1 is the default. The next timeout value is limited to a maximum value of 60 seconds if the value with exponential backoff calculation is greater than 60 seconds.
max-multicast-solicits	Sets the maximum number of multicast solicits sent during Neighbor Unreachability Detection. The value ranges from 3 to 255. 3 is the default.
max-unicast-solicits	Sets the maximum number of unicast solicits sent during Neighbor Unreachability Detection. The value ranges from 3 to 10. 3 is the default.

8.4.25 ipv6 prefix-list

To create a prefix list or add a prefix list entry, use the `ipv6 prefix-list` command in Global Configuration mode. Prefix lists allow matching of route prefixes with those specified in the prefix list. Each prefix list includes a sequence of prefix list entries ordered by their sequence numbers. A router sequentially examines each prefix list entry to determine if the route's prefix matches that of the entry. An empty or nonexistent prefix list permits all prefixes. An implicit deny is assume if a given prefix does not match any entries of a prefix list. Once a match or deny occurs the router does not go through the rest of the list. A prefix list may be used within a route map to match a route's prefix using the command "match ip address" on page 567.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64.

Default	No prefix lists are configured by default. When neither the ge nor the le option is configured, the destination prefix must match the network/length exactly. If the ge option is configured without the le option, any prefix with a network mask greater than or equal to the ge value is considered a match. Similarly, if the le option is configured without the ge option, a prefix with a network mask less than or equal to the le value is considered a match.
Format	`ip prefix-list` *`list-name`* `{[seq` *`number`*`] {permit | deny}` *`ipv6-prefix/prefix-length`* `[ge` *`length`*`] [le` *`length`*`] | renumber` *`renumber-interval first-statement-number`*`}`
Mode	Global Configuration

Parameter	Description
list-name	The text name of the prefix list. Up to 32 characters.
seq number	(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and applied in that order. If you do not specify a sequence number, the system will automatically select a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The value ranges from 1 to 4,294,967,294.
permit	Permit routes whose destination prefix matches the statement.
deny	Deny routes whose destination prefix matches the statement.

Parameter	Description
ipv6-prefix/ prefix-length	Specifies the match criteria for routes being compared to the prefix list statement. The ipv6-prefix can be any valid IP prefix. The length is any IPv6 prefix length from 0 to 32.
ge length	(Optional) If this option is configured, then a prefix is only considered a match if its network mask length is greater than or equal to this value. This value must be longer than the network length and less than or equal to 32.
le length	(Optional) If this option is configured, then a prefix is only considered a match if its network mask length is less than or equal to this value. This value must be longer than the ge length and less than or equal to 32.
renumber	(Optional) Provides the option to renumber the sequence numbers of the IP prefix list statements with a given interval starting from a particular sequence number. The valid range for *renumber-interval* is 1–100, and the valid range for *first-statement-number* is 1–1000.

8.4.25.1 no ip prefix-list

To delete a prefix list or a statement in a prefix list, use the no form of this command. The command no ip prefix-list list-name deletes the entire prefix list. To remove an individual statement from a prefix list, you must specify the statement exactly, with all its options.

Format	`no ip prefix-list` *list-name* `[seq` *number*`] {permit	deny}` *network/length* `[ge` *length*`] [le` *length*`]`
Mode	Global Configuration

8.4.26 ipv6 unreachables

Use this command to enable the generation of ICMPv6 Destination Unreachable messages on the interface or range of interfaces. By default, the generation of ICMPv6 Destination Unreachable messages is enabled.

Default	enable
Format	`ipv6 unreachables`
Mode	Interface Config

8.4.26.1 no ipv6 unreachables

Use this command to prevent the generation of ICMPv6 Destination Unreachable messages.

Format	`no ipv6 unreachables`
Mode	Interface Config

8.4.27 ipv6 unresolved-traffic

Use this command to control the rate at which IPv6 data packets come into the CPU. By default, rate limiting is disabled. When enabled, the rate can range from 50 to 1024 packets per second.

Default	enable
Format	`ipv6 unresolved-traffic rate-limit` *<50-1024>*
Mode	Global Config

8.4.27.1 no ipv6 unresolved-traffic

Use this command to disable the rate limiting.

Format	`no ipv6 unresolved-traffic rate-limit`
Mode	Global Config

8.4.28 ipv6 icmp error-interval

Use this command to limit the rate at which ICMPv6 error messages are sent. The rate limit is configured as a token bucket, with two configurable parameters, *burst-size* and *burst-interval*.

The *burst-interval* specifies how often the token bucket is initialized with *burst-size* tokens. *burst-interval* is from 0 to 2147483647 milliseconds (msec).

The *burst-size* is the number of ICMPv6 error messages that can be sent during one *burst-interval*. The range is from 1 to 200 messages.

To disable ICMP rate limiting, set *burst-interval* to zero (0).

Default	- *burst-interval* of 1000 msec. - *burst-size* of 100 messages
Format	`ipv6 icmp error-interval` ***`burst-interval`*** `[`***`burst-size`***`]`
Mode	Global Config

8.4.28.1 no ipv6 icmp error-interval

Use the no form of the command to return *burst-interval* and *burst-size* to their default values.

Format	`no ipv6 icmp error-interval`
Mode	Global Config

8.4.29 show ipv6 brief

Use this command to display the IPv6 status of forwarding mode and IPv6 unicast routing mode.

Format	`show ipv6 brief`
Mode	Privileged EXEC

Term	Definition
IPv6 Forwarding Mode	Shows whether the IPv6 forwarding mode is enabled.
IPv6 Unicast Routing Mode	Shows whether the IPv6 unicast routing mode is enabled.
IPv6 Hop Limit	Shows the unicast hop count used in IPv6 packets originated by the node. For more information, see “ipv6 hop-limit” on page 671.
ICMPv6 Rate Limit Error Interval	Shows how often the token bucket is initialized with burst-size tokens. For more information, see “ipv6 icmp error-interval” on page 682.
ICMPv6 Rate Limit Burst Size	Shows the number of ICMPv6 error messages that can be sent during one *burst-interval*. For more information, see “ipv6 icmp error-interval” on page 682.
Maximum Routes	Shows the maximum IPv6 route table size.
IPv6 Unresolved Data Rate Limit	Shows the rate in packets-per-second for the number of IPv6 data packets trapped to CPU when the packet fails to be forwarded in the hardware due to unresolved hardware address of the destined IPv6 node.
IPv6 Neighbors Dynamic Renew	Shows the dynamic renewal mode for the periodic NUD (neighbor unreachability detection) run on the existing IPv6 neighbor entries based on the activity of the entries in the hardware.
IPv6 NUD Maximum Unicast Solicits	Shows the maximum number of unicast Neighbor Solicitations sent during NUD (neighbor unreachabililty detection) before switching to multicast Neighbor Solicitations.

Term	Definition
IPv6 NUD Maximum Multicast Solicits	Shows the maximum number of multicast Neighbor Solicitations sent during NUD (neighbor unreachabililty detection) when in UNREACHABLE state.
IPv6 NUD Exponential Backoff Multiple	Shows the exponential backoff multiple to be used in the calculation of the next timeout value for Neighbor Solicitation transmission during NUD (neighbor unreachabililty detection) following the exponential backoff algorithm.
System uRPF Mode	Shows whether unicast Reverse Path Forwarding (uRPF) is enabled.

Example: The following shows example CLI display output for the command.

```
(Switch) #show ipv6 brief

IPv6 Unicast Routing Mode...................... Disable
IPv6 Hop Limit................................. 0
ICMPv6 Rate Limit Error Interval............... 1000 msec
ICMPv6 Rate Limit Burst Size................... 100 messages
Maximum Routes................................. 4096

IPv6 Unresolved Data Rate Limit................ 1024 pps
IPv6 Neighbors Dynamic Renew................... Disable
IPv6 NUD Maximum Unicast Solicits.............. 3
IPv6 NUD Maximum Multicast Solicits............ 3
IPv6 NUD Exponential Backoff Multiple.......... 1
System uRPF Mode............................... Enabled
```

8.4.30 show ipv6 interface

Use this command to show the usability status of IPv6 interfaces and whether ICMPv6 Destination Unreachable messages may be sent. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. The keyword loopback specifies the loopback interface directly. The keyword tunnel specifies the IPv6 tunnel interface.

Format	`show ipv6 interface {brief	slot/port|vlan 1-4093|loopback 0-7|tunnel 0-7}`
Mode	Privileged EXEC

If you use the ***brief*** parameter, the following information displays for all configured IPv6 interfaces:

Term	Definition
Interface	The interface in ***slot/port*** format.
IPv6 Operational Mode	Shows whether the mode is enabled or disabled.
IPv6 Address/ Length	Shows the IPv6 address and length on interfaces with IPv6 enabled.
Method	Indicates how each IP address was assigned. The field contains one of the following values: • DHCP - The address is leased from a DHCP server. • Manual - The address is manually configured. Global addresses with no annotation are assumed to be manually configured.

If you specify an interface, the following information also appears.

Term	Definition
Routing Mode	Shows whether IPv6 routing is enabled or disabled.
IPv6 Enable Mode	Shows whether IPv6 is enabled on the interface.
Administrative Mode	Shows whether the interface administrative mode is enabled or disabled.
Bandwidth	Shows bandwidth of the interface.
Interface Maximum Transmission Unit	The MTU size, in bytes.
Router Duplicate Address Detection Transmits	The number of consecutive duplicate address detection probes to transmit.
Address Autoconfigure Mode	Shows whether the autoconfigure mode is enabled or disabled.
Address DHCP Mode	Shows whether the DHCPv6 client is enabled on the interface.
IPv6 Hop Limit Unspecified	Indicates if the router is configured on this interface to send Router Advertisements with unspecified (0) as the Current Hop Limit value.
Router Advertisement NS Interval	The interval, in milliseconds, between router advertisements for advertised neighbor solicitations.
Router Advertisement Lifetime	Shows the router lifetime value of the interface in router advertisements.
Router Advertisement Reachable Time	The amount of time, in milliseconds, to consider a neighbor reachable after neighbor discovery confirmation.
Router Advertisement Interval	The frequency, in seconds, that router advertisements are sent.
Router Advertisement Managed Config Flag	Shows whether the managed configuration flag is set (enabled) for router advertisements on this interface.
Router Advertisement Other Config Flag	Shows whether the other configuration flag is set (enabled) for router advertisements on this interface.
Router Advertisement Router Preference	Shows the router preference.
Router Advertisement Suppress Flag	Shows whether router advertisements are suppressed (enabled) or sent (disabled).
IPv6 Destination Unreachables	Shows whether ICMPv6 Destination Unreachable messages may be sent (enabled) or not (disabled). For more information, see “ipv6 unreachables” on page 681.
ICMPv6 Redirect	Specifies if ICMPv6 redirect messages are sent back to the sender by the Router in the redirect scenario is enabled on this interface.

If an IPv6 prefix is configured on the interface, the following information also appears.

Term	Definition
IPv6 Prefix is	The IPv6 prefix for the specified interface.
Preferred Lifetime	The amount of time the advertised prefix is a preferred prefix.
Valid Lifetime	The amount of time the advertised prefix is valid.
Onlink Flag	Shows whether the onlink flag is set (enabled) in the prefix.
Autonomous Flag	Shows whether the autonomous address-configuration flag (autoconfig) is set (enabled) in the prefix.

Example: The following shows example CLI display output for the command.

```
(alpha-stack) #show ipv6 interface brief

           Oper.
Interface  Mode     IPv6 Address/Length
---------- -------- --------------------------------
0/33       Enabled  FE80::211:88FF:FE2A:3E3C/128
```

```
                 2033::211:88FF:FE2A:3E3C/64
0/17      Enabled  FE80::211:88FF:FE2A:3E3C/128
                 2017::A42A:26DB:1049:43DD/128                      [DHCP]
4/1       Enabled  FE80::211:88FF:FE2A:3E3C/128
                 2001::211:88FF:FE2A:3E3C/64                        [AUTO]
4/2       Disabled FE80::211:88FF:FE2A:3E3C/128                      [TENT]
```

Example: The following shows example CLI display output for the command.

```
(Switch) #show ipv6 interface 0/4/1

IPv6 is enabled
IPv6 Prefix is ................................ fe80::210:18ff:fe00:1105/128
                                                2001::1/64
Routing Mode................................... Enabled
IPv6 Enable Mode............................... Enabled
Administrative Mode............................ Enabled
IPv6 Operational Mode.......................... Enabled
Bandwidth...................................... 10000  kbps
Interface Maximum Transmit Unit................ 1500
Router Duplicate Address Detection Transmits... 1
Address DHCP Mode.............................. Disabled
IPv6 Hop Limit Unspecified..................... Enabled
Router Advertisement NS Interval............... 0
Router Advertisement Lifetime.................. 1800
Router Advertisement Reachable Time............ 0
Router Advertisement Interval.................. 600
Router Advertisement Managed Config Flag....... Disabled
Router Advertisement Other Config Flag......... Disabled
Router Advertisement Router Preference......... medium
Router Advertisement Suppress Flag............. Disabled
IPv6 Destination Unreachables.................. Enabled
ICMPv6 Redirects............................... Enabled


Prefix 2001::1/64
Preferred Lifetime............................. 604800
Valid Lifetime................................. 2592000
Onlink Flag.................................... Enabled
Autonomous Flag................................ Enabled
```

8.4.31 show ipv6 interface vlan

Use the show ipv6 interface vlan in Privileged EXEC mode to show to show the usability status of IPv6 VLAN interfaces.

Format `show ipv6 interface vlan` *`vlan-id`* `[prefix]`

Mode

- Privileged EXEC
- User EXEC

Parameter	Description
vlan-id	Valid VLAN ID
prefix	Display IPv6 Interface Prefix Information

8.4.32 show ipv6 dhcp interface

This command displays a list of all IPv6 addresses currently leased from a DHCP server on a specific in-band interface. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format	`show ipv6 dhcp [interface {slot/port|vlan 1-4093}]`
Modes	Privileged EXEC

Term	Definition
Mode	Displays whether the specified interface is in Client mode or not.
State	State of the DHCPv6 Client on this interface.The valid values are: INACTIVE, SOLICIT, REQUEST, ACTIVE, RENEW, REBIND, RELEASE.
Server DUID	DHCPv6 Unique Identifier of the DHCPv6 Server on this interface.
T1 Time	The T1 time specified by the DHCPv6 server. After the client has held the address for this length of time, the client tries to renew the lease.
T2 Time	The T2 time specified by the DHCPv6 server. If the lease renewal fails, then when the client has held the lease for this length of time, the client sends a Rebind message to the server.
Interface IAID	An identifier for an identity association chosen by this client.
Leased Address	The IPv6 address leased by the DHCPv6 Server for this interface.
Preferred Lifetime	The preferred lifetime of the IPv6 address, as defined in RFC 2462.
Valid Lifetime	The valid lifetime of the IPv6 address, as defined by RFC 2462.
Renew Time	The time until the client tries to renew the lease
Expiry Time	The time until the address expires.

8.4.33 show ipv6 nd raguard policy

This command shows the status of IPv6 RA GUARD feature on the switch. It lists the ports/interfaces on which this feature is enabled and the associated device role.

Format	`show ipv6 nd raguard policy`
Mode	Privileged EXEC

Term	Definition
Interface	The port/interface on which this feature is enabled.
Role	The associated device role for the interface.

Example:

```
(Switching) # show ipv6 nd raguard policy

          Configured Interfaces

          Interface        Role
          ---------------  -------
          Gi0/1            Host
```

8.4.34 show ipv6 neighbors

Use this command to display information about the IPv6 neighbors.

Format	`show ipv6 neighbor [interface {`*`slot/port`*`	vlan `*`1-4093`*`	tunnel `*`0-7`*`}	`*`ipv6-address`*`]`
Mode	Privileged EXEC

Term	Definition
Interface	The interface in *slot/port* format.
IPv6 Address	IPV6 address of neighbor or interface.
MAC Address	Link-layer Address.
IsRtr	Shows whether the neighbor is a router. If the value is TRUE, the neighbor is known to be a router, and FALSE otherwise. A value of FALSE might mean that routers are not always *known* to be routers.
Neighbor State	State of neighbor cache entry. Possible values are Incomplete, Reachable, Stale, Delay, Probe, and Unknown.
Last Updated	The time in seconds that has elapsed since an entry was added to the cache.
Type	The type of neighbor entry. The type is Static if the entry is manually configured and Dynamic if dynamically resolved.

8.4.35 clear ipv6 neighbors

Use this command to clear all entries IPv6 neighbor table or an entry on a specific interface. Use the ***slot/port*** parameter to specify the interface.

Format	`clear ipv6 neighbors `*`[slot/port]`*
Mode	Privileged EXEC

8.4.36 show ipv6 protocols

This command lists a summary of the configuration and status for the active IPv6 routing protocols. The command lists routing protocols that are configured and enabled. If a protocol is selected on the command line, the display is limited to that protocol.

Format	`show ipv6 protocols [ospf]`
Mode	Privileged EXEC

Parameter	Description
Routing Protocol	OSPFv3.
Router ID	The router ID configured for OSPFv3.
OSPF Admin Mode	Whether OSPF is enabled or disabled globally.
Maximum Paths	The maximum number of next hops in an OSPF route.
Default Route Advertise	Whether OSPF is configured to originate a default route.
Always	Whether default advertisement depends on having a default route in the common routing table.
Metric	The metric configured to be advertised with the default route.
Metric Type	The metric type for the default route.

Example: The following shows example CLI display output for the command.

```
(Router) #show ipv6 protocols

Routing Protocol .............................. OSPFv3
Router ID ..................................... 1.1.1.1
OSPF Admin Mode ............................... Enable
Maximum Paths ................................. 4
Distance ...................................... Intra 110 Inter 110 Ext 110

Default Route Advertise ....................... Disabled
Always ........................................ FALSE
Metric ........................................ Not configured
Metric Type ................................... External Type 2

Number of Active Areas ........................ 0 (0 normal, 0 stub, 0 nssa)
ABR Status .................................... Disable
ASBR Status ................................... Disable
```

8.4.37 show ipv6 route

This command displays the IPv6 routing table The ***ipv6-address*** specifies a specific IPv6 address for which the best-matching route would be displayed. The ***ipv6-prefix/ipv6-prefix-length*** specifies a specific IPv6 network for which the matching route would be displayed. The ***interface*** specifies that the routes with next-hops on the ***interface*** be displayed. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. The ***protocol*** specifies the protocol that installed the routes. The ***protocol*** is one of the following keywords: ***connected***, ***ospf***, ***static***. The ***all*** specifies that all routes including best and nonbest routes are displayed. Otherwise, only the best routes are displayed.

NOTICE If you use the ***connected*** keyword for ***protocol***, the ***all*** option is not available because there are no best or nonbest connected routes.

Format	`show ipv6 route [{`*`ipv6-address [protocol]`*`	{{`*`ipv6-prefix/ipv6-prefix-length`*`	slot/port|vlan `*`1-4093`*`} [`*`protocol`*`]	`*`protocol`*`	summary} [all]	all}]`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Route Codes	The key for the routing protocol codes that might appear in the routing table output.

The `show ipv6 route` command displays the routing tables in the following format:

```
Codes: C - connected, S - static
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
       ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, Truncated
```

The columns for the routing table display the following information:

Term	Definition
Code	The code for the routing protocol that created this routing entry.
Default Gateway	The IPv6 address of the default gateway. When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway.
IPv6-Prefix/IPv6-Prefix-Length	The IPv6-Prefix and prefix-length of the destination IPv6 network corresponding to this route.
Preference/ Metric	The administrative distance (preference) and cost (metric) associated with this route. An example of this output is [1/0], where 1 is the preference and 0 is the metric.
Tag	The decimal value of the tag associated with a redistributed route, if it is not 0.

Term	Definition
Next-Hop	The outgoing router IPv6 address to use when forwarding traffic to the next router (if any) in the path toward the destination.
Route-Timestamp	The last updated time for dynamic routes. The format of Route-Timestamp will be • Days:Hours:Minutes if days > = 1 • Hours:Minutes:Seconds if days < 1
Interface	The outgoing router interface to use when forwarding traffic to the next destination. For reject routes, the next hop interface would be `Null0` interface.
T	A flag appended to an IPv6 route to indicate that it is an ECMP route, but only one of its next hops has been installed in the forwarding table. The forwarding table may limit the number of ECMP routes or the number of ECMP groups. When an ECMP route cannot be installed because such a limit is reached, the route is installed with a single next hop. Such truncated routes are identified by a T after the interface name.

To administratively control the traffic destined to a particular network and prevent it from being forwarded through the router, you can configure a static reject route on the router. Such traffic would be discarded and the ICMP destination unreachable message is sent back to the source. This is typically used for preventing routing loops. The reject route added in the RTO is of the type OSPF Inter-Area. Reject routes (routes of REJECT type installed by any protocol) are not redistributed by OSPF/RIP. Reject routes are supported in both OSPFv2 and OSPFv3.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ipv6 route

IPv6 Routing Table - 3 entries

Codes: C - connected, S - static
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
       ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2

S     2001::/64 [10/0] directly connected,   Null0
C     2003::/64 [0/0]
       via ::,   0/11
S     2005::/64 [1/0]
       via 2003::2,   0/11
C 5001::/64 [0/0]
     via ::,   0/5
OE1 6001::/64 [110/1]
     via fe80::200:42ff:fe7d:2f19,   00h:00m:23s,  0/5
OI 7000::/64 [110/6]
     via fe80::200:4fff:fe35:c8bb,   00h:01m:47s,  0/11
```

Example: The following shows example CLI display output for the command to indicate a truncated route.

```
(router) #show ipv6 route

IPv6 Routing Table - 2 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
       ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2

C     2001:db9:1::/64 [0/0]
       via ::,   0/1
OI    3000::/64 [110/1]
       via fe80::200:e7ff:fe2e:ec3f,   00h:00m:11s,  0/1   T
```

8.4.38 show ipv6 route ecmp-groups

This command reports all current ECMP groups in the IPv6 routing table. An ECMP group is a set of two or more next hops used in one or more routes. The groups are numbered arbitrarily from 1 to n. The output indicates the number of next hops in the group and the number of routes that use the set of next hops. The output lists the IPv6 address and outgoing interface of each next hop in each group.

Format `show ipv6 route ecmp-groups`

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(router) #show ipv6 route ecmp-groups

ECMP Group 1 with 2 next hops (used by 1 route)
        2001:DB8:1::1 on interface 2/1
  2001:DB8:2::14 on interface 2/2

ECMP Group 2 with 3 next hops (used by 1 route)
  2001:DB8:4::15 on interface 2/32
  2001:DB8:7::12 on interface 2/33
  2001:DB8:9::45 on interface 2/34
```

8.4.39 show ipv6 route hw-failure

Use this command to display the routes that failed to be added to the hardware due to hash errors or a table full condition.

Format `show ipv6 route hw-failure`

Mode Privileged EXEC

Example: The following example displays the command output.

```
(Routing) #show ipv6 route connected

IPv6 Routing Table - 2 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route, B - BGP Derived
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
       ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
P – Net Prototype

C    2001::/128 [0/0]
      via ::,   0/1
C    2005::/128 [0/0]
      via ::,   0/2

(Routing) #show ipv6 route hw-failure

IPv6 Routing Table - 4 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route, B - BGP Derived
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
       ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
P – Net Prototype

P    3001::/64 [0/1]
      via 2001::4,   00h:00m:04s,  0/1  hw-failure
P    3001:0:0:1::/64 [0/1]
      via 2001::4,   00h:00m:04s,  0/1  hw-failure
P    3001:0:0:2::/64 [0/1]
      via 2001::4,   00h:00m:04s,  0/1  hw-failure
```

```
P    3001:0:0:3::/64 [0/1]
      via 2001::4,   00h:00m:04s,  0/1  hw-failure
```

8.4.40 show ipv6 route net-prototype

This command displays the net-prototype routes. The net-prototype routes are displayed with a P.

Format `show ipv6 route net-prototype`

Modes Privileged EXEC

Example:

```
(Routing) #show ipv6 route net-prototype
IPv6 Routing Table - 2 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route, B - BGP Derived
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
       ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
       P – Net Prototype

P    3001::/64 [0/1]
      via 2001::4,   00h:00m:04s,  0/1
P    3001:0:0:1::/64 [0/1]
      via 2001::4,   00h:00m:04s,  0/1
```

8.4.41 show ipv6 route preferences

Use this command to show the preference value associated with the type of route. Lower numbers have a greater preference. A route with a preference of 255 cannot be used to forward traffic.

Format `show ipv6 route preferences`

Mode Privileged EXEC

Term	Definition
Local	Preference of directly-connected routes.
Static	Preference of static routes.
OSPF Intra	Preference of routes within the OSPF area.
OSPF Inter	Preference of routes to other OSPF routes that are outside of the area.
OSPF External	Preference of OSPF external routes.

8.4.42 show ipv6 route summary

This command displays a summary of the state of the routing table. When the optional `all` keyword is given, some statistics, such as the number of routes from each source, include counts for alternate routes. An alternate route is a route that is not the most preferred route to its destination and therefore is not installed in the forwarding table. To include only the number of best routes, do not use the optional keyword.

Format `show ipv6 route summary [all]`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Connected Routes	Total number of connected routes in the routing table.
Static Routes	Total number of static routes in the routing table.
OSPF Routes	Total number of routes installed by OSPFv3 protocol.

Term	Definition
Reject Routes	Total number of reject routes installed by all protocols.
Number of Prefixes	Summarizes the number of routes with prefixes of different lengths.
Total Routes	The total number of routes in the routing table.
Best Routes	The number of best routes currently in the routing table. This number only counts the best route to each destination.
Alternate Routes	The number of alternate routes currently in the routing table. An alternate route is a route that was not selected as the best route to its destination.
Route Adds	The number of routes that have been added to the routing table.
Route Modifies	The number of routes that have been changed after they were initially added to the routing table.
Route Deletes	The number of routes that have been deleted from the routing table.
Unresolved Route Adds	The number of route adds that failed because none of the route's next hops were on a local subnet. Note that static routes can fail to be added to the routing table at startup because the routing interfaces are not yet up. This counter gets incremented in this case. The static routes are added to the routing table when the routing interfaces come up.
Invalid Route Adds	The number of routes that failed to be added to the routing table because the route was invalid. A log message is written for each of these failures.
Failed Route Adds	The number of routes that failed to be added to the routing table because of a resource limitation in the routing table.
Reserved Locals	The number of routing table entries reserved for a local subnet on a routing interface that is down. Space for local routes is always reserved so that local routes can be installed when a routing interface bounces.
Unique Next Hops	The number of distinct next hops used among all routes currently in the routing table. These include local interfaces for local routes and neighbors for indirect routes.
Unique Next Hops High Water	The highest count of unique next hops since counters were last cleared.
Next Hop Groups	The current number of next hop groups in use by one or more routes. Each next hop group includes one or more next hops.
Next Hop Groups High Water	The highest count of next hop groups since counters were last cleared.
ECMP Groups	The number of next hop groups with multiple next hops.
ECMP Routes	The number of routes with multiple next hops currently in the routing table.
Truncated ECMP Routes	The number of ECMP routes that are currently installed in the forwarding table with just one next hop. The forwarding table may limit the number of ECMP routes or the number of ECMP groups. When an ECMP route cannot be installed because such a limit is reached, the route is installed with a single next hop.
ECMP Retries	The number of ECMP routes that have been installed in the forwarding table after initially being installed with a single next hop.
Routes with n Next Hops	The current number of routes with each number of next hops.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ipv6 route summary

Connected Routes.............................. 4
Static Routes................................. 0
6To4 Routes................................... 0
BGP Routes.................................... 10
  External.................................... 0
  Internal.................................... 10
  Local....................................... 0
OSPF Routes................................... 13
  Intra Area Routes........................... 0
  Inter Area Routes........................... 13
  External Type-1 Routes...................... 0
  External Type-2 Routes...................... 0
```

```
Reject Routes................................. 0
Total routes.................................. 17

Best Routes (High)............................ 17 (17)
Alternate Routes.............................. 0
Route Adds.................................... 44
Route Deletes................................. 27
Unresolved Route Adds......................... 0
Invalid Route Adds............................ 0
Failed Route Adds............................. 0
Reserved Locals............................... 0

Unique Next Hops (High)....................... 8 (8)
Next Hop Groups (High)........................ 8 (8)
ECMP Groups (High)............................ 3 (3)
ECMP Routes................................... 12
Truncated ECMP Routes......................... 0
ECMP Retries.................................. 0
Routes with 1 Next Hop........................ 5
Routes with 2 Next Hops....................... 1
Routes with 3 Next Hops....................... 1
Routes with 4 Next Hops....................... 10

  Number of Prefixes:
    /64: 17
```

8.4.43 show ipv6 snooping counters

This command displays the counters associated with IPv6 RA GUARD feature. The number of router advertisement and router redirect packets dropped by the switch globally due to RA GUARD feature are displayed in the command output.

Format	`show ipv6 snooping counters`
Modes	• Privileged EXEC • Global Config

Example:

```
(Switching) #  show ipv6 snooping counters

IPv6 Dropped Messages

RA(Router Advertisement - ICMP type 134)

REDIR(Router Redirect - ICMP type 137)

RA             Redir
-------        -------
0               0
```

8.4.44 show ipv6 vlan

This command displays IPv6 VLAN routing interface addresses.

Format	`show ipv6 vlan`
Modes	• Privileged EXEC • User EXEC

Term	Definition
MAC Address used by Routing VLANs	Shows the MAC address.

The rest of the output for this command is displayed in a table with the following column headings:

Column Headings	Definition
VLAN ID	The VLAN ID of a configured VLAN.
Logical Interface	The interface in *slot/port* format that is associated with the VLAN ID.
IPv6 Address/ Prefix Length	The IPv6 prefix and prefix length associated with the VLAN ID.

8.4.45 show ipv6 traffic

Use this command to show traffic and statistics for IPv6 and ICMPv6. Specify a logical, loopback, or tunnel interface to view information about traffic on a specific interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. If you do not specify an interface, the command displays information about traffic on all interfaces.

Format	`show ipv6 traffic [{`*`slot/port`*`|vlan `*`1-4093`*`| loopback `*`loopback-id`*`	tunnel `*`tunnel-id`*`}]`
Mode	Privileged EXEC

Term	Definition
Total Datagrams Received	Total number of input datagrams received by the interface, including those received in error.
Received Datagrams Locally Delivered	Total number of datagrams successfully delivered to IPv6 user-protocols (including ICMP). This counter increments at the interface to which these datagrams were addressed, which might not necessarily be the input interface for some of the datagrams.
Received Datagrams Discarded Due To Header Errors	Number of input datagrams discarded due to errors in their IPv6 headers, including version number mismatch, other format errors, hop count exceeded, errors discovered in processing their IPv6 options, etc.
Received Datagrams Discarded Due To MTU	Number of input datagrams that could not be forwarded because their size exceeded the link MTU of outgoing interface.
Received Datagrams Discarded Due To No Route	Number of input datagrams discarded because no route could be found to transmit them to their destination.
Received Datagrams With Unknown Protocol	Number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol. This counter increments at the interface to which these datagrams were addressed, which might not be necessarily the input interface for some of the datagrams.
Received Datagrams Discarded Due To Invalid Address	Number of input datagrams discarded because the IPv6 address in their IPv6 header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (for example, `::0`) and unsupported addresses (for example, addresses with unallocated prefixes). For entities which are not IPv6 routers and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
Received Datagrams Discarded Due To Truncated Data	Number of input datagrams discarded because datagram frame didn't carry enough data.
Received Datagrams Discarded Other	Number of input IPv6 datagrams for which no problems were encountered to prevent their continue processing, but which were discarded (e.g., for lack of buffer space). Note that this counter does not include datagrams discarded while awaiting re-assembly.
Received Datagrams Reassembly Required	Number of IPv6 fragments received which needed to be reassembled at this interface. Note that this counter increments at the interface to which these fragments were addressed, which might not be necessarily the input interface for some of the fragments.
Datagrams Successfully Reassembled	Number of IPv6 datagrams successfully reassembled. Note that this counter increments at the interface to which these datagrams were addressed, which might not be necessarily the input interface for some of the fragments.

Term	Definition
Datagrams Failed To Reassemble	Number of failures detected by the IPv6 reassembly algorithm (for whatever reason: timed out, errors, etc.). Note that this is not necessarily a count of discarded IPv6 fragments since some algorithms (notably the algorithm in by combining them as they are received. This counter increments at the interface to which these fragments were addressed, which might not be necessarily the input interface for some of the fragments.
Datagrams Forwarded	Number of output datagrams which this entity received and forwarded to their final destinations. In entities which do not act as IPv6 routers, this counter will include only those packets which were Source-Routed via this entity, and the Source-Route processing was successful. Note that for a successfully forwarded datagram the counter of the outgoing interface increments.
Datagrams Locally Transmitted	Total number of IPv6 datagrams which local IPv6 user-protocols (including ICMP) supplied to IPv6 in requests for transmission. Note that this counter does not include any datagrams counted in ipv6IfStatsOutForwDatagrams.
Datagrams Transmit Failed	Number of output IPv6 datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (e.g., for lack of buffer space). Note that this counter would include datagrams counted in ipv6IfStatsOutForwDatagrams if any such packets met this (discretionary) discard criterion.
Fragments Created	Number of output datagram fragments that have been generated as a result of fragmentation at this output interface.
Datagrams Successfully Fragmented	Number of IPv6 datagrams that have been successfully fragmented at this output interface.
Datagrams Failed To Fragment	Number of IPv6 datagrams that have been discarded because they needed to be fragmented at this output interface but could not be.
Fragments Created	The number of fragments that were created.
Multicast Datagrams Received	Number of multicast packets received by the interface.
Multicast Datagrams Transmitted	Number of multicast packets transmitted by the interface.
Total ICMPv6 messages received	Total number of ICMP messages received by the interface which includes all those counted by ipv6IfIcmpInErrors. Note that this interface is the interface to which the ICMP messages were addressed which may not be necessarily the input interface for the messages.
ICMPv6 Messages with errors	Number of ICMP messages which the interface received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, etc.).
ICMPv6 Destination Unreachable Messages Received	Number of ICMP Destination Unreachable messages received by the interface.
ICMPv6 Messages Prohibited Administratively Received	Number of ICMP destination unreachable/communication administratively prohibited messages received by the interface.
ICMPv6 Time Exceeded Messages Received	Number of ICMP Time Exceeded messages received by the interface.
ICMPv6 Parameter Problem Messages Received	Number of ICMP Parameter Problem messages received by the interface.
ICMPv6 Packet Too Big Messages Received	Number of ICMP Packet Too Big messages received by the interface.
ICMPv6 Echo Request Messages Received	Number of ICMP Echo (request) messages received by the interface.
ICMPv6 Echo Reply Messages Received	Number of ICMP Echo Reply messages received by the interface.
ICMPv6 Router Solicit Messages Received	Number of ICMP Router Solicit messages received by the interface.
ICMPv6 Router Advertisement Messages Received	Number of ICMP Router Advertisement messages received by the interface.
ICMPv6 Neighbor Solicit Messages Received	Number of ICMP Neighbor Solicit messages received by the interface.

Term	Definition
ICMPv6 Neighbor Advertisement Messages Received	Number of ICMP Neighbor Advertisement messages received by the interface.
ICMPv6 Redirect Messages Received	Number of Redirect messages received by the interface.
ICMPv6 Group Membership Query Messages Received	Number of ICMPv6 Group Membership Query messages received by the interface.
ICMPv6 Group Membership Response Messages Received	Number of ICMPv6 Group Membership response messages received by the interface.
ICMPv6 Group Membership Reduction Messages Received	Number of ICMPv6 Group Membership reduction messages received by the interface.
Total ICMPv6 Messages Transmitted	Total number of ICMP messages which this interface attempted to send. Note that this counter includes all those counted by icmpOutErrors.
ICMPv6 Messages Not Transmitted Due To Error	Number of ICMP messages which this interface did not send due to problems discovered within ICMP such as a lack of buffers. This value should not include errors discovered outside the ICMP layer such as the inability of IPv6 to route the resultant datagram. In some implementations there may be no types of error which contribute to this counter's value.
ICMPv6 Destination Unreachable Messages Transmitted	Number of ICMP Destination Unreachable messages sent by the interface.
ICMPv6 Messages Prohibited Administratively Transmitted	Number of ICMP destination unreachable/communication administratively prohibited messages sent.
ICMPv6 Time Exceeded Messages Transmitted	Number of ICMP Time Exceeded messages sent by the interface.
ICMPv6 Parameter Problem Messages Transmitted	Number of ICMP Parameter Problem messages sent by the interface.
ICMPv6 Packet Too Big Messages Transmitted	Number of ICMP Packet Too Big messages sent by the interface.
ICMPv6 Echo Request Messages Transmitted	Number of ICMP Echo (request) messages sent by the interface.ICMP echo messages sent.
ICMPv6 Echo Reply Messages Transmitted	Number of ICMP Echo Reply messages sent by the interface.
ICMPv6 Router Solicit Messages Transmitted	Number of ICMP Router Solicitation messages sent by the interface.
ICMPv6 Router Advertisement Messages Transmitted	Number of ICMP Router Advertisement messages sent by the interface.
ICMPv6 Neighbor Solicit Messages Transmitted	Number of ICMP Neighbor Solicitation messages sent by the interface.
ICMPv6 Neighbor Advertisement Messages Transmitted	Number of ICMP Neighbor Advertisement messages sent by the interface.
ICMPv6 Redirect Messages Received	Number of Redirect messages sent. For a host, this object will always be zero, since hosts do not send redirects.
ICMPv6 Group Membership Query Messages Transmitted	Number of ICMPv6 Group Membership Query messages sent.
ICMPv6 Group Membership Response Messages Transmitted	Number of ICMPv6 Group Membership Response messages sent.
ICMPv6 Group Membership Reduction Messages Transmitted	Number of ICMPv6 Group Membership Reduction messages sent.
ICMPv6 Duplicate Address Detects	Number of duplicate addresses detected by the interface.

8.4.46 clear ipv6 route counters

The command resets to zero the IPv6 routing table counters reported in the command “show ipv6 route summary” on page 691. The command only resets event counters. Counters that report the current state of the routing table, such as the number of routes of each type, are not reset.

Format	`clear ipv6 route counters`
Mode	Privileged EXEC

8.4.47 clear ipv6 snooping counters

This command clears the counters associated with IPv6 RA GUARD feature.

Format	`clear ipv6 snooping counters`
Mode	• Privileged EXEC • Global Config

8.4.48 clear ipv6 statistics

Use this command to clear IPv6 statistics for all interfaces or for a specific interface, including loopback and tunnel interfaces. IPv6 statistics display in the output of the `show ipv6 traffic` command. If you do not specify an interface, the counters for all IPv6 traffic statistics reset to zero.

Format	`clear ipv6 statistics [{`*`slot/port`*`	loopback `*`loopback-id`*`	tunnel `*`tunnel-id`*`}]`
Mode	Privileged EXEC

8.5 OSPFv3 Commands

This section describes the commands you use to configure OSPFv3, which is a link-state routing protocol that you use to route traffic within a network. This section includes the following subsections:

- “Global OSPFv3 Commands” on page 697
- “OSPFv3 Interface Commands” on page 710
- “OSPFv3 Graceful Restart Commands” on page 714
- “OSPFv3 Stub Router Commands” on page 717
- “OSPFv3 Show Commands” on page 718

Global OSPFv3 Commands

8.5.1 ipv6 router ospf

Use this command to enter Router OSPFv3 Config mode.

Format	`router ospf`
Mode	Global Config

8.5.2 area default-cost (OSPFv3)

This command configures the monetary default cost for the stub area. The operator must specify the area id and an integer value between 1–16777215.

Format	`area `*`areaid`*` default-cost `*`1-16777215`*
Mode	Router OSPFv3 Config

8.5.3 area nssa (OSPFv3)

This command configures the specified areaid to function as an NSSA.

Format	area *areaid* nssa
Mode	Router OSPFv3 Config

8.5.3.1 no area nssa

This command disables nssa from the specified area id.

Format	no area *areaid* nssa
Mode	Router OSPFv3 Config

8.5.4 area nssa default-info-originate (OSPFv3)

This command configures the metric value and type for the default route advertised into the NSSA. The optional metric parameter specifies the metric of the default route and is to be in a range of 1-16777214. If no metric is specified, the default value is 10. The metric type can be comparable (nssa-external 1) or noncomparable (nssa-external 2).

Format	area *areaid* nssa default-info-originate [*metric*] [{comparable | non-comparable}]
Mode	Router OSPFv3 Config

8.5.4.1 no area nssa default-info-originate (OSPFv3)

This command disables the default route advertised into the NSSA.

Format	no area *areaid* nssa default-info-originate [*metric*] [{comparable | non-comparable}]
Mode	Router OSPFv3 Config

8.5.5 area nssa no-redistribute (OSPFv3)

This command configures the NSSA ABR so that learned external routes will not be redistributed to the NSSA.

Format	area *areaid* nssa no-redistribute
Mode	Router OSPFv3 Config

8.5.5.1 no area nssa no-redistribute (OSPFv3)

This command disables the NSSA ABR so that learned external routes are redistributed to the NSSA.

Format	no area *areaid* nssa no-redistribute
Mode	Router OSPFv3 Config

8.5.6 area nssa no-summary (OSPFv3)

This command configures the NSSA so that summary LSAs are not advertised into the NSSA.

Format	area *areaid* nssa no-summary
Mode	Router OSPFv3 Config

8.5.6.1 no area nssa no-summary (OSPFv3)

This command disables nssa from the summary LSAs.

Format	no area *areaid* nssa no-summary
Mode	Router OSPFv3 Config

8.5.7 area nssa translator-role (OSPFv3)

This command configures the translator role of the NSSA. A value of ***always*** causes the router to assume the role of the translator the instant it becomes a border router and a value of ***candidate*** causes the router to participate in the translator election process when it attains border router status.

Format	area *areaid* nssa translator-role {always | candidate}
Mode	Router OSPFv3 Config

8.5.7.1 no area nssa translator-role (OSPFv3)

This command disables the nssa translator role from the specified area id.

Format	no area *areaid* nssa translator-role {always | candidate}
Mode	Router OSPFv3 Config

8.5.8 area nssa translator-stab-intv (OSPFv3)

This command configures the translator ***stabilityinterval*** of the NSSA. The ***stabilityinterval*** is the period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.

Format	area *areaid* nssa translator-stab-intv *stabilityinterval*
Mode	Router OSPFv3 Config

8.5.8.1 no area nssa translator-stab-intv (OSPFv3)

This command disables the nssa translator's ***stabilityinterval*** from the specified area id.

Format	no area *areaid* nssa translator-stab-intv *stabilityinterval*
Mode	Router OSPFv3 Config

8.5.9 area range (OSPFv3)

Use this command to configure a summary prefix that an area border router advertises for a specific area.

Default	No area ranges are configured by default. No cost is configured by default.
Format	area *area-id* range *prefix netmask* {summarylink | nssaexternallink} [advertise | not-advertise] [cost *cost*]
Mode	Router OSPFv3 Config

Parameter	Description
area-id	The area identifier for the area whose networks are to be summarized.
prefix netmask	The summary prefix to be advertised when the ABR computes a route to one or more networks within this prefix in this area.
summarylink	When this keyword is given, the area range is used when summarizing prefixes advertised in type 3 summary LSAs.
nssaexternallink	When this keyword is given, the area range is used when translating type 7 LSAs to type 5 LSAs.
advertise	[Optional] When this keyword is given, the summary prefix is advertised when the area range is active. This is the default.
not-advertise	[Optional] When this keyword is given, neither the summary prefix nor the contained prefixes are advertised when the area range is active. When the not-advertise option is given, any static cost previously configured is removed from the system configuration.
cost	[Optional] If an optional cost is given, OSPF sets the metric field in the inter-area -prefix LSA to the configured value rather than setting the metric to the largest cost among the networks covered by the area range.

8.5.9.1 no area range

The no form of this command to delete a summary prefix or remove a static cost.

Format	`no area` *`areaid`* range *`prefix netmask`* `{summarylink	nssaexternallink} cost`
Mode	Router OSPFv3 Config

8.5.10 area stub (OSPFv3)

This command creates a stub area for the specified area ID. A stub area is characterized by the fact that AS External LSAs are not propagated into the area. Removing AS External LSAs and Summary LSAs can significantly reduce the link state database of routers within the stub area.

Format	`area` *`areaid`* `stub`
Mode	Router OSPFv3 Config

8.5.10.1 no area stub

This command deletes a stub area for the specified area ID.

Format	`no area` *`areaid`* `stub`
Mode	Router OSPFv3 Config

8.5.11 area stub no-summary (OSPFv3)

This command disables the import of Summary LSAs for the stub area identified by ***areaid***.

Default	enabled
Format	`area` *`areaid`* `stub no-summary`
Mode	Router OSPFv3 Config

8.5.11.1 no area stub no-summary

This command sets the Summary LSA import mode to the default for the stub area identified by ***areaid***.

Format	`no area` *`areaid`* `stub summarylsa`
Mode	Router OSPFv3 Config

8.5.12 area virtual-link (OSPFv3)

This command creates the OSPF virtual interface for the specified ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`area` *`areaid`* `virtual-link` *`neighbor`*
Mode	Router OSPFv3 Config

8.5.12.1 no area virtual-link

This command deletes the OSPF virtual interface from the given interface, identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area` *`areaid`* `virtual-link` *`neighbor`*
Mode	Router OSPFv3 Config

8.5.13 area virtual-link dead-interval (OSPFv3)

This command configures the dead interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor*.** The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 1 to 65535.

Default	40
Format	`area` *`areaid`* `virtual-link` *`neighbor`* `dead-interval` *`seconds`*
Mode	Router OSPFv3 Config

8.5.13.1 no area virtual-link dead-interval

This command configures the default dead interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area` *`areaid`* `virtual-link` *`neighbor`* `dead-interval`
Mode	Router OSPFv3 Config

8.5.14 area virtual-link hello-interval (OSPFv3)

This command configures the hello interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 1 to 65535.

Default	10
Format	`area` *`areaid`* `virtual-link` *`neighbor`* `hello-interval` *`seconds`*
Mode	Router OSPFv3 Config

8.5.14.1 no area virtual-link hello-interval

This command configures the default hello interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area` *`areaid`* `virtual-link` *`neighbor`* `hello-interval`
Mode	Router OSPFv3 Config

8.5.15 area virtual-link retransmit-interval (OSPFv3)

This command configures the retransmit interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 0 to 3600.

Default	5
Format	`area` *`areaid`* `virtual-link` *`neighbor`* `retransmit-interval` *`seconds`*
Mode	Router OSPFv3 Config

8.5.15.1 no area virtual-link retransmit-interval

This command configures the default retransmit interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area` *`areaid`* `virtual-link` *`neighbor`* `retransmit-interval`
Mode	Router OSPFv3 Config

8.5.16 area virtual-link transmit-delay (OSPFv3)

This command configures the transmit delay for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 0 to 3600 (1 hour).

Default	1
Format	`area` *`areaid`* `virtual-link` *`neighbor`* `transmit-delay` *`seconds`*
Mode	Router OSPFv3 Config

8.5.16.1 no area virtual-link transmit-delay

This command configures the default transmit delay for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	`no area` *`areaid`* `virtual-link` *`neighbor`* `transmit-delay`
Mode	Router OSPFv3 Config

8.5.17 auto-cost (OSPFv3)

By default, OSPF computes the link cost of each interface from the interface bandwidth. Faster links have lower metrics, making them more attractive in route selection. The configuration parameters in the **`auto-cost reference bandwidth`** and **`bandwidth`** commands give you control over the default link cost. You can configure for OSPF an interface bandwidth that is independent of the actual link speed. A second configuration parameter allows you to control the ratio of interface bandwidth to link cost. The link cost is computed as the ratio of a reference bandwidth to the interface bandwidth (ref_bw / interface bandwidth), where interface bandwidth is defined by the **`bandwidth`** command. Because the default reference bandwidth is 100 Mbps, OSPF uses the same default link cost for all interfaces whose bandwidth is 100 Mbps or greater. Use the **`auto-cost`** command to change the reference bandwidth, specifying the reference bandwidth in megabits per second (Mbps). The reference bandwidth range is 1–4294967 Mbps.

Default	100Mbps
Format	`auto-cost reference-bandwidth` *`1-4294967`*
Mode	Router OSPFv3 Config

8.5.17.1 no auto-cost reference-bandwidth (OSPFv3)

Use this command to set the reference bandwidth to the default value.

Format	`no auto-cost reference-bandwidth`
Mode	Router OSPFv3 Config

8.5.18 clear ipv6 ospf

Use this command to disable and re-enable OSPF.

Format	`clear ipv6 ospf`
Mode	Privileged EXEC

8.5.19 clear ipv6 ospf configuration

Use this command to reset the OSPF configuration to factory defaults.

Format	`clear ipv6 ospf configuration`
Mode	Privileged EXEC

8.5.20 clear ipv6 ospf counters

Use this command to reset global and interface statistics.

Format	`clear ipv6 ospf counters`
Mode	Privileged EXEC

8.5.21 clear ipv6 ospf neighbor

Use this command to drop the adjacency with all OSPF neighbors. On each neighbor's interface, send a one-way hello. Adjacencies may then be re-established. To drop all adjacencies with a specific router ID, specify the neighbor's Router ID using the optional parameter *[neighbor-id]*.

Format	`clear ipv6 ospf neighbor` *`[neighbor-id]`*
Mode	Privileged EXEC

8.5.22 clear ipv6 ospf neighbor interface

To drop adjacency with all neighbors on a specific interface, use the optional parameter `[slot/port]`. The argument *`slot/port`* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. To drop adjacency with a specific router ID on a specific interface, use the optional parameter *[neighbor-id]*.

Format	`clear ipv6 ospf neighbor interface [slot/port|vlan 1-4093] [neighbor-id]`
Mode	Privileged EXEC

8.5.23 clear ipv6 ospf redistribution

Use this command to flush all self-originated external LSAs. Reapply the redistribution configuration and re-originate prefixes as necessary.

Format	`clear ipv6 ospf redistribution`
Mode	Privileged EXEC

8.5.24 default-information originate (OSPFv3)

This command is used to control the advertisement of default routes.

Default	• metric—unspecified • type—2
Format	`default-information originate [always] [metric 0-16777214] [metric-type {1 | 2}]`
Mode	Router OSPFv3 Config

8.5.24.1 no default-information originate (OSPFv3)

This command is used to control the advertisement of default routes.

Format	`no default-information originate [metric] [metric-type]`
Mode	Router OSPFv3 Config

8.5.25 default-metric (OSPFv3)

This command is used to set a default for the metric of distributed routes.

Format	`default-metric 1-16777214`
Mode	Router OSPFv3 Config

8.5.25.1 no default-metric (OSPFv3)

This command is used to set a default for the metric of distributed routes.

Format	`no default-metric`
Mode	Router OSPFv3 Config

8.5.26 distance ospf (OSPFv3)

This command sets the route preference value of OSPF route types in the router. Lower route preference values are preferred when determining the best route. The type of OSPF route can be intra, inter, or external. All the external type routes are given the same preference value. The range of ***preference*** value is 1 to 255.

Default 110

Format `distance ospf {intra-area 1-255 | inter-area 1-255 | external 1-255}`

Mode Router OSPFv3 Config

8.5.26.1 no distance ospf

This command sets the default route preference value of OSPF routes in the router. The type of OSPF route can be intra, inter, or external. All the external type routes are given the same preference value.

Format `no distance ospf {intra-area | inter-area | external}`

Mode Router OSPFv3 Config

8.5.27 enable (OSPFv3)

This command resets the default administrative mode of OSPF in the router (active).

Default enabled

Format `enable`

Mode Router OSPFv3 Config

8.5.27.1 no enable (OSPFv3)

This command sets the administrative mode of OSPF in the router to inactive.

Format `no enable`

Mode Router OSPFv3 Config

8.5.28 exit-overflow-interval (OSPFv3)

This command configures the exit overflow interval for OSPF. It describes the number of seconds after entering Overflow state that a router will wait before attempting to leave the overflow state. This allows the router to again originate non-default AS-external-LSAs. When set to 0, the router will not leave overflow state until restarted. The range for ***seconds*** is 0 to 2147483647 seconds.

Default 0

Format `exit-overflow-interval seconds`

Mode Router OSPFv3 Config

8.5.28.1 no exit-overflow-interval

This command configures the default exit overflow interval for OSPF.

Format `no exit-overflow-interval`

Mode Router OSPFv3 Config

8.5.29 external-lsdb-limit (OSPFv3)

This command configures the external LSDB limit for OSPF. If the value is –1, then there is no limit. When the number of nondefault AS-external-LSAs in a router's link-state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit nondefault AS-external-LSAs in it database. The external LSDB limit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area. The range for *`limit`* is –1 to 2147483647.

Default	-1
Format	`external-lsdb-limit` *`limit`*
Mode	Router OSPFv3 Config

8.5.29.1 no external-lsdb-limit

This command configures the default external LSDB limit for OSPF.

Format	`no external-lsdb-limit`
Mode	Router OSPFv3 Config

8.5.30 maximum-paths (OSPFv3)

This command sets the number of paths that OSPF can report for a given destination where *`maxpaths`* is platform dependent.

Default	4
Format	`maximum-paths` *`maxpaths`*
Mode	Router OSPFv3 Config

8.5.30.1 no maximum-paths

This command resets the number of paths that OSPF can report for a given destination back to its default value.

Format	`no maximum-paths`
Mode	Router OSPFv3 Config

8.5.31 passive-interface default (OSPFv3)

Use this command to enable global passive mode by default for all interfaces. It overrides any interface level passive mode. OSPF shall not form adjacencies over a passive interface.

Default	disabled
Format	`passive-interface default`
Mode	Router OSPFv3 Config

8.5.31.1 no passive-interface default

Use this command to disable the global passive mode by default for all interfaces. Any interface previously configured to be passive reverts to nonpassive mode.

Format	`no passive-interface default`
Mode	Router OSPFv3 Config

8.5.32 passive-interface (OSPFv3)

Use this command to set the interface or tunnel as passive. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. It overrides the global passive mode that is currently effective on the interface or tunnel.

Default	disabled
Format	`passive-interface {slot/port|vlan 1-4093|tunnel tunnel-id}`
Mode	Router OSPFv3 Config

8.5.32.1 no passive-interface

Use this command to set the interface or tunnel as nonpassive. It overrides the global passive mode that is currently effective on the interface or tunnel.

Format	`no passive-interface {slot/port|vlan 1-4093|tunnel tunnel-id}`
Mode	Router OSPFv3 Config

8.5.33 redistribute (OSPFv3)

This command configures the OSPFv3 protocol to allow redistribution of routes from the specified source protocol/routers.

Default	• metric—unspecified • type—2 • tag—0
Format	`redistribute {static	connected} [metric 0-16777214] [metric-type {1	2}] [tag 0-4294967295]`
Mode	Router OSPFv3 Config

8.5.33.1 no redistribute

This command configures OSPF protocol to prohibit redistribution of routes from the specified source protocol/routers.

Format	`no redistribute {static	connected} [metric] [metric-type] [tag]`
Mode	Router OSPFv3 Config

8.5.34 router-id (OSPFv3)

This command sets a 4-digit dotted-decimal number uniquely identifying the router ospf id. The ***ipaddress*** is a configured value.

Format	`router-id ipaddress`
Mode	Router OSPFv3 Config

8.5.35 timers pacing lsa-group

Use this command to adjust how OSPFv3 groups LSAs for periodic refresh. OSPFv3 refreshes self-originated LSAs approximately once every 30 minutes. When OSPFv3 refreshes LSAs, it considers all self-originated LSAs whose age is from 1800 to 1800 plus the pacing group size. Grouping LSAs for refresh allows OSPFv3 to combine refreshed LSAs into a minimal number of LS Update packets. Minimizing the number of Update packets makes LSA distribution more efficient.

When OSPFv3 originates a new or changed LSA, it selects a random refresh delay for the LSA. When the refresh delay expires, OSPFv3 refreshes the LSA. By selecting a random refresh delay, OSPFv3 avoids refreshing a large number of LSAs at one time, even if a large number of LSAs are originated at one time.

seconds is the width of the window in which LSAs are refreshed. The range for the pacing group window is from 10 to 1800 seconds.

Default	60 seconds
Format	`timers pacing lsa-group` *`seconds`*
Mode	Privileged EXEC

8.5.35.1 no timers pacing lsa-group

This command returns the LSA Group Pacing parameter to the factory default value of 60 seconds.

Format	`no timers pacing lsa-group`
Mode	Privileged EXEC

8.5.36 timers throttle spf

The initial “wait interval” is set to an amount of delay specified by the spf-hold value. If an SPF calculation is not scheduled during the current “wait interval”, the next SPF calculation is scheduled at a delay of *spf-start*. If there has been an SPF calculation scheduled during the current “wait interval”, the “wait interval” is set to two times the current “wait interval” until the “wait interval” reaches the maximum time in milliseconds as specified in *spf-maximum*. Subsequent wait times remain at the maximum until the values are reset or an LSA is received between SPF calculations.

Default	*spf-start* = 2000 ms *spf-hold* = 5000 ms *spf-maximum* = 5000 ms
Format	`timers throttle spf` *`spf-start spf-hold spf-maximum`*
Mode	Privileged EXEC

Parameter	Description
spf-start	Indicates the SPF schedule delay in milliseconds when no SPF calculation has been scheduled during the current “wait interval”. Value range is 1 to 600000 milliseconds.
spf-hold	Indicates the initial SPF “wait interval” in milliseconds. Value range is 1 to 600000 milliseconds.
spf-maximum	Indicates the maximum SPF “wait interval” in milliseconds. Value range is 1 to 600000 milliseconds.

8.5.36.1 no timers throttle spf

This command returns the SPF throttling parameters to the factory default values.

Format	`no timers throttle spf`
Mode	Privileged EXEC

8.5.37 trapflags (OSPFv3)

Use this command to enable individual OSPF traps, enable a group of trap flags at a time, or enable all the trap flags at a time. The different groups of trapflags, and each group's specific trapflags to enable or disable, are listed in Table 13.

Table 13: Trapflag Groups (OSPFv3)

Group	Flags
errors	• authentication-failure • bad-packet • config-error • virt-authentication-failure • virt-bad-packet • virt-config-error
lsa	• lsa-maxage • lsa-originate
overflow	• lsdb-overflow • lsdb-approaching-overflow
retransmit	• packets • virt-packets
state-change	• if-state-change • neighbor-state-change • virtif-state-change • virtneighbor-state-change

- To enable the individual flag, enter the `group name` followed by that particular flag.
- To enable all the flags in that group, give the group name followed by `all`.
- To enable all the flags, give the command as `trapflags all`.

Default disabled

Format

```
trapflags {
all |
errors {all | authentication-failure | bad-packet | config-error | virt-
authentication-failure | virt-bad-packet | virt-config-error} |
lsa {all | lsa-maxage | lsa-originate} |
overflow {all | lsdb-overflow | lsdb-approaching-overflow} |
retransmit {all | packets | virt-packets} |
state-change {all | if-state-change | neighbor-state-change | virtif-state-change |
virtneighbor-state-change}
}
```

Mode Router OSPFv3 Config

8.5.37.1 no trapflags

Use this command to revert to the default reference bandwidth.

- To disable the individual flag, enter the `group name` followed by that particular flag.
- To disable all the flags in that group, give the group name followed by `all`.
- To disable all the flags, give the command as `trapflags all`.

Format

```
no trapflags {
all |
errors {all | authentication-failure | bad-packet | config-error | virt-
authentication-failure | virt-bad-packet | virt-config-error} |
lsa {all | lsa-maxage | lsa-originate} |
overflow {all | lsdb-overflow | lsdb-approaching-overflow} |
retransmit {all | packets | virt-packets} |
state-change {all | if-state-change | neighbor-state-change | virtif-state-
change | virtneighbor-state-change}
}
```

Mode Router OSPFv3 Config

OSPFv3 Interface Commands

8.5.38 ipv6 ospf area

This command sets the OSPF area to which the specified router interface or range of interfaces belongs. It also enables OSPF on the specified router interface or range of interfaces. The ***area*** is a 32-bit integer, formatted as a 4-digit dotted-decimal number or a decimal value in the range of 0-4294967295. The ***area*** uniquely identifies the area to which the interface connects. Assigning an area ID for an area that does not yet exist, causes the area to be created with default values.

Format `ipv6 ospf area` *`0-4294967295`*

Mode Interface Config

8.5.39 ipv6 ospf cost

This command configures the cost on an OSPF interface or range of interfaces. The ***`cost`*** parameter has a range of 1 to 65535.

Default 10

Format `ipv6 ospf cost` *`1-65535`*

Mode Interface Config

8.5.39.1 no ipv6 ospf cost

This command configures the default cost on an OSPF interface.

Format `no ipv6 ospf cost`

Mode Interface Config

8.5.40 ipv6 ospf dead-interval

This command sets the OSPF dead interval for the specified interface or range of interfaces. The value for ***seconds*** is a valid positive integer, which represents the length of time in seconds that a router's Hello packets have not been seen before its neighbor routers declare that the router is down. The value for the length of time must be the same for all routers attached to a common network. This value should be some multiple of the Hello Interval (i.e., 4). Valid values range for ***seconds*** is from 1 to 2147483647.

NOTICE Effective with FASTPATH 4.4.4 and later, valid values range in seconds from 1 to 65535.

Default	40
Format	`ipv6 ospf dead-interval` *`1-2147483647`*
Mode	Interface Config

8.5.40.1 no ipv6 ospf dead-interval

This command sets the default OSPF dead interval for the specified interface or range of interfaces.

Format	`no ipv6 ospf dead-interval`
Mode	Interface Config

8.5.41 ipv6 ospf hello-interval

This command sets the OSPF hello interval for the specified interface. The value for ***seconds*** is a valid positive integer, which represents the length of time in seconds. The value for the length of time must be the same for all routers attached to a network. Valid values for ***seconds*** range from 1 to 65535.

Default	10
Format	`ipv6 ospf hello-interval` *`seconds`*
Mode	Interface Config

8.5.41.1 no ipv6 ospf hello-interval

This command sets the default OSPF hello interval for the specified interface.

Format	`no ipv6 ospf hello-interval`
Mode	Interface Config

8.5.42 ipv6 ospf link-lsa-suppression

Use this command to enable Link LSA Suppression on an interface. When Link LSA Suppression is enabled on a point-to-point (P2P) interface, no Link LSA protocol packets are originated (transmitted) on the interface. This configuration does not apply to non-P2P interfaces.

Default	False
Format	`ipv6 ospf link-lsa-suppression`
Mode	Privileged EXEC

8.5.42.1 no ipv6 ospf link-lsa-suppression

This command returns Link LSA Suppression for the interface to disabled. When Link LSA Suppression is disabled, Link LSA protocol packets are originated (transmitted) on the P2P interface.

Format	`no ipv6 ospf link-lsa-suppression`
Mode	Privileged EXEC

8.5.43 ipv6 ospf mtu-ignore

This command disables OSPF maximum transmission unit (MTU) mismatch detection on an interface or range of interfaces. OSPF Database Description packets specify the size of the largest IP packet that can be sent without fragmentation on the interface. When a router receives a Database Description packet, it examines the MTU advertised by the neighbor. By default, if the MTU is larger than the router can accept, the Database Description packet is rejected and the OSPF adjacency is not established.

Default	enabled
Format	`ipv6 ospf mtu-ignore`
Mode	Interface Config

8.5.43.1 no ipv6 ospf mtu-ignore

This command enables the OSPF MTU mismatch detection.

Format	`no ipv6 ospf mtu-ignore`
Mode	Interface Config

8.5.44 ipv6 ospf network

This command changes the default OSPF network type for the interface or range of interfaces. Normally, the network type is determined from the physical IP network type. By default all Ethernet networks are OSPF type broadcast. Similarly, tunnel interfaces default to point-to-point. When an Ethernet port is used as a single large bandwidth IP network between two routers, the network type can be point-to-point since there are only two routers. Using point-to-point as the network type eliminates the overhead of the OSPF designated router election. It is normally not useful to set a tunnel to OSPF network type broadcast.

Default	broadcast
Format	`ipv6 ospf network {broadcast | point-to-point}`
Mode	Interface Config

8.5.44.1 no ipv6 ospf network

This command sets the interface type to the default value.

Format	`no ipv6 ospf network {broadcast | point-to-point}`
Mode	Interface Config

8.5.45 ipv6 ospf prefix-suppression

This command suppresses the advertisement of the IPv6 prefixes that are associated with an interface, except for those associated with secondary IPv6 addresses. This command takes precedence over the global configuration. If this configuration is not specified, the global prefix-suppression configuration applies.

prefix-suppression can be disabled at the interface level by using the disable option. The disable option is useful for excluding specific interfaces from performing prefix-suppression when the feature is enabled globally.

Note that the disable option disable is not equivalent to not configuring the interface specific prefix-suppression. If prefix-suppression is not configured at the interface level, the global prefix-suppression configuration is applicable for the IPv6 prefixes associated with the interface.

Default	prefix-suppression is not configured.
Format	`ipv6 ospf prefix-suppression [disable]`
Mode	Interface Config

8.5.45.1 no ipv6 ospf prefix-suppression

This command removes prefix-suppression configurations at the interface level. When the `no ipv6 ospf prefix-suppression` command is used, global prefix-suppression applies to the interface. Not configuring the command is not equal to disabling interface level prefix-suppression.

Format	`no ipv6 ospf prefix-suppression`
Mode	Interface Config

8.5.46 ipv6 ospf priority

This command sets the OSPF priority for the specified router interface or range of interfaces. The priority of the interface is a priority integer from 0 to 255. A value of 0 indicates that the router is not eligible to become the designated router on this network.

Default	1, which is the highest router priority
Format	`ipv6 ospf priority` *0-255*
Mode	Interface Config

8.5.46.1 no ipv6 ospf priority

This command sets the default OSPF priority for the specified router interface.

Format	`no ipv6 ospf priority`
Mode	Interface Config

8.5.47 ipv6 ospf retransmit-interval

This command sets the OSPF retransmit Interval for the specified interface or range of interfaces. The retransmit interval is specified in seconds. The value for ***seconds*** is the number of seconds between link-state advertisement retransmissions for adjacencies belonging to this router interface. This value is also used when retransmitting database description and link-state request packets. Valid values range from 0 to 3600 (1 hour).

Default	5
Format	`ipv6 ospf retransmit-interval` *seconds*
Mode	Interface Config

8.5.47.1 no ipv6 ospf retransmit-interval

This command sets the default OSPF retransmit Interval for the specified interface.

Format	`no ipv6 ospf retransmit-interval`
Mode	Interface Config

8.5.48 ipv6 ospf transmit-delay

This command sets the OSPF Transit Delay for the specified interface or range of interfaces. The transmit delay is specified in seconds. In addition, it sets the estimated number of seconds it takes to transmit a link state update packet over this interface. Valid values for ***seconds*** range from 1 to 3600 (1 hour).

Default	1
Format	`ipv6 ospf transmit-delay` *`seconds`*
Mode	Interface Config

8.5.48.1 no ipv6 ospf transmit-delay

This command sets the default OSPF Transit Delay for the specified interface.

Format	`no ipv6 ospf transmit-delay`
Mode	Interface Config

OSPFv3 Graceful Restart Commands

The OSPFv3 protocol can be configured to participate in the checkpointing service, so that these protocols can execute a "graceful restart" when the management unit fails. In a graceful restart, the hardware to continues forwarding IPv6 packets using OSPFv3 routes while a backup switch takes over management unit responsibility.

Graceful restart uses the concept of "helpful neighbors". A fully adjacent router enters helper mode when it receives a link state announcement (LSA) from the restarting management unit indicating its intention of performing a graceful restart. In helper mode, a switch continues to advertise to the rest of the network that they have full adjacencies with the restarting router, thereby avoiding announcement of a topology change and and the potential for flooding of LSAs and shortest-path-first (SPF) runs (which determine OSPF routes). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

Graceful restart can be enabled for either planned or unplanned restarts, or both. A planned restart is initiated by the operator through the management command `initiate failover`. The operator may initiate a failover in order to take the management unit out of service (for example, to address a partial hardware failure), to correct faulty system behavior which cannot be corrected through less severe management actions, or other reasons. An unplanned restart is an unexpected failover caused by a fatal hardware failure of the management unit or a software hang or crash on the management unit.

8.5.49 nsf (OSPFv3)

Use this command to enable the OSPF graceful restart functionality on an interface. To disable graceful restart, use the no form of the command.

Default	Disabled
Format	`nsf [ietf] [planned-only]`
Modes	Router OSPFv3 Config

Parameter	Description
ietf	This keyword is accepted but not required.
planned-only	This optional keyword indicates that OSPF should only perform a graceful restart when the restart is planned (i.e., when the restart is a result of the initiate failover command).

8.5.49.1 no nsf (OSPFv3)

Use this command to disable graceful restart for all restarts.

8.5.50 nsf restart-interval (OSPFv3)

Use this command to configure the number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. This is referred to as the grace period. The restarting router includes the grace period in its grace LSAs. For planned restarts (using the `initiate failover` command), the grace LSAs are sent prior to restarting the management unit, whereas for unplanned restarts, they are sent after reboot begins.

The grace period must be set long enough to allow the restarting router to reestablish all of its adjacencies and complete a full database exchange with each of those neighbors.

Default	120 seconds
Format	`nsf [ietf] restart-interval` *`1-1800`*
Modes	Router OSPFv3 Config

Parameter	Description
ietf	This keyword is accepted but not required.
seconds	The number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. The range is from 1 to 1800 seconds.

8.5.50.1 no nsfrestart-interval (OSPFv3)

Use this command to revert the grace period to its default value.

Format	`no [ietf] nsf restart-interval`
Modes	Router OSPFv3 Config

8.5.51 nsf helper (OSPFv3)

Use this command to enable helpful neighbor functionality for the OSPF protocol. You can enable this functionality for planned or unplanned restarts, or both.

Default	OSPF may act as a helpful neighbor for both planned and unplanned restarts
Format	`nsf helper [planned-only]`
Modes	Router OSPFv3 Config

Parameter	Description
planned-only	This optional keyword indicates that OSPF should only help a restarting router performing a planned restart.

8.5.51.1 no nsf helper (OSPFv3)

Use this command to disable helpful neighbor functionality for OSPF.

Format	`no nsf helper`
Modes	Router OSPFv3 Config

8.5.52 nsf ietf helper disable (OSPFv3)

Use this command to disable helpful neighbor functionality for OSPF.

NOTICE

The commands `no nsf helper` and `nsf ietf helper disable` are functionally equivalent. The command `nsf ietf helper disable` is supported solely for compatibility with other network software CLI.

Format	`nsf ietf helper disable`
Modes	Router OSPFv3 Config

8.5.53 nsf helper strict-lsa-checking (OSPFv3)

The restarting router is unable to react to topology changes. In particular, the restarting router will not immediately update its forwarding table; therefore, a topology change may introduce forwarding loops or black holes that persist until the graceful restart completes. By exiting the graceful restart on a topology change, a router tries to eliminate the loops or black holes as quickly as possible by routing around the restarting router. A helpful neighbor considers a link down with the restarting router to be a topology change, regardless of the strict LSA checking configuration.

Use this command to require that an OSPF helpful neighbor exit helper mode whenever a topology change occurs.

Default	Enabled.
Format	`nsf [ietf] helper strict-lsa-checking`
Modes	Router OSPFv3 Config

Parameter	Description
ietf	This keyword is accepted but not required.

8.5.53.1 no nsf [ietf] helper strict-lsa-checking (OSPFv3)

Use this command to allow OSPF to continue as a helpful neighbor in spite of topology changes.

Default	Enabled.
Format	`nsf [ietf] helper strict-lsa-checking`
Modes	Router OSPFv3 Config

OSPFv3 Stub Router Commands

8.5.54 max-metric router-lsa

To configure OSPFv3 to enter stub router mode, use this command in Router OSPFv3 Global Configuration mode. When OSPFv3 is in stub router mode, OSPFv3 sets the metric in the nonstub links in its router LSA to MaxLinkMetric. Other routers therefore compute very long paths through the stub router, and prefer any alternate path. Doing so eliminates all transit traffic through the stub router, when alternate routes are available. Stub router mode is useful when adding or removing a router from a network or to avoid transient routes when a router reloads.

You can administratively force OSPFv3 into stub router mode. OSPFv3 remains in stub router mode until you take OSPFv3 out of stub router mode. Alternatively, you can configure OSPF to start in stub router mode for a configurable period of time after the router boots up.

If you set the summary LSA metric to 16,777,215, other routers will skip the summary LSA when they compute routes.

If you have configured the router to enter stub router mode on startup (max-metric router-lsa on-startup), and then enter max-metric router lsa, there is no change. If OSPFv3 is administratively in stub router mode (the max-metric router-lsa command has been given), and you configure OSPFv3 to enter stub router mode on startup (max-metric router-lsa on-startup), OSPFv3 exits stub router mode (assuming the startup period has expired) and the configuration is updated. Without any parameters, stub router mode only sends maximum metric values for router LSAs.

Default	`OSPF is not in stub router mode by default`

Format	`max-metric router-lsa [on-startup seconds] [summary-lsa {metric}]`
	`max-metric router-lsa [external-lsa [`*`max-metric-value`*`]] [inter-area-lsas [`*`max-metric-value`*`]] [on-startup `*`seconds`*`] [summary-lsa [`*`max-metric-value`*`]]`

Mode	OSPFv3 Router Configuration

Parameter	Description
external-lsa	(Optional) Sends the maximum metric values for external LSAs. *max-metric-value* is the maximum metric value to use for LSAs. The range is 1 to 16777215 (0xFFFFFF). The default value is 16711680 (0xFF0000).
inter-area-lsas	(Optional) Sends the maximum metric values for Inter-Area-Router LSAs
on-startup	(Optional) Starts OSPF in stub router mode. *seconds* is the number of seconds that OSPF remains in stub router mode after a reboot. The range is 5 to 86,400 seconds. There is no default value.
summary-lsa	(Optional) Sends the maximum metric values for Summary LSAs

8.5.54.1 no max-metric router-lsa

Use this command in OSPFv3 Router Configuration mode to disable stub router mode. The command clears either type of stub router mode (always or on-startup) and resets all LSA options. If OSPF is configured to enter global configuration mode on startup, and during normal operation you want to immediately place OSPF in stub router mode, issue the command no max-metric router-lsa on-startup. The command no max-metric with the external-lsa, inter-area-lsas, or summary-lsa option router-lsa summary-lsa causes OSPF to send summary LSAs with metrics computed using normal procedures.

Format	`no max-metric router-lsa [external-lsa] [inter-area-lsas] [on-startup] [summary-lsa]`
Mode	OSPFv3 Router Configuration

8.5.55 clear ipv6 ospf stub-router

Use this command to force OSPF to exit stub router mode when it has automatically entered stub router mode because of a resource limitation. OSPF only exits stub router mode if it entered stub router mode because of a resource limitation or it if is in stub router mode at startup. This command has no effect if OSPF is configured to be in stub router mode permanently.

Format	`clear ipv6 ospf stub-router`
Mode	Privileged EXEC

OSPFv3 Show Commands

8.5.56 show ipv6 ospf

This command displays information relevant to the OSPF router.

Format	`show ipv6 ospf`
Mode	• Privileged EXEC • User EXEC

NOTICE Some of the information below displays only if you enable OSPF and configure certain features.

Term	Definition
Router ID	A 32-bit integer in dotted decimal format identifying the router, about which information is displayed. This is a configured value.
OSPF Admin Mode	Shows whether the administrative mode of OSPF in the router is enabled or disabled. This is a configured value.
External LSDB Limit	The maximum number of non-default AS-external-LSAs entries that can be stored in the link-state database.
Exit Overflow Interval	The number of seconds that, after entering overflow state, a router will attempt to leave overflow state.
SPF Start Time	The number of milliseconds the SPF calculation is delayed if no SPF calculation has been scheduled during the current “wait interval”.
SPF Hold Time	The number of milliseconds of the initial “wait interval”.
SPF Maximum Hold Time	The maximum number of milliseconds of the “wait interval”.
LSA Refresh Group Pacing Time	The size of the LSA refresh group window, in seconds.
AutoCost Ref BW	Shows the value of the auto-cost reference bandwidth configured on the router.
Default Passive Setting	Shows whether the interfaces are passive by default.
Maximum Paths	The maximum number of paths that OSPF can report for a given destination.
Default Metric	Default value for redistributed routes.
Default Route Advertise	Indicates whether the default routes received from other source protocols are advertised or not.
Always	Shows whether default routes are always advertised.
Metric	The metric for the advertised default routes. If the metric is not configured, this field is blank.
Metric Type	Shows whether the routes are External Type 1 or External Type 2.

Term	Definition
Number of Active Areas	The number of active OSPF areas. An "active" OSPF area is an area with at least one interface up.
ABR Status	Shows whether the router is an OSPF Area Border Router.
ASBR Status	Shows if the ASBR mode is enabled or disabled. Enable implies that the router is an autonomous system border router. Router automatically becomes an ASBR when it is configured to redistribute routes learnt from other protocol. The possible values for the ASBR status is enabled (if the router is configured to re-distribute routes learned by other protocols) or disabled (if the router is not configured for the same).
Stub Router Status	The status of the stub router: Active or Inactive.
Stub Router Reason	This is displayed only if the stub router is active. Shows the reason for the stub router: Configured, Startup, or Resource Limitation
Stub Router Startup Time Remaining	This is displayed only if the stub router is in startup stub router mode. The remaining time (in seconds) until OSPF exits stub router mode.
Stub Router Duration	This row is only listed if the stub router is active and the router entered stub mode because of a resource limitation. The time elapsed since the router last entered the stub router mode. The duration is displayed in DD:HH:MM:SS format.
External LSDB Overflow	When the number of non-default external LSAs exceeds the configured limit, External LSDB Limit, OSPF goes into LSDB overflow state. In this state, OSPF withdraws all of its self-originated non-default external LSAs. After the Exit Overflow Interval, OSPF leaves the overflow state, if the number of external LSAs has been reduced.
External LSA Count	The number of external (LS type 5) link-state advertisements in the link-state database.
External LSA Checksum	The sum of the LS checksums of external link-state advertisements contained in the link-state database.
New LSAs Originated	The number of new link-state advertisements that have been originated.
LSAs Received	The number of link-state advertisements received determined to be new instantiations.
LSA Count	The total number of link state advertisements currently in the link state database.
Maximum Number of LSAs	The maximum number of LSAs that OSPF can store.
LSA High Water Mark	The maximum size of the link state database since the system started.
Retransmit List Entries	The total number of LSAs waiting to be acknowledged by all neighbors. An LSA may be pending acknowledgment from more than one neighbor.
Maximum Number of Retransmit Entries	The maximum number of LSAs that can be waiting for acknowledgment at any given time.
Retransmit Entries High Water Mark	The highest number of LSAs that have been waiting for acknowledgment.
Redistributing	This field is a heading and appears only if you configure the system to take routes learned from a non-OSPF source and advertise them to its peers.
Source	Shows source protocol/routes that are being redistributed. Possible values are static, connectedor RIP.
Metric	The metric of the routes being redistributed.
Metric Type	Shows whether the routes are External Type 1 or External Type 2.
Tag	The decimal value attached to each external route.
Subnets	For redistributing routes into OSPF, the scope of redistribution for the specified protocol.
Distribute-List	The access list used to filter redistributed routes.

Term	Definition
Prefix-suppression	Displays whether prefix-suppression is enabled or disabled on the given interface.
NSF Support	Indicates whether nonstop forwarding (NSF) is enabled for the OSPF protocol for planned restarts, unplanned restarts or both (Always).
NSF Restart Interval	The user-configurable grace period during which a neighboring router will be in the helper state after receiving notice that the management unit is performing a graceful restart.
NSF Restart Status	The current graceful restart status of the router.
NSF Restart Age	Number of seconds until the graceful restart grace period expires.
NSF Restart Exit Reason	Indicates why the router last exited the last restart: • None — Graceful restart has not been attempted. • In Progress — Restart is in progress. • Completed — The previous graceful restart completed successfully. • Timed Out — The previous graceful restart timed out. • Topology Changed — The previous graceful restart terminated prematurely because of a topology change.
NSF Help Support	Indicates whether helpful neighbor functionality has been enabled for OSPF for planned restarts, unplanned restarts, or both (Always).
NSF help Strict LSA checking	Indicates whether strict LSA checking has been enabled. If enabled, then an OSPF helpful neighbor will exit helper mode whenever a topology change occurs. If disabled, an OSPF neighbor will continue as a helpful neighbor in spite of topology changes.

8.5.57 show ipv6 ospf abr

This command displays the internal OSPFv3 routes to reach Area Border Routers (ABR). This command takes no options.

Format	`show ipv6 ospf abr`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Type	The type of the route to the destination. It can be either: • intra — Intra-area route • inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

8.5.58 show ipv6 ospf area

This command displays information about the area. The ***areaid*** identifies the OSPF area that is being displayed.

Format	`show ipv6 ospf area` *`areaid`*
Modes	• Privileged EXEC • User EXEC

Term	Definition
AreaID	The area id of the requested OSPF area.
External Routing	A number representing the external routing capabilities for this area.
Spf Runs	The number of times that the intra-area route table has been calculated using this area's link-state database.
Area Border Router Count	The total number of area border routers reachable within this area.
Area LSA Count	Total number of link-state advertisements in this area's link-state database, excluding AS External LSAs.
Area LSA Checksum	A number representing the Area LSA Checksum for the specified AreaID excluding the external (LS type 5) link-state advertisements.
Stub Mode	Represents whether the specified Area is a stub area or not. The possible values are enabled and disabled. This is a configured value.
Import Summary LSAs	Shows whether to import summary LSAs (enabled).
OSPF Stub Metric Value	The metric value of the stub area. This field displays only if the area is a configured as a stub area.

The following OSPF NSSA specific information displays only if the area is configured as an NSSA.

Term	Definition
Import Summary LSAs	Shows whether to import summary LSAs into the NSSA.
Redistribute into NSSA	Shows whether to redistribute information into the NSSA.
Default Information Originate	Shows whether to advertise a default route into the NSSA.
Default Metric	The metric value for the default route advertised into the NSSA.
Default Metric Type	The metric type for the default route advertised into the NSSA.
Translator Role	The NSSA translator role of the ABR, which is always or candidate.
Translator Stability Interval	The amount of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.
Translator State	Shows whether the ABR translator state is disabled, always, or elected.

8.5.59 show ipv6 ospf asbr

This command displays the internal OSPFv3 routes to reach Autonomous System Boundary Routers (ASBR). This command takes no options.

Format	`show ipv6 ospf asbr`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Type	The type of the route to the destination. It can be either: • intra — Intra-area route • inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

8.5.60 show ipv6 ospf database

This command displays information about the link state database when OSPFv3 is enabled. If you do not enter any parameters, the command displays the LSA headers for all areas. Use the optional ***areaid*** parameter to display database information about a specific area. Use the other optional parameters to specify the type of link state advertisements to display. Use ***external*** to display the external LSAs. Use ***inter-area*** to display the inter-area LSAs. Use ***link*** to display the link LSAs. Use ***network*** to display the network LSAs. Use nssa-external to display NSSA external LSAs. Use ***prefix*** to display intra-area Prefix LSAs. Use ***router*** to display router LSAs. Use ***unknown area***, ***unknown as***, or ***unknown link*** to display unknown area, AS or link-scope LSAs, respectively. Use ***lsid*** to specify the link state ID (LSID). Use ***adv-router*** to show the LSAs that are restricted by the advertising router. Use ***self-originate*** to display the LSAs in that are self originated. The information below is only displayed if OSPF is enabled.

Format `show ipv6 ospf [areaid] database [{external | inter-area {prefix | router} | link | net work | nssa-external | prefix | router | unknown {area | as | link}}] [lsid] [{adv-router [rtrid] | self-originate}]`

Modes
- Privileged EXEC
- User EXEC

For each link-type and area, the following information is displayed.

Term	Definition
Link Id	A number that uniquely identifies an LSA that a router originates from all other self originated LSAs of the same LS type.
Adv Router	The Advertising Router. Is a 32-bit dotted decimal number representing the LSDB interface.
Age	A number representing the age of the link state advertisement in seconds.
Sequence	A number that represents which LSA is more recent.
Checksum	The total number LSA checksum.
Prefix	The IPv6 prefix.
Interface	The interface for the link.
Rtr Count	The number of routers attached to the network.

8.5.61 show ipv6 ospf database database-summary

Use this command to display the number of each type of LSA in the database and the total number of LSAs in the database.

Format `show ipv6 ospf database database-summary`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Router	Total number of router LSAs in the OSPFv3 link state database.
Network	Total number of network LSAs in the OSPFv3 link state database.
Inter-area Prefix	Total number of inter-area prefix LSAs in the OSPFv3 link state database.
Inter-area Router	Total number of inter-area router LSAs in the OSPFv3 link state database.
Type-7 Ext	Total number of NSSA external LSAs in the OSPFv3 link state database.
Link	Total number of link LSAs in the OSPFv3 link state database.
Intra-area Prefix	Total number of intra-area prefix LSAs in the OSPFv3 link state database.
Link Unknown	Total number of link-source unknown LSAs in the OSPFv3 link state database.
Area Unknown	Total number of area unknown LSAs in the OSPFv3 link state database.
AS Unknown	Total number of as unknown LSAs in the OSPFv3 link state database.
Type-5 Ext	Total number of AS external LSAs in the OSPFv3 link state database.
Self-Originated Type-5	Total number of self originated AS external LSAs in the OSPFv3 link state database.
Total	Total number of router LSAs in the OSPFv3 link state database.

8.5.62 show ipv6 ospf interface

This command displays the information for the IFO object or virtual interface tables. The argument `slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format.

Format	`show ipv6 ospf interface {slot/port|vlan 1-4093|loopback loopback-id	tunnel tunnel-id}`
Modes	• Privileged EXEC • User EXEC

Term	Definition
IP Address	The IPv6 address of the interface.
ifIndex	The interface index number associated with the interface.
OSPF Admin Mode	Shows whether the admin mode is enabled or disabled.
OSPF Area ID	The area ID associated with this interface.
Router Priority	The router priority. The router priority determines which router is the designated router.
Retransmit Interval	The frequency, in seconds, at which the interface sends LSA.
Hello Interval	The frequency, in seconds, at which the interface sends Hello packets.
Dead Interval	The amount of time, in seconds, the interface waits before assuming a neighbor is down.
LSA Ack Interval	The amount of time, in seconds, the interface waits before sending an LSA acknowledgement after receiving an LSA.
Interface Transmit Delay	The number of seconds the interface adds to the age of LSA packets before transmission.
Authentication Type	The type of authentication the interface performs on LSAs it receives.
Metric Cost	The priority of the path. Low costs have a higher priority than high costs.
Prefix-suppression	Displays whether prefix-suppression is enabled, disabled, or unconfigured on the given interface.
Passive Status	Shows whether the interface is passive or not.
OSPF MTU-ignore	Shows whether to ignore MTU mismatches in database descriptor packets sent from neighboring routers.
Link LSA Suppression	The configured state of Link LSA Suppression for the interface.

The following information only displays if OSPF is initialized on the interface:

Term	Definition
OSPF Interface Type	Broadcast LANs, such as Ethernet and IEEE 802.5, take the value ***broadcast***. The OSPF Interface Type will be 'broadcast'.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router.
Designated Router	The router ID representing the designated router.
Backup Designated Router	The router ID representing the backup designated router.
Number of Link Events	The number of link events.
Metric Cost	The cost of the OSPF interface.

8.5.63 show ipv6 ospf interface brief

This command displays brief information for the IFO object or virtual interface tables.

Format `show ipv6 ospf interface brief`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port*
OSPF Admin Mode	States whether OSPF is enabled or disabled on a router interface.
OSPF Area ID	The OSPF Area ID for the specified interface.
Router Priority	The router priority. The router priority determines which router is the designated router.
Metric Cost	The priority of the path. Low costs have a higher priority than high costs.
Hello Interval	The frequency, in seconds, at which the interface sends Hello packets.
Dead Interval	The amount of time, in seconds, the interface waits before assuming a neighbor is down.
Retransmit Interval	The frequency, in seconds, at which the interface sends LSA.
Retransmit Delay Interval	The number of seconds the interface adds to the age of LSA packets before transmission.
LSA Ack Interval	The amount of time, in seconds, the interface waits before sending an LSA acknowledgement after receiving an LSA.

8.5.64 show ipv6 ospf interface stats

This command displays the statistics for a specific interface. The command displays information only if OSPF is enabled.

Format `show ipv6 ospf interface stats` *`slot/port`*

Modes
- Privileged EXEC
- User EXEC

Term	Definition
OSPFv3 Area ID	The area id of this OSPF interface.
IP Address	The IP address associated with this OSPF interface.
OSPFv3 Interface Events	The number of times the specified OSPF interface has changed its state, or an error has occurred.
Virtual Events	The number of state changes or errors that occurred on this virtual link.

Term	Definition
Neighbor Events	The number of times this neighbor relationship has changed state, or an error has occurred.
Packets Received	The number of OSPFv3 packets received on the interface.
Packets Transmitted	The number of OSPFv3 packets sent on the interface.
LSAs Sent	The total number of LSAs flooded on the interface.
LSA Acks Received	The total number of LSA acknowledged from this interface.
LSA Acks Sent	The total number of LSAs acknowledged to this interface.
Sent Packets	The number of OSPF packets transmitted on the interface.
Received Packets	The number of valid OSPF packets received on the interface.
Discards	The number of received OSPF packets discarded because of an error in the packet or an error in processing the packet.
Bad Version	The number of received OSPF packets whose version field in the OSPF header does not match the version of the OSPF process handling the packet.
Virtual Link Not Found	The number of received OSPF packets discarded where the ingress interface is in a non-backbone area and the OSPF header identifies the packet as belonging to the backbone, but OSPF does not have a virtual link to the packet's sender.
Area Mismatch	The number of OSPF packets discarded because the area ID in the OSPF header is not the area ID configured on the ingress interface.
Invalid Destination Address	The number of OSPF packets discarded because the packet's destination IP address is not the address of the ingress interface and is not the AllDrRouters or AllSpfRouters multicast addresses.
No Neighbor at Source Address	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor. NOTE: Does not apply to Hellos.
Invalid OSPF Packet Type	The number of OSPF packets discarded because the packet type field in the OSPF header is not a known type.
Hellos Ignored	The number of received Hello packets that were ignored by this router from the new neighbors after the limit has been reached for the number of neighbors on an interface or on the system as a whole.

Table 11 on page 623 lists the number of OSPF packets of each type sent and received on the interface.

8.5.65 show ipv6 ospf lsa-group

This command displays the number of self-originated LSAs within each LSA group.

Format	`show ipv6 ospf lsa-group`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Total self-originated LSAs	The number of LSAs the router is currently originating.
Average LSAs per group	The number of self-originated LSAs divided by the number of LSA groups. The number of LSA groups is the refresh interval (1800 seconds) divided by the pacing interval (configured with `timers pacing lsa-group`) plus two.
Pacing group limit	The maximum number of self-originated LSAs in one LSA group. If the number of LSAs in a group exceeds this limit, OSPF redistributes LSAs throughout the refresh interval to achieve better balance.
Groups	For each LSA pacing group, the output shows the range of LSA ages in the group and the number of LSAs in the group.

Example: The following shows an example of the command.

```
(R1) #show ipv6 ospf lsa-group

Total self-originated LSAs:  3019
Average LSAs per group:  100
Pacing group limit:  400
Number of self-originated LSAs within each LSA group...


Group Start Age   Group End Age    Count
              0              59       96
             60             119       88
            120             179      102
            180             239       95
            240             299       95
            300             359       92
            360             419       48
            420             479       58
            480             539      103
            540             599       99
            600             659      119
            660             719      110
            720             779      106
            780             839      122
            840             899      110
            900             959       99
            960            1019      135
           1020            1079      101
           1080            1139       94
           1140            1199      115
           1200            1259      110
           1260            1319      111
           1320            1379      111
           1380            1439       99
           1440            1499      102
           1500            1559       96
           1560            1619      106
           1620            1679      111
           1680            1739      106
           1740            1799       80
           1800            1859        0
           1860            1919        0
```

8.5.66 show ipv6 ospf max-metric

This command displays the configured maximum metrics for stub-router mode.

Format	`show ipv6 ospf max-metric`
Modes	• Privileged EXEC • User EXEC

Example: The following shows an example of the command.

```
(config)#show ipv6 ospf max-metric
OSPFv3 Router with ID (3.3.3.3)
 Start time: 00:00:00, Time elapsed: 00:01:05
 Originating router-LSAs with maximum metric
    Condition: on startup for 1000 seconds, State: inactive
    Advertise external-LSAs with metric 16711680
```

8.5.67 show ipv6 ospf neighbor

This command displays information about OSPF neighbors. If you do not specify a neighbor IP address, the output displays summary information in a table. If you specify an interface or tunnel, only the information for that interface or tunnel displays. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. The ***ip-address*** is the IP address of the neighbor, and when you specify this, detailed information about the neighbor displays. The information below only displays if OSPF is enabled and the interface has a neighbor.

Format	`show ipv6 ospf neighbor [interface {slot/port|vlan 1-4093|tunnel tunnel_id}][ip-address]`
Modes	- Privileged EXEC - User EXEC

If you do not specify an IP address, a table with the following columns displays for all neighbors or the neighbor associated with the interface that you specify:

Term	Definition
Router ID	The 4-digit dotted-decimal number of the neighbor router.
Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of '0' indicates that the router is not eligible to become the designated router on this network.
Intf ID	The interface ID of the neighbor.
Interface	The interface of the local router in ***slot/port*** format.
State	The state of the neighboring routers. Possible values are: - Down- initial state of the neighbor conversation - no recent information has been received from the neighbor. - Attempt - no recent information has been received from the neighbor but a more concerted effort should be made to contact the neighbor. - Init - an Hello packet has recently been seen from the neighbor, but bidirectional communication has not yet been established. - 2 way - communication between the two routers is bidirectional. - Exchange start - the first step in creating an adjacency between the two neighboring routers, the goal is to decide which router is the master and to decide upon the initial DD sequence number. - Exchange - the router is describing its entire link state database by sending Database Description packets to the neighbor. - Full - the neighboring routers are fully adjacent and they will now appear in router-LSAs and network-LSAs.
Dead Time	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.
Restart Helper Status	Indicates the status of this router as a helper during a graceful restart of the router specified in the command line: - Helping—This router is acting as a helpful neighbor to the specified router. - Not Helping—This router is not a helpful neighbor at this time.
Restart Reason	When this router is in helpful neighbor mode, this indicates the reason for the restart as provided by the restarting router.
Remaining Grace Time	The number of seconds remaining the in current graceful restart interval. This is displayed only when this router is currently acting as a helpful neighbor for the router specified in the command.

Term	Definition
Restart Helper Exit Reason	Indicates the reason that the specified router last exited a graceful restart. • None—Graceful restart has not been attempted • In Progress—Restart is in progress • Completed—The previous graceful restart completed successfully • Timed Out—The previous graceful restart timed out • Topology Changed—The previous graceful restart terminated prematurely because of a topology change

If you specify an IP address for the neighbor router, the following fields display:

Term	Definition
Interface	The interface of the local router in *slot/port* format.
Area ID	The area ID associated with the interface.
Options	An integer value that indicates the optional OSPF capabilities supported by the neighbor. These are listed in its Hello packets. This enables received Hello Packets to be rejected (i.e., neighbor relationships will not even start to form) if there is a mismatch in certain crucial OSPF capabilities.
Router Priority	The router priority for the specified interface.
Dead Timer Due	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.
State	The state of the neighboring routers.
Events	Number of times this neighbor relationship has changed state, or an error has occurred.
Retransmission Queue Length	An integer representing the current length of the retransmission queue of the specified neighbor router Id of the specified interface.

8.5.68 show ipv6 ospf range

This command displays the set of OSPFv3 area ranges configured for a given area.

Format	`show ipv6 ospf range` *`areaid`*
Modes	Privileged EXEC

Term	Definition
Area ID	The area whose prefixes are summarized.
IPv6 Prefix/Prefix Length	The summary prefix and prefix length.
Type	S (Summary Link) or E (External Link)
Action	Enabled or Disabled
Cost	Metric to be advertised when the range is active.

8.5.69 show ipv6 ospf statistics

This command displays information about the 15 most recent Shortest Path First (SPF) calculations. SPF is the OSPF routing table calculation.

Format	`show ipv6 ospf statistics`
Modes	• Privileged EXEC • User EXEC

The command displays the following information with the most recent statistics displayed at the end of the table.

Term	Definition
Delta T	The time since the routing table was computed. The time is in the format hours, minutes, and seconds (hh:mm:ss).
Intra	The time taken to compute intra-area routes, in milliseconds.
Summ	The time taken to compute inter-area routes, in milliseconds.
Ext	The time taken to compute external routes, in milliseconds.
SPF Total	The total time taken to compute routes, in milliseconds. The total may exceed the sum of Intra, Summ, and Ext times.
RIB Update	The time from the completion of the routing table calculation until all changes have been made in the common routing table [the Routing Information Base (RIB)], in milliseconds
Reason	The event or events that triggered the SPF. The reason codes are as follows: • R: New router LSA • N: New network LSA • SN: New network (inter-area prefix) summary LSA • SA: New ASBR (inter-area router) summary LSA • X: New external LSA • IP: New intra-area prefix LSA • L: New Link LSA

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 ospf statistics

 Area 0.0.0.0: SPF algorithm executed 10 times

Delta T         Intra       Summ        Ext     SPF Total   RIB Update   Reason

23:32:46            0          0          0             0            0    R, IP
23:32:09            0          0          0             0            0    R, N, IP
23:32:04            0          0          0             0            0    R
23:31:44            0          0          0             0            0    R, N, IP
23:31:39            0          0          0             0            1    R
23:29:57            0          3          7            10          131    R
23:29:52            0         14         29            43          568    SN
04:07:23            0          9         23            33          117    SN
04:07:23            0          9         23            33          117    SN
04:07:18            0          0          0             1          485    SN
04:07:14            0          1          0             1            3     X
```

8.5.70 show ipv6 ospf stub table

This command displays the OSPF stub table. The information below will only be displayed if OSPF is initialized on the switch.

Format	`show ipv6 ospf stub table`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Area ID	A 32-bit identifier for the created stub area.
Type of Service	Type of service associated with the stub metric. For this release, Normal TOS is the only supported type.

Term	Definition
Metric Val	The metric value is applied based on the TOS. It defaults to the least metric of the type of service among the interfaces to other areas. The OSPF cost for a route is a function of the metric value.
Import Summary LSA	Controls the import of summary LSAs into stub areas.

8.5.71 show ipv6 ospf virtual-link

This command displays the OSPF Virtual Interface information for a specific area and neighbor. The ***areaid*** parameter identifies the area and the ***neighbor*** parameter identifies the neighbor's Router ID.

Format `show ipv6 ospf virtual-link` *`areaid neighbor`*

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Area ID	The area id of the requested OSPF area.
Neighbor Router ID	The input neighbor Router ID.
Hello Interval	The configured hello interval for the OSPF virtual interface.
Dead Interval	The configured dead interval for the OSPF virtual interface.
Interface Transmit Delay	The configured transmit delay for the OSPF virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPF virtual interface.
Authentication Type	The type of authentication the interface performs on LSAs it receives.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router. This is the state of the OSPF interface.
Neighbor State	The neighbor state.

8.5.72 show ipv6 ospf virtual-link brief

This command displays the OSPFV3 Virtual Interface information for all areas in the system.

Format `show ipv6 ospf virtual-link brief`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Area ID	The area id of the requested OSPFV3 area.
Neighbor	The neighbor interface of the OSPFV3 virtual interface.
Hello Interval	The configured hello interval for the OSPFV3 virtual interface.
Dead Interval	The configured dead interval for the OSPFV3 virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPFV3 virtual interface.
Transmit Delay	The configured transmit delay for the OSPFV3 virtual interface.

8.6 DHCPv6 Commands

This section describes the commands you use to configure the DHCPv6 server on the system and to view DHCPv6 information.

8.6.1 service dhcpv6

This command enables DHCPv6 configuration on the router.

Default	enabled
Format	`service dhcpv6`
Mode	Global Config

8.6.1.1 no service dhcpv6

This command disables DHCPv6 configuration on router.

Format	`no service dhcpv6`
Mode	Global Config

8.6.2 ipv6 dhcp client pd

Use this command to enable the Dynamic Host Configuration Protocol (DHCP) for IPv6 client process (if the process is not currently running) and to enable requests for prefix delegation through a specified interface. When prefix delegation is enabled and a prefix is successfully acquired, the prefix is stored in the IPv6 general prefix pool with an internal name defined by the automatic argument.

NOTICE The Prefix Delegation client is supported on only one IP interface.

rapid-commit enables the use of a two-message exchange method for prefix delegation and other configuration. If enabled, the client includes the rapid commit option in a solicit message.

The DHCP for IPv6 client, server, and relay functions are mutually exclusive on an interface. If one of these functions is already enabled and a user tries to configure a different function on the same interface, a message is displayed.

Default	Prefix delegation is disabled on an interface.
Format	`ipv6 dhcp client pd [rapid-commit]`
Mode	Interface Config

Example: The following examples enable prefix delegation on interface 0/1:

```
(Switch) #configure
(Switch) (Config)#interface 0/1
(Switch) (Interface 0/1)# ipv6 dhcp client pd

(Switch) #configure
(Switch) (Config)#interface 0/1
(Switch) (Interface 0/1)# ipv6 dhcp client pd rapid-commit
```

8.6.2.1 no ipv6 dhcp client pd

This command disables requests for prefix delegation.

Format	`no ipv6 dhcp client pd`
Mode	Interface Config

8.6.3 ipv6 dhcp server

Use this command to configure DHCPv6 server functionality on an interface or range of interfaces. The ***pool-name*** is the DHCPv6 pool containing stateless and/or prefix delegation parameters, *automatic* enables the server to automatically determine which pool to use when allocating addresses for a client, ***rapid-commit*** is an option that allows for an abbreviated exchange between the client and server, and ***pref-value*** is a value used by clients to determine preference between multiple DHCPv6 servers. For a particular interface, DHCPv6 server and DHCPv6 relay functions are mutually exclusive.

Format	`ipv6 dhcp server {pool-name	automatic}[rapid-commit] [preference pref-value]`
Mode	Interface Config

8.6.4 ipv6 dhcp relay destination

Use this command to configure an interface for DHCPv6 relay functionality on an interface or range of interfaces. Use the ***destination*** keyword to set the relay server IPv6 address. The ***relay-address*** parameter is an IPv6 address of a DHCPv6 relay server. Use the ***interface*** keyword to set the relay server interface. The ***relay-interface*** parameter is an interface (***slot/port***) to reach a relay server. The optional ***remote-id*** is the Relay Agent Information Option “remote ID” suboption to be added to relayed messages.This can either be the special keyword ***duid-ifid***, which causes the “remote ID” to be derived from the DHCPv6 server DUID and the relay interface number, or it can be specified as a user-defined string.

NOTICE If relay-address is an IPv6 global address, then relay-interface is not required. If relay-address is a link-local or multicast address, then relay-interface is required. Finally, if you do not specify a value for relay-address, then you must specify a value for relay-interface and the DHCPV6-ALL-AGENTS multicast address (i.e. FF02::1:2) is used to relay DHCPv6 messages to the relay server.

Format	`ipv6 dhcp relay {destination [relay-address] interface [relay-interface]| interface [relay-interface]} [remote-id (duid-ifid | user-defined-string)]`
Mode	Interface Config

8.6.5 ipv6 dhcp relay remote-id

This command configures the relay agent information option *remote ID* sub-option to be added to the DHCPv6 relayed messages. This can either be the special keyword `duid-ifid`, which causes the remote ID to be derived from the DHCPv6 Server DUID and the relay interface number, or it can be specified as a user-defined string.

Default	None configured
Format	`ipv6 dhcp relay remote-id {duid-ifid	user-defined-string)]`
Mode	Interface Config

8.6.5.1 no ipv6 dhcp relay remote-id

This command resets the relay agent information option *remote ID* sub-option to be added to the DHCPv6 relayed messages to the default value.

Default	None configured
Format	`no ipv6 dhcp relay remote-id {`*`duid-ifid`*`	user-defined-string)]`
Mode	Interface Config

8.6.6 ipv6 dhcp pool

Use this command from Global Config mode to enter IPv6 DHCP Pool Config mode. Use the **exit** command to return to Global Config mode. To return to the User EXEC mode, enter CTRL+Z. The ***pool-name*** should be less than 31 alpha-numeric characters. DHCPv6 pools are used to specify information for DHCPv6 server to distribute to DHCPv6 clients. These pools are shared between multiple interfaces over which DHCPv6 server capabilities are configured.

Once the DHCP for IPv6 configuration information pool has been created, use the `ipv6 dhcp server` command to associate the pool with a server on an interface. If you do not configure an information pool, use the `ipv6 dhcp server interface` configuration command to enable the DHCPv6 server function on an interface.

When you associate a DHCPv6 pool with an interface, only that pool services requests on the associated interface. The pool also services other interfaces. If you do not associate a DHCPv6 pool with an interface, it can service requests on any interface. Not using any IPv6 address prefix means that the pool returns only configured options.

Format	`ipv6 dhcp pool `*`pool-name`*
Mode	Global Config

8.6.6.1 no ipv6 dhcp pool

This command removes the specified DHCPv6 pool.

Format	`no ipv6 dhcp pool `*`pool-name`*
Mode	Global Config

8.6.7 address prefix (IPv6)

Use this command to sets an address prefix for address assignment. This address must be in hexadecimal, using 16-bit values between colons.

If `lifetime` values are not configured, the default lifetime values for *valid-lifetime* and *preferred-lifetime* are considered to be infinite.

Format	`address prefix `*`ipv6-prefix`*` [lifetime {`*`valid-lifetime preferred-lifetime`*`	infinite}]`
Mode	IPv6 DHCP Pool Config

Term	Definition
lifetime	(Optional) Sets a length of time for the hosts to remember router advertisements. If configured, both valid and preferred lifetimes must be configured.
valid-lifetime	The amount of time, in seconds, the prefix remains valid for the requesting router to use. The range is from 60 through 4294967294. The *preferred-lifetime* value cannot exceed the *valid-lifetime* value.
preferred-lifetime	The amount of time, in seconds, that the prefix remains preferred for the requesting router to use. The range is from 60 through 4294967294. The *preferred-lifetime* value cannot exceed the *valid-lifetime* value.
infinite	An unlimited lifetime.

Example: The following example shows how to configure an IPv6 address prefix for the IPv6 configuration pool *pool1*:

```
(Switch) #configure
(Switch) (Config)# ipv6 dhcp pool pool1
(Switch) (Config-dhcp6s-pool)# address prefix 2001::/64
(Switch) (Config-dhcp6s-pool)# exit
```

8.6.8 domain-name (IPv6)

This command sets the DNS domain name which is provided to DHCPv6 client by DHCPv6 server. DNS domain name is configured for stateless server support. Domain name consist of no more than 31 alpha-numeric characters. DHCPv6 pool can have multiple number of domain names with maximum of 8.

Format `domain-name` *`dns-domain-name`*

Mode IPv6 DHCP Pool Config

8.6.8.1 no domain-name

This command will remove dhcpv6 domain name from dhcpv6 pool.

Format `no domain-name` *`dns-domain-name`*

Mode IPv6 DHCP Pool Config

8.6.9 dns-server (IPv6)

This command sets the ipv6 DNS server address which is provided to dhcpv6 client by dhcpv6 server. DNS server address is configured for stateless server support. DHCPv6 pool can have multiple number of domain names with a maximum of 8.

Format `dns-server` *`dns-server-address`*

Mode IPv6 DHCP Pool Config

8.6.9.1 no dns-server

This command will remove DHCPv6 server address from DHCPv6 server.

Format `no dns-server` *`dns-server-address`*

Mode IPv6 DHCP Pool Config

8.6.10 prefix-delegation (IPv6)

Multiple IPv6 prefixes can be defined within a pool for distributing to specific DHCPv6 Prefix delegation clients. Prefix is the delegated IPv6 prefix. DUID is the client's unique DUID value (Example: 00:01:00:09:f8:79:4e:00:04:76:73:43:76'). Name is 31 characters textual client's name which is useful for logging or tracing only. Valid lifetime is the valid lifetime for the delegated prefix in seconds and preferred lifetime is the preferred lifetime for the delegated prefix in seconds.

Default

- valid-lifetime—2592000
- preferred-lifetime—604800

Format `prefix-delegation` *`prefix/prefixlength DUID`* `[name` *`hostname`*`][valid-lifetime` *`04294967295`*`][preferred-lifetime` *`0-4294967295`*`]`

Mode IPv6 DHCP Pool Config

8.6.10.1 no prefix-delegation

This command deletes a specific prefix-delegation client.

Format	`no prefix-delegation` *`prefix/prefix-delegation DUID`*
Mode	IPv6 DHCP Pool Config

8.6.11 show ipv6 dhcp

This command displays the DHCPv6 server name and status.

Format	`show ipv6 dhcp`
Mode	Privileged EXEC

Term	Definition
DHCPv6 is Enabled (Disabled)	The status of the DHCPv6 server.
Server DUID	If configured, shows the DHCPv6 unique identifier.

8.6.12 show ipv6 dhcp statistics

This command displays the IPv6 DHCP statistics for all interfaces.

Format	`show ipv6 dhcp statistics`
Mode	Privileged EXEC

Term	Definition
DHCPv6 Solicit Packets Received	Number of solicit received statistics.
DHCPv6 Request Packets Received	Number of request received statistics.
DHCPv6 Confirm Packets Received	Number of confirm received statistics.
DHCPv6 Renew Packets Received	Number of renew received statistics.
DHCPv6 Rebind Packets Received	Number of rebind received statistics.
DHCPv6 Release Packets Received	Number of release received statistics.
DHCPv6 Decline Packets Received	Number of decline received statistics.
DHCPv6 Inform Packets Received	Number of inform received statistics.
DHCPv6 Relay-forward Packets Received	Number of relay forward received statistics.
DHCPv6 Relay-reply Packets Received	Number of relay-reply received statistics.
DHCPv6 Malformed Packets Received	Number of malformed packets statistics.
Received DHCPv6 Packets Discarded	Number of DHCP discarded statistics.
Total DHCPv6 Packets Received	Total number of DHCPv6 received statistics
DHCPv6 Advertisement Packets Transmitted	Number of advertise sent statistics.
DHCPv6 Reply Packets Transmitted	Number of reply sent statistics.
DHCPv6 Reconfig Packets Transmitted	Number of reconfigure sent statistics.
DHCPv6 Relay-reply Packets Transmitted	Number of relay-reply sent statistics.
DHCPv6 Relay-forward Packets Transmitted	Number of relay-forward sent statistics.
Total DHCPv6 Packets Transmitted	Total number of DHCPv6 sent statistics.

8.6.13 show ipv6 dhcp interface

This command displays DHCPv6 information for all relevant interfaces or the specified interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *slot/port* format. If you specify an interface, you can use the optional `statistics` parameter to view statistics for the specified interface.

Format	`show ipv6 dhcp interface {`*`slot/port`*`|vlan `*`1-4093`*`} [statistics]`
Mode	Privileged EXEC

Term	Definition
IPv6 Interface	The interface name in *slot/port* format.
Mode	Shows whether the interface is a IPv6 DHCP relay or server.

If the interface mode is server, the following information displays.

Term	Definition
Pool Name	The pool name specifying information for DHCPv6 server distribution to DHCPv6 clients.
Server Preference	The preference of the server.
Option Flags	Shows whether rapid commit is enabled.

If the interface mode is relay, the following information displays.

Term	Definition
Relay Address	The IPv6 address of the relay server.
Relay Interface Number	The relay server interface in *slot/port* format.
Relay Remote ID	If configured, shows the name of the relay remote.
Option Flags	Shows whether rapid commit is configured.

If you use the statistics parameter, the command displays the IPv6 DHCP statistics for the specified interface. See "show ipv6 dhcp statistics" on page 735 for information about the output.

8.6.14 show ipv6 dhcp binding

This command displays configured DHCP pool.

Format	`show ipv6 dhcp binding [`*`ipv6-address`*`]`
Mode	Privileged EXEC

Term	Definition
DHCP Client Address	Address of DHCP Client.
DUID	String that represents the Client DUID.
IAID	Identity Association ID.
Prefix/Prefix Length	IPv6 address and mask length for delegated prefix.
Prefix Type	IPV6 Prefix type (IAPD, IANA, or IATA).
Client Address	Address of DHCP Client.
Client Interface	IPv6 Address of DHCP Client.
Expiration	Address of DNS server address.

Term	Definition
Valid Lifetime	Valid lifetime in seconds for delegated prefix.
Preferred Lifetime	Preferred lifetime in seconds for delegated prefix.

8.6.15 show ipv6 dhcp pool

This command displays configured DHCP pool.

Format	`show ipv6 dhcp pool` *`pool-name`*
Mode	Privileged EXEC

Term	Definition
DHCP Pool Name	Unique pool name configuration.
Client DUID	Client's DHCP unique identifier. DUID is generated using the combination of the local system burned-in MAC address and a timestamp value.
Host	Name of the client.
Prefix/Prefix Length	IPv6 address and mask length for delegated prefix.
Preferred Lifetime	Preferred lifetime in seconds for delegated prefix.
Valid Lifetime	Valid lifetime in seconds for delegated prefix.
DNS Server Address	Address of DNS server address.
Domain Name	DNS domain name.

8.6.16 show network ipv6 dhcp statistics

This command displays the statistics of the DHCPv6 client running on the network management interface.

Format	`show network ipv6 dhcp statistics`
Mode	• Privileged EXEC • User EXEC

Field	Description
DHCPv6 Advertisement Packets Received	The number of DHCPv6 Advertisement packets received on the network interface.
DHCPv6 Reply Packets Received	The number of DHCPv6 Reply packets received on the network interface.
Received DHCPv6 Advertisement Packets Discarded	The number of DHCPv6 Advertisement packets discarded on the network interface.
Received DHCPv6 Reply Packets Discarded	The number of DHCPv6 Reply packets discarded on the network interface.
DHCPv6 Malformed Packets Received	The number of DHCPv6 packets that are received malformed on the network interface.
Total DHCPv6 Packets Received	The total number of DHCPv6 packets received on the network interface.
DHCPv6 Solicit Packets Transmitted	The number of DHCPv6 Solicit packets transmitted on the network interface.
DHCPv6 Request Packets Transmitted	The number of DHCPv6 Request packets transmitted on the network interface.
DHCPv6 Renew Packets Transmitted	The number of DHCPv6 Renew packets transmitted on the network interface.

Field	Description
DHCPv6 Rebind Packets Transmitted	The number of DHCPv6 Rebind packets transmitted on the network interface.
DHCPv6 Release Packets Transmitted	The number of DHCPv6 Release packets transmitted on the network interface.
Total DHCPv6 Packets Transmitted	The total number of DHCPv6 packets transmitted on the network interface.

Example: The following shows example CLI display output for the command.

```
(admin)#show network ipv6 dhcp statistics
DHCPv6 Client Statistics
-------------------------

DHCPv6 Advertisement Packets Received................. 0
DHCPv6 Reply Packets Received......................... 0
Received DHCPv6 Advertisement Packets Discarded....... 0
Received DHCPv6 Reply Packets Discarded............... 0
DHCPv6 Malformed Packets Received..................... 0
Total DHCPv6 Packets Received......................... 0

DHCPv6 Solicit Packets Transmitted.................... 0
DHCPv6 Request Packets Transmitted.................... 0
DHCPv6 Renew Packets Transmitted...................... 0
DHCPv6 Rebind Packets Transmitted..................... 0
DHCPv6 Release Packets Transmitted.................... 0
Total DHCPv6 Packets Transmitted...................... 0
```

8.6.17 show serviceport ipv6 dhcp statistics

This command displays the statistics of the DHCPv6 client running on the serviceport management interface.

Format	`show serviceport ipv6 dhcp statistics`
Mode	• Privileged EXEC • User EXEC

Field	Description
DHCPv6 Advertisement Packets Received	The number of DHCPv6 Advertisement packets received on the service port interface.
DHCPv6 Reply Packets Received	The number of DHCPv6 Reply packets received on the service port interface.
Received DHCPv6 Advertisement Packets Discarded	The number of DHCPv6 Advertisement packets discarded on the service port interface.
Received DHCPv6 Reply Packets Discarded	The number of DHCPv6 Reply packets discarded on the service port interface.
DHCPv6 Malformed Packets Received	The number of DHCPv6 packets that are received malformed on the service port interface.
Total DHCPv6 Packets Received	The total number of DHCPv6 packets received on the service port interface.
DHCPv6 Solicit Packets Transmitted	The number of DHCPv6 Solicit packets transmitted on the service port interface.
DHCPv6 Request Packets Transmitted	The number of DHCPv6 Request packets transmitted on the service port interface.
DHCPv6 Renew Packets Transmitted	The number of DHCPv6 Renew packets transmitted on the service port interface.

Field	Description
DHCPv6 Rebind Packets Transmitted	The number of DHCPv6 Rebind packets transmitted on the service port interface.
DHCPv6 Release Packets Transmitted	The number of DHCPv6 Release packets transmitted on the service port interface.
Total DHCPv6 Packets Transmitted	The total number of DHCPv6 packets transmitted on the service port interface.

Example: The following shows example CLI display output for the command.

```
(admin)#show serviceport ipv6 dhcp statistics
DHCPv6 Client Statistics
-------------------------

DHCPv6 Advertisement Packets Received................. 0
DHCPv6 Reply Packets Received......................... 0
Received DHCPv6 Advertisement Packets Discarded....... 0
Received DHCPv6 Reply Packets Discarded............... 0
DHCPv6 Malformed Packets Received..................... 0
Total DHCPv6 Packets Received......................... 0

DHCPv6 Solicit Packets Transmitted.................... 0
DHCPv6 Request Packets Transmitted.................... 0
DHCPv6 Renew Packets Transmitted...................... 0
DHCPv6 Rebind Packets Transmitted..................... 0
DHCPv6 Release Packets Transmitted.................... 0
Total DHCPv6 Packets Transmitted...................... 0
```

8.6.18 clear ipv6 dhcp

Use this command to clear DHCPv6 statistics for all interfaces or for a specific interface. Use the ***slot/port*** parameter to specify the interface.

Format	`clear ipv6 dhcp {statistics	interface slot/port statistics}`
Mode	Privileged EXEC

8.6.19 clear ipv6 dhcp binding

This command deletes an automatic address binding from the DHCP server database. ***address*** is a valid IPv6 address.

A binding table entry on the DHCP for IPv6 server is automatically:

- Created whenever a prefix is delegated to a client from the configuration pool.
- Updated when the client renews, rebinds, or confirms the prefix delegation.
- Deleted when the client releases all the prefixes in the binding voluntarily, all prefixes' valid lifetimes have expired, or an administrator runs the clear ipv6 dhcp binding command.

If the `clear ipv6 dhcp binding` command is used with the optional *ipv6-address* argument specified, only the binding for the specified client is deleted. If the `clear ipv6 dhcp binding` command is used without the *ipv6-address* argument, all automatic client bindings are deleted from the DHCP for IPv6 binding table.

Format	`clear ipv6 dhcp binding [ipv6-address]`
Mode	Privileged EXEC

8.6.20 clear network ipv6 dhcp statistics

Use this command to clear the DHCPv6 statistics ***on the network management*** interface.

Format	`clear network ipv6 dhcp statistics`
Mode	• Privileged EXEC

8.6.21 clear serviceport ipv6 dhcp statistics

Use this command to clear the DHCPv6 client statistics *`on the service port`* interface.

Format	`clear serviceport ipv6 dhcp statistics`
Mode	• Privileged EXEC

8.7 DHCPv6 Snooping Configuration Commands

This section describes commands you use to configure IPv6 DHCP Snooping.

8.7.1 ipv6 dhcp snooping

Use this command to globally enable IPv6 DHCP Snooping.

Default	disabled
Format	`ipv6 dhcp snooping`
Mode	Global Config

8.7.1.1 no ipv6 dhcp snooping

Use this command to globally disable IPv6 DHCP Snooping.

Format	`no ipv6 dhcp snooping`
Mode	Global Config

8.7.2 ipv6 dhcp snooping vlan

Use this command to enable DHCP Snooping on a list of comma-separated VLAN ranges.

Default	disabled
Format	`ipv6 dhcp snooping vlan` *`vlan-list`*
Mode	Global Config

8.7.2.1 no ipv6 dhcp snooping vlan

Use this command to disable DHCP Snooping on VLANs.

Format	`no ipv6 dhcp snooping vlan` *`vlan-list`*
Mode	Global Config

8.7.3 ipv6 dhcp snooping verify mac-address

Use this command to enable verification of the source MAC address with the client hardware address in the received DCHP message.

Default	enabled
Format	`ipv6 dhcp snooping verify mac-address`
Mode	Global Config

8.7.3.1 no ipv6 dhcp snooping verify mac-address

Use this command to disable verification of the source MAC address with the client hardware address.

Format	`no ipv6 dhcp snooping verify mac-address`
Mode	Global Config

8.7.4 ipv6 dhcp snooping database

Use this command to configure the persistent location of the DHCP Snooping database. This can be local or a remote file on a given IP machine.

Default	local
Format	`ipv6 dhcp snooping database {local|tftp://hostIP/filename}`
Mode	Global Config

8.7.5 ip dhcp snooping database write-delay

Use this command to configure the interval in seconds at which the DHCP Snooping database is persisted. The interval value ranges from 15 to 86400 seconds.

Default	300 seconds
Format	`ip dhcp snooping database write-delay` *in seconds*
Mode	Global Config

8.7.5.1 no ip dhcp snooping database write-delay

Use this command to set the write delay value to the default value.

Format	`no ip dhcp snooping database write-delay`
Mode	Global Config

8.7.6 ipv6 dhcp snooping binding

Use this command to configure static DHCP Snooping binding.

Format	`ipv6 dhcp snooping binding` *mac-address* `vlan` *vlan id ip address* `interface` *interface id*
Mode	Global Config

8.7.6.1 no ipv6 dhcp snooping binding

Use this command to remove the DHCP static entry from the DHCP Snooping database.

Format	`no ipv6 dhcp snooping binding` *mac-address*
Mode	Global Config

8.7.7 ipv6 dhcp snooping trust

Use this command to configure an interface or range of interfaces as trusted.

Default	disabled
Format	`ipv6 dhcp snooping trust`
Mode	Interface Config

8.7.7.1 no ipv6 dhcp snooping trust

Use this command to configure the port as untrusted.

Format	`no ipv6 dhcp snooping trust`
Mode	Interface Config

8.7.8 ipv6 dhcp snooping log-invalid

Use this command to control the logging DHCP messages filtration by the DHCP Snooping application. This command can be used to configure a single interface or a range of interfaces.

Default	disabled
Format	`ipv6 dhcp snooping log-invalid`
Mode	Interface Config

8.7.8.1 no ipv6 dhcp snooping log-invalid

Use this command to disable the logging DHCP messages filtration by the DHCP Snooping application.

Format	`no ipv6 dhcp snooping log-invalid`
Mode	Interface Config

8.7.9 ipv6 dhcp snooping limit

Use this command to control the rate at which the DHCP Snooping messages come on an interface or range of interfaces. By default, rate limiting is disabled. When enabled, the rate can range from 0 to 300 packets per second. The burst level range is 1 to 15 seconds. Rate limiting is configured on a physical port and may be applied to trusted and untrusted ports.

Default	disabled (no limit)
Format	`ipv6 dhcp snooping limit {rate pps [`*`burst interval seconds`*`]}`
Mode	Interface Config

8.7.9.1 no ipv6 dhcp snooping limit

Use this command to set the rate at which the DHCP Snooping messages come, and the burst level, to the defaults.

Format	`no ipv6 dhcp snooping limit`
Mode	Interface Config

8.7.10 ipv6 verify source

Use this command to configure the IPv6SG source ID attribute to filter the data traffic in the hardware. Source ID is the combination of IP address and MAC address. Normal command allows data traffic filtration based on the IP address. With the “port-security” option, the data traffic is filtered based on the IP and MAC addresses.

This command can be used to configure a single interface or a range of interfaces.

Default	`the source ID is the IP address`
Format	`ipv6 verify source {port-security}`
Mode	Interface Config

8.7.10.1 no ipv6 verify source

Use this command to disable the IPv6SG configuration in the hardware. You cannot disable port-security alone if it is configured.

Format	`no ipv6 verify source`
Mode	Interface Config

8.7.11 ipv6 verify binding

Use this command to configure static IPv6 source guard (IPv6SG) entries.

Format	`ipv6 verify binding` *`mac-address`* `vlan` *`vlan id ipv6 address`* `interface` *`interface id`*
Mode	Global Config

8.7.11.1 no ipv6 verify binding

Use this command to remove the IPv6SG static entry from the IPv6SG database.

Format	`no ipv6 verify binding` *`mac-address`* `vlan` *`vlan id ipv6 address`* `interface` *`interface id`*
Mode	Global Config

8.7.12 show ipv6 dhcp snooping

Use this command to display the DHCP Snooping global configurations and per port configurations.

Format	`show ipv6 dhcp snooping`
Mode	• Privileged EXEC • User EXEC

Term	Definition
Interface	The interface for which data is displayed.
Trusted	If it is enabled, DHCP snooping considers the port as trusted. The factory default is disabled.
Log Invalid Pkts	If it is enabled, DHCP snooping application logs invalid packets on the specified interface.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping

DHCP snooping is Disabled
DHCP snooping source MAC verification is enabled
DHCP snooping is enabled on the following VLANs:
11 - 30, 40

Interface   Trusted    Log Invalid Pkts
---------   --------   ----------------
0/1          Yes             No
0/2          No             Yes
0/3          No             Yes
0/4          No              No
0/6          No              No
```

8.7.13 show ipv6 dhcp snooping binding

Use this command to display the DHCP Snooping binding entries. To restrict the output, use the following options:

- Dynamic: Restrict the output based on DCHP snooping.
- Interface: Restrict the output based on a specific interface.
- Static: Restrict the output based on static entries.
- VLAN: Restrict the output based on VLAN.

Format	`show ipv6 dhcp snooping binding [{static/dynamic}] [interface` *`slot/port`*`] [vlan id]`
Mode	• Privileged EXEC • User EXEC

Term	Definition
MAC Address	Displays the MAC address for the binding that was added. The MAC address is the key to the binding database.
IPv6 Address	Displays the valid IPv6 address for the binding rule.
VLAN	The VLAN for the binding rule.
Interface	The interface to add a binding into the DHCP snooping interface.
Type	Binding type; statically configured from the CLI or dynamically learned.
Lease (sec)	The remaining lease time for the entry.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping binding

Total number of bindings: 2

MAC Address          IPv6 Address   VLAN  Interface  Type  Lease time (Secs)
------------------  -------------- ----  ---------  ---- ------------------
00:02:B3:06:60:80   2000::1/64     10    0/1                86400
00:0F:FE:00:13:04   3000::1/64     10    0/1                86400
```

8.7.14 show ipv6 dhcp snooping database

Use this command to display the DHCP Snooping configuration related to the database persistency.

Format `show ipv6 dhcp snooping database`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
Agent URL	Bindings database agent URL.
Write Delay	The maximum write time to write the database into local or remote.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping database

agent url:  /10.131.13.79:/sai1.txt

write-delay:  5000
```

8.7.15 show ipv6 dhcp snooping interfaces

Use this command to show the DHCP Snooping status of all interfaces or a specified interface.

Format `show ipv6 dhcp snooping interfaces [interface` *`slot/port`*`]`

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping interfaces

 Interface    Trust State    Rate Limit    Burst Interval
                                (pps)       (seconds)
-----------   ----------   ----------   --------------
   1/g1            No           15               1
   1/g2            No           15               1
   1/g3            No           15               1

(switch) #show ip dhcp snooping interfaces ethernet 0/1

 Interface    Trust State    Rate Limit    Burst Interval
                                (pps)       (seconds)
-----------   ----------   ----------   --------------
   0/1             Yes          15               1
```

8.7.16 show ipv6 dhcp snooping statistics

Use this command to list statistics for IPv6 DHCP Snooping security violations on untrusted ports.

Format `show ipv6 dhcp snooping statistics`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
Interface	The IPv6 address of the interface in *slot/port* format.
MAC Verify Failures	Represents the number of DHCP messages that were filtered on an untrusted interface because of source MAC address and client hardware address mismatch.
Client Ifc Mismatch	Represents the number of DHCP release and Deny messages received on the different ports than learned previously.
DHCP Server Msgs Rec'd	Represents the number of DHCP server messages received on Untrusted ports.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping statistics

 Interface    MAC Verify   Client Ifc   DHCP Server
               Failures     Mismatch    Msgs Rec'd
-----------  ----------   ----------   -----------
0/2                   0            0             0
0/3                   0            0             0
0/4                   0            0             0
0/5                   0            0             0
0/6                   0            0             0
0/7                   0            0             0
0/8                   0            0             0
0/9                   0            0             0
0/10                  0            0             0
0/11                  0            0             0
0/12                  0            0             0
0/13                  0            0             0
0/14                  0            0             0
0/15                  0            0             0
0/16                  0            0             0
0/17                  0            0             0
0/18                  0            0             0
0/19                  0            0             0
0/20                  0            0             0
```

8.7.17 clear ipv6 dhcp snooping binding

Use this command to clear all DHCPv6 Snooping bindings on all interfaces or on a specific interface.

Format `clear ipv6 dhcp snooping binding [interface slot/port]`

Mode

- Privileged EXEC
- User EXEC

8.7.18 clear ipv6 dhcp snooping statistics

Use this command to clear all DHCPv6 Snooping statistics.

Format `clear ipv6 dhcp snooping statistics`

Mode

- Privileged EXEC
- User EXEC

8.7.19 show ipv6 verify

Use this command to display the IPv6 configuration on a specified slot/port.

Format	`show ipv6 verify` *`interface`*
Mode	Privileged EXEC User EXEC

Term	Definition
Interface	Interface address in slot/port format.
Filter Type	Is one of two values: • ip-v6mac: User has configured MAC address filtering on this interface. • ipv6: Only IPv6 address filtering on this interface.
IPv6 Address	IPv6 address of the interface
MAC Address	If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, then the MAC Address field displays "permit-all."
VLAN	The VLAN for the binding rule.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 verify 0/1

Interface  Filter Type    IP Address       MAC Address      Vlan
---------  -----------  ---------------  -----------------  -----
    0/1     ipv6-mac       2000::1/64      00:02:B3:06:60:80     10
    0/1     ipv6-mac       3000::1/64      00:0F:FE:00:13:04     10
```

8.7.20 show ipv6 verify source

Use this command to display the IPv6SG configurations on all ports. If the interface option is specified, the output is restricted to the specified slot/port.

Format	`show ipv6 verify source {`*`interface`*`}`
Mode	Privileged EXEC User EXEC

Term	Definition
Interface	Interface address in slot/port format.
Filter Type	Is one of two values: • ip-v6mac: User has configured MAC address filtering on this interface. • ipv6: Only IPv6 address filtering on this interface.
IPv6 Address	IPv6 address of the interface
MAC Address	If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, then the MAC Address field displays "permit-all."
VLAN	The VLAN for the binding rule.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 verify source

Interface  Filter Type    IP Address       MAC Address      Vlan
---------  -----------  ---------------  -----------------  -----
    0/1     ipv6-mac       2000::1/64      00:02:B3:06:60:80     10
    0/1     ipv6-mac       3000::1/64      00:0F:FE:00:13:04     10
```

8.7.21 show ipv6 source binding

Use this command to display the IPv6SG bindings.

Format `show ipv6 source binding [{dhcp-snooping|static}] [interface slot/port] [vlan id]`

Mode
- Privileged EXEC
- User EXEC

Term	Definition
MAC Address	The MAC address for the entry that is added.
IP Address	The IP address of the entry that is added.
Type	Entry type; statically configured from CLI or dynamically learned from DHCP Snooping.
VLAN	VLAN for the entry.
Interface	IP address of the interface in *slot/port* format.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 source binding

MAC Address            IP Address       Type         Vlan     Interface
-----------------  ---------------  -------------  -----  -------------
00:00:00:00:00:08          2000::1  dhcp-snooping    2         0/1
00:00:00:00:00:09          3000::1  dhcp-snooping    3         0/1
00:00:00:00:00:0A          4000::1  dhcp-snooping    4         0/1
```

9/ Quality of Service Commands

This chapter describes the Quality of Service (QoS) commands available in the FASTPATH CLI.

The QoS Commands chapter contains the following sections:

- “Class of Service Commands” on page 749
- “Differentiated Services Commands” on page 758
- “DiffServ Class Commands” on page 759
- “DiffServ Policy Commands” on page 766
- “DiffServ Service Commands” on page 772
- “DiffServ Show Commands” on page 773
- “MAC Access Control List Commands” on page 778
- “IP Access Control List Commands” on page 785
- “IPv6 Access Control List Commands” on page 799
- “Time Range Commands for Time-Based ACLs” on page 807
- “Auto-Voice over IP Commands” on page 809
- “iSCSI Optimization Commands” on page 812

NOTICE

The commands in this chapter are in one of two functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.

9.1 Class of Service Commands

This section describes the commands you use to configure and view Class of Service (CoS) settings for the switch. The commands in this section allow you to control the priority and transmission rate of traffic.

NOTICE

Commands you issue in the Interface Config mode only affect a single interface. Commands you issue in the Global Config mode affect all interfaces.

9.1.1 classofservice dot1p-mapping

This command maps an 802.1p priority to an internal traffic class. The ***userpriority*** values can range from 0-7. The ***trafficclass*** values range from 0-6, although the actual number of available traffic classes depends on the platform.

Format	`classofservice dot1p-mapping` *`userpriority trafficclass`*
Modes	• Global Config • Interface Config

9.1.1.1 no classofservice dot1p-mapping

This command maps each 802.1p priority to its default internal traffic class value.

Format `no classofservice dot1p-mapping`

Modes

- Global Config
- Interface Config

9.1.2 classofservice ip-dscp-mapping

This command maps an IP DSCP value to an internal traffic class. The ***ipdscp*** value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.

The ***trafficclass*** values can range from 0-6, although the actual number of available traffic classes depends on the platform.

Format `classofservice ip-dscp-mapping` *`ipdscp trafficclass`*

Mode Global Config

9.1.2.1 no classofservice ip-dscp-mapping

This command maps each IP DSCP value to its default internal traffic class value.

Format `no classofservice ip-dscp-mapping`

Mode Global Config

9.1.3 classofservice ip-precedence-mapping

This command maps an IP Precedence value to an internal traffic class for a specific interface. The ***0-7*** parameter is optional and is only valid on platforms that support independent per-port class of service mappings.

Format `classofservice ip-precedence-mapping` *`0-7`*

Mode Global Config

Term	Definition
0-7	The IP Precedence value.

9.1.3.1 no classofservice ip-precedence-mapping

This command returns the mapping to its default value.

Format `no classofservice ip-dscp-mapping`

Mode Global Config

9.1.4 classofservice trust

This command sets the class of service trust mode of an interface or range of interfaces. You can set the mode to trust one of the Dot1p (802.1p), IP DSCP, or IP Precedence packet markings. You can also set the interface mode to untrusted. If you configure an interface to use Dot1p, the mode does not appear in the output of the `4.4.21 show running-config` command because Dot1p is the default.

NOTICE The `classofservice trust dot1p` command will not be supported in future releases of the software because Dot1p is the default value. Use the `no classofservice trust` command to set the mode to the default value.

Default dot1p

Format `classofservice trust {dot1p | ip-dscp | untrusted}`

Modes
- Global Config
- Interface Config

9.1.4.1 no classofservice trust

This command sets the interface mode to the default value.

Format `no classofservice trust`

Modes
- Global Config
- Interface Config

9.1.5 cos-queue max-bandwidth

This command specifies the maximum transmission bandwidth guarantee for each interface queue on an interface, a range of interfaces, or all interfaces. The total number of queues supported per interface is platform specific. A value from 0-100 (percentage of link rate) must be specified for each supported queue, with 0 indicating no maximum bandwidth. The sum of all values entered must not exceed 100.

Format `cos-queue max-bandwidth` *`bw-0 bw-1 … bw-n`*

Modes
- Global Config
- Interface Config

9.1.5.1 no cos-queue max-bandwidth

This command restores the default for each queue's minimum bandwidth value.

Format `no cos-queue min-bandwidth`

Modes
- Global Config
- Interface Config

9.1.6 cos-queue min-bandwidth

This command specifies the minimum transmission bandwidth guarantee for each interface queue on an interface, a range of interfaces, or all interfaces. The total number of queues supported per interface is platform specific. A value from 0-100 (percentage of link rate) must be specified for each supported queue, with 0 indicating no guaranteed minimum bandwidth. The sum of all values entered must not exceed 100.

Format `cos-queue min-bandwidth` *`bw-0 bw-1 … bw-n`*

Modes
- Global Config
- Interface Config

9.1.6.1 no cos-queue min-bandwidth

This command restores the default for each queue's minimum bandwidth value.

Format `no cos-queue min-bandwidth`

Modes
- Global Config
- Interface Config

9.1.7 cos-queue random-detect

This command activates weighted random early discard (WRED) for each specified queue on the interface. Specific WRED parameters are configured using the `random-detect queue-parms` and the `random-detect exponential-weighting-constant` commands.

Format `cos-queue random-detect` *`queue-id-1`* `[`*`queue-id-2 … queue-id-n`*`]`

Modes
- Global Config
- Interface Config

When specified in Interface Config' mode, this command affects a single interface only, whereas in Global Config mode, it applies to all interfaces.

At least one, but no more than *n* queue-id values are specified with this command. Duplicate queue-id values are ignored. Each queue-id value ranges from 0 to (*n*–1), where n is the total number of queues supported per interface. The number *n* = 7 and corresponds to the number of supported queues (traffic classes).

9.1.7.1 no cos-queue random-detect

Use this command to disable WRED, thereby restoring the default tail drop operation for the specified queues on the interface.

Format `no cos-queue random-detect` *`queue-id-1`* `[`*`queue-id-2 … queue-id-n`*`]`

Modes
- Global Config
- Interface Config

9.1.8 cos-queue strict

This command activates the strict priority scheduler mode for each specified queue for an interface queue on an interface, a range of interfaces, or all interfaces.

Format `cos-queue strict` *`queue-id-1 [queue-id-2 … queue-id-n]`*

Modes
- Global Config
- Interface Config

9.1.8.1 no cos-queue strict

This command restores the default weighted scheduler mode for each specified queue.

Format `no cos-queue strict` *`queue-id-1`* `[`*`queue-id-2 … queue-id-n`*`]`

Modes
- Global Config
- Interface Config

9.1.9 random-detect

This command is used to enable WRED for the interface as a whole, and is only available when per-queue WRED activation control is not supported by the device Specific WRED parameters are configured using the `random-detect queue-parms` and the `random-detect exponential-weighting-constant` commands.

Format `random-detect`

Modes
- Global Config
- Interface Config

When specified in Interface Config mode, this command affects a single interface only, whereas in Global Config mode, it applies to all interfaces. The Interface Config mode command is only available on platforms that support independent per-port class of service queue configuration.

9.1.9.1 no random-detect

Use this command to disable WRED, thereby restoring the default tail drop operation for all queues on the interface.

Format `no random-detect`

Modes
- Global Config
- Interface Config

9.1.10 random-detect exponential weighting-constant

This command is used to configure the WRED decay exponent for a CoS queue interface.

Format `random-detect exponential-weighting-constant` *`0-15`*

Modes
- Global Config
- Interface Config

9.1.10.1 no random-detect exponential-weighting-constant

Use this command to set the WRED decay exponent back to the default.

Format `no random-detect exponential-weighting-constant`

Modes
- Global Config
- Interface Config

9.1.11 random-detect queue-parms

This command is used to configure WRED parameters for each drop precedence level supported by a queue. It is used only when per-COS queue configuration is enabled (using the `cos-queue random-detect` command).

Format `random-detect queue-parms` *`queue-id-1`* `[`*`queue-id-2 … queue-id-n`*`] min-thresh` *`thresh-prec-1 … thresh-prec-n`* `max-thresh` *`thresh-prec-1 … thresh-prec-n`* `drop-probability` *`prob-prec-1 … prob-prec-n`*

Modes
- Global Config
- Interface Config

Each parameter is specified for each possible drop precedence (*color* of TCP traffic). The last precedence applies to all non-TCP traffic. For example, in a 3-color system, four of each parameter specified: green TCP, yellow TCP, red TCP, and non-TCP, respectively.

Term	Definition
min-thresh	The minimum threshold the queue depth (as a percentage) where WRED starts marking and dropping traffic.
max-thresh	The maximum threshold is the queue depth (as a percentage) above which WRED marks / drops all traffic.
drop-probability	The percentage probability that WRED will mark/drop a packet, when the queue depth is at the maximum threshold. (The drop probability increases linearly from 0 just before the minimum threshold, to this value at the maximum threshold, then goes to 100% for larger queue depths).

9.1.11.1 no random-detect queue-parms

Use this command to set the WRED configuration back to the default.

Format	`no random-detect queue-parms` *`queue-id-1`* `[`*`queue-id-2 … queue-id-n`*`]`
Modes	- Global Config - Interface Config

9.1.12 traffic-shape

This command specifies the maximum transmission bandwidth limit for the interface as a whole. The bandwidth values are from 0-100 in increments of 1. You can also specify this value for a range of interfaces or all interfaces. Also known as rate shaping, traffic shaping has the effect of smoothing temporary traffic bursts over time so that the transmitted traffic rate is bounded.

Format	`traffic-shape` *`bw`*
Modes	- Global Config - Interface Config

9.1.12.1 no traffic-shape

This command restores the interface shaping rate to the default value.

Format	`no traffic-shape`
Modes	- Global Config - Interface Config

9.1.13 show classofservice dot1p-mapping

This command displays the current Dot1p (802.1p) priority mapping to internal traffic classes for a specific interface. The *`slot/port`* parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the 802.1p mapping table of the interface is displayed. If omitted, the most recent global configuration settings are displayed. For more information, see “Voice VLAN Commands” on page 339.

Format	`show classofservice dot1p-mapping [`*`slot/port`*`]`
Mode	Privileged EXEC

The following information is repeated for each user priority.

Term	Definition
User Priority	The 802.1p user priority value.
Traffic Class	The traffic class internal queue identifier to which the user priority value is mapped.

9.1.14 show classofservice ip-dscp-mapping

This command displays the current IP DSCP mapping to internal traffic classes for the global configuration settings.

Format	`show classofservice ip-dscp-mapping`
Mode	Privileged EXEC

The following information is repeated for each user priority.

Term	Definition
IP DSCP	The IP DSCP value.
Traffic Class	The traffic class internal queue identifier to which the IP DSCP value is mapped.

9.1.15 show classofservice ip-precedence-mapping

This command displays the current IP Precedence mapping to internal traffic classes for a specific interface. The *slot/port* parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the IP Precedence mapping table of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	`show classofservice ip-precedence-mapping [slot/port]`
Mode	Privileged EXEC

Term	Definition
IP Precedence	The IP Precedence value.
Traffic Class	The traffic class internal queue identifier to which the IP Precedence value is mapped.

9.1.16 show classofservice trust

This command displays the current trust mode setting for a specific interface. The *slot/port* parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If you specify an interface, the command displays the port trust mode of the interface. If you do not specify an interface, the command displays the most recent global configuration settings.

Format	`show classofservice trust [slot/port]`
Mode	Privileged EXEC

Term	Definition
Class of Service Trust Mode	The the trust mode, which is either Dot1P, IP DSCP, or Untrusted.
Non-IP Traffic Class	(IP DSCP mode only) The traffic class used for non-IP traffic.
Untrusted Traffic Class	(Untrusted mode only) The traffic class used for all untrusted traffic.

9.1.17 show interfaces cos-queue

This command displays the class-of-service queue configuration for the specified interface. The *slot/port* parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the class-of-service queue configuration of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	`show interfaces cos-queue [slot/port]`
Mode	Privileged EXEC

Term	Definition
Interface Shaping Rate	The global interface shaping rate value.
WRED Decay Exponent	The global WRED decay exponent value.
Queue Id	An interface supports n queues numbered 0 to (n-1). The specific n value is platform dependent.
Minimum Bandwidth	The minimum transmission bandwidth guarantee for the queue, expressed as a percentage. A value of 0 means bandwidth is not guaranteed and the queue operates using best-effort. This is a configured value.
Maximum Bandwidth	The maximum transmission bandwidth guarantee for the queue, expressed as a percentage. A value of 0 means bandwidth is not guaranteed and the queue operates using best-effort. This is a configured value.
Scheduler Type	Indicates whether this queue is scheduled for transmission using a strict priority or a weighted scheme. This is a configured value.
Queue Management Type	The queue depth management technique used for this queue (tail drop).

If you specify the interface, the command also displays the following information.

Term	Definition
Interface	The *slot/port* of the interface. If displaying the global configuration, this output line is replaced with a Global Config indication.
Interface Shaping Rate	The maximum transmission bandwidth limit for the interface as a whole. It is independent of any per-queue maximum bandwidth value(s) in effect for the interface. This is a configured value.
WRED Decay Exponent	The configured WRED decay exponent for a CoS queue interface.

9.1.18 show interfaces random-detect

This command displays the global WRED settings for each CoS queue. If you specify the slot/port, the command displays the WRED settings for each CoS queue on the specified interface.

Format	`show interfaces random-detect [slot/port]`
Mode	Privileged EXEC

Term	Definition
Queue ID	An interface supports n queues numbered 0 to (n-1). The specific n value is platform dependent.
WRED Minimum Threshold	The configured minimum threshold the queue depth (as a percentage) where WRED starts marking and dropping traffic.
WRED Maximum Threshold	The configured maximum threshold is the queue depth (as a percentage) above which WRED marks / drops all traffic.
WRED Drop Probability	The configured percentage probability that WRED will mark/drop a packet, when the queue depth is at the maximum threshold. (The drop probability increases linearly from 0 just before the minimum threshold, to this value at the maximum threshold, then goes to 100% for larger queue depths).

9.1.19 show interfaces tail-drop-threshold

This command displays the tail drop threshold information. If you specify the slot/port, the command displays the tail drop threshold information for the specified interface.

Format	`show interfaces tail-drop-threshold [slot/port]`
Mode	Privileged EXEC

9.1.20 show protection-group

This command lists the protection groups. All or specified protection groups can be displayed. The protection groups are listed with the interface members, the egress masks are listed related to the calculation type (user specified, related to the protection group or '--' for default).

Format **`show protection-group`** *`<0..3>`*
`show protection-group all`

Mode Privileged EXEC

9.1.21 protection-group (configure)

This command adds a protection group and/or a name associated to a group. The addition of a protection group has no effect as long as no members are included (interface). Optional a name can be assigned to a protection group with parameter 'name' when adding the group or for an already active group. The length of the name is restricted to 15 characters.

For stacking this command is only valid inside a unit (receiving and sending ports in same unit).

Format **`protection-group`** *`<0..3>`*
`protection-group` *`<0..3>`* **`name`** *`name`*

Mode Global Config

9.1.21.1 no protection-group (configure)

This command deletes a protection group and/or a name associated to a group. If deleting a protection group all members of this group are deleted too. The name can be deleted by using the 'no' command with the parameter 'name' (the protection group remains active then). The length of the name is restricted to 15 characters.

Format **`no protection-group`** *`<0..3>`*
`no protection-group` *`<0..3>`* **`name`** *`name`*

Mode Global Config

9.1.22 protection-group (interface)

This command includes/excludes interfaces to/from a protection group or sets an egress-mask for an interface.

If an interface is member in a protection group it may sent packets to interfaces which are not member of any group (unprotected) and to interfaces in the same group, but not to interfaces in another group. An egress-mask is calculated based on the protection-groups containing for each interface (bit 0 for first interface) a bit, indicating that it is allowed (1) or prohibited (0) to forward to this interface. The calculated egress-mask can be displayed by "show protection-group mask" below.

The calculated egress-mask may be overridden by setting directly this mask (use parameter "mask"). This is not supported for stacking mode.

For a LAG the minimal egress mask over all member interfaces (either calculated for protection-groups or directly set) is used (<mask-member-1> & … & <mask-member-N>).

Format **`protection-group {`***`<0..3>`* **`| mask`** *`<mask>}`*

Mode Interface Config

9.1.22.1 no protection-group (interface)

The command deletes an interface to a protection group or deletes an egress port mask. The command deletes an egress mask for an interface if specifying the keyword ‘mask’.

Format	`no protection-group {<0..3>	mask <mask>}`
Mode	Interface Config

9.2 Differentiated Services Commands

This section describes the commands you use to configure QOS Differentiated Services (DiffServ).

You configure DiffServ in several stages by specifying three DiffServ components:

1. Class
    a. Creating and deleting classes.
    b. Defining match criteria for a class.
2. Policy
    a. Creating and deleting policies
    b. Associating classes with a policy
    c. Defining policy statements for a policy/class combination
3. Service
    a. Adding and removing a policy to/from an inbound interface

The DiffServ class defines the packet filtering criteria. The attributes of a DiffServ policy define the way the switch processes packets. You can define policy attributes on a per-class instance basis. The switch applies these attributes when a match occurs.

Packet processing begins when the switch tests the match criteria for a packet. The switch applies a policy to a packet when it finds a class match within that policy.

The following rules apply when you create a DiffServ class:

- Each class can contain a maximum of one referenced (nested) class
- Class definitions do not support hierarchical service policies

A given class definition can contain a maximum of one reference to another class. You can combine the reference with other match criteria. The referenced class is truly a reference and not a copy since additions to a referenced class affect all classes that reference it. Changes to any class definition currently referenced by any other class must result in valid class definitions for all derived classes, otherwise the switch rejects the change. You can remove a class reference from a class definition.

The only way to remove an individual match criterion from an existing class definition is to delete the class and re-create it.

NOTICE The mark possibilities for policing include CoS, IP DSCP, and IP Precedence. While the latter two are only meaningful for IP packet types, CoS marking is allowed for both IP and non-IP packets, since it updates the 802.1p user priority field contained in the VLAN tag of the layer 2 packet header.

9.2.1 diffserv

This command sets the DiffServ operational mode to active. While disabled, the DiffServ configuration is retained and can be changed, but it is not activated. When enabled, DiffServ services are activated.

Format	`diffserv`
Mode	Global Config

9.2.1.1 no diffserv

This command sets the DiffServ operational mode to inactive. While disabled, the DiffServ configuration is retained and can be changed, but it is not activated. When enabled, DiffServ services are activated.

Format	`no diffserv`
Mode	Global Config

9.3 DiffServ Class Commands

Use the DiffServ class commands to define traffic classification. To classify traffic, you specify Behavior Aggregate (BA), based on DSCP and Multi-Field (MF) classes of traffic (name, match criteria).

This set of commands consists of class creation/deletion and matching, with the class match commands specifying Layer 3, Layer 2, and general match criteria. The class match criteria are also known as class rules, with a class definition consisting of one or more rules to identify the traffic that belongs to the class.

NOTICE Once you create a class match criterion for a class, you cannot change or delete the criterion. To change or delete a class match criterion, you must delete and re-create the entire class.

The CLI command root is `class-map`.

9.3.1 class-map

This command defines a DiffServ class of type match-all. When used without any match condition, this command enters the class-map mode. The *`class-map-name`* is a case sensitive alphanumeric string from 1 to 31 characters uniquely identifying an existing DiffServ class.

NOTICE The class-map-name 'default' is reserved and must not be used.

The class type of `match-all` indicates all of the individual match conditions must be true for a packet to be considered a member of the class.This command may be used without specifying a class type to enter the Class-Map Config mode for an existing DiffServ class.

NOTICE The optional keywords [{`ipv4 | ipv6`}] specify the Layer 3 protocol for this class. If not specified, this parameter defaults to `ipv4`. This maintains backward compatibility for configurations defined on systems before IPv6 match items were supported.
The optional keyword `appiq` creates a new DiffServ appiq class. Regular expressions found in the traffic patterns in layer 7 applications can be matched to the App-IQ class using a `match signature` command.

NOTICE The CLI mode is changed to Class-Map Config or Ipv6-Class-Map Config when this command is successfully executed depending on the [{`ipv4 | ipv6`}] keyword specified.

Format	`class-map match-all` *`class-map-name`* `[{appiq	ipv4	ipv6}]`
Mode	Global Config

9.3.1.1 no class-map

This command eliminates an existing DiffServ class. The ***class-map-name*** is the name of an existing DiffServ class. (The class name default is reserved and is not allowed here.) This command may be issued at any time; if the class is currently referenced by one or more policies or by any other class, the delete action fails.

Format	`no class-map` *`class-map-name`*
Mode	Global Config

9.3.2 class-map rename

This command changes the name of a DiffServ class. The ***class-map-name*** is the name of an existing DiffServ class. The ***new-class-map-name*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the class.

Default	none
Format	`class-map rename` *`class-map-name new-class-map-name`*
Mode	Global Config

9.3.3 match ethertype

This command adds to the specified class definition a match condition based on the value of the ethertype. The ***ethertype*** value is specified as one of the following keywords: **appletalk**, **arp**, **ibmsna**, **ipv4**, **ipv6**, **ipx**, **mplsmcast**, **mplsucast**, **netbios**, **novell**, **pppoe**, **rarp** or as a custom EtherType value in the range of 0x0600-0xFFFF. Use the [not] option to negate the match condition.

NOTICE This command is not available on the Broadcom BCM5630x platform.

Format	`match [not] ethertype {`*`keyword	custom 0x0600-0xFFFF`*`}`
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.4 match any

This command adds to the specified class definition a match condition whereby all packets are considered to belong to the class. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] any`
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.5 match class-map

This command adds to the specified class definition the set of match conditions defined for another class. The ***refclassname*** is the name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

Default	none
Format	`match class-map` *`refclassname`*
Mode	Class-Map Config Ipv6-Class-Map Config

NOTICE

- The parameters ***refclassname*** and ***class-map-name*** can not be the same.
- Only one other class may be referenced by a class.
- Any attempts to delete the ***refclassname*** class while the class is still referenced by any ***class-map-name*** fails.
- The combined match criteria of ***class-map-name*** and ***refclassname*** must be an allowed combination based on the class type.
- Any subsequent changes to the ***refclassname*** class match criteria must maintain this validity, or the change attempt fails.
- The total number of class rules formed by the complete reference class chain (including both predecessor and successor classes) must not exceed a platform-specific maximum. In some cases, each removal of a refclass rule reduces the maximum number of available rules in the class definition by one.

9.3.5.1 no match class-map

This command removes from the specified class definition the set of match conditions defined for another class. The ***refclassname*** is the name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

Format	`no match class-map` *`refclassname`*
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.6 match cos

This command adds to the specified class definition a match condition for the Class of Service value (the only tag in a single tagged packet or the first or outer 802.1Q tag of a double VLAN tagged packet). The value may be from 0 to 7. Use the [not] option to negate the match condition.

NOTICE

This command is not available on the Broadcom BCM5630x platform.

Default	none
Format	`match [not] cos` *`0-7`*
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.7 match secondary-cos

This command adds to the specified class definition a match condition for the secondary Class of Service value (the inner 802.1Q tag of a double VLAN tagged packet). The value may be from 0 to 7. Use the [not] option to negate the match condition.

NOTICE

This command is supported on the following platforms:

- BCM56314
- BCM56504
- BCM56214
- BCM56224

Default	none
Format	`match [not]secondary-cos` *`0-7`*
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.8 match destination-address mac

This command adds to the specified class definition a match condition based on the destination MAC address of a packet. The ***macaddr*** parameter is any layer 2 MAC address formatted as six, two-digit hexadecimal numbers separated by colons (e.g., 00:11:22:dd:ee:ff). The ***macmask*** parameter is a layer 2 MAC address bit mask, which need not be contiguous, and is formatted as six, two-digit hexadecimal numbers separated by colons (e.g., ff:07:23:ff:fe:dc). Use the [not] option to negate the match condition.

NOTICE This command is not available on the Broadcom BCM5630x platform.

Default	none
Format	`match [not] destination-address mac` *`macaddr macmask`*
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.9 match dstip

This command adds to the specified class definition a match condition based on the destination IP address of a packet. The ***ipaddr*** parameter specifies an IP address. The ***ipmask*** parameter specifies an IP address bit mask and must consist of a contiguous set of leading 1 bits. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] dstip` *`ipaddr ipmask`*
Mode	Class-Map Config

9.3.10 match dstip6

This command adds to the specified class definition a match condition based on the destination IPv6 address of a packet. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] dstip6` *`destination-ipv6-prefix/prefix-length`*
Mode	Ipv6-Class-Map Config

9.3.11 match dstl4port

This command adds to the specified class definition a match condition based on the destination layer 4 port of a packet using a single keyword or numeric notation. To specify the match condition as a single keyword, the value for ***portkey*** is one of the supported port name keywords. The currently supported ***portkey*** values are: domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, www. Each of these translates into its equivalent port number. To specify the match condition using a numeric notation, one layer 4 port number is required. The port number is an integer from 0 to 65535. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] dstl4port {`*`portkey	0-65535`*`}`
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.12 match ip dscp

This command adds to the specified class definition a match condition based on the value of the IP DiffServ Code Point (DSCP) field in a packet, which is defined as the high-order six bits of the Service Type octet in the IP header (the low-order two bits are not checked).

The ***dscpval*** value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef. Use the [not] option to negate the match condition.

NOTICE The ip dscp, ip precedence, and ip tos match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Default	none
Format	`match [not] ip dscp `*`dscpval`*
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.13 match ip precedence

This command adds to the specified class definition a match condition based on the value of the IP Precedence field in a packet, which is defined as the high-order three bits of the Service Type octet in the IP header (the low-order five bits are not checked). The precedence value is an integer from 0 to 7. Use the [not] option to negate the match condition.

NOTICE The IP DSCP, IP Precedence, and IP ToS match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Default	none
Format	`match [not] ip precedence `*`0-7`*
Mode	Class-Map Config

9.3.14 match ip tos

This command adds to the specified class definition a match condition based on the value of the IP TOS field in a packet, which is defined as all eight bits of the Service Type octet in the IP header. The value of ***tosbits*** is a two-digit hexadecimal number from 00 to ff. The value of ***tosmask*** is a two-digit hexadecimal number from 00 to ff. The ***tosmask*** denotes the bit positions in ***tosbits*** that are used for comparison against the IP TOS field in a packet. For example, to check for an IP TOS value having bits 7 and 5 set and bit 1 clear, where bit 7 is most significant, use a ***tosbits*** value of a0 (hex) and a ***tosmask*** of a2 (hex). Use the [not] option to negate the match condition.

NOTICE The IP DSCP, IP Precedence, and IP ToS match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

NOTICE This “free form” version of the IP DSCP/Precedence/TOS match specification gives the user complete control when specifying which bits of the IP Service Type field are checked.

Default	none
Format	`match [not] ip tos` *`tosbits tosmask`*
Mode	Class-Map Config

9.3.15 match ip6flowlbl

Use this command to enter an IPv6 flow label value. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] ip6flowlbl label` *`0-1048575`*
Mode	IPv6-Class-Map Config

9.3.16 match protocol

This command adds to the specified class definition a match condition based on the value of the IP Protocol field in a packet using a single keyword notation or a numeric value notation.

To specify the match condition using a single keyword notation, the value for **`protocol-name`** is one of the supported protocol name keywords. The currently supported values are: ***`icmp`***, ***`igmp`***, ***`ip`***, ***`tcp`***, ***`udp`***. A value of ***`ip`*** matches all protocol number values.

To specify the match condition using a numeric value notation, the protocol number is a standard value assigned by IANA and is interpreted as an integer from 0 to 255. Use the [not] option to negate the match condition.

NOTICE This command does not validate the protocol number value against the current list defined by IANA.

Default	none
Format	`match [not] protocol {`*`protocol-name`* `|` *`0-255`*`}`
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.17 match signature

This command maps the available signatures from the rules file to the AppIQ class. When the appiq class is created, this menu displays an index number and its signature pattern. A single signature can be mapped using a number or multiple signatures can be selected and mapped to a class. Using this command without an index value maps all the available signatures to the same class.

Default	none
Format	`match signature [<`*`StartIndex`*`>-<`*`EndIndex`*`>]`
Mode	Class-Map Config

9.3.18 match source-address mac

This command adds to the specified class definition a match condition based on the source MAC address of a packet. The ***address*** parameter is any layer 2 MAC address formatted as six, two-digit hexadecimal numbers separated by colons (e.g., 00:11:22:dd:ee:ff). The ***macmask*** parameter is a layer 2 MAC address bit mask, which may not be contiguous, and is formatted as six, two-digit hexadecimal numbers separated by colons (e.g., ff:07:23:ff:fe:dc). Use the [not] option to negate the match condition.

NOTICE This command is not available on the Broadcom 5630x platform.

Default	none
Format	`match [not] source-address mac` *address macmask*
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.19 match srcip

This command adds to the specified class definition a match condition based on the source IP address of a packet. The ***ipaddr*** parameter specifies an IP address. The ***ipmask*** parameter specifies an IP address bit mask and must consist of a contiguous set of leading 1 bits. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] srcip` *ipaddr ipmask*
Mode	Class-Map Config

9.3.20 match srcip6

This command adds to the specified class definition a match condition based on the source IP address of a packet. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] srcip6` *source-ipv6-prefix/prefix-length*
Mode	Ipv6-Class-Map Config

9.3.21 match srcl4port

This command adds to the specified class definition a match condition based on the source layer 4 port of a packet using a single keyword or numeric notation. To specify the match condition as a single keyword notation, the value for ***portkey*** is one of the supported port name keywords (listed below). The currently supported ***portkey*** values are: domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, www. Each of these translates into its equivalent port number, which is used as both the start and end of a port range.

To specify the match condition as a numeric value, one layer 4 port number is required. The port number is an integer from 0 to 65535. Use the [not] option to negate the match condition.

Default	none
Format	`match [not] srcl4port {`*portkey* `|` *0-65535*`}`
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.22 match src port

This command adds a match condition for a range of layer source 4 ports. If an interface receives traffic that is within the configured range of layer 4 source ports, then only the `appiq` class is in effect. *portvalue* specifies a single source port.

Default	none
Format	`match src port {portstart-portend | portvalue}`
Mode	Class-Map Config

9.3.23 match vlan

This command adds to the specified class definition a match condition based on the value of the layer 2 VLAN Identifier field (the only tag in a single tagged packet or the first or outer tag of a double VLAN tagged packet). The VLAN ID is an integer from 0 to 4093. Use the [not] option to negate the match condition.

NOTICE This command is not available on the Broadcom 5630x platform.

Default	none
Format	`match [not] vlan 0-4093`
Mode	Class-Map Config Ipv6-Class-Map Config

9.3.24 match secondary-vlan

This command adds to the specified class definition a match condition based on the value of the layer 2 secondary VLAN Identifier field (the inner 802.1Q tag of a double VLAN tagged packet). The secondary VLAN ID is an integer from 0 to 4093. Use the [not] option to negate the match condition.

NOTICE This command is not available on the Broadcom 5630x platform.

Default	none
Format	`match [not] secondary-vlan 0-4093`
Mode	Class-Map Config Ipv6-Class-Map Config

9.4 DiffServ Policy Commands

Use the DiffServ policy commands to specify traffic conditioning actions, such as policing and marking, to apply to traffic classes

Use the policy commands to associate a traffic class that you define by using the class command set with one or more QoS policy attributes. Assign the class/policy association to an interface to form a service. Specify the policy name when you create the policy.

Each traffic class defines a particular treatment for packets that match the class definition. You can associate multiple traffic classes with a single policy. When a packet satisfies the conditions of more than one class, preference is based on the order in which you add the classes to the policy. The first class you add has the highest precedence.

This set of commands consists of policy creation/deletion, class addition/removal, and individual policy attributes.

NOTICE The only way to remove an individual policy attribute from a class instance within a policy is to remove the class instance and re-add it to the policy. The values associated with an existing policy attribute can be changed without removing the class instance.

The CLI command root is `policy-map`.

9.4.1 assign-queue

This command modifies the queue id to which the associated traffic stream is assigned. The ***queueid*** is an integer from 0 to *n*-1, where *n* is the number of egress queues supported by the device.

Format	`assign-queue` *queueid*
Mode	Policy-Class-Map Config
Incompatibilities	Drop

9.4.2 drop

This command specifies that all packets for the associated traffic stream are to be dropped at ingress.

Format	`drop`
Mode	Policy-Class-Map Config
Incompatibilities	Assign Queue, Mark (all forms), Mirror, Police, Redirect

9.4.3 mirror

This command specifies that all incoming packets for the associated traffic stream are copied to a specific egress interface (physical port or LAG).

NOTICE This command is not available on the Broadcom 5630x platform.

Format	`mirror` *slot/port*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Redirect

9.4.4 redirect

This command specifies that all incoming packets for the associated traffic stream are redirected to a specific egress interface (physical port or port-channel).

NOTICE This command is not available on the Broadcom 5630x platform.

Format	`redirect` *slot/port*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mirror

9.4.5 conform-color

Use this command to enable color-aware traffic policing and define the conform-color class map. Used in conjunction with the police command where the fields for the conform level are specified. The ***class-map-name*** parameter is the name of an existing DiffServ class map.

NOTICE This command may only be used after specifying a police command for the policy-class instance.

Format	`conform-color` *`class-map-name`*
Mode	Policy-Class-Map Config

9.4.6 class

This command creates an instance of a class definition within the specified policy for the purpose of defining treatment of the traffic class through subsequent policy attribute statements. The ***classname*** is the name of an existing DiffServ class.

NOTICE This command causes the specified policy to create a reference to the class definition.

NOTICE The CLI mode is changed to Policy-Class-Map Config when this command is successfully executed.

Format	`class` *`classname`*
Mode	Policy-Map Config

9.4.6.1 no class

This command deletes the instance of a particular class and its defined treatment from the specified policy. ***classname*** is the names of an existing DiffServ class.

NOTICE This command removes the reference to the class definition for the specified policy.

Format	`no class` *`classname`*
Mode	Policy-Map Config

9.4.7 mark cos

This command marks all packets for the associated traffic stream with the specified class of service (CoS) value in the priority field of the 802.1p header (the only tag in a single tagged packet or the first or outer 802.1Q tag of a double VLAN tagged packet). If the packet does not already contain this header, one is inserted. The CoS value is an integer from 0 to 7.

Default	1
Format	`mark-cos` *`0-7`*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark IP DSCP, IP Precedence, Police

9.4.8 mark secondary-cos

This command marks the outer VLAN tags in the packets for the associated traffic stream as secondary CoS.

Default	1
Format	`mark secondary-cos` *`0-7`*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark IP DSCP, IP Precedence, Police

9.4.9 mark cos-as-sec-cos

This command marks outer VLAN tag priority bits of all packets as the inner VLAN tag priority, marking Cos as Secondary CoS. This essentially means that the inner VLAN tag CoS is copied to the outer VLAN tag CoS.

Format	mark-cos-as-sec-cos
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark IP DSCP, IP Precedence, Police

Example: The following shows an example of the command.

```
(switch) (Config-policy-classmap)#mark cos-as-sec-cos
```

9.4.10 mark ip-dscp

This command marks all packets for the associated traffic stream with the specified IP DSCP value.

The *`dscpval`* value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.

Format	`mark ip-dscp` *`dscpval`*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark CoS, Mark IP Precedence, Police

9.4.11 mark ip-precedence

This command marks all packets for the associated traffic stream with the specified IP Precedence value. The IP Precedence value is an integer from 0 to 7.

NOTICE This command may not be used on IPv6 classes. IPv6 does not have a precedence field.

Format	`mark ip-precedence` *`0-7`*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark CoS, Mark IP Precedence, Police
Policy Type	In

9.4.12 police-simple

This command is used to establish the traffic policing style for the specified class. The simple form of the police command uses a single data rate and burst size, resulting in two outcomes: conform and violate. The conforming data rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295. The conforming burst size is specified in kilobytes (KB) and is an integer from 1 to 128.

For each outcome, the only possible actions are drop, set-cos-as-sec-cos, set-cos-transmit, set-sec-cos-transmit, set-dscp-transmit, set-prec-transmit, or transmit. In this simple form of the police command, the conform action defaults to transmit and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

For set-dscp-transmit, a ***dscpval*** value is required and is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.

For set-prec-transmit, an IP Precedence value is required and is specified as an integer from 0-7.

For set-cos-transmit an 802.1p priority value is required and is specified as an integer from 0-7.

Format	`police-simple {`*1-4294967295 1-128*` conform-action {drop	set-cos-as-sec-cos	set-cos-transmit `*0-7*`	set-sec-cos-transmit `*0-7*`	set-prec-transmit `*0-7*`	set-dscp-transmit `*0-63*`	transmit} [violate-action {drop	set-cos-as-sec-cos	set-cos-transmit `*0-7*`	set-sec-cos-transmit `*0-7*`	set-prec-transmit `*0-7*`	set-dscp-transmit `*0-63*`	transmit}]}`
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark (all forms)

Example: The following shows an example of the command.

```
(switch) (Config-policy-classmap)#police-simple 1 128 conform-action transmit violate-action drop
```

9.4.13 police-single-rate

This command is the single-rate form of the police command and is used to establish the traffic policing style for the specified class. For each outcome, the only possible actions are drop, set-cos-as-sec-cost, set-cos-transmit, set-sec-cos-transmit, set-dscp-transmit, set-prec-transmit, or transmit. In this single-rate form of the police command, the conform action defaults to send, the exceed action defaults to drop, and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

Format	`police-single-rate {`*1-4294967295 1-128 1-128*` conform-action {drop	set-cos-as-sec-cos	set-cos-transmit `*0-7*`	set-sec-cos-transmit `*0-7*`	set-prec-transmit `*0-7*`	set-dscp-transmit `*0-63*`	transmit} exceed-action {drop	set-cos-as-sec-cos	set-cos-transmit `*0-7*`	set-sec-cos-transmit `*0-7*`	set-prec-transmit `*0-7*`	set-dscp-transmit `*0-63*`	transmit} [violate-action {drop	set-cos-as-sec-cos-transmit	set-cos-transmit `*0-7*`	set-sec-cos-transmit `*0-7*`	set-prec-transmit `*0-7*`	set-dscp-transmit `*0-63*`	transmit}]}`
Mode	Policy-Class-Map Config

9.4.14 police-two-rate

This command is the two-rate form of the police command and is used to establish the traffic policing style for the specified class. For each outcome, the only possible actions are drop, set-cos-as-sec-cos, set-cos-transmit, set-sec-cos-transmit, set-dscp-transmit, set-prec-transmit, or transmit. In this two-rate form of the police command, the conform action defaults to send, the exceed action defaults to drop, and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

Format

```
police-two-rate {1-4294967295 1-4294967295 1-128 1-128 conform-action {drop | set-cos-as-sec-cos | set-cos-transmit 0-7 | set-sec-cos-transmit 0-7 | set-prec-transmit 0-7 | set-dscp-transmit 0-63 | transmit} exceed-action {drop | set-cos-as-sec-cos | set-cos-transmit 0-7 | set-sec-cos-transmit 0-7 | set-prec-transmit 0-7 | set-dscp-transmit 0-63 | transmit} [violate-action {drop | set-cos-as-sec-cos | set-cos-transmit 0-7 | set-sec-cos-transmit 0-7 | set-prec-transmit 0-7 | set-dscp-transmit 0-63 | transmit}]}
```

Mode Policy-Class-Map Config

9.4.15 policy-map

This command establishes a new DiffServ policy. The ***policyname*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the policy. The type of policy is specific to the inbound traffic direction as indicated by the `in` parameter, or the outbound traffic direction as indicated by the `out` parameter, respectively.

NOTICE The CLI mode is changed to Policy-Map Config when this command is successfully executed.

Format

```
policy-map policyname {in|out}
```

Mode Global Config

9.4.15.1 no policy-map

This command eliminates an existing DiffServ policy. The ***policyname*** parameter is the name of an existing DiffServ policy. This command may be issued at any time. If the policy is currently referenced by one or more interface service attachments, this delete attempt fails.

Format

```
no policy-map policyname
```

Mode Global Config

9.4.16 policy-map rename

This command changes the name of a DiffServ policy. The ***policyname*** is the name of an existing DiffServ class. The ***newpolicyname*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the policy.

Format

```
policy-map rename policyname newpolicyname
```

Mode Global Config

9.4.17 show protection-group

This command lists the protection groups. All or specified protection groups can be displayed. The protection groups are listed with the interface members, the egress masks are listed related to the calculation type (user specified, related to the protection group or '--' for default).

Format

```
show protection-group <0..3>
show protection-group all
```

Mode Privileged EXEC

9.4.18 protection-group (configure)

This command adds a protection group and/or a name associated to a group. The addition of a protection group has no effect as long as no members are included (interface). Optional a name can be assigned to a protection group with parameter 'name' when adding the group or for an already active group. The length of the name is restricted to 15 characters.

For stacking this command is only valid inside a unit (receiving and sending ports in same unit).

Format **`protection-group`** *`<0..3>`*
`protection-group` *`<0..3>`* **`name`** *`name`*

Mode Global Config

9.4.18.1 no protection-group (configure)

This command deletes a protection group and/or a name associated to a group. If deleting a protection group all members of this group are deleted too. The name can be deleted by using the 'no' command with the parameter 'name' (the protection group remains active then). The length of the name is restricted to 15 characters.

Format **`no protection-group`** *`<0..3>`*
`no protection-group` *`<0..3>`* **`name`** *`name`*

Mode Global Config

9.4.19 protection-group (interface)

This command includes/excludes interfaces to/from a protection group or sets an egress-mask for an interface.

If an interface is member in a protection group it may sent packets to interfaces which are not member of any group (unprotected) and to interfaces in the same group, but not to interfaces in another group. An egress-mask is calculated based on the protection-groups containing for each interface (bit 0 for first interface) a bit, indicating that it is allowed (1) or prohibited (0) to forward to this interface. The calculated egress-mask can be displayed by "show protection-group mask" below.

The calculated egress-mask may be overridden by setting directly this mask (use parameter "mask"). This is not supported for stacking mode.

For a LAG the minimal egress mask over all member interfaces (either calculated for protection-groups or directly set) is used (<mask-member-1> & … & <mask-member-N>).

Format **`protection-group {`***`<0..3>`* **`| mask`** *`<mask>}`*

Mode Interface Config

9.4.19.1 no protection-group (interface)

The command deletes an interface to a protection group or deletes an egress port mask. The command deletes an egress mask for an interface if specifying the keyword 'mask'.

Format **`no protection-group {`***`<0..3>`* / **`mask`** *`<mask>}`*

Mode Interface Config

9.5 DiffServ Service Commands

Use the DiffServ service commands to assign a DiffServ traffic conditioning policy, which you specified by using the policy commands, to an interface in the incoming direction

The service commands attach a defined policy to a directional interface. You can assign only one policy at any one time to an interface in the inbound direction. DiffServ is not used in the outbound direction.

This set of commands consists of service addition/removal.

The CLI command root is `service-policy`.

9.5.1 service-policy

This command attaches a policy to an interface in the inbound direction as indicated by the `in` parameter, or the outbound direction as indicated by the `out` parameter, respectively. The ***policyname*** parameter is the name of an existing DiffServ policy. This command causes a service to create a reference to the policy.

NOTICE This command effectively enables DiffServ on an interface in the inbound direction. There is no separate interface administrative 'mode' command for DiffServ.

NOTICE This command fails if any attributes within the policy definition exceed the capabilities of the interface. Once a policy is successfully attached to an interface, any attempt to change the policy definition, that would result in a violation of the interface capabilities, causes the policy change attempt to fail.

Format `service-policy {in|out}` *`policymapname`*

Modes
- Global Config
- Interface Config

NOTICE Each interface can have one policy attached.

9.5.1.1 no service-policy

This command detaches a policy from an interface in the inbound direction as indicated by the `in` parameter, or the outbound direction as indicated by the `out` parameter, respectively. The ***policyname*** parameter is the name of an existing DiffServ policy.

NOTICE This command causes a service to remove its reference to the policy. This command effectively disables DiffServ on an interface in the inbound direction or an interface in the outbound direction. There is no separate interface administrative 'mode' command for DiffServ.

Format `no service-policy {in|out}` *`policymapname`*

Modes
- Global Config
- Interface Config

9.6 DiffServ Show Commands

Use the DiffServ show commands to display configuration and status information for classes, policies, and services. You can display DiffServ information in summary or detailed formats. The status information is only shown when the DiffServ administrative mode is enabled.

9.6.1 show class-map

This command displays all configuration information for the specified class. The ***class-name*** is the name of an existing DiffServ class.

Format `show class-map` *`class-name`*

Modes
- Privileged EXEC
- User EXEC

If the class-name is specified the following fields are displayed:

Term	Definition
Class Name	The name of this class.
Class Type	A class type of all means every match criterion defined for the class is evaluated simultaneously and must all be true to indicate a class match.
Class Layer3 Protocol	The Layer 3 protocol for this class. Possible values are IPv4 and IPv6.
Match Criteria	The Match Criteria fields are only displayed if they have been configured. Not all platforms support all match criteria values. They are displayed in the order entered by the user. The fields are evaluated in accordance with the class type. The possible Match Criteria fields are: Destination IP Address, Destination Layer 4 Port, Destination MAC Address, Ethertype, Source MAC Address, VLAN, Class of Service, Every, IP DSCP, IP Precedence, IP TOS, Protocol Keyword, Reference Class, Source IP Address, and Source Layer 4 Port.
Values	The values of the Match Criteria.

If you do not specify the Class Name, this command displays a list of all defined DiffServ classes. The following fields are displayed:

Term	Definition
Class Name	The name of this class. (Note that the order in which classes are displayed is not necessarily the same order in which they were created.)
Class Type	A class type of all means every match criterion defined for the class is evaluated simultaneously and must all be true to indicate a class match.
Ref Class Name	The name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

9.6.2 show diffserv

This command displays the DiffServ General Status Group information, which includes the current administrative mode setting as well as the current and maximum number of rows in each of the main DiffServ private MIB tables. This command takes no options.

Format	`show diffserv`
Mode	Privileged EXEC

Term	Definition
DiffServ Admin mode	The current value of the DiffServ administrative mode.
Class Table Size Current/Max	The current and maximum number of entries (rows) in the Class Table.
Class Rule Table Size Current/Max	The current and maximum number of entries (rows) in the Class Rule Table.
Policy Table Size Current/Max	The current and maximum number of entries (rows) in the Policy Table.
Policy Instance Table Size Current/Max	The current and maximum number of entries (rows) in the Policy Instance Table.
Policy Instance Table Max Current/Max	The current and maximum number of entries (rows) for the Policy Instance Table.
Policy Attribute Table Max Current/Max	The current and maximum number of entries (rows) for the Policy Attribute Table.
Service Table Size Current/Max	The current and maximum number of entries (rows) in the Service Table.

9.6.3 show policy-map

This command displays all configuration information for the specified policy. The `policyname` is the name of an existing DiffServ policy.

Format	`show policy-map [policyname]`
Mode	Privileged EXEC

If the Policy Name is specified the following fields are displayed:

Term	Definition
Policy Name	The name of this policy.
Policy Type	The policy type (only inbound policy definitions are supported for this platform.)
Class Members	The class that is a member of the policy.

The following information is repeated for each class associated with this policy (only those policy attributes actually configured are displayed):

Term	Definition
Assign Queue	Directs traffic stream to the specified QoS queue. This allows a traffic classifier to specify which one of the supported hardware queues are used for handling packets belonging to the class.
Class Name	The name of this class.
Committed Burst Size (KB)	The committed burst size, used in simple policing.
Committed Rate (Kbps)	The committed rate, used in simple policing.
Conform Action	The current setting for the action taken on a packet considered to conform to the policing parameters. This is not displayed if policing is not in use for the class under this policy.
Conform Color Mode	The current setting for the color mode. Policing uses either color blind or color aware mode. Color blind mode ignores the coloration (marking) of the incoming packet. Color aware mode takes into consideration the current packet marking when determining the policing outcome.
Conform COS	The CoS mark value if the conform action is set-cos-transmit.
Conform DSCP Value	The DSCP mark value if the conform action is set-dscp-transmit.
Conform IP Precedence Value	The IP Precedence mark value if the conform action is set-prec-transmit.
Drop	Drop a packet upon arrival. This is useful for emulating access control list operation using DiffServ, especially when DiffServ and ACL cannot co-exist on the same interface.
Exceed Action	The action taken on traffic that exceeds settings that the network administrator specifies.
Exceed Color Mode	The current setting for the color of exceeding traffic that the user may optionally specify.
Mark CoS	The class of service value that is set in the 802.1p header of inbound packets. This is not displayed if the mark cos was not specified.
Mark CoS as Secondary CoS	The secondary 802.1p priority value (second/inner VLAN tag. Same as CoS (802.1p) marking, but the dot1p value used for remarking is picked from the dot1p value in the secondary (i.e. inner) tag of a double-tagged packet.
Mark IP DSCP	The mark/re-mark value used as the DSCP for traffic matching this class. This is not displayed if mark ip description is not specified.
Mark IP Precedence	The mark/re-mark value used as the IP Precedence for traffic matching this class. This is not displayed if mark ip precedence is not specified.

Term	Definition
Mirror	Copies a classified traffic stream to a specified egress port (physical port or LAG). This can occur in addition to any marking or policing action. It may also be specified along with a QoS queue assignment. This field does not display on Broadcom 5630x platforms.
Non-Conform Action	The current setting for the action taken on a packet considered to not conform to the policing parameters. This is not displayed if policing not in use for the class under this policy.
Non-Conform COS	The CoS mark value if the non-conform action is set-cos-transmit.
Non-Conform DSCP Value	The DSCP mark value if the non-conform action is set-dscp-transmit.
Non-Conform IP Precedence Value	The IP Precedence mark value if the non-conform action is set-prec-transmit.
Peak Rate	Guarantees a committed rate for transmission, but also transmits excess traffic bursts up to a user-specified peak rate, with the understanding that a downstream network element (such as the next hop's policer) might drop this excess traffic. Traffic is held in queue until it is transmitted or dropped (per type of queue depth management.) Peak rate shaping can be configured for the outgoing transmission stream for an AP traffic class (although average rate shaping could also be used.)
Peak Burst Size	(PBS). The network administrator can set the PBS as a means to limit the damage expedited forwarding traffic could inflict on other traffic (e.g., a token bucket rate limiter) Traffic that exceeds this limit is discarded.
Policing Style	The style of policing, if any, used (simple).
Redirect	Forces a classified traffic stream to a specified egress port (physical port or LAG). This can occur in addition to any marking or policing action. It may also be specified along with a QoS queue assignment. This field does not display on Broadcom 5630x platforms.

If the Policy Name is not specified this command displays a list of all defined DiffServ policies. The following fields are displayed:

Term	Definition
Policy Name	The name of this policy. (The order in which the policies are displayed is not necessarily the same order in which they were created.)
Policy Type	The policy type (Only inbound is supported).
Class Members	List of all class names associated with this policy.

Example: The following shows example CLI display output including the mark-cos-as-sec-cos option specified in the policy action.

```
(FASTPATH Routing) #show policy-map p1
Policy Name.................................... p1
Policy Type.................................... In
Class Name..................................... c1
Mark CoS as Secondary CoS...................... Yes
```

Example: The following shows example CLI display output including the mark-cos-as-sec-cos action used in the policing (simple-police, police-single-rate, police two-rate) command.

```
(FASTPATH Routing) #show policy-map p2
Policy Name....................... p2
Policy Type....................... In
Class Name........................ c2
Policing Style.................... Police Two Rate
Committed Rate.................... 1
Committed Burst Size.............. 1
Peak Rate......................... 1
Peak Burst Size................... 1
Conform Action.................... Mark CoS as Secondary CoS
Exceed Action..................... Mark CoS as Secondary CoS
Non-Conform Action................ Mark CoS as Secondary CoS
Conform Color Mode................ Blind
Exceed Color Mode................. Blind
```

9.6.4 show diffserv service

This command displays policy service information for the specified interface and direction. The ***slot/port*** parameter specifies a valid ***slot/port*** number for the system.

Format	`show diffserv service slot/port in`
Mode	Privileged EXEC

Term	Definition
DiffServ Admin Mode	The current setting of the DiffServ administrative mode. An attached policy is only in effect on an interface while DiffServ is in an enabled mode.
Interface	*slot/port*
Direction	The traffic direction of this interface service.
Operational Status	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface in the indicated direction.
Policy Details	Attached policy details, whose content is identical to that described for the show policy-map ***policymapname*** command (content not repeated here for brevity).

9.6.5 show diffserv service brief

This command displays all interfaces in the system to which a DiffServ policy has been attached. The inbound direction parameter is optional.

Format	`show diffserv service brief [in]`
Mode	Privileged EXEC

Term	Definition
DiffServ Mode	The current setting of the DiffServ administrative mode. An attached policy is only active on an interface while DiffServ is in an enabled mode.

The following information is repeated for interface and direction (only those interfaces configured with an attached policy are shown):

Term	Definition
Interface	*slot/port*
Direction	The traffic direction of this interface service.
OperStatus	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface in the indicated direction.

9.6.6 show policy-map interface

This command displays policy-oriented statistics information for the specified interface and direction. The ***slot/port*** parameter specifies a valid interface for the system. Instead of *`slot/port`*, `lag` *`lag-intf-num`* can be used as an alternate way to specify the LAG interface. `lag` *`lag-intf-num`* can also be used to specify the LAG interface where *`lag-intf-num`* is the LAG port number.

NOTICE This command is only allowed while the DiffServ administrative mode is enabled.

Format	`show policy-map interface` *`slot/port`* `[in]`
Mode	Privileged EXEC

Term	Definition
Interface	*slot/port*
Direction	The traffic direction of this interface service.
Operational Status	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface in the indicated direction.

The following information is repeated for each class instance within this policy:

Term	Definition
Class Name	The name of this class instance.
In Discarded Packets	A count of the packets discarded for this class instance for any reason due to DiffServ treatment of the traffic class.

9.6.7 show service-policy

This command displays a summary of policy-oriented statistics information for all interfaces in the specified direction.

Format	`show service-policy in`
Mode	Privileged EXEC

The following information is repeated for each interface and direction (only those interfaces configured with an attached policy are shown):

Term	Definition
Interface	*slot/port*
Operational Status	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface.

9.7 MAC Access Control List Commands

This section describes the commands you use to configure MAC Access Control List (ACL) settings. MAC ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources.

The following rules apply to MAC ACLs:

- The maximum number of ACLs you can create is hardware dependent. The limit applies to all ACLs, regardless of type.
- The system supports only Ethernet II frame types.
- The maximum number of rules per MAC ACL is hardware dependent.
- For the Broadcom 5630x platform, if you configure an IP ACL on an interface, you cannot configure a MAC ACL on the same interface.

9.7.1 mac access-list extended

This command creates a MAC Access Control List (ACL) identified by ***name***, consisting of classification fields defined for the Layer 2 header of an Ethernet frame. The ***name*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the MAC access list. The rate-limit attribute configures the committed rate and the committed burst size.

If a MAC ACL by this name already exists, this command enters Mac-Access-List config mode to allow updating the existing MAC ACL.

NOTICE The CLI mode changes to Mac-Access-List Config mode when you successfully execute this command.

Format	`mac access-list extended` *name*
Mode	Global Config

9.7.1.1 no mac access-list extended

This command deletes a MAC ACL identified by ***name*** from the system.

Format	`no mac access-list extended` *name*
Mode	Global Config

9.7.2 mac access-list extended rename

This command changes the name of a MAC Access Control List (ACL). The ***name*** parameter is the name of an existing MAC ACL. The ***newname*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the MAC access list.

This command fails if a MAC ACL by the name ***newname*** already exists.

Format	`mac access-list extended rename` *name newname*
Mode	Global Config

9.7.3 mac access-list resequence

Use this command to renumber the sequence numbers of the entries for specified MAC access list with the given increment value starting from a particular sequence number. The command is used to edit the sequence numbers of ACL rules in the ACL and change the order in which entries are applied. This command is not saved in startup configuration and is not displayed in running configuration.

NOTICE If the generated sequence number exceeds the maximum sequence number, the ACL rule creation fails and an informational message is displayed.

Default	10
Format	`mac access-list resequence {`*name*`|` *id* `}` *starting-sequence-number increment*
Mode	Global Config

Parameter	Description
starting-sequence-number	The sequence number from which to start. The range is 1–2147483647. The default is 10.
increment	The amount to increment. The range is 1–2147483647. The default is 10.

9.7.4 {deny | permit} (MAC ACL)

This command creates a new rule for the current MAC access list. A rule may either deny or permit traffic according to the specified classification fields. At a minimum, the source and destination MAC value must be specified, each of which may be substituted using the keyword any to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format.

Format [*sequence-number*] {deny|permit} {*srcmac* | any} {*dstmac* | any} [*ethertypekey* | *0x0600-0xFFFF*] [vlan {eq *0-4095*}] [cos *0-7*] [[log] [time-range *time-range-name*] [assign-queue *queue-id*]] [{mirror | redirect} *slot/port*][rate-limit *rate burst-size*]

Mode Mac-Access-List Config

NOTICE An implicit deny all MAC rule always terminates the access list.

NOTICE For BCM5630x and BCM5650x based systems, assign-queue, redirect, and mirror attributes are configurable for a deny rule, but they have no operational effect.

The *sequence-number* specifies the sequence number for the ACL rule. The sequence number is specified by the user or is generated by device.

If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in ACL is used and this rule is placed in the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. A rule cannot be created that duplicates an already existing one and a rule cannot be configured with a sequence number that is already used for another rule.

For example, if user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, the user can move the ACL rule to a different position in the ACL.

The Ethertype may be specified as either a keyword or a four-digit hexadecimal value from 0x0600-0xFFFF. The currently supported ***ethertypekey*** values are: appletalk, arp, ibmsna, ipv4, ipv6, ipx, mplsmcast, mplsucast, netbios, novell, pppoe, rarp. Each of these translates into its equivalent Ethertype value(s).

Ethertype Keyword	Corresponding Value
appletalk	0x809B
arp	0x0806
ibmsna	0x80D5
ipv4	0x0800
ipv6	0x86DD
ipx	0x8037
mplsmcast	0x8848
mplsucast	0x8847
netbios	0x8191
novell	0x8137, 0x8138
pppoe	0x8863, 0x8864
rarp	0x8035

The `vlan` and `cos` parameters refer to the VLAN identifier and 802.1p user priority fields, respectively, of the VLAN tag. For packets containing a double VLAN tag, this is the first (or outer) tag.

The `time-range` parameter allows imposing time limitation on the MAC ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist and the MAC ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the MAC ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see “Time Range Commands for Time-Based ACLs” on page 807.

The `assign-queue` parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed ***`queue-id`*** value is 0-(n-1), where n is the number of user configurable queues available for the hardware platform. The ***`assign-queue`*** parameter is valid only for a `permit` rule.

For the Broadcom 5650x platform, the ***`mirror`*** parameter allows the traffic matching this rule to be copied to the specified ***`slot/port`***, while the redirect parameter allows the traffic matching this rule to be forwarded to the specified ***`slot/port`***. The ***`assign-queue`*** and ***`redirect`*** parameters are only valid for a `permit` rule.

NOTICE The ***`mirror`*** and ***`redirect`*** parameters are not available on the Broadcom 5630x platform.

NOTICE The special command form `{deny` | `permit}` `any any` is used to match all Ethernet layer 2 packets, and is the equivalent of the IP access list “match every” rule.

The permit command's optional attribute rate-limit allows you to permit only the allowed rate of traffic as per the configured rate in kbps, and burst-size in kbytes.

Example: The following shows an example of the command.

```
(Routing) (Config)#mac access-list extended mac1
(Routing) (Config-mac-access-list)#permit 00:00:00:00:aa:bb ff:ff:ff:ff:00:00 any rate-limit 32 16
(Routing) (Config-mac-access-list)#exit
```

9.7.4.1 no *sequence-number*

Use this command to remove the ACL rule with the specified sequence number from the ACL.

Format	`no` *`sequence-number`*
Mode	MAC-Access-List Config

9.7.5 mac access-group

This command either attaches a specific MAC Access Control List (ACL) identified by ***name*** to an interface or range of interfaces, or associates it with a VLAN ID, in a given direction. The ***name*** parameter must be the name of an existing MAC ACL.

An optional sequence number may be specified to indicate the order of this mac access list relative to other mac access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified mac access list replaces the currently attached mac access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

This command specified in 'Interface Config' mode only affects a single interface, whereas the 'Global Config' mode setting is applied to all interfaces. The VLAN keyword is only valid in the 'Global Config' mode. The 'Interface Config' mode command is only available on platforms that support independent per-port class of service queue configuration.

An optional *control-plane* is specified to apply the MAC ACL on CPU port. The control packets like BPDU are also dropped because of the implicit deny all rule added to the end of the list. To overcome this, permit rules must be added to allow the control packets.

NOTICE The keyword *control-plane* is only available in Global Config mode.

NOTICE You should be aware that the ***out*** option may or may not be available, depending on the platform.

Format `mac access-group` *`name`* `{{control-plane|in|out} vlan` *`vlan-id`* `{in|out}} [sequence` *`1-4294967295`*`]`

Modes
- Global Config
- Interface Config

Parameter	Description
name	The name of the Access Control List.
sequence	A optional sequence number that indicates the order of this IP access list relative to the other IP access lists already assigned to this interface and direction. The range is 1 to 4294967295.
vlan-id	A VLAN ID associated with a specific IP ACL in a given direction.

Example: The following shows an example of the command.

```
(Routing)(Config)#mac access-group mac1 control-plane
```

9.7.5.1 no mac access-group

This command removes a MAC ACL identified by ***name*** from the interface in a given direction.

Format `no mac access-group` *`name`* `{{control-plane|in|out} vlan` *`vlan-id`* `{in|out}}`

Modes
- Global Config
- Interface Config

Example: The following shows an example of the command.

```
(Routing)(Config)#no mac access-group mac1 control-plane
```

9.7.6 remark

This command adds a new comment to the ACL rule.

Use the remark keyword to add comments (remarks) to ACL rule entries belonging to an IPv4, IPv6, MAC, or ARP ACL. Up to L7_ACL_MAX_RULES_PER_LIST*10 remarks per ACL and up to 10 remarks per ACL rule can be configured. Also, up to L7_ACL_MAX_RULES*2 remarks for all QOS ACLs(IPv4/IPv6/MAC) for device can be configured. The total length of the remark cannot exceed 100 characters. A remark can contain characters in the range A-Z, a-z, 0-9, and special characters like space, hyphen, underscore. Remarks are associated to the ACL rule that is immediately created after the remarks are created. If the ACL rule is removed, the associated remarks are also deleted. Remarks are shown only in `show running-config` and are not displayed in `show ip access-lists`.

Remarks can only be added before creating the rule. If a user creates up to 10 remarks, each of them is linked to the next created rule.

Default None

Format `remark` *`comment`*

Mode
- IPv4-Access-List Config
- IPv6-Access-List-Config
- MAC-Access-List Config
- ARP-Access-List Config

Example:

```
(Config)#arp access-list new
(Config-arp-access-list)#remark "test1"
(Config-arp-access-list)#permit ip host 1.1.1.1 mac host 00:01:02:03:04:05
(Config-arp-access-list)#remark "test1"
(Config-arp-access-list)#remark "test2"
(Config-arp-access-list)#remark "test3"
(Config-arp-access-list)#permit ip host 1.1.1.2 mac host 00:03:04:05:06:07
(Config-arp-access-list)#permit ip host 2.1.1.2 mac host 00:03:04:05:06:08
(Config-arp-access-list)#remark "test4"
(Config-arp-access-list)#remark "test5"
(Config-arp-access-list)#permit ip host 2.1.1.3 mac host 00:03:04:05:06:01
```

9.7.6.1 no remark

Use this command to remove a remark from an ACL access-list.

When the first occurrence of the remark in ACL is found, the remark is deleted. Repeated execution of this command with the same remark removes the remark from the next ACL rule that has the remark associated with it (if there is any rule configured with the same remark). If there are no more rules with this remark, an error message is displayed

If there is no such remark associated with any rule and such remark is among not associated remarks, it is removed.

Default	None
Format	`no remark` *`comment`*
Mode	• IPv4-Access-List Config • IPv6-Access-List-Config • MAC-Access-List Config • ARP-Access-List Config

9.7.7 show mac access-lists

This command displays summary information for all Mac Access lists and ACL rule hit count of packets matching the configured ACL rule within an ACL. This counter value rolls-over on reaching the maximum value. There is a dedicated counter for each ACL rule. ACL counters do not interact with PBR counters.

For ACL with multiple rules, once a match occurs at any one specific rule, counters associated with this rule only get incremented (for example, consider an ACL with three rules, after matching rule two, counters for rule three would not be incremented).

For ACL counters, If an ACL rule is configured without RATE-LIMIT, the counter value is count of forwarded/discarded packets. (For example: For a burst of 100 packets, the Counter value is 100).

If the ACL rule is configured with RATE LIMIT, the counter value is the MATCHED packet count. If the sent traffic rate exceeds the configured limit, the counters still display matched packet count (despite getting dropped beyond the configured limit since match criteria is met) which would equal the sent rate. For example, if rate limit is set to 10 kbps and 'matching' traffic is sent at 100 kbps, counters reflect a 100 kbps value. If the sent traffic rate is less than the configured limit, counters display only the matched packet count. Either way, only the matched packet count is reflected in the counters, irrespective of whether they get dropped or forwarded. ACL counters do not interact with diffserv policies.

Use the access list name to display detailed information of a specific MAC ACL.

NOTICE The command output varies based on the match criteria configured within the rules of an ACL.

Format	`show mac access-lists [`*`name`*`]`
Mode	Privileged EXEC

Term	Definition
ACL Name	The user-configured name of the ACL.
ACL Counters	Identifies whether the ACL counters are enabled or disabled.
Interface(s)	The inbound or outbound interfaces to which the ACL is applied.
Sequence Number	The ordered rule number identifier defined within the MAC ACL.
Action	The action associated with each rule. The possible values are Permit or Deny.
Source MAC Address	The source MAC address for this rule.
Source MAC Mask	The source MAC mask for this rule.
Committed Rate	The committed rate defined by the rate-limit attribute.
Committed Burst Size	The committed burst size defined by the rate-limit attribute.
Destination MAC Address	The destination MAC address for this rule.
Ethertype	The Ethertype keyword or custom value for this rule.
VLAN ID	The VLAN identifier value or range for this rule.
COS	The COS (802.1p) value for this rule.
Log	Displays when you enable logging for the rule.
Assign Queue	The queue identifier to which packets matching this rule are assigned.
Mirror Interface	On Broadcom 5650x platforms, the slot/port to which packets matching this rule are copied.
Redirect Interface	On Broadcom 5650x platforms, the `slot/port` to which packets matching this rule are forwarded.
Time Range Name	Displays the name of the time-range if the MAC ACL rule has referenced a time range.
Rule Status	Status (Active/Inactive) of the MAC ACL rule.
ACL Hit Count	The ACL rule hit count of packets matching the configured ACL rule within an ACL.

Example: The following shows example CLI display output for the command.

```
(Routing) #show mac access-lists mac1

ACL Name: mac1
ACL Counters: Enabled

Outbound Interface(s): control-plane

Sequence Number: 10
Action.............................permit
Source MAC Address................ 00:00:00:00:AA:BB
Source MAC Mask....................FF:FF:FF:FF:00:00
Committed Rate.....................32
Committed Burst Size...............16
ACL hit count .....................0

Sequence Number: 25
Action.............................permit
Source MAC Address................ 00:00:00:00:AA:BB
Source MAC Mask....................FF:FF:FF:FF:00:00
Destination MAC Address........... 01:80:C2:00:00:00
Destination MAC Mask...............00:00:00:FF:FF:FF
Ethertype..........................ipv6
VLAN...............................36
CoS Value..........................7
Assign Queue.......................4
Redirect Interface.................0/34
Committed Rate.....................32
Committed Burst Size...............16
ACL hit count .....................0
```

9.8 IP Access Control List Commands

This section describes the commands you use to configure IP Access Control List (ACL) settings. IP ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources.

The following rules apply to IP ACLs:

- FASTPATH software does not support IP ACL configuration for IP packet fragments.
- The maximum number of ACLs you can create is hardware dependent. The limit applies to all ACLs, regardless of type.
- The maximum number of rules per IP ACL is hardware dependent.
- On Broadcom 5630x platforms, if you configure a MAC ACL on an interface, you cannot configure an IP ACL on the same interface.
- Wildcard masking for ACLs operates differently from a subnet mask. A wildcard mask is in essence the inverse of a subnet mask. With a subnet mask, the mask has ones (1's) in the bit positions that are used for the network address, and has zeros (0's) for the bit positions that are not used. In contrast, a wildcard mask has (0's) in a bit position that must be checked. A 1 in a bit position of the ACL mask indicates the corresponding bit can be ignored.

9.8.1 access-list

This command creates an IP Access Control List (ACL) that is identified by the access list number, which is 1-99 for standard ACLs or 100-199 for extended ACLs. Table 14 describes the parameters for the `access-list` command.

IP Standard ACL:

Format

```
access-list 1-99 {remark comment} | {[sequence-number]} [rule 1-1023] {deny | permit} {every | srcip srcmask | host srcip} [time-range time-range-name] [log] [assign-queue queue-id] [{mirror | redirect} slot/port] [rate-limit rate burst-size]
```

Mode Global Config

IP Extended ACL:

Format

```
access-list 100-199 {remark comment} | {[sequence-number]} [rule 1-1023] {deny | permit} {every | {{eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp | 0 -255} {srcip srcmask|any|host srcip}[range {portkey|startport} {portkey|endport} {eq|neq|lt|gt} {portkey|0-65535}{dstip dstmask|any|host dstip}[{range {portkey|startport} {portkey|endport} | {eq | neq | lt | gt} {portkey | 0-65535} ] [flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]] [icmp-type icmp-type [icmp-code icmp-code] | icmp-message icmp-message] [igmp-type igmp-type] [fragments] [precedence precedence | tos tos [ tosmask] | dscp dscp]}} [time-range time-range-name]  [log] [assign-queue queue-id] [{mirror | redirect} slot/port] [rate-limit rate burst-size]
```

Mode Global Config

NOTICE

IPv4 extended ACLs have the following limitations for egress ACLs:

- Match on port ranges is not supported.
- The rate-limit command is not supported.

Table 14: ACL Command Parameters

Parameter	Description
`remark` *`comment`*	Use the remark keyword to add a comment (remark) to an IP standard or IP extended ACL. The remarks make the ACL easier to understand and scan. Each remark is limited to 100 characters. A remark can consist of characters in the range A-Z, a-z, 0-9, and special characters: space, hyphen, underscore. Remarks are displayed only in show running configuration. One remark per rule can be added for IP standard or IP extended ACL. User can remove only remarks that are not associated with a rule. Remarks associated with a rule are removed when the rule is removed
`sequence-number`	Specifies a sequence number for the ACL rule. Every rule receives a sequence number. A sequence number is specified by the user or is generated by the device. If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in the ACL is used and this rule is located in the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. It is not allowed to create a rule that duplicates an already existing one and a rule cannot be configured with a sequence number that is already used for another rule. For example, if user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, user can move the ACL rule to a different position in the ACL.
`1-99` `or` *`100-199`*	Range 1 to 99 is the access list number for an IP standard ACL. Range 100 to 199 is the access list number for an IP extended ACL.
`[rule` *`1-1023`*`]`	Specifies the IP access list rule.
`{deny | permit}`	Specifies whether the IP ACL rule permits or denies an action. ***Note:*** For 5630x and 5650x-based systems, assign-queue, redirect, and mirror attributes are configurable for a deny rule, but they have no operational effect.
`every`	Match every packet.
`{eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp |` *`0-255`*`}`	Specifies the protocol to filter for an extended IP ACL rule.
`srcip srcmask``|any|host` *`scrip`*	Specifies a source IP address and source netmask for match condition of the IP ACL rule. Specifying any specifies *srcip* as 0.0.0.0 and *srcmask* as 255.255.255.255. Specifying host *A.B.C.D* specifies *srcip* as A.B.C.D and *srcmask* as 0.0.0.0.

Table 14: ACL Command Parameters

Parameter	Description
{{range{portkey|startport}{portkey|endport}|{eq|neq|lt|gt} *{portkey | 0-65535}]*	***Note:*** This option is available only if the protocol is TCP or UDP. Specifies the source layer 4 port match condition for the IP ACL rule. You can use the port number, which ranges from 0-65535, or you specify the ***portkey***, which can be one of the following keywords: • For TCP: *bgp*, *domain*, *echo*, *ftp*, *ftp-data*, *http*, *smtp*, *telnet*, *www*, *pop2*, *pop3*. • For UDP: ***domain, echo, ntp, rip, snmp, tftp***, *time*, and ***who***. For both TCP and UDP, each of these keywords translates into its equivalent port number, which is used as both the start and end of a port range. If *range* is specified, the IP ACL rule matches only if the layer 4 port number falls within the specified portrange. The *startport* and *endport* parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between will be part of the layer 4 port range. When *eq* is specified, the IP ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey. When *lt* is specified, IP ACL rule matches if the layer 4 port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>. When *gt* is specified, the IP ACL rule matches if the layer 4 port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535. When *neq* is specified, IP ACL rule matches only if the layer 4 port number is not equal to the specified port number or portkey. Two rules are added in the hardware one with range equal to 0 to <specified port number _- 1> and one with range equal to <<specified port number _+ 1 to 65535>> Port number matches only apply to unfragmented or first fragments.
dstip dstmask|any|host *dstip*	Specifies a destination IP address and netmask for match condition of the IP ACL rule. Specifying any implies specifying *dstip* as 0.0.0.0 and *dstmask* as 255.255.255.255. Specifying host A.B.C.D implies *dstip* as A.B.C.D and *dstmask* as 0.0.0.0.
[precedence *precedence* | tos *tos* [*tosmask*] | dscp *dscp*]	Specifies the TOS for an IP ACL rule depending on a match of precedence or DSCP values using the parameters ***dscp***, ***precedence***, ***tos/tosmask***. ***Note:*** *tosmask* is an optional parameter.
flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]	***Note:*** This option is available only if the protocol is tcp. Specifies that the IP ACL rule matches on the TCP flags. When +<tcpflagname> is specified, a match occurs if the specified <tcpflagname> flag is set in the TCP header. When -<tcpflagname> is specified, a match occurs if the specified <tcpflagname> flag is *NOT* set in the TCP header. When established is specified, a match occurs if the specified RST or ACK bits are set in the TCP header. Two rules are installed in the hardware when the established option is specified.

Table 14: ACL Command Parameters

Parameter	Description
`[icmp-type` *`icmp-type`* `[icmp-code` *`icmp-code`*`] | icmp-message` *`icmp-message`*`]`	***Note:*** This option is available only if the protocol is icmp. Specifies a match condition for ICMP packets. When *icmp-type* is specified, the IP ACL rule matches on the specified ICMP message type, a number from 0 to 255. When *icmp-code* is specified, the IP ACL rule matches on the specified ICMP message code, a number from 0 to 255. Specifying *icmp-message* implies that both *icmp-type* and *icmp-code* are specified. The following icmp-messages are supported: *echo*, *echo-reply*, *host-redirect*, *mobile-redirect*, *net-redirect*, *net-unreachable*, *redirect*, *packet-too-big*, *port-unreachable*, *source-quench*, *router-solicitation*, *router-advertisement*, *time-exceeded*, *ttl-exceeded* and *unreachable*.
`igmp-type` *`igmp-type`*	This option is available only if the protocol is igmp. When *igmp-type* is specified, the IP ACL rule matches on the specified IGMP message type, a number from 0 to 255.
`fragments`	Specifies that the IP ACL rule matches on fragmented IP packets.
`[log]`	Specifies that this rule is to be logged.
`[time-range` *`time-range-name`*`]`	Allows imposing time limitation on the ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see "Time Range Commands for Time-Based ACLs" on page 807.
`[assign-queue` *`queue-id`*`]`	Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
`[{mirror | redirect}` *`slot/port`*`]`	For Broadcom 5650x platforms, specifies the mirror or redirect interface which is the ***`slot/port`*** to which packets matching this rule are copied or forwarded, respectively. The ***`mirror`*** and ***`redirect`*** parameters are not available on the Broadcom 5630x platform.
`[rate-limit` *`rate burst-size`*`]`	Specifies the allowed rate of traffic as per the configured rate in kbps, and burst-size in kbytes.

9.8.1.1 no access-list

This command deletes an IP ACL that is identified by the parameter ***accesslistnumber*** from the system. The range for ***accesslistnumber*** 1-99 for standard access lists and 100-199 for extended access lists.

Format	`no access-list` *`accesslistnumber`* `[rule` *`1-1023`*`]`
Mode	Global Config

9.8.2 access-list counters enable

Use this command to enable ACL counters for IPv4, IPv6 and MAC access lists.

Default	Enabled
Format	`access-list counters enable`
Mode	Global Config

9.8.2.1 no access-list counters enable

Use this command to disable ACL counters for IPv4, IPv6 and MAC access lists.

Format	`no access-list counters enable`
Mode	Global Config

9.8.3 ip access-list

This command creates an extended IP Access Control List (ACL) identified by *name*, consisting of classification fields defined for the IP header of an IPv4 frame. The *name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IP access list. The rate-limit attribute configures the committed rate and the committed burst size.

If an IP ACL by this name already exists, this command enters IPv4-Access_List config mode to allow updating the existing IP ACL.

NOTICE The CLI mode changes to IPv4-Access-List Config mode when you successfully execute this command.

Format	`ip access-list` *`name`*
Mode	Global Config

9.8.3.1 no ip access-list

This command deletes the IP ACL identified by name from the system.

Format	`no ip access-list` *`name`*
Mode	Global Config

9.8.4 ip access-list rename

This command changes the name of an IP Access Control List (ACL). The *name* parameter is the names of an existing IP ACL. The new*name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IP access list.

This command fails is an IP ACL by the name new*name* already exists.

Format	ip access-list rename *name newname*
Mode	Global Config

9.8.5 ip access-list resequence

Use this command to renumber the sequence numbers of the entries for specified IP access list with the given increment value starting from a particular sequence number. The command is used to edit the sequence numbers of ACL rules in the ACL and change the order in which entries are applied. This command is not saved in startup configuration and is not displayed in running configuration.

NOTICE If the generated sequence number exceeds the maximum sequence number, the ACL rule creation fails and an informational message is displayed.

Default	10
Format	ip access-list resequence {*name*| *id* } *starting-sequence-number increment*
Mode	Global Config

Parameter	Description
starting-sequence-number	The sequence number from which to start. The range is 1–2147483647. The default is 10.
increment	The amount to increment. The range is 1–2147483647. The default is 10.

9.8.6 {deny | permit} (IP ACL)

This command creates a new rule for the current IP access list. A rule may either deny or permit traffic according to the specified classification fields. At a minimum, either the every keyword or the protocol, source address, and destination address values must be specified. The source and destination IP address fields may be specified using the keyword **any** to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format.

Format	[*sequence-number*] {deny | permit} {every | {{eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp | *0 -255*} {srcip *srcmask* | any | host *srcip*} [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}] {dstip *dstmask* | any | host *dstip*} [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}] [flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]] [icmp-type *icmp-type* [icmp-code icmp-code] | icmp-message icmp-message] [igmp-type igmp-type] [fragments] [precedence *precedence* | tos *tos* [*tosmask*] | dscp *dscp*]}} [time-range *time-range-name*] [log] [assign-queue *queue-id*] [{mirror | redirect} *slot/port*] [rate-limit *rate burst-size*]
Mode	Ipv4-Access-List Config

NOTICE An implicit deny all IP rule always terminates the access list.

NOTICE For BCM5630x-based systems, the ***mirror*** and ***redirect*** parameters are not available.

NOTICE

For BCM5650x-based systems, the ***`mirror`*** parameter allows the traffic matching this rule to be copied to the specified ***`slot/port`***, while the redirect parameter allows the traffic matching this rule to be forwarded to the specified ***`slot/port`***. The ***`assign-queue`*** and ***`redirect`*** parameters are only valid for a **`permit`** rule.

NOTICE

For IPv4, the following are not supported for egress ACLs:

- A match on port ranges
- The rate-limit command

NOTICE

This command takes effect only when PIM-SM is configured as the PIM mode.

The **`time-range`** parameter allows imposing time limitation on the IP ACL rule as defined by the specified time range. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see "Time Range Commands for Time-Based ACLs" on page 807.

The **`assign-queue`** parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed ***`queue-id`*** value is 0-(n-1), where n is the number of user configurable queues available for the hardware platform. The ***`assign-queue`*** parameter is valid only for a **`permit`** rule.

The permit command's optional attribute rate-limit allows you to permit only the allowed rate of traffic as per the configured rate in kbps, and burst-size in kbytes.

Parameter	Description
sequence-number	The *sequence-number* specifies the sequence number for the ACL rule. The sequence number is specified by the user or is generated by device. If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in ACL is used and this rule is placed at the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. A rule cannot be created that duplicates an already existing one and a rule cannot be configured with a sequence number that is already used for another rule. For example, if user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, the user can move the ACL rule to a different position in the ACL.
{deny | permit}	Specifies whether the IP ACL rule permits or denies the matching traffic.
Every	Match every packet.
{**`eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp |`** *`0 -255`*}	Specifies the protocol to match for the IP ACL rule.
srcip srcmask | any | host *srcip*	Specifies a source IP address and source netmask to match for the IP ACL rule. Specifying "any" implies specifying *srcip* as "0.0.0.0" and *srcmask* as "255.255.255.255". Specifying "host A.B.C.D" implies *srcip* as "A.B.C.D" and *srcmask* as "0.0.0.0".

Parameter	Description
[{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}]	***Note:*** This option is available only if the protocol is tcp or udp. Specifies the layer 4 port match condition for the IP ACL rule. Port number can be used, which ranges from 0-65535, or the portkey, which can be one of the following keywords: • For tcp protocol: bgp, domain, echo, ftp, ftp-data, http, smtp, telnet, www, pop2, pop3 • For udp protocol: domain, echo, ntp, rip, snmp, tftp, time, who Each of these keywords translates into its equivalent port number. When range is specified, the IP ACL rule matches only if the layer 4 port number falls within the specified port range. The startport and endport parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal to or greater than the starting port. The starting port, ending port, and all ports in between will be part of the layer 4 port range. When eq is specified, IP ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey. When lt is specified, IP ACL rule matches if the layer 4 port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>. When gt is specified, IP ACL rule matches if the layer 4 port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535. When neq is specified, IP ACL rule matches only if the layer 4 port number is not equal to the specified port number or port key. Two rules are added in the hardware one with range equal to 0 to <specified port number _- 1> and one with range equal to <<specified port number _+ 1 to 65535>>. Port number matches only apply to unfragmented or first fragments.
dstip dstmask | any | host *dstip*	Specifies a destination IP address and netmask for match condition of the IP ACL rule. Specifying any implies specifying dstip as 0.0.0.0 and dstmask as 255.255.255.255. Specifying host A.B.C.D implies dstip as A.B.C.D and dstmask as 0.0.0.0.
[precedence *precedence* | tos *tos* [*tosmask*] | dscp *dscp*]	Specifies the TOS for an IP ACL rule depending on a match of precedence or DSCP values using the parameters *dscp*, *precedence*, *tos/tosmask*. tosmask is an optional parameter.
flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]	Specifies that the IP ACL rule matches on the tcp flags. When +<tcpflagname> is specified, a match occurs if specified <tcpflagname> flag is set in the TCP header. When -<tcpflagname> is specified, a match occurs if specified <tcpflagname> flag is NOT set in the TCP header. When established is specified, a match occurs if either the specified RST or ACK bits are set in the TCP header. Two rules are installed in hardware to when the established option is specified. This option is available only if protocol is tcp.

Parameter	Description
[icmp-type *icmp-type* [icmp-code *icmp-code*] | icmp-message *icmp-message*]	***Note:*** This option is available only if the protocol is ICMP. Specifies a match condition for ICMP packets. When *icmp-type* is specified, IP ACL rule matches on the specified ICMP message type, a number from 0 to 255. When *icmp-code* is specified, IP ACL rule matches on the specified ICMP message code, a number from 0 to 255. Specifying *icmp-message* implies both *icmp-type* and *icmp-code* are specified. The following icmp-messages are supported: echo, echo-reply, host-redirect, mobile-redirect, net-redirect, net-unreachable, redirect, packet-too-big, port-unreachable, source-quench, router-solicitation, router-advertisement, time-exceeded, ttl-exceeded and unreachable. The ICMP message is decoded into corresponding ICMP type and ICMP code within that ICMP type.
igmp-type *igmp-type*	***Note:*** This option is visible only if the protocol is IGMP. When *igmp-type* is specified, the IP ACL rule matches on the specified IGMP message type, a number from 0 to 255.
fragments	Specifies that IP ACL rule matches on fragmented IP packets.
log	Specifies that this rule is to be logged.
time-range *time-range-name*	Allows imposing a time limitation on the ACL rule as defined by the parameter time-range-name. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive.
assign-queue *queue-id*	Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
{mirror | redirect} *unit/slot/ port*	Specifies the mirror or redirect interface which is the slot/ port to which packets matching this rule are copied or forwarded, respectively.
rate-limit *rate burst-size*	Specifies the allowed rate of traffic as per the configured rate in kbps, and burst-size in kbytes.

Example: The following shows an example of the command.

```
(Routing) (Config)#ip access-list ip1

(Routing) (Config-ipv4-acl)#permit icmp any any rate-limit 32 16

(Routing) (Config-ipv4-acl)#exit
```

9.8.6.1 no *sequence-number*

Use this command to remove the ACL rule with the specified sequence number from the ACL.

Format	`no` *`sequence-number`*
Mode	Ipv4-Access-List Config

9.8.7 ip access-group

This command either attaches a specific IP Access Control List (ACL) identified by `accesslistnumber` or `name` to an interface, range of interfaces, or all interfaces; or associates it with a VLAN ID in a given direction. The parameter `name` is the name of the Access Control List.

An optional sequence number may be specified to indicate the order of this IP access list relative to other IP access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached IP access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

An optional *control-plane* is specified to apply the ACL on CPU port. The IPv4 control packets like RADIUS and TACACS+ are also dropped because of the implicit deny all rule added at the end of the list. To overcome this, permit rules must be added to allow the IPv4 control packets.

NOTICE The keyword *control-plane* is only available in Global Config mode.

NOTICE You should be aware that the **`out`** option may or may not be available, depending on the platform.

Default	none
Format	`ip access-group {accesslistnumber|name} {{control-plane|in|out}|vlan vlan-id {in|out}} [sequence 1-4294967295]`
Modes	• Interface Config • Global Config

Parameter	Description
accesslistnumber	Identifies a specific IP ACL. The range is 1 to 199.
sequence	A optional sequence number that indicates the order of this IP access list relative to the other IP access lists already assigned to this interface and direction. The range is 1 to 4294967295.
vlan-id	A VLAN ID associated with a specific IP ACL in a given direction.
name	The name of the Access Control List.

Example: The following shows an example of the command.

```
(Routing) (Config)#ip access-group ip1 control-plane
```

9.8.7.1 no ip access-group

This command removes a specified IP ACL from an interface.

Default	none
Format	`no ip access-group {`*accesslistnumber*`|`*name*`} {{`*control-plane*`|`*in*`|`*out*`}|vlan` *vlan-id* `{in|out}}`
Mode	• Interface Config • Global Config

Example: The following shows an example of the command.

```
(Routing)(Config)#no ip access-group ip1 control-plane
```

9.8.8 acl-trapflags

This command enables the ACL trap mode.

Default	disabled
Format	`acl-trapflags`
Mode	Global Config

9.8.8.1 no acl-trapflags

This command disables the ACL trap mode.

Format	`no acl-trapflags`
Mode	Global Config

9.8.9 show ip access-lists

Use this command to view summary information about all IP ACLs configured on the switch. To view more detailed information about a specific access list, specify the ACL number or name that is used to identify the IP ACL. It displays committed rate, committed burst size, and ACL rule hit count of packets matching the configured ACL rule within an ACL. This counter value rolls-over on reaching the maximum value. There is a dedicated counter for each ACL rule. ACL counters do not interact with PBR counters.

For ACL with multiple rules, once a match occurs at any one specific rule, counters associated with this rule only get incremented for example, consider an ACL with three rules, after matching rule two, counters for rule three would not be incremented).

For ACL counters, if an ACL rule is configured without RATE-LIMIT, the counter value is count of forwarded/discarded packets (for example: If burst of 100 packets sent from IXIA, the Counter value is 100).

If an ACL rule is configured with RATE LIMIT, the counter value will be the MATCHED packet count. If the sent traffic rate exceeds the configured limit, counters will still display matched packet count (despite getting dropped beyond the configured limit since match criteria is met) that would equal the sent rate. For example, if rate limit is set to 10 kbps and 'matching' traffic is sent at 100 kbps, counters would reflect 100 kbps value. If the sent traffic rate is less than the configured limit, counters would display only matched packet count. Either way, only matched packet count is reflected in the counters, irrespective of whether they get dropped or forwarded. ACL counters do not interact with diffserv policies.

Format	`show ip access-lists [`*accesslistnumber* `|` *name*`]`
Mode	Privileged EXEC

Term	Definition
ACL Counters	Shows whether ACL counters are enabled or disabled.
Current number of ACLs	The number of ACLs of any type currently configured on the system.

Term	Definition
Maximum number of ACLs	The maximum number of ACLs of any type that can be configured on the system.
ACL ID/Name	Identifies the configured ACL number or name.
Rules	Identifies the number of rules configured for the ACL.
Direction	Shows whether the ACL is applied to traffic coming into the interface (inbound/ingress) or leaving the interface (outbound/egress).
Interface(s)	IThe interface(s) to which the ACL is applied (ACL interface bindings).
VLAN(s)	The VLANs to which the ACL is applied (ACL VLAN bindings).

If you specify an IP ACL number or name, the following information displays:

NOTICE Only the access list fields that you configure are displayed. Thus, the command output varies based on the match criteria configured within the rules of an ACL.

Term	Definition
ACL ID	The user-configured ACL identifier.
ACL Counters	Identifies whether the ACL counters are enabled or disabled.
Interface(s)	The inbound or outbound interfaces to which the ACL is applied.
Sequence Number	The number identifier for each rule that is defined for the IP ACL.
Action	The action associated with each rule. The possible values are Permit or Deny.
Match All	Indicates whether this access list applies to every packet. Possible values are True or False.
Protocol	The protocol to filter for this rule.
ICMP Type	***Note:*** This is shown only if the protocol is ICMP. The ICMP message type for this rule.
Starting Source L4 port	The starting source layer 4 port.
Ending Source L4 port	The ending source layer 4 port.
Starting Destination L4 port	The starting destination layer 4 port.
Ending Destination L4 port	The ending destination layer 4 port.
ICMP Code	***Note:*** This is shown only if the protocol is ICMP. The ICMP message code for this rule.
Fragments	If the ACL rule matches on fragmented IP packets.
Committed Rate	The committed rate defined by the rate-limit attribute.
Committed Burst Size	The committed burst size defined by the rate-limit attribute.
Source IP Address	The source IP address for this rule.
Source IP Mask	The source IP Mask for this rule.
Source L4 Port Keyword	The source port for this rule.
Destination IP Address	The destination IP address for this rule.
Destination IP Mask	The destination IP Mask for this rule.
Destination L4 Port Keyword	The destination port for this rule.
IP DSCP	The value specified for IP DSCP.
IP Precedence	The value specified IP Precedence.
IP TOS	The value specified for IP TOS.
Fragments	Specifies whether the IP ACL rule matches on fragmented IP packets is enabled.

Term	Definition
TTL Field Value	The value specified for the TTL.
Log	Displays when you enable logging for the rule.
Assign Queue	The queue identifier to which packets matching this rule are assigned.
Mirror Interface	The slot/port to which packets matching this rule are copied.
Redirect Interface	The slot/port to which packets matching this rule are forwarded.
Time Range Name	Displays the name of the time-range if the IP ACL rule has referenced a time range.
Rule Status	Status (Active/Inactive) of the IP ACL rule.
ACL Hit Count	The ACL rule hit count of packets matching the configured ACL rule within an ACL.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip access-lists ip1

ACL Name: ip1
ACL Counters: Enabled
Inbound Interface(s): 1/0/30


Sequence Number: 1
Action...................................... permit
Match All................................... FALSE
Protocol.................................... 1(icmp)
ICMP Type...................................3(Destination Unreachable)
Starting Source L4 port.....................80
Ending Source L4 port.......................85
Starting Destination L4 port................180
Ending Destination L4 port..................185
ICMP Code...................................0
Fragments...................................FALSE
Committed Rate.............................. 32
Committed Burst Size........................ 16
ACL hit count ..............................0
```

9.8.10 show access-lists

This command displays IP ACLs, IPv6 ACLs, and MAC access control lists information for a designated interface and direction. Instead of *slot/port*, `lag` *lag-intf-num* can be used as an alternate way to specify the LAG interface. `lag` *lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.Use the control-plane keyword to display the ACLs applied on the CPU port.

Format	`show access-lists interface {`*slot/port* `in|out	control-plane}`
Mode	Privileged EXEC

Term	Definition
ACL Type	Type of access list (IP, IPv6, or MAC).
ACL ID	Access List name for a MAC or IPv6 access list or the numeric identifier for an IP access list.
Sequence Number	An optional sequence number may be specified to indicate the order of this access list relative to other access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If the sequence number is not specified by the user, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used. Valid range is (1 to 4294967295).
in|out	• in – Display Access List information for a particular interface and the in direction. • out – Display Access List information for a particular interface and the out direction.

Example: The following shows an example of the command.

```
(Routing) #show access-lists interface control-plane

ACL Type             ACL ID                          Sequence Number
--------         -------------------------------  ---------------
IPv6            ip61                                    1
```

9.8.11 show access-lists vlan

This command displays Access List information for a particular VLAN ID. The ***vlan-id*** parameter is the VLAN ID of the VLAN with the information to view. The `{in | out}` options specifies the direction of the VLAN ACL information to view.

Format `show access-lists vlan` *`vlan-id`* `in|out`

Mode Privileged EXEC

Term	Definition
ACL Type	Type of access list (IP, IPv6, or MAC).
ACL ID	Access List name for a MAC or IPv6 access list or the numeric identifier for an IP access list.
Sequence Number	An optional sequence number may be specified to indicate the order of this access list relative to other access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If the sequence number is not specified by the user, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used. Valid range is (1 to 4294967295).

9.8.12 acl-traptime

This command sets the time interval for generating ACL traps. An ACL trap is generated if ACL trap generation is enabled and an ACL rule applies for an incoming packet. The generation is checked for a specified time interval. The time interval value indicates seconds. The range is 30..600, the default value is 300.

Format **`acl-traptime`** *`<30-600>`*

Mode Global Config

9.8.12.1 no acl-traptime

This command disables the time interval for generating ACL traps.

Format **`no acl-traptime`**

Mode Global Config

9.8.13 show acl-traptime

This command displays the time interval for generating ACL traps. A trap is generated if an ACL rule applies for an incoming packet.

Format `show acl-traptime`

Mode Privileged Exec

9.9 IPv6 Access Control List Commands

This section describes the commands you use to configure IPv6 Access Control List (ACL) settings. IPv6 ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources.

The following rules apply to IPv6 ACLs:

- The maximum number of ACLs you create is 100, regardless of type.
- The system supports only Ethernet II frame types.
- The maximum number of rules per IPv6 ACL is hardware dependent.

9.9.1 ipv6 access-list

This command creates an IPv6 Access Control List (ACL) identified by ***name***, consisting of classification fields defined for the IP header of an IPv6 frame. The ***name*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IPv6 access list. The rate-limit attribute configures the committed rate and the committed burst size.

If an IPv6 ACL by this name already exists, this command enters IPv6-Access-List config mode to allow updating the existing IPv6 ACL.

NOTICE The CLI mode changes to IPv6-Access-List Config mode when you successfully execute this command.

Format `ipv6 access-list` *`name`*

Mode Global Config

9.9.1.1 no ipv6 access-list

This command deletes the IPv6 ACL identified by ***name*** from the system.

Format `no ipv6 access-list` *`name`*

Mode Global Config

9.9.2 ipv6 access-list rename

This command changes the name of an IPv6 ACL. The ***name*** parameter is the name of an existing IPv6 ACL. The ***newname*** parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IPv6 access list.

This command fails is an IPv6 ACL by the name ***newname*** already exists.

Format `ipv6 access-list rename` *`name newname`*

Mode Global Config

9.9.3 ipv6 access-list resequence

Use this command to renumber the sequence numbers of the entries for specified IPv6 access list with the given increment value starting from a particular sequence number. The command is used to edit the sequence numbers of ACL rules in the ACL and change the order in which entries are applied. This command is not saved in startup configuration and is not displayed in running configuration.

NOTICE If the generated sequence number exceeds the maximum sequence number, the ACL rule creation fails and an informational message is displayed.

Default	10
Format	`ipv6 access-list resequence {name| id } starting-sequence-number increment`
Mode	Global Config

Parameter	Description
starting-sequence-number	The sequence number from which to start. The range is 1–2147483647. The default is 10.
increment	The amount to increment. The range is 1–2147483647. The default is 10.

9.9.4 {deny | permit} (IPv6)

This command creates a new rule for the current IPv6 access list. A rule may either deny or permit traffic according to the specified classification fields. At a minimum, either the ***every*** keyword or the protocol, source address, and destination address values must be specified. The source and destination IPv6 address fields may be specified using the keyword ***any*** to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format.

Format	`{deny | permit} {every | {{icmpv6 | ipv6 | tcp | udp | 0-255} {source-ipv6-prefix/prefix-length | any | host source-ipv6-address} [{range {portkey | startport} {portkey | endport} | {eq | neq | lt | gt} {portkey | 0-65535}] {destination-ipv6-prefix/prefix-length | any | host destination-ipv6-address} [{range {portkey | startport} {portkey | endport} | {eq | neq | lt | gt} {portkey | 0-65535}] [flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]] [flow-label value] [icmp-type icmp-type [icmp-code icmp-code] | icmp-message icmp-message] [routing] [fragments] [sequence sequence-number] [dscp dscp]}} [log] [assign-queue queue-id] [{mirror | redirect} slot/port] [rate-limit rate burst-size]`
Mode	IPv6-Access-List Config

NOTICE An implicit deny all IPv6 rule always terminates the access list.

The **`time-range`** parameter allows imposing time limitation on the IPv6 ACL rule as defined by the parameter ***`time-range-name`***. If a time range with the specified name does not exist and the IPv6 ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the IPv6 ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see “Time Range Commands for Time-Based ACLs” on page 807.

The assign-queue parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed ***`queue-id`*** value is 0-(n-1), where ***n*** is the number of user configurable queues available for the hardware platform. The ***`assign-queue`*** parameter is valid only for a permit rule.

For the Broadcom 5650x platform, the ***`mirror`*** parameter allows the traffic matching this rule to be copied to the specified ***`slot/port`***, while the redirect parameter allows the traffic matching this rule to be forwarded to the specified ***`slot/port`***. The ***`assign-queue`*** and ***`redirect`*** parameters are only valid for a **`permit`** rule.

NOTICE The ***`mirror`*** and ***`redirect`*** parameters are not available on the Broadcom 5630x platform.

The permit command's optional attribute rate-limit allows you to permit only the allowed rate of traffic as per the configured rate in kbps, and burst-size in kbytes.

IPv6 ACLs have the following limitations:

- Port ranges are not supported for egress IPv6 ACLs.
- For BCM5684X platforms, The IPv6 ACL *routing* keyword is not supported when an IPv6 address is specified.
- For BCM5684X and BCM5644X platforms, the IPv6 ACL *fragment* keyword matches only on the first two IPv6 extension headers for the fragment header (next header code 44). If the fragment header appears in the third or subsequent header, it is not matched.
- For platforms other than BCM5684X and BCM5644X, the IPv6 ACL *fragment* keyword matches only on the first IPv6 extension header (next header code 44). If the fragment header appears in the second or subsequent header, it is not matched.
- For platforms other than the BCM5644X, the IPv6 ACL *routing* keyword matches only on the first IPv6 extension header (next header code 43). If the fragment header appears in the second or subsequent header, it is not matched.
- The rate-limit command is not supported for egress IPv6 ACLs.

Parameter	Description
`{deny	permit}`	Specifies whether the IPv6 ACL rule permits or denies the matching traffic.
`Every`	Specifies to match every packet.
`{`*`protocolkey`*`	`*`number`*`}`	Specifies the protocol to match for the IPv6 ACL rule. The current list is: *icmpv6*, *ipv6*, *tcp*, and *udp.*
`source-ipv6-prefix/prefix-length``	any	`*`host source-ipv6-address`*	Specifies a source IPv6 source address and prefix length to match for the IPv6 ACL rule. Specifying any implies specifying "::/0 " Specifying *host source-ipv6-address* implies matching the specified IPv6 address. This *source-ipv6-address* argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

Parameter	Description
`[{range {`*`portkey`*` | `*`startport`*`} {`*`portkey`*` | `*`endport`*`} | {eq | neq | lt | gt} {`*`portkey`*` | `*`0-65535`*`} ]`	***Note:*** This option is available only if the protocol is TCP or UDP. Specifies the layer 4 port match condition for the IPv6 ACL rule. A port number can be used, in the range 0-65535, or the *portkey*, which can be one of the following keywords: • For TCP: *bgp*, *domain*, *echo*, *ftp*, *ftp-data*, *http*, *smtp*, *telnet*, *www*, *pop2*, *pop3* • For UDP: *domain*, *echo*, *ntp*, *rip*, *snmp*, *tftp*, *time*, *who*. Each of these keywords translates into its equivalent port number. When range is specified, IPv6 ACL rule matches only if the layer 4 port number falls within the specified portrange. The *startport* and *endport* parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between are part of the layer 4 port range. When eq is specified, IPv6 ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey. When lt is specified, IPv6 ACL rule matches if the layer 4 port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>. When gt is specified, IPv6 ACL rule matches if the layer 4 port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535. When neq is specified, IPv6 ACL rule matches only if the layer 4 port number is not equal to the specified port number or portkey. Two rules are added in the hardware one with range equal to 0 to <specified port number - 1> and one with range equal to <<specified port number + 1 to 65535>>
`destination-ipv6-prefix/prefix-length`` | any | `*`host destination-ipv6-address`*	Specifies a destination IPv6 source address and prefix length to match for the IPv6 ACL rule. Specifying any implies specifying “::/0 “ Specifying *host destination-ipv6-address* implies matching the specified IPv6 address. This *destination-ipv6-address* argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

Parameter	Description
`sequence` *`sequence-number`*	Specifies a sequence number for the ACL rule. Every rule receives a sequence number. The sequence number is specified by the user or is generated by the device. If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in ACL is used and this rule is placed at the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. It is not allowed to create a rule that duplicates an already existing one. A rule cannot be configured with a sequence number that is already used for another rule. For example, if a user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, user can move the ACL rule to a different position in the ACL
`[dscp` *`dscp`*`]`	Specifies the dscp value to match for for the IPv6 rule.
`flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]`	Specifies that the IPv6 ACL rule matches on the tcp flags. When +<tcpflagname> is specified, a match occurs if specified <tcpflagname> flag is set in the TCP header. When "-<tcpflagname>" is specified, a match occurs if specified <tcpflagname> flag is *NOT* set in the TCP header. When established is specified, a match occurs if specified either RST or ACK bits are set in the TCP header. Two rules are installed in hardware to when "established" option is specified. This option is visible only if protocol is "tcp".
`[icmp-type` *`icmp-type [`*`icmp-code` *`icmp-code] |`* `icmp-message` *`icmp-message`*`]`	***Note:*** This option is available only if the protocol is icmpv6. Specifies a match condition for ICMP packets. When *icmp-type* is specified, IPv6 ACL rule matches on the specified ICMP message type, a number from 0 to 255. When *icmp-code* is specified, IPv6 ACL rule matches on the specified ICMP message code, a number from 0 to 255. Specifying *icmp-message* implies both icmp-type and icmp-code are specified. The following icmp-messages are supported: *destination-unreachable*, *echo-reply*, *echo-request*, *header*, *hop-limit*, *mld-query*, *mld-reduction*, *mld-report*, *nd-na*, *nd-ns*, *next-header*, *no-admin*, *no-route*, *packet-too-big*, *port-unreachable*, *router-solicitation*, *router-advertisement*, *router-renumbering*, *time-exceeded*, and *unreachable*. The ICMP message is decoded into the corresponding ICMP type and ICMP code within that ICMP type.
`Fragments`	Specifies that IPv6 ACL rule matches on fragmented IPv6 packets (Packets that have the next header field is set to 44).
`Routing`	Specifies that IPv6 ACL rule matches on IPv6 packets that have routing extension headers (the next header field is set to 43).

Parameter	Description
`Log`	Specifies that this rule is to be logged.
`time-range` *`time-range-name`*	Allows imposing a time limitation on the ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied immediately. If a time range with the specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied when the time-range with the specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive.
`assign-queue` *`queue-id`*	Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
`{mirror | redirect}` *`unit/slot/ port`*	Specifies the mirror or redirect interface which is the slot/port to which packets matching this rule are copied or forwarded, respectively.
`rate-limit` *`rate burst-size`*	Specifies the allowed rate of traffic as per the configured rate in kbps, and burst-size in kbytes.

Example: The following shows an example of the command.

```
(Routing) (Config)#ipv6 access-list ip61

(Routing) (Config-ipv6-acl)#permit udp any any rate-limit 32 16

(Routing) (Config-ipv6-acl)#exit
```

9.9.4.1 no *sequence-number*

Use this command to remove the ACL rule with the specified sequence number from the ACL.

Format	`no` *`sequence-number`*
Mode	Ipv6-Access-List Config

9.9.5 ipv6 traffic-filter

This command either attaches a specific IPv6 ACL identified by ***name*** to an interface or range of interfaces, or associates it with a VLAN ID in a given direction. The ***name*** parameter must be the name of an existing IPv6 ACL.

An optional sequence number may be specified to indicate the order of this mac access list relative to other IPv6 access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specifiedIPv6 access list replaces the currently attached IPv6 access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

This command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The `vlan` keyword is only valid in the Global Config mode. The Interface Config mode command is only available on platforms that support independent per-port class of service queue configuration.

An optional *control-plane* is specified to apply the ACL on CPU port. The IPv6 control packets like IGMPv6 are also dropped because of the implicit *deny all* rule added at the end of the list. To overcome this, permit rules must be added to allow the IPv6 control packets.

NOTICE The keyword *control-plane* is only available in Global Config mode.

NOTICE You should be aware that the ***out*** option may or may not be available, depending on the platform.

Format	`ipv6 traffic-filter` *`name`* `{{control-plane |in|out}|vlan` *`vlan-id`* `{in|out}} [sequence` *`1-4294967295`*`]`
Modes	- Global Config - Interface Config

Example: The following shows an example of the command.

```
(Routing)(Config)#ipv6 traffic-filter ip61 control-plane
```

9.9.5.1 no ipv6 traffic-filter

This command removes an IPv6 ACL identified by ***name*** from the interface(s) in a given direction.

Format	`no ipv6 traffic-filter <`*`name`*`{{control-plane	in	out}	vlan <`*`vlan-id`*`> {in|out}}`
Modes	- Global Config - Interface Config

Example: The following shows an example of the command.

```
(Routing) (Config)#no ipv6 traffic-filter ip61 control-plane
```

9.9.6 show ipv6 access-lists

This command displays summary information of all the IPv6 Access lists. Use the access list *name* to display detailed information of a specific IPv6 ACL.

This command displays information about the attributes icmp-type, icmp-code, fragments, routing, tcp flags, and source and destination L4 port ranges. It displays committed rate, committed burst size, and ACL rule hit count of packets matching the configured ACL rule within an ACL. This counter value rolls-over on reaching the maximum value. There is a dedicated counter for each ACL rule. ACL counters do not interact with PBR counters.

For ACL with multiple rules, once a match occurs at any one specific rule, counters associated with this rule only get incremented (for example, consider an ACL with three rules, after matching rule two, counters for rule three would not be incremented).

For ACL counters, If an ACL rule is configured without RATE-LIMIT, the counter value is a count of the forwarded/discarded packets. (For example: for a burst of 100 packets, the Counter value is 100).

If an ACL rule is configured with RATE LIMIT, the counter value is that of the MATCHED packet count. If the sent traffic rate exceeds the configured limit, the counters still display matched packet count (despite getting dropped beyond the configured limit since match criteria is met) that equals the sent rate. For example, if the rate limit is set to 10 Kbps and 'matching' traffic is sent at 100 Kbps, counters would reflect 100 Kbps value. If the sent traffic rate is less than the configured limit, the counters display only the matched packet count. Either way, only the matched packet count is reflected in the counters, irrespective of whether they get dropped or forwarded. ACL counters do not interact with DiffServ policies.

Format	`show ipv6 access-lists` *`[name]`*
Mode	Privileged EXEC

Term	Definition
ACL Counters	Shows whether ACL counters are enabled or disabled.
Current number of all ACLs	The number of ACLs of any type currently configured on the system.
Maximum number of all ACLs	The number of ACLs of any type that can be configured on the system.
IPv6 ACL Name	The configured ACL name.
Rules	The number of rules configured for the ACL.
Direction	Shows whether the ACL is applied to traffic coming into the interface (inbound/ingress) or leaving the interface (outbound/egress).
Interface(s)	Identifies the interface(s) to which the ACL is applied (ACL interface bindings).
VLAN(s)	Identifies the VLANs to which the ACL is applied (ACL VLAN bindings).

If you specify an IPv6 ACL name, the following information displays:

NOTICE Only the access list fields that you configure are displayed. Thus, the command output varies based on the match criteria configured within the rules of an ACL.

Term	Definition
ACL Name	The user-configured name of the ACL.
ACL Counters	Identifies whether the ACL counters are enabled or disabled.
Interface(s)	The inbound and/or outbound interfaces to which the ACL is applied.
Sequence Number	The ordered rule number identifier defined within the IPv6 ACL.
Action	The action associated with each rule. The possible values are Permit or Deny.
Match Every	Indicates whether this access list applies to every packet. Possible values are True or False.
Protocol	The protocol to filter for this rule.
Committed Rate	The committed rate defined by the rate-limit attribute.
Committed Burst Size	The committed burst size defined by the rate-limit attribute.
Source IP Address	The source IP address for this rule.
Source L4 Port Keyword	The source port for this rule.
Destination IP Address	The destination IP address for this rule.
Destination L4 Port Keyword	The destination port for this rule.
IP DSCP	The value specified for IP DSCP.
Flow Label	The value specified for IPv6 Flow Label.
Log	Displays when you enable logging for the rule.
Assign Queue	The queue identifier to which packets matching this rule are assigned.
Mirror Interface	The *slot/port* to which packets matching this rule are copied.
Redirect Interface	The *slot/port* to which packets matching this rule are forwarded.
Time Range Name	Displays the name of the time-range if the IPv6 ACL rule has referenced a time range.
Rule Status	Status (Active/Inactive) of the IPv6 ACL rule.
ACL Hit Count	The ACL rule hit count of packets matching the configured ACL rule within an ACL.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 access-lists ip61

ACL Name: ip61
ACL Counters: Enabled

Outbound Interface(s): control-plane

Rule Number: 1
Action......................................... permit
Match Every.................................... FALSE
Protocol....................................... 17(udp)
Committed Rate................................. 32
Committed Burst Size........................... 16
ACL hit count ..................................0
```

9.10 Time Range Commands for Time-Based ACLs

Time-based ACLs allow one or more rules within an ACL to be based on time. Each ACL rule within an ACL except for the implicit *deny all* rule can be configured to be active and operational only during a specific time period. The time range commands allow you to define specific times of the day and week in order to implement time-based ACLs. The time range is identified by a name and can then be referenced by an ACL rule defined with in an ACL.

9.10.1 time-range

Use this command to create a time range identified by *name*, consisting of one absolute time entry and/or one or more periodic time entries. The *name* parameter is a case-sensitive, alphanumeric string from 1 to 31 characters that uniquely identifies the time range. An alpha-numeric string is defined as consisting of only alphabetic, numeric, dash, underscore, or space characters.

If a time range by this name already exists, this command enters Time-Range config mode to allow updating the time range entries

NOTICE When you successfully execute this command, the CLI mode changes to Time-Range Config mode.

Format	`time-range` *`name`*
Mode	Global Config

9.10.1.1 no time-range

This command deletes a time-range identified by *name*.

Format	`no time-range` *`name`*
Mode	Global Config

9.10.2 absolute

Use this command to add an absolute time entry to a time range. Only one absolute time entry is allowed per time-range. The *time* parameter is based on the currently configured time zone.

The `[start` *`time date`*`]` parameters indicate the time and date at which the configuration that referenced the time range starts going into effect. The time is expressed in a 24-hour clock, in the form of hours:minutes. For example, 8:00 is 8:00 am and 20:00 is 8:00 pm. The date is expressed in the format day month year. If no start time and date are specified, the configuration statement is in effect immediately.

The `[end` *`time date`*`]` parameters indicate the time and date at which the configuration that referenced the time range is no longer in effect. The end time and date must be after the start time and date. If no end time and date are specified, the configuration statement is in effect indefinitely.

Format	`absolute [start` *`time date`*`] [end` *`time date`*`]`
Mode	Time-Range Config

9.10.2.1 no absolute

This command deletes the absolute time entry in the time range

Format	`no absolute`
Mode	Time-Range Config

9.10.3 periodic

Use this command to add a periodic time entry to a time range. The *time* parameter is based off of the currently configured time zone.

The first occurrence of the ***days-of-the-week*** argument is the starting day(s) from which the configuration that referenced the time range starts going into effect. The second occurrence is the ending day or days from which the configuration that referenced the time range is no longer in effect. If the end days-of-the-week are the same as the start, they can be omitted

This argument can be any single day or combinations of days: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday. Other possible values are:

- daily—Monday through Sunday
- weekdays—Monday through Friday
- weekend—Saturday and Sunday

If the ending days of the week are the same as the starting days of the week, they can be omitted.

The first occurrence of the `time` argument is the starting hours:minutes which the configuration that referenced the time range starts going into effect. The second occurrence is the ending hours:minutes at which the configuration that referenced the time range is no longer in effect.

The hours:minutes are expressed in a 24-hour clock. For example, 8:00 is 8:00 am and 20:00 is 8:00 pm.

Format	`periodic` *`days-of-the-week time`* `to` *`time`*
Mode	Time-Range Config

9.10.3.1 no periodic

This command deletes a periodic time entry from a time range

Format	`no periodic` *`days-of-the-week time`* `to` *`time`*
Mode	Time-Range Config

9.10.4 show time-range

Use this command to display a time range and all the absolute/periodic time entries that are defined for the time range. Use the ***name*** parameter to identify a specific time range to display. When ***name*** is not specified, all the time ranges defined in the system are displayed.

Format	`show time-range [`*`name`*`]`
Mode	Privileged EXEC

The information in the following table displays when no time range name is specified.

Term	Definition
Admin Mode	The administrative mode of the time range feature on the switch
Current number of all Time Ranges	The number of time ranges currently configured in the system.
Maximum number of all Time Ranges	The maximum number of time ranges that can be configured in the system.
Time Range Name	Name of the time range.
Status	Status of the time range (active/inactive)
Periodic Entry count	The number of periodic entries configured for the time range.
Absolute Entry	Indicates whether an absolute entry has been configured for the time range (Exists).

9.11 Auto-Voice over IP Commands

This section describes the commands you use to configure Auto-Voice over IP (VoIP) commands. The Auto-VoIP feature explicitly matches VoIP streams in Ethernet switches and provides them with a better class-of-service than ordinary traffic. When you enable the Auto-VoIP feature on an interface, the interface scans incoming traffic for the following call-control protocols:

- Session Initiation Protocol (SIP)
- H.323
- Skinny Client Control Protocol (SCCP)

When a call-control protocol is detected, the switch assigns the traffic in that session to the highest CoS queue, which is generally used for time-sensitive traffic.

9.11.1 auto-voip

Use this command to configure auto VoIP mode. The supported modes are protocol-based and oui-based. Protocol-based auto VoIP prioritizes the voice data based on the layer 4 port used for the voice session. OUI based auto VoIP prioritizes the phone traffic based on the known OUI of the phone.

When both modes are enabled, if the connected phone OUI is one of the configured OUI, then the voice data is prioritized using OUI Auto VoIP, otherwise protocol-based Auto VoIP is used to prioritize the voice data.

Active sessions are cleared if protocol-based auto VoIP is disabled on the port.

Default	oui-based
Format	`auto-voip [protocol-based	oui-based]`
Mode	• Global Config • Interface Config

9.11.1.1 no auto-voip

Use the no form of the command to set the default mode.

9.11.2 auto-voip oui

Use this command to configure an OUI for Auto VoIP. The traffic from the configured OUI will get the highest priority over the other traffic. The *oui-prefix* is a unique OUI that identifies the device manufacturer or vendor. The OUI is specified in three octet values (each octets represented as two hexadecimal digits) separated by colons. The *string* is a description of the OUI that identifies the manufacturer or vendor associated with the OUI.

Default	A list of known OUIs is present.
Format	`auto-voip oui` *oui-prefix* `oui-desc` *string*
Mode	Global Config

Example: The following example shows how to add an OUI to the table.

```
(Routing) (Config)#auto-voip oui 00:03:6B desc "Cisco VoIPPhone"
```

9.11.2.1 no auto-voip oui

Use the no form of the command to remove a configured OUI prefix from the table.

Format	`no auto-voip oui` *oui-prefix*
Mode	Global Config

9.11.3 auto-voip oui-based priority

Use this command to configure the global OUI based auto VoIP priority. If the phone OUI is matches one of the configured OUI, then the priority of traffic from the phone is changed to OUI priority configured through this command. The *`priority-value`* is the 802.1p priority used for traffic that matches a value in the known OUI list. If the interface detects an OUI match, the switch assigns the traffic in that session to the traffic class mapped to this priority value. Traffic classes with a higher value are generally used for time-sensitive traffic.

Default	Highest available priority.
Format	`auto-voip oui-based priority` *`priority-value`*
Mode	Global Config

Example: The following example shows how to add an OUI to the table.

```
(Routing) (Config)#auto-voip oui 00:03:6B desc "Cisco VoIPPhone"
```

9.11.3.1 no auto-voip oui

Use the no form of the command to remove a configured OUI prefix from the table.

Format	`no auto-voip oui` *`oui-prefix`*
Mode	• Global Config • Interface Config

9.11.4 auto-voip protocol-based

Use this command to configure the global protocol-based auto VoIP remarking priority or traffic-class. If remark priority is configured, the voice data of the session is remarked with the priority configured through this command. The *`remark-priority`* is the 802.1p priority used for protocol-based VoIP traffic. If the interface detects a call-control protocol, the device marks traffic in that session with the specified 802.1p priority value to ensure voice traffic always gets the highest priority throughout the network path.

The *`tc`* value is the traffic class used for protocol-based VoIP traffic. If the interface detects a call-control protocol, the device assigns the traffic in that session to the configured Class of Service (CoS) queue. Traffic classes with a higher value are generally used for time-sensitive traffic. The CoS queue associated with the specified traffic class should be configured with the appropriate bandwidth allocation to allow priority treatment for VoIP traffic.

NOTICE You must enable tagging on auto VoIP enabled ports to remark the voice data upon egress.

Default	Traffic class 7
Format	`auto-voip protocol-based {remark` *`remark-priority`* `| traffic-class` *`tc`*`}`
Mode	• Global Config • Interface Config

9.11.4.1 no auto-voip protocol-based

Use this command to reset the global protocol based auto VoIP remarking priority or traffic-class to the default.

Format	`no auto-voip protocol-based {remark` *`remark-priority`* `| traffic-class` *`tc`*`}`
Mode	• Global Config • Interface Config

9.11.5 auto-voip vlan

Use this command to configure the global Auto VoIP VLAN ID. The VLAN behavior is depend on the configured auto VoIP mode. The auto-VoIP VLAN is the VLAN used to segregate VoIP traffic from other non-voice traffic. All VoIP traffic that matches a value in the known OUI list gets assigned to this VoIP VLAN.

Default	None
Format	`auto-voip vlan` *`vlan-id`*
Mode	Global Config

9.11.5.1 no auto-voip vlan

Use the no form of the command to reset the auto-VoIP VLAN ID to the default value.

Format	`no auto-voip vlan`
Mode	Global Config

9.11.6 show auto-voip

Use this command to display the auto VoIP settings on the interface or interfaces of the switch.

Format	`show auto-voip {protocol-based|oui-based} interface` {*slot/port*|`all`}
Mode	Privileged EXEC

Field	Description
VoIP VLAN ID	The global VoIP VLAN ID.
Prioritization Type	The type of prioritization used on voice traffic.
Class Value	• If the Prioritization Type is configured as `traffic-class`, then this value is the queue value. • If the Prioritization Type is configured as `remark`, then this value is 802.1p priority used to re-mark the voice traffic.
Priority	The 802.1p priority. This field is valid for OUI auto VoIP.
AutoVoIP Mode	The Auto VoIP mode on the interface.

Example: The following shows example CLI display output for the command.

```
(Routing)# show auto-voip protocol-based interface all

VoIP VLAN Id................................... 2
Prioritization Type............................ traffic-class
Class Value....................................   7

Interface      Auto VoIP  Operational Status
                  Mode
---------     -------------- -----------------
0/1           Disabled       Down
0/2           Disabled       Down
0/3           Disabled       Down
0/4           Disabled       Down
```

Example: The following shows example CLI display output for the command.

```
(Routing)# show auto-voip oui-based interface all

VoIP VLAN Id................................... 2
Priority....................................... 7
Interface    Auto VoIP    Operational Status
```

```
                Mode
---------  -------------- ------------------
0/1        Disabled       Down
0/2        Disabled       Down
0/3        Disabled       Down
0/4        Disabled       Down
0/5        Disabled       Down
```

9.11.7 show auto-voip oui-table

Use this command to display the VoIP oui-table information.

Format	`show auto-voip oui-table`
Mode	Privileged EXEC

Parameter	Description
OUI	OUI of the source MAC address.
Status	Default or configured entry.
OUI Description	Description of the OUI.

Example: The following shows example CLI display output for the command.

```
(Routing)# show auto-voip oui-table

OUI          Status          Description
---------    ----------     ---------
00:01:E3     Default         SIEMENS
00:03:6B     Default         CISCO1
00:01:01     Configured      VoIP phone
```

9.12 iSCSI Optimization Commands

This section describes commands you use to monitor iSCSI sessions and prioritize iSCSI packets. iSCSI Optimization provides a means of giving traffic between iSCSI initiator and target systems special Quality of Service (QoS) treatment. This is accomplished by monitoring traffic to detect packets used by iSCSI stations to establish iSCSI sessions and connections. Data from these exchanges is used to create classification rules that assign the traffic between the stations to a configured traffic class. Packets in the flow are queued and scheduled for egress on the destination port based on these rules.

9.12.1 iscsi aging time

This command sets the aging time for iSCSI sessions. Behavior when changing aging time:

- When aging time is increased, current sessions will be timed out according to the new value.
- When aging time is decreased, any sessions that have been dormant for a time exceeding the new setting will be immediately deleted from the table. All other sessions will continue to be monitored against the new time out value.

Default	`10 minutes`
Format	`iscsi aging time` ***`time`***
Mode	Global Config

Parameter	Description
time	The number of minutes a session must be inactive prior to its removal. Range: 1-43,200.

Example: The following example sets the aging time for iSCSI sessions to 100 minutes.

```
(switch)(config)#iscsi aging time 100
```

9.12.1.1 no iscsi aging time

Use the `no` form of the command to reset the aging time value to the default value.

Format	`no iscsi aging time`
Mode	Global Config

9.12.2 iscsi cos

This command sets the quality of service profile that will be applied to iSCSI flows. iSCSI flows are assigned by default to the highest VPT/DSCP mapped to the highest queue not used for stack management. The user should also take care of configuring the relevant Class of Service parameters for the queue in order to complete the setting.

Setting the VPT/DSCP sets the QoS profile which determines the egress queue to which the frame is mapped. The switch default setting for egress queues scheduling is Weighted Round Robin (WRR).

You may complete the QoS setting by configuring the relevant ports to work in other scheduling and queue management modes via the Class of Service settings. Depending on the platform, these choices may include strict priority for the queue used for iSCSI traffic. The downside of strict priority is that, in certain circumstances (under heavy high priority traffic), other lower priority traffic may get starved. In WRR the queue to which the flow is assigned to can be set to get the required percentage.

Format	`iscsi cos {vpt vpt	dscp dscp} [remark]`
Mode	Global Config

Parameter	Description
vpt/dscp	The VLAN Priority Tag or DSCP to assign iSCSI session packets.
remark	Mark the iSCSI frames with the configured VPT/DSCP when egressing the switch.

Example: The following example sets the quality of service profile that will be applied to iSCSI flows.

```
(switch)(config)#iscsi cos vpt 5 remark
```

9.12.2.1 no iscsi cos

Use the `no` form of the command to return to the default.

Format	`no iscsi cos`
Mode	Global Config

9.12.3 iscsi enable

This command globally enables iSCSI awareness.

Default	disabled
Format	`iscsi enable`
Mode	Global Config

Example: The following example enables iSCSI awareness.

```
(switch)(config)#iscsi enable
```

9.12.3.1 no iscsi enable

This command disables iSCSI awareness. When you use the `no iscsi enable` command, iSCSI resources will be released.

Format	`no iscsi enable`
Mode	Global Config

9.12.4 iscsi target port

This command configures an iSCSI target port and, optionally, a target system's IP address and IQN name. When working with private iSCSI ports (not IANA-assigned ports 3260/860), it is recommended to specify the target IP address as well, so that the switch will only snoop frames with which the TCP destination port is one of the configured TCP ports, and the destination IP is the target's IP address. This way the CPU will not be falsely loaded by non-iSCSI flows (if by chance other applications also choose to use these un-reserved ports.

When a port is already defined and not bound to an IP address, and you want to bind it to an IP address, you should first remove it by using the `no` form of the command and then add it again, this time together with the relevant IP address.

Target names are only for display when using the show iscsi command. These names are not used to match with the iSCSI session information acquired by snooping.

A maximum of 16 TCP ports can be configured either bound to IP or not.

Default	iSCSI well-known ports 3260 and 860 are configured as default but can be removed as any other configured target.
Format	`iscsi target port` *tcp-port-1 [tcp-port-2...tcp-port-16]* `[address` *ip-address]* `[name` *targetname*`]`
Mode	Global Config

Parameter	Description
tcp-port-n	TCP port number or list of TCP port numbers on which the iSCSI target listens to requests. Up to 16 TCP ports can be defined in the system in one command or by using multiple commands.
ip-address	IP address of the iSCSI target. When the no form of this command is used, and the tcp port to be deleted is one bound to a specific IP address, the address field must be present.
targetname	iSCSI name of the iSCSI target. The name can be statically configured; however, it can be obtained from iSNS or from sendTargets response. The initiator must present both its iSCSI Initiator Name and the iSCSI Target Name to which it wishes to connect in the first login request of a new session or connection.

Example: The following example configures TCP Port 49154 to target IP address 172.16.1.20.

```
(switch)(config)#iscsi target port 49154 address 172.16.1.20
```

9.12.4.1 no iscsi target port

Use the `no` form of the command to delete an iSCSI target port, address, and name.

9.12.5 show iscsi

This command displays the iSCSI settings.

Format	`show iscsi`
Mode	Privileged EXEC

Example: The following are examples of the commands used for iSCSI.

Example #1: Show iSCSI (Default Configuration)

```
(switch)#show iscsi
iSCSI disabled
iSCSI vpt is 5, remark
Session aging time: 10 min
Maximum number of sessions is 192
--------------------------------------------
iSCSI Targets and TCP ports:
--------------------------------------------
TCP Port   Target IP Address     Name
860        Not Configured        Not Configured
3260       Not Configured        Not Configured
```

Example #2: Enable iSCSI.

```
(switch)#configure
(switch)(config)#iscsi enable
```

Example #3: Show iSCSI (After Enable)

The following configuration detects iSCSI sessions and connections established using TCP ports 3260 or 860. Packets sent on detected iSCSI TCP connections are assigned to traffic class 2 (see the CoS configuration shown below). Since remark is enabled, the packets are marked with IEEE 802.1p priority to 5 before transmission.

```
(switch)#show iscsi
iscsi enabled
iSCSI vpt is 5, remark
Session aging time: 10 min
Maximum number of sessions is 192
--------------------------------------------
iSCSI Targets and TCP ports:
--------------------------------------------
TCP Port   Target IP Address     Name
860        Not Configured        Not Configured
3260       Not Configured        Not Configured

(switch)#show classofservice dot1p-mapping
User Priority    Traffic Class
-------------    -------------
       0               1
       1               0
       2               0
       3               1
       4               2
       5               2
       6               3
       6               3
```

9.12.6 show iscsi sessions

This command displays the iSCSI sessions.

Default	`If not specified, sessions are displayed in short mode (not detailed).`
Format	`show iscsi sessions [detailed]`
Mode	Privileged EXEC

Example: The following example displays the iSCSI sessions.

```
(switch) # show iscsi sessions
Target: iqn.1993-11.com.disk-vendor:diskarrays.sn.45678
-----------------------------------------------------------
Initiator: iqn.1992-04.com.os-vendor.plan9:cdrom.12
ISID: 11
Initiator: iqn.1995-05.com.os-vendor.plan9:cdrom.10
ISID: 222
-----------------------------------------------------------
Target: iqn.103-1.com.storage-vendor:sn.43338.
storage.tape:sys1.xyz
Session 3:
Initiator: iqn.1992-04.com.os-vendor.plan9:cdrom.12
Session 4:
Initiator: iqn.1995-05.com.os-vendor.plan9:cdrom.10
-----------------------------------------------------------
```

```
(switch)# show iscsi sessions detailed
Target: iqn.1993-11.com.disk-vendor:diskarrays.sn.45678
-----------------------------------------------------------
Session 1:

Initiator: iqn.1992-04.com.os
vendor.plan9:cdrom.12.storage:sys1.xyz
-----------------------------------------------------------
Time started: 17-Jul-2008 10:04:50
Time for aging out: 10 min
ISID: 11

Initiator         Initiator         Target            Target
IP address        TCP port          IP address        IP port
172.16.1.3        49154             172.16.1.20       30001
172.16.1.4        49155             172.16.1.21       30001
172.16.1.5        49156             172.16.1.22       30001

Session 2:
-----------------------------------------------------------
Initiator: iqn.1995-05.com.os-vendor.plan9:cdrom.10
Time started: 17-Aug-2008  21:04:50
Time for aging out: 2 min
ISID: 22
Initiator         Initiator         Target            Target
IP address        TCP port          IP address        IP port
172.16.1.30       49200             172.16.1.20       30001
172.16.1.30       49201             172.16.1.21       30001
```

10/ IP Multicast Commands

This chapter describes the IP Multicast commands available in the FASTPATH CLI.

The IP Multicast Commands chapter contains the following sections:

NOTICE The commands in this chapter are in one of two functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.

10.1 Multicast Commands

This section describes the commands you use to configure IP Multicast and to view IP Multicast settings and statistics.

10.1.1 ip mcast boundary

This command adds an administrative scope multicast boundary specified by ***groupipaddr*** and ***mask*** for which this multicast administrative boundary is applicable. ***groupipaddr*** is a group IP address and ***mask*** is a group IP mask. This command can be used to configure a single interface or a range of interfaces.

Format	ip mcast boundary *groupipaddr mask*
Mode	Interface Config

10.1.1.1 no ip mcast boundary

This command deletes an administrative scope multicast boundary specified by ***groupipaddr*** and ***mask*** for which this multicast administrative boundary is applicable. ***groupipaddr*** is a group IP address and ***mask*** is a group IP mask.

Format	no ip mcast boundary *groupipaddr mask*
Mode	Interface Config

10.1.2 ip mroute

This command configures an IPv4 Multicast Static Route for a source.

Default	No MRoute is configured on the system.
Format	ip mroute *src-ip-addr src-mask rpf-addr preference*
Mode	Global Config

Parameter	Description
src-ip-addr	The IP address of the multicast source network.
src-mask	The IP mask of the multicast data source.
rpf-ip-addr	The IP address of the RPF next-hop router toward the source.
preference	The administrative distance for this Static MRoute, that is, the preference value. The range is 1 to 255.

10.1.2.1 no ip mroute

This command removes the configured IPv4 Multicast Static Route.

Format	no ip mroute *src-ip-addr*
Mode	Global Config

10.1.3 ip multicast

This command sets the administrative mode of the IP multicast forwarder in the router to active. This command also enables the administrative mode of IPv6 multicast routing.

Default	disabled
Format	ip multicast
Mode	Global Config

10.1.3.1 no ip multicast

This command sets the administrative mode of the IP multicast forwarder in the router to inactive.

Format	`no ip multicast`
Mode	Global Config

10.1.4 ip multicast ttl-threshold

This command is specific to IPv4. Use this command to apply the given Time-to-Live threshold value to a routing interface or range of interfaces. The `ttl-threshold` is the TTL threshold which is to be applied to the multicast Data packets which are to be forwarded from the interface. This command sets the Time-to-Live threshold value such that any data packets forwarded over the interface having TTL value above the configured value are dropped. The value for `ttl-threshold` ranges from 0 to 255.

Default	1
Format	`ip multicast ttl-threshold` *`ttlvalue`*
Mode	Interface Config

10.1.4.1 no ip multicast ttl-threshold

This command applies the default `ttl-threshold` to a routing interface. The `ttl-threshold` is the TTL threshold which is to be applied to the multicast Data packets which are to be forwarded from the interface.

Format	`no ip multicast ttl-threshold`
Mode	Interface Config

10.1.5 show ip mcast

This command displays the system-wide multicast information.

Format	`show ip mcast`
Modes	- Privileged EXEC - User EXEC

Term	Definition
Admin Mode	The administrative status of multicast. Possible values are enabled or disabled.

Term	Definition
Protocol State	The current state of the multicast protocol. Possible values are Operational or Non-Operational.
Table Max Size	The maximum number of entries allowed in the multicast table.
Protocol	The multicast protocol running on the router. Possible values are PIMDM, PIMSM, or DVMRP.
Multicast Forwarding Cache Entry Count	The number of entries in the multicast forwarding cache.

10.1.6 show ip mcast boundary

This command displays all the configured administrative scoped multicast boundaries. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format `show ip mcast boundary {slot/port|vlan 1-4093|all}`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port*
Group Ip	The group IP address.
Mask	The group IP mask.

10.1.7 show ip mcast interface

This command displays the multicast information for the specified interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format `show ip mcast interface {slot/port|vlan 1-4093}`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port*
TTL	The time-to-live value for this interface.

10.1.8 show ip mroute

This command displays a summary or all the details of the multicast table.

NOTICE This command replaces the `show ip mcast mroute` command.

Format `show ip mroute {detail | summary | group group-address | source source-address}`

Modes
- Privileged EXEC
- User EXEC

If you use the **`detail,`** `group`, or `source` parameters in PIM Sparse mode, the command displays the following fields:

Parameter	Description
Flags	• F: Register flag. Indicates that the source connected router is sending registers to RP. This flag can be seen only on Designated Router connected to source. • T: SPT-bit set. Indicates that packets have been received on the shortest path source tree. • R: RP-bit set. Indicates that the (S, G) entry is pointing toward the RP. This flag typically indicates a prune state along the shared tree for a particular source.
Outgoing interface flags	• C: Connected. A member of the multicast group is directly connected to the interface. • J: Received PIM (*,G) Join on this interface.
Timers:Uptime/Expires	• Uptime: Indicates per interface how long (in hours, minutes, and seconds) the entry has been in the IP multicast routing table. • Expires: Indicates per interface how long (in seconds) until the entry will be removed from the IP multicast routing table
Counters	• Joins: Indicates the number of (*,G) or (S,G) joins received for the given entry. • Prunes: Indicates the number of (*,G) or (S,G) prunes received for the given entry. • Registers: Indicates the number of register messages received for the given (S,G) entry. • Register Stops: Indicates the number of register stop messages received for the given (S,G) entry.
RPF Address	IP address of the upstream router to the source.
Outgoing interface list	List of outgoing Interfaces.
Protocol	The current operating multicast routing protocol.
RP	Address of the RP router.
Incoming interface	Expected interface for a multicast packet from the source. If the packet is not received on this interface, it is discarded.

If you use the **`detail`** parameter in any mode other than PIM sparse mode, the command displays the following fields:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the **`summary`** parameter in PIM Sparse mode, the command displays the following fields:

Parameter	Description
Source IP	Source address of the multicast route entry.
Group IP	Group address of the multicast route entry.
Protocol	The current operating multicast routing protocol.
Incoming Interface	Expected interface for a multicast packet from the source. If the packet is not received on this interface, it is discarded.
Outgoing Interface List	List of outgoing Interfaces.

If you use the `summary` parameter, the command displays the following fields:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which the entry was created.
Incoming Interface	The interface on which the packet for the source/group arrives.
Outgoing Interface List	The list of outgoing interfaces on which the packet is forwarded.

Example: This example shows the output for the summary parameter in PIM Sparse mode.

```
(FASTPATH Routing) #show  ip mroute summary

                  Multicast route table summary
                                           Incoming  Outgoing
Source IP       Group IP        Protocol   Interface Interface List
--------------- --------------- ---------- --------- ---------------
192.168.10.1    225.1.1.1        PIMSM      Vl10     Vl20, Vl30
```

Example: This example shows the output for the detail parameter in PIM Sparse mode.

```
IP Multicast Routing Table
Flags: C - Connected, J - Received Pim (*,G) Join,
R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime/Expires    Protocol: PIMSM

( *,225.6.6.6)
00:00:41/000    RP: 1.1.1.1
Joins/Prunes: 0/0
Incoming interface:            RPF nbr: 0.0.0.0
Outgoing interface list:
4/1        00:00:41/218    Joins:          0    Flags:   C

( *,225.7.7.7)
00:00:36/000    RP: 1.1.1.1
Joins/Prunes: 0/0
Incoming interface:            RPF nbr: 0.0.0.0
Outgoing interface list:
4/1        00:00:36/224    Joins:          0    Flags:   C

(3.3.3.11,225.6.6.6)
00:00:51/158    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/2        RPF nbr: 3.3.3.11
Outgoing interface list:
4/1        00:00:41/000    Joins:          0

(3.3.3.11,225.7.7.7)
00:17:42/201    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/2        RPF nbr: 3.3.3.11
Outgoing interface list:
4/1        00:00:36/000    Joins:          0
```

Example: This example shows the output for the detail parameter in PIM Dense mode when a multicast routing protocol other than PIMSM is enabled.

```
(FASTPATH Routing) (Config)#show ip mroute detail

IP Multicast Routing Table
                                Expiry Time   Up Time
Source IP       Group IP        (hh:mm:ss)    (hh:mm:ss)    RPF Neighbor    Flags
--------------- --------------- ------------- ------------- --------------- -----
192.168.10.1    225.1.1.1       00:02:45      05:37:09      192.168.20.5    SPT
```

Example: This example shows IPv6 output for the detail parameter in PIM Sparse mode.

```
#show ipv6 mroute detail

IP Multicast Routing Table
Flags: C - Connected, J - Received Pim (*,G) Join,
R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime/Expires    Protocol: PIMSM

( *,ff43::3)
00:00:41/000    RP: 2001::1
Joins/Prunes: 0/0
Incoming interface:            RPF nbr: ::
Outgoing interface list:
4/1        00:00:41/219    Joins:          0    Flags:   C

( *,ff24::6)
00:00:22/000    RP: 2001::1
Joins/Prunes: 0/0
Incoming interface:            RPF nbr: ::
Outgoing interface list:
4/1        00:00:41/219    Joins:          0    Flags:   C

(3001::10,ff43::3)
00:00:07/203    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/2        RPF nbr: 3001::10
Outgoing interface list:
4/1        00:00:07/000    Joins:          0

(4001::33,ff22::3)
00:00:55/108    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/1        RPF nbr: 3001::10
Outgoing interface list:
4/2        00:00:66/000    Joins:          0

(3001::10,ff43::3)
00:00:07/203    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/1        RPF nbr: 3001::10
Outgoing interface list:
4/2        00:00:77/000    Joins:          0
```

Example: This example shows output for the group parameter in PIM Sparse mode.

```
(U16)# show ip mroute group 229.10.0.1
IP Multicast Routing Table

Flags: C - Connected,J - Received PIM (*,G) Join,
       R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime(HH:MM:SS)/Expiry(SSS)
Protocol: PIMSM

(*, 229.10.0.1), 00:04:35/179, RP: 192.0.2.20
```

```
Joins/Prunes: 20/1
Incoming interface: Null, RPF Address: 0.0.0.0
Outgoing interface list:
    VLAN 6    00:00:30/150  Joins:15  Flags: C
    VLAN 5    00:04:35/150  Joins:10  Flags: C
    VLAN 2    00:01:28/0    Joins:20  Flags: J

(192.0.2.20, 229.10.0.1), 00:04:35/177, Flags: T
Joins/Prunes:20/1 , Reg/Reg-Stop:100/0
Incoming interface: VLAN 2, RPF Address: 0.0.0.0
Outgoing interface list:
    VLAN 5    00:03:25/0    Joins:20
    VLAN 6    00:00:10/0    Joins:5
```

Example: The following example shows output for the source parameter in PIM Sparse mode.

```
(U16)# show ip mroute source 192.0.2.20
IP Multicast Routing Table

Flags: C - Connected,J - Received PIM (*,G) Join,
       R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime(HH:MM:SS)/Expiry(SSS)
Protocol: PIMSM

(192.0.2.20, 229.10.0.1), 00:04:35/177, Flags: T
Joins/Prunes:20/1 , Reg/Reg-Stop:100/0
Incoming interface: VLAN 2, RPF Address: 0.0.0.0
Outgoing interface list:
    VLAN 5    00:03:25/0    Joins:20
    VLAN 6    00:00:10/0    Joins:5
```

10.1.9 show ip mcast mroute group

This command displays the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given *groupipaddr*.

Format	`show ip mcast mroute group` *`groupipaddr`* `{detail	summary}`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this group arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

10.1.10 show ip mcast mroute source

This command displays the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given source IP address or source IP address and group IP address pair.

Format	`show ip mcast mroute source` *`sourceipaddr`* `{summary |` *`groupipaddr`*`}`
Modes	• Privileged EXEC • User EXEC

If you use the ***groupipaddr*** parameter, the command displays the following column headings in the output table:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the `summary` parameter, the command displays the following column headings in the output table:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this source arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

10.1.11 show ip mcast mroute static

Use the `show ip mcast mroute static` command in Privileged EXEC or User EXEC mode to display all the static routes configured in the static mcast table, if it is specified, or display the static route associated with the particular *sourceipaddr*.

Format	`show ip mcast mroute static [`*`sourceipaddr`*`]`
Modes	• Privileged EXEC • User EXEC

Parameter	Description
Source IP	IP address of the multicast source network.
Source Mask	The subnetwork mask pertaining to the sourceIP.
RPF Address	The IP address of the RPF next-hop router toward the source.
Preference	The administrative distance for this Static MRoute.

Example: The following shows example CLI display output for the command.

```
console#show ip mcast mroute static

                        MULTICAST STATIC ROUTES
Source IP          Source Mask    RPF Address     Preference
--------------- --------------- --------------- ----------
1.1.1.1         255.255.255.0   2.2.2.2         23
```

10.1.12 clear ip mroute

This command deletes all or the specified IP multicast route entries.

NOTICE This command only clears dynamic mroute entries. It does not clear static mroutes.

Format `clear ip mroute {*|group-address[source-address]}`

Modes Privileged EXEC

Parameter	Description
*	Deletes all IPv4 entries from the IP multicast routing table.
group-address	IP address of the multicast group.
source-address	The IP address of a multicast source that is sending multicast traffic to the group.

Example: The following deletes all entries from the IP multicast routing table:

```
(Broadcom FASTPATH Routing) # clear ip mroute *
```

Example: The following deletes all entries from the IP multicast routing table that match the given multicast group address (224.1.2.1), irrespective of which source is sending for this group:

```
(Broadcom FASTPATH Routing) # clear ip mroute 224.1.2.1
```

Example: The following deletes all entries from the IP multicast routing table that match the given multicast group address (224.1.2.1) and the multicast source address (192.168.10.10):

```
(Broadcom FASTPATH Routing) # clear ip mroute 224.1.2.1 192.168.10.10
```

10.1.13 multicast (interface)

This command configures the port based multicast handling. The command defines the handling for port specific unregistered multicast addresses. The default handling in FASTPATH is that such packets are flooded (argument 'default'). The user can change the behavior that such packets are dropped (argument 'none'). The flooding mode is set per port. It can be applied to either individual physical ports or to a port-channel.

Format `multicast flood {default | none}`

Mode Interface Config

10.1.14 show port multicast

This command displays the port based multicast handling. The commands displays for a specified interface or all interfaces the multicast flooding settings. The displayed fields are

- the interface
- the multicast flooding, indicating whether a packet with unregistered multicast address should be flooded or not (yes/no).

Format `show port multicast {<slot/port> | all}`

Mode Priviledged Exec

10.2 DVMRP Commands

This section describes the Distance Vector Multicast Routing Protocol (DVMRP) commands.

10.2.1 ip dvmrp

This command sets administrative mode of DVMRP in the router to active.

Default	disabled
Format	`ip dvmrp`
Mode	Global Config

10.2.1.1 no ip dvmrp

This command sets administrative mode of DVMRP in the router to inactive.

Format	`no ip dvmrp`
Mode	Global Config

10.2.2 ip dvmrp metric

This command configures the metric for an interface or range of interfaces. This value is used in the DVMRP messages as the cost to reach this network. This field has a range of 1 to 31.

Default	1
Format	`ip dvmrp metric` *`metric`*
Mode	Interface Config

10.2.2.1 no ip dvmrp metric

This command resets the metric for an interface to the default value. This value is used in the DVMRP messages as the cost to reach this network.

Format	`no ip dvmrp metric`
Mode	Interface Config

10.2.3 ip dvmrp trapflags

This command enables the DVMRP trap mode.

Default	disabled
Format	`ip dvmrp trapflags`
Mode	Global Config

10.2.3.1 no ip dvmrp trapflags

This command disables the DVMRP trap mode.

Format	`no ip dvmrp trapflags`
Mode	Global Config

10.2.4 ip dvmrp

This command sets the administrative mode of DVMRP on an interface or range of interfaces to active.

Default	disabled
Format	`ip dvmrp`
Mode	Interface Config

10.2.4.1 no ip dvmrp

This command sets the administrative mode of DVMRP on an interface to inactive.

Format	`no ip dvmrp`
Mode	Interface Config

10.2.5 show ip dvmrp

This command displays the system-wide information for DVMRP.

Format	`show ip dvmrp`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Admin Mode	Indicates whether DVMRP is enabled or disabled.
Version String	The version of DVMRP being used.
Number of Routes	The number of routes in the DVMRP routing table.
Reachable Routes	The number of entries in the routing table with non-infinite metrics.

The following fields are displayed for each interface.

Term	Definition
Interface	*slot/port*
Interface Mode	The mode of this interface. Possible values are Enabled and Disabled.
State	The current state of DVMRP on this interface. Possible values are Operational or Non-Operational.

10.2.6 show ip dvmrp interface

This command displays the interface information for DVMRP on the specified interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format `show ip dvmrp interface {slot/port|vlan 1-4093}`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface Mode	Indicates whether DVMRP is enabled or disabled on the specified interface.
Metric	The metric of this interface. This is a configured value.
Local Address	The IP address of the interface.

The following field is displayed only when DVMRP is operational on the interface.

Term	Definition
Generation ID	The Generation ID value for the interface. This is used by the neighboring routers to detect that the DVMRP table should be resent.

The following fields are displayed only if DVMRP is enabled on this interface.

Term	Definition
Received Bad Packets	The number of invalid packets received.
Received Bad Routes	The number of invalid routes received.
Sent Routes	The number of routes that have been sent on this interface.

10.2.7 show ip dvmrp neighbor

This command displays the neighbor information for DVMRP.

Format `show ip dvmrp neighbor`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
IfIndex	The value of the interface used to reach the neighbor.
Nbr IP Addr	The IP address of the DVMRP neighbor for which this entry contains information.
State	The state of the neighboring router. The possible value for this field are ACTIVE or DOWN.
Up Time	The time since this neighboring router was learned.
Expiry Time	The time remaining for the neighbor to age out. This field is not applicable if the State is DOWN.
Generation ID	The Generation ID value for the neighbor.
Major Version	The major version of DVMRP protocol of neighbor.
Minor Version	The minor version of DVMRP protocol of neighbor.
Capabilities	The capabilities of neighbor.
Received Routes	The number of routes received from the neighbor.
Rcvd Bad Pkts	The number of invalid packets received from this neighbor.

Term	Definition
Rcvd Bad Routes	The number of correct packets received with invalid routes.

10.2.8 show ip dvmrp nexthop

This command displays the next hop information on outgoing interfaces for routing multicast datagrams.

Format	`show ip dvmrp nexthop`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Source IP	The sources for which this entry specifies a next hop on an outgoing interface.
Source Mask	The IP Mask for the sources for which this entry specifies a next hop on an outgoing interface.
Next Hop Interface	The interface in ***slot/port*** format for the outgoing interface for this next hop.
Type	The network is a LEAF or a BRANCH.

10.2.9 show ip dvmrp prune

This command displays the table listing the router's upstream prune information.

Format	`show ip dvmrp prune`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Group IP	The multicast Address that is pruned.
Source IP	The IP address of the source that has pruned.
Source Mask	The network Mask for the prune source. It should be all 1s or both the prune source and prune mask must match.
Expiry Time (secs)	The expiry time in seconds. This is the time remaining for this prune to age out.

10.2.10 show ip dvmrp route

This command displays the multicast routing information for DVMRP.

Format	`show ip dvmrp route`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Source Address	The multicast address of the source group.
Source Mask	The IP Mask for the source group.
Upstream Neighbor	The IP address of the neighbor which is the source for the packets for a specified multicast address.
Interface	The interface used to receive the packets sent by the sources.
Metric	The distance in hops to the source subnet. This field has a different meaning than the Interface Metric field.

Term	Definition
Expiry Time (secs)	The expiry time in seconds, which is the time left for this route to age out.
Up Time (secs)	The time when a specified route was learnt, in seconds.

10.3 PIM Commands

This section describes the commands you use to configure Protocol Independent Multicast -Dense Mode (PIM-DM) and Protocol Independent Multicast - Sparse Mode (PIM-SM). PIM-DM and PIM-SM are multicast routing protocols that provides scalable inter-domain multicast routing across the Internet, independent of the mechanisms provided by any particular unicast routing protocol. Only one PIM mode can be operational at a time.

10.3.1 ip pim dense

This command administratively enables the PIM Dense mode across the router.

Default	disabled
Format	`ip pim dense`
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ip pim dense
```

10.3.1.1 no ip pim dense

This command administratively disables the PIM Dense mode across the router.

Format	`no ip pim dense`
Mode	Global Config

10.3.2 ip pim sparse

This command administratively enables the PIM Sparse mode across the router.

Default	disabled
Format	`ip pim sparse`
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ip pim sparse
```

10.3.2.1 no ip pim sparse

This command administratively disables the PIM Sparse mode across the router.

Format	`no ip pim sparse`
Mode	Global Config

10.3.3 ip pim

Use this command to administratively enable PIM on the specified interface.

Default	disabled
Format	`ip pim`
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(FASTPATH) (Interface 0/1) #ip pim
```

10.3.3.1 no ip pim

Use this command to disable PIM on the specified interface.

Format	`no ip pim`
Mode	Interface Config

10.3.4 ip pim hello-interval

This command configures the transmission frequency of PIM hello messages the specified interface. This field has a range of 0 to 18000 seconds.

Default	30
Format	`ip pim hello-interval` *`seconds`*
Mode	Interface Config

Example: The following shows an example of the command.

```
(FASTPATH) (Interface 0/1) #ip pim hello-interval 50
```

10.3.4.1 no ip pim hello-interval

This command resets the transmission frequency of hello messages between PIM enabled neighbors to the default value.

Format	`no ip pim hello-interval`
Mode	Interface Config

10.3.5 ip pim bsr-border

Use this command to prevent bootstrap router (BSR) messages from being sent or received on the specified interface.

NOTICE This command takes effect only when Sparse mode in enabled in the Global mode.

Default	disabled
Format	`ip pim bsr-border`
Mode	Interface Config

Example: The following shows an example of the command.

```
(FASTPATH) (Interface 0/1) #ip pim bsr-border
```

10.3.5.1 no ip pim bsr-border

Use this command to disable the specified interface from being the BSR border.

Format	`no ip pim bsr-border`
Mode	Interface Config

10.3.6 ip pim bsr-candidate

This command is used to configure the router to announce its candidacy as a bootstrap router (BSR). The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	Disabled
Format	`ip pim bsr-candidate interface {`*`slot/port`*`|vlan `*`1-4093`*`}` *`hash-mask-length [bsr-priority]`* `[interval `*`interval`*`]`
Mode	Global Config

Parameters	Description
slot/port	Interface number on this router from which the BSR address is derived, to make it a candidate. This interface must be enabled with PIM.
hash-mask-length	Length of a mask (32 bits maximum) that is to be ANDed with the group address before the hash function is called. All groups with the same seed hash correspond to the same RP. For example, if this value is 24, only the first 24 bits of the group addresses matter. This allows you to get one RP for multiple groups.
bsr-priority	Priority of the candidate BSR. The range is an integer from 0 to 255. The BSR with the larger priority is preferred. If the priority values are the same, the router with the larger IP address is the BSR. The default value is 0.
interval	[Optional] Indicates the BSR candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(FASTPATH) (Config) #ip pim bsr-candidate interface 0/1 32 5
(FASTPATH) (Config) #ip pim bsr-candidate interface 0/1 32 5 interval 100
```

10.3.6.1 no ip pim bsr-candidate

Use this command to remove the configured PIM Candidate BSR router.

Format	`no ip pim bsr-candidate interface {`*`slot/port`*`|vlan `*`1-4093`*`}`
Mode	Global Config

10.3.7 ip pim dr-priority

Use this command to set the priority value for which a router is elected as the designated router (DR).

NOTICE This command takes effect only when Sparse mode is enabled in the Global mode.

Default	1
Format	`ip pim dr-priority` *`0-2147483647`*
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(FASTPATH) (Interface 0/1) #ip pim dr-priority 10
```

10.3.7.1 no ip pim dr-priority

Use this command to return the DR Priority on the specified interface to its default value.

Format	`no ip pim dr-priority`
Mode	Interface Config

10.3.8 ip pim join-prune-interval

Use this command to configure the frequency of PIM Join/Prune messages on a specified interface. The join/prune interval is specified in seconds. This parameter can be configured to a value from 0 to 18000.

NOTICE This command takes effect only when is configured as the PIM mode.

Default	60
Format	`ip pim join-prune-interval` *`0-18000`*
Mode	Interface Config

Example: The following shows examples of the command.

```
(FASTPATH) (Interface 0/1) #ip pim join-prune-interval 90
```

10.3.8.1 no ip pim join-prune-interval

Use this command to set the join/prune interval on the specified interface to the default value.

Format	`no ip pim join-prune-interval`
Mode	Interface Config

10.3.9 ip pim rp-address

This command defines the address of a PIM Rendezvous point (RP) for a specific multicast group range.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	0
Format	`ip pim rp-address` *`rp-address group-address group-mask`* `[override]`
Mode	Global Config

Parameter	Description
rp-address	The IP address of the RP.
group-address	The group address supported by the RP.
group-mask	The group mask for the group address.
override	[Optional] Indicates that if there is a conflict, the RP configured with this command prevails over the RP learned by BSR.

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ip pim rp-address 192.168.10.1
   224.1.2.0 255.255.255.0
```

10.3.9.1 no ip pim rp-address

Use this command to remove the address of the configured PIM Rendezvous point (RP) for the specified multicast group range.

Format	no ip pim rp-address *rp-address group-address group-mask* [override]
Mode	Global Config

10.3.10 ip pim rp-candidate

Use this command to configure the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR) for a specific multicast group range. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	Disabled
Format	ip pim rp-candidate interface {*slot/port*|vlan *1-4093*} *group-address group-mask* [interval *interval*]
Mode	Global Config

Parameter	Description
slot/port	The IP address associated with this interface type and number is advertised as a candidate RP address. This interface must be enabled with PIM.
group-address	The multicast group address that is advertised in association with the RP address.
group-mask	The multicast group prefix that is advertised in association with the RP address.
interval	[Optional] Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(FASTPATH) (Config) #ip pim rp-candidate interface 0/1 224.1.2.0 255.255.255.0
(FASTPATH) (Config) #ip pim rp-candidate interface 0/1 224.1.2.0 255.255.255.0 interval 200
```

10.3.10.1 no ip pim rp-candidate

Use this command to remove the configured PIM candidate Rendezvous point (RP) for a specific multicast group range.

Format	no ip pim rp-candidate interface {*slot/port*|vlan *1-4093*} *group-address group-mask*
Mode	Global Config

10.3.11 ip pim ssm

Use this command to define the Source Specific Multicast (SSM) range of IP multicast addresses on the router.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	disabled
Format	ip pim ssm {default | *group-address group-mask*}
Mode	Global Config

Parameter	Description
default-range	Defines the SSM range access list to 232/8.

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ip pim ssm default
(FASTPATH) (Config) #ip pim ssm 232.1.2.0 255.255.255.0
```

10.3.11.1 no ip pim ssm

Use this command to remove the Source Specific Multicast (SSM) range of IP multicast addresses on the router.

Format	no ip pim ssm {default | *group-address group-mask*}
Mode	Global Config

10.3.12 ip pim-trapflags

This command enables the PIM trap mode for both Sparse Mode (SM) and Dense Mode. (DM).

Default	disabled
Format	ip pim-trapflags
Mode	Global Config

10.3.12.1 no ip pim-trapflags

This command sets the PIM trap mode to the default.

Format	no ip pim-trapflags
Mode	Global Config

10.3.13 ip pim spt-threshold

Use this command to configure the Data Threshold rate for the last-hop router to switch to the shortest path on the router. The rate is specified in Kilobits per second. The possible values are 0 to 2000.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	`0`
Format	`ip pim spt-threshold` *`0-2000`*
Modes	Global Config

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ip pim spt-threshold 100
```

10.3.13.1 no ip pim spt-threshold

This command is used to set the data threshold rate for the RP router to the default value.

Format	`no ip pim-spt-threshold`
Mode	Global Config

10.3.14 show ip mfc

This command displays mroute entries in the multicast forwarding (MFC) database.

Format	`show ip mfc`
Modes	• Privileged EXEC • User EXEC

Terms	Parameters
MFC IPv4 Mode	Enabled when IPv4 Multicast routing is operational.
MFC IPv6 Mode	Enabled when IPv6 Multicast routing is operational.
MFC Entry Count	The number of entries present in MFC.
Current multicast IPv4 Protocol	The current operating IPv4 multicast routing protocol.
Current multicast IPv6 Protocol	The current operating multicast IPv6 routing protocol.
Total Software Forwarded packets	Total Number of multicast packets forwarded in software.
Source Address	Source address of the multicast route entry.
Group Address	Group address of the multicast route entry.
Packets Forwarded in Software for this entry	Number of multicast packets that are forwarded in software for a specific multicast route entry,
Protocol	Multicast Routing Protocol that has added a specific entry
Expiry Time (secs)	Expiry time for a specific Multicast Route entry in seconds.
Up Time (secs)	Up Time in seconds for a specific Multicas Routing entry.
Incoming interface	Incoming interface for a specific Multicast Route entry.
Outgoing interface list	Outgoing interface list for a specific Multicast Route entry.

Example:

```
(FASTPATH Routing) (Config)#show ip mfc

MFC IPv4 Mode.................................. Enabled
MFC IPv6 Mode.................................. Disabled
MFC Entry Count ............................... 1
Current multicast IPv4 protocol................ PIMSM
Current multicast IPv6 protocol................ No protocol enabled.
Total software forwarded packets .............. 0

Source address: 192.168.10.5
Group address: 225.1.1.1
Packets forwarded in software for this entry: 0           Protocol: PIM-SM
Expiry Time (secs): 206      Up Time (secs): 4
Incoming interface: 0/10    Outgoing interface list: None
```

10.3.15 show ip pim

This command displays the system-wide information for PIM-DM or PIM-SM.

Format	`show ip pim`
Modes	Privileged EXEC User EXEC

NOTICE If the PIM mode is PIM-DM (dense), some of the fields in the following table do not display in the command output because they are applicable only to PIM-SM.

Term	Definition
PIM Mode	Indicates the configured mode of the PIM protocol as dense (PIM-DM) or sparse (PIM-SM)
Interface	*slot/port*
Interface Mode	Indicates whether PIM is enabled or disabled on this interface.
Operational Status	The current state of PIM on this interface: Operational or Non-Operational.

Example: The following shows example CLI display output for the command.

Example #1: PIM Mode - Dense

```
(FASTPATH) #show ip pim

PIM Mode       Dense

InterfaceInterface-ModeOperational-Status
---------   --------------    ------------------
0/1         Enabled           Operational
0/3         Disabled          Non-Operational
```

Example #2: PIM Mode - Sparse

```
(FASTPATH) #show ip pim

PIM Mode       Sparse

InterfaceInterface-ModeOperational-Status
---------   --------------    ------------------
0/1         Enabled           Operational
0/3         Disabled          Non-Operational
```

Example #3: PIM Mode - None

```
(FASTPATH) #show ip pim

PIM Mode        None

None of the routing interfaces are enabled for PIM.
```

10.3.16 show ip pim ssm

This command displays the configured source specific IP multicast addresses. If no SSM Group range is configured, this command output is `No SSM address range is configured`.

Format `show ip pim ssm`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Group Address	The IP multicast address of the SSM group.
Prefix Length	The network prefix length.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ip pim ssm

Group Address/Prefix Length
----------------------------
232.0.0.0/8
```

If no SSM Group range is configured, this command displays the following message:

```
No SSM address range is configured.
```

10.3.17 show ip pim interface

This command displays the PIM interface status parameters. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format. If no interface is specified, the command displays the status parameters of all PIM-enabled interfaces.

Format `show ip pim interface [`*`slot/port`*`|vlan `*`1-4093`*`}]`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port The interface number.*
Mode	Indicates the active PIM mode enabled on the interface is dense or sparse.
Hello Interval	The frequency at which PIM hello messages are transmitted on this interface. By default, the value is 30 seconds.
Join Prune Interval	The join/prune interval value for the PIM router. The interval is in seconds.
DR Priority	The priority of the Designated Router configured on the interface. This field is not applicable if the interface mode is Dense.
BSR Border	Identifies whether this interface is configured as a bootstrap router border interface.
Neighbor Count	The number of PIM neighbors learned on this interface. This is a dynamic value and is shown only when a PIM interface is operational.

Term	Definition
Designated Router	The IP address of the elected Designated Router for this interface. This is a dynamic value and will only be shown when a PIM interface is operational. This field is not applicable if the interface mode is Dense.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ip pim interface

Interface.......................................0/1
  Mode..........................................Sparse
  Hello Interval (secs).........................30
  Join Prune Interval (secs)....................60
  DR Priority...................................1
  BSR Border....................................Disabled
  Neighbor Count................................1
  Designated Router.............................192.168.10.1

Interface.......................................0/2
  Mode..........................................Sparse
  Hello Interval (secs).........................30
  Join Prune Interval (secs)....................60
  DR Priority...................................1
  BSR Border....................................Disabled
  Neighbor Count................................1
  Designated Router.............................192.168.10.1
```

If none of the interfaces are enabled for PIM, the following message is displayed:

```
None of the routing interfaces are enabled for PIM.
```

10.3.18 show ip pim neighbor

This command displays PIM neighbors discovered by PIMv2 Hello messages. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format. If the interface number is not specified, the command displays the status parameters of all PIM-enabled interfaces.

Format	`show ip pim neighbor [{`*`slot/port`*`|vlan `*`1-4093`*`}]`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Neighbor Address	The IP address of the PIM neighbor on an interface.
Interface	*slot/port*
Up Time	The time since this neighbor has become active on this interface.
Expiry Time	Time remaining for the neighbor to expire.
DR Priority	The DR Priority configured on this Interface (PIM-SM only). ***Note:*** DR Priority is applicable only when sparse-mode configured routers are neighbors. Otherwise, NA is displayed in this field. ***Note:*** DR indicates that the neighbor is the PIM Designated Router in that subnet.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ip pim neighbor 0/1

Neighbor Addr   Interface Uptime      Expiry Time DR
                          (hh:mm:ss) (hh:mm:ss)   Priority
--------------- --------- ----------- ----------- --------
192.168.10.2    0/1       00:02:55     00:01:15   10 (DR)


(FASTPATH) #show ip pim neighbor

Neighbor Addr   Interface  Uptime      Expiry Time DR
                           (hh:mm:ss) (hh:mm:ss)   Priority
--------------- ---------  ----------- ----------- --------
192.168.10.2    0/1        00:02:55     00:01:15   10 (DR)
192.168.20.2    0/2        00:03:50     00:02:10   1
```

If no neighbors have been learned on any of the interfaces, the following message is displayed:

```
No neighbors exist on the router.
```

10.3.19 show ip pim bsr-router

This command displays the bootstrap router (BSR) information.

Format	`show ip pim bsr-router {candidate | elected}`
Mode	Privileged EXEC User EXEC

Parameter	Definition
BSR Address	IP address of the BSR.
BSR Priority	Priority as configured in the `ip pim bsr-candidate` command.
BSR Hash Mask Length	Length of a mask (maximum 32 bits) that is to be ANDed with the group address before the hash function is called. This value is configured in the `ip pim bsr-candidate` command.
C-BSR Advertisement Interval	Indicates the configured C-BSR Advertisement interval with which the router, acting as a C-BSR, will periodically send the C-BSR advertisement messages.
Next Bootstrap Message	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.

Example: The following shows example CLI display output for the command.

Example #1:

```
(FASTPATH) #show ip pim bsr-router elected

BSR Address................................... 192.168.10.1
  BSR Priority................................ 0
  BSR Hash Mask Length........................ 30
  Next Bootstrap message (hh:mm:ss)........... 00:00:24
```

Example #2:

```
(FASTPATH) #show ip pim bsr-router candidate

BSR Address................................... 192.168.10.1
  BSR Priority................................ 0
  BSR Hash Mask Length........................ 30
  C-BSR Advertisement Interval (secs)......... 60
  Next Bootstrap message (hh:mm:ss)........... NA
```

If no configured or elected BSRs exist on the router, the following message is displayed:

```
No BSR's exist/learned on this router.
```

10.3.20 show ip pim rp-hash

This command displays the rendezvous point (RP) selected for the specified group address.

Format	`show ip pim rp-hash` *`group-address`*
Modes	• Privileged EXEC • User EXEC

Term	Definition
RP Address	The IP address of the RP for the group specified.
Type	Indicates the mechanism (BSR or static) by which the RP was selected.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ip pim rp-hash 224.1.2.0

RP Address192.168.10.1
   TypeStatic
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist/learned on this router.
```

10.3.21 show ip pim rp mapping

Use this command to display the mapping for the PIM group to the active Rendezvous points (RP) of which the router is a aware (either configured or learned from the bootstrap router (BSR)). Use the optional parameters to limit the display to a specific RP address or to view group-to-candidate RP or group to Static RP mapping information.

Format	`show ip pim rp mapping [{`*`rp-address`*`|candidate|static}]`
Modes	• Privileged EXEC • User EXEC

Term	Definition
RP Address	The IP address of the RP for the group specified.
Group Address	The IP address of the multicast group.
Group Mask	The subnet mask associated with the group.
Origin	Indicates the mechanism (BSR or static) by which the RP was selected.
C-RP Advertisement Interval	Indicates the configured C-RP Advertisement interval with which the router acting as a Candidate RP will periodically send the C-RP advertisement messages to the elected BSR.

Example: The following show examples of CLI display output for the command.

Example #1:

```
(FASTPATH) #show ip pim rp mapping 192.168.10.1

RP Address        192.168.10.1
   Group Address  224.1.2.1
   Group Mask     255.255.255.0
   Origin         Static
```

Example #2:

```
 (FASTPATH) #show ip pim rp mapping

RP Address        192.168.10.1
   Group Address  224.1.2.1
   Group Mask      255.255.255.0
   Origin          Static

RP Address         192.168.20.1
   Group Address   229.2.0.0
   Group Mask      255.255.0.0
   Origin          Static
```

Example #3:

```
(FASTPATH) # show ip pim rp mapping candidate

RP Address.................................... 192.168.10.1
   Group Address............................. 224.1.2.1
   Group Mask................................ 255.255.0.0
   Origin.................................... BSR
   C-RP Advertisement Interval (secs)......... 60
   Next Candidate RP Advertisement (hh:mm:ss). 00:00:15
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist on this router.
```

10.3.22 show ip pim statistics

This command displays statistics for the received PIM control packets per interface. This command displays statistics only if PIM sparse mode is enabled.

Format	`show ip pim statistics`
Modes	• Privileged EXEC • User EXEC

The following information is displayed.

Parameters	Description
Stat	RX: Packets received Tx: Packets transmitted
Interface	The PIM-enabled routing interface
Hello	The number of PIM Hello messages
Register	The number of PIM Register messages
Reg-Stop	The number of PIM Register-stop messages
Join/Pru	The number of PIM Join/Prune messages
BSR	The number of PIM Boot Strap messages
Assert	The number of PIM Assert messages
CRP	The number of PIM Candidate RP Advertisement messages.

Example:

Example 1:

```
(Routing) #show ip pim statistics
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10        Rx      0        0        0        0     0      0      0
            Tx      2        0        0        0     0      0      0

     Invalid Packets Received - 0
---------------------------------------------------------------------
Vl20        Rx      0        0        0        5     0      0      0
            Tx      8        7        0        0     0      0      0
     Invalid Packets Received - 0
---------------------------------------------------------------------
0/5         Rx       0        0        6        5     0     0     0
            Tx       10       9        0        0     0     0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------
```

Example 2:

```
(Routing) #show ip pim statistics vlan 10
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10        Rx       0        0        0        0     0     0     0
            Tx       2        0        0        0     0     0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------
```

Example 3:

```
(Routing) #show ip pim statistics 0/5
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
0/5         Rx       0        0        6        5     0     0     0
            Tx       10       9        0        0     0     0     0

     Invalid Packets Received - 0
```

NOTICE For ipv6 statistics use the key word ipv6.

10.4 Internet Group Message Protocol Commands

This section describes the commands you use to view and configure Internet Group Message Protocol (IGMP) settings.

10.4.1 ip igmp

This command sets the administrative mode of IGMP in the system to active on an interface, range of interfaces, or on all interfaces.

Default	disabled
Format	`ip igmp`
Modes	• Global Config • Interface Config

10.4.1.1 no ip igmp

This command sets the administrative mode of IGMP in the system to inactive.

Format	`no ip igmp`
Modes	• Global Config • Interface Config

10.4.2 ip igmp header-validation

Use this command to enable header validation for IGMP messages.

Default	disabled
Format	`ip igmp header-validation`
Mode	Global Config

10.4.2.1 no ip igmp header-validation

This command disables header validation for IGMP messages.

Format	`no ip igmp header-validation`
Mode	Global Config

10.4.3 ip igmp version

This command configures the version of IGMP for an interface or range of interfaces. The value for ***version*** is either 1, 2 or 3.

Default	3
Format	`ip igmp version` *`version`*
Modes	Interface Config

10.4.3.1 no ip igmp version

This command resets the version of IGMP to the default value.

Format	`no ip igmp version`
Modes	Interface Config

10.4.4 ip igmp last-member-query-count

This command sets the number of Group-Specific Queries sent by the interface or range of interfaces before the router assumes that there are no local members on the interface. The range for ***count*** is 1 to 20.

Format	`ip igmp last-member-query-count` *`count`*
Modes	Interface Config

10.4.4.1 no ip igmp last-member-query-count

This command resets the number of Group-Specific Queries to the default value.

Format	`no ip igmp last-member-query-count`
Modes	Interface Config

10.4.5 ip igmp last-member-query-interval

This command configures the Maximum Response Time inserted in Group-Specific Queries which are sent in response to Leave Group messages. The range for ***seconds*** is 0 to 255 tenths of a second. This value can be configured on one interface or a range of interfaces

Default	10 tenths of a second (1 second)
Format	`ip igmp last-member-query-interval` *`seconds`*
Modes	Interface Config

10.4.5.1 no ip igmp last-member-query-interval

This command resets the Maximum Response Time to the default value.

Format	`no ip igmp last-member-query-interval`
Modes	Interface Config

10.4.6 ip igmp query-interval

This command configures the query interval for the specified interface or range of interfaces. The query interval determines how fast IGMP Host-Query packets are transmitted on this interface. The range for **`query-interval`** is 1 to 3600 seconds.

Default	125 seconds
Format	`ip igmp query-interval` *`seconds`*
Modes	Interface Config

10.4.6.1 no ip igmp query-interval

This command resets the query interval for the specified interface to the default value. This is the frequency at which IGMP Host-Query packets are transmitted on this interface.

Format	`no ip igmp query-interval`
Modes	Interface Config

10.4.7 ip igmp query-max-response-time

This command configures the maximum response time interval for the specified interface or range of interfaces, which is the maximum query response time advertised in IGMPv2 queries on this interface.The time interval is specified in tenths of a second. The range for **`gmp query-max-response-time`** is 0 to 255 tenths of a second.

Default	100
Format	`ip igmp query-max-response-time` *`0-255`*
Mode	Interface Config

10.4.7.1 no ip igmp query-max-response-time

This command resets the maximum response time interval for the specified interface, which is the maximum query response time advertised in IGMPv2 queries on this interface to the default value. The maximum response time interval is reset to the default time.

Format	`no ip igmp query-max-response-time`
Mode	Interface Config

10.4.8 ip igmp robustness

This command configures the robustness that allows tuning of the interface or range of interfaces. The robustness is the tuning for the expected packet loss on a subnet. If a subnet is expected to have a lot of loss, the Robustness variable may be increased for the interface. The range for ***`robustness`*** is 1 to 255.

Default	2
Format	`ip igmp robustness` *`1-255`*
Mode	Interface Config

10.4.8.1 no ip igmp robustness

This command sets the robustness value to default.

Format	`no ip igmp robustness`
Mode	Interface Config

10.4.9 ip igmp startup-query-count

This command sets the number of Queries sent out on startup, separated by the Startup Query Interval on the interface or range of interfaces. The range for ***`count`*** is 1 to 20.

Default	2
Format	`ip igmp startup-query-count` *`1-20`*
Mode	Interface Config

10.4.9.1 no ip igmp startup-query-count

This command resets the number of Queries sent out on startup, separated by the Startup Query Interval on the interface to the default value.

Format	`no ip igmp startup-query-count`
Mode	Interface Config

10.4.10 ip igmp startup-query-interval

This command sets the interval between General Queries sent on startup on the interface or range of interfaces. The time interval value is in seconds. The range for ***`interval`*** is 1 to 300 seconds.

Default	31
Format	`ip igmp startup-query-interval` *`1-300`*
Mode	Interface Config

10.4.10.1 no ip igmp startup-query-interval

This command resets the interval between General Queries sent on startup on the interface to the default value.

Format	`no ip igmp startup-query-interval`
Mode	Interface Config

10.4.11 show ip igmp

This command displays the system-wide IGMP information.

Format	`show ip igmp`
Modes	• Privileged EXEC • User EXEC

Term	Definition
IGMP Admin Mode	The administrative status of IGMP. This is a configured value.
Interface	*slot/port*
Interface Mode	Indicates whether IGMP is enabled or disabled on the interface. This is a configured value.
Protocol State	The current state of IGMP on this interface. Possible values are Operational or Non-Operational.

10.4.12 show ip igmp groups

This command displays the registered multicast groups on the interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format. If [detail] is specified this command displays the registered multicast groups on the interface in detail.

Format	`show ip igmp groups {slot/port|vlan 1-4093 [detail]}`
Mode	Privileged EXEC

If you do not use the **`detail`** keyword, the following fields appear:

Term	Definition
IP Address	The IP address of the interface participating in the multicast group.
Subnet Mask	The subnet mask of the interface participating in the multicast group.
Interface Mode	This displays whether IGMP is enabled or disabled on this interface.

The following fields are not displayed if the interface is not enabled:

Term	Definition
Querier Status	This displays whether the interface has IGMP in Querier mode or Non-Querier mode.
Groups	The list of multicast groups that are registered on this interface.

If you use the **`detail`** keyword, the following fields appear:

Term	Definition
Multicast IP Address	The IP address of the registered multicast group on this interface.
Last Reporter	The IP address of the source of the last membership report received for the specified multicast group address on this interface.
Up Time	The time elapsed since the entry was created for the specified multicast group address on this interface.
Expiry Time	The amount of time remaining to remove this entry before it is aged out.
Version1 Host Timer	The time remaining until the local router assumes that there are no longer any IGMP version 1 multicast members on the IP subnet attached to this interface. This could be an integer value or “-----” if there is no Version 1 host present.

Term	Definition
Version2 Host Timer	The time remaining until the local router assumes that there are no longer any IGMP version 2 multicast members on the IP subnet attached to this interface. This could be an integer value or "-----" if there is no Version 2 host present.
Group Compatibility Mode	The group compatibility mode (v1, v2 or v3) for this group on the specified interface.

10.4.13 show ip igmp interface

This command displays the IGMP information for the interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format `show ip igmp interface {slot/port|vlan 1-4093}`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface	*slot/port*
IGMP Admin Mode	The administrative status of IGMP.
Interface Mode	Indicates whether IGMP is enabled or disabled on the interface.
IGMP Version	The version of IGMP running on the interface. This value can be configured to create a router capable of running either IGMP version 1 or 2.
Query Interval	The frequency at which IGMP Host-Query packets are transmitted on this interface.
Query Max Response Time	The maximum query response time advertised in IGMPv2 queries on this interface.
Robustness	The tuning for the expected packet loss on a subnet. If a subnet is expected to be have a lot of loss, the Robustness variable may be increased for that interface.
Startup Query Interval	The interval between General Queries sent by a Querier on startup.
Startup Query Count	The number of Queries sent out on startup, separated by the Startup Query Interval.
Last Member Query Interval	The Maximum Response Time inserted into Group-Specific Queries sent in response to Leave Group messages.
Last Member Query Count	The number of Group-Specific Queries sent before the router assumes that there are no local members.

10.4.14 show ip igmp interface membership

This command displays the list of interfaces that have registered in the multicast group.

Format `show ip igmp interface membership multiipaddr [detail]`

Mode Privileged EXEC

Term	Definition
Interface	Valid unit, slot and port number separated by forward slashes.
Interface IP	The IP address of the interface participating in the multicast group.
State	The interface that has IGMP in Querier mode or Non-Querier mode.
Group Compatibility Mode	The group compatibility mode (v1, v2 or v3) for the specified group on this interface.

Term	Definition
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group on this interface. This is "-----" for IGMPv1 and IGMPv2 Membership Reports.

If you use the `detail` keyword, the following fields appear:

Term	Definition
Interface	Valid unit, slot and port number separated by forward slashes.
Group Compatibility Mode	The group compatibility mode (v1, v2 or v3) for the specified group on this interface.
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group on this interface. This is "-----" for IGMPv1 and IGMPv2 Membership Reports.
Source Hosts	The list of unicast source IP addresses in the group record of the IGMPv3 Membership Report with the specified multicast group IP address. This is "-----" for IGMPv1 and IGMPv2 Membership Reports.
Expiry Time	The amount of time remaining to remove this entry before it is aged out. This is "-----" for IGMPv1 and IGMPv2 Membership Reports.

10.4.15 show ip igmp interface stats

This command displays the IGMP statistical information for the interface. The statistics are only displayed when the interface is enabled for IGMP. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format	`show ip igmp interface stats [slot/port|vlan 1-4093]`
Modes	- Privileged EXEC - User EXEC

Term	Definition
Querier Status	The status of the IGMP router, whether it is running in Querier mode or Non-Querier mode.
Querier IP Address	The IP address of the IGMP Querier on the IP subnet to which this interface is attached.
Querier Up Time	The time since the interface Querier was last changed.
Querier Expiry Time	The amount of time remaining before the Other Querier Present Timer expires. If the local system is the querier, the value of this object is zero.
Wrong Version Queries	The number of queries received whose IGMP version does not match the IGMP version of the interface.
Number of Joins	The number of times a group membership has been added on this interface.
Number of Groups	The current number of membership entries for this interface.

10.5 IGMP Proxy Commands

The IGMP Proxy is used by IGMP Router (IPv4 system) to enable the system to issue IGMP host messages on behalf of hosts that the system discovered through standard IGMP router interfaces. With IGMP Proxy enabled, the system acts as proxy to all the hosts residing on its router interfaces.

10.5.1 ip igmp-proxy

This command enables the IGMP Proxy on the an interface or range of interfaces. To enable the IGMP Proxy on an interface, you must enable multicast forwarding. Also, make sure that there are no multicast routing protocols enabled on the router.

Format	`ip igmp-proxy`
Mode	Interface Config

10.5.1.1 no ip igmp-proxy

This command disables the IGMP Proxy on the router.

Format	`no ip igmp-proxy`
Mode	Interface Config

10.5.2 ip igmp-proxy unsolicit-rprt-interval

This command sets the unsolicited report interval for the IGMP Proxy interface or range of interfaces. This command is valid only when you enable IGMP Proxy on the interface or range of interfaces. The value of ***`interval`*** can be 1-260 seconds.

Default	1
Format	`ip igmp-proxy unsolicit-rprt-interval` *`1-260`*
Mode	Interface Config

10.5.2.1 no ip igmp-proxy unsolicit-rprt-interval

This command resets the unsolicited report interval of the IGMP Proxy router to the default value.

Format	`no ip igmp-proxy unsolicit-rprt-interval`
Mode	Interface Config

10.5.3 ip igmp-proxy reset-status

This command resets the host interface status parameters of the IGMP Proxy interface (or range of interfaces). This command is valid only when you enable IGMP Proxy on the interface.

Format	`ip igmp-proxy reset-status`
Mode	Interface Config

10.5.4 show ip igmp-proxy

This command displays a summary of the host interface status parameters. It displays the following parameters only when you enable IGMP Proxy.

Format	`show ip igmp-proxy`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface index	The interface number of the IGMP Proxy.
Admin Mode	States whether the IGMP Proxy is enabled or not. This is a configured value.
Operational Mode	States whether the IGMP Proxy is operationally enabled or not. This is a status parameter.
Version	The present IGMP host version that is operational on the proxy interface.
Number of Multicast Groups	The number of multicast groups that are associated with the IGMP Proxy interface.
Unsolicited Report Interval	The time interval at which the IGMP Proxy interface sends unsolicited group membership report.
Querier IP Address on Proxy Interface	The IP address of the Querier, if any, in the network attached to the upstream interface (IGMP-Proxy interface).
Older Version 1 Querier Timeout	The interval used to timeout the older version 1 queriers.
Older Version 2 Querier Timeout	The interval used to timeout the older version 2 queriers.
Proxy Start Frequency	The number of times the IGMP Proxy has been stopped and started.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ip igmp-proxy
Interface Index.......................................... 0/1
Admin Mode.............................................. Enable
Operational Mode........................................ Enable
Version.................................................... 3
Num of Multicast Groups............................ 0
Unsolicited Report Interval......................... 1
Querier IP Address on Proxy Interface........ 5.5.5.50
Older Version 1 Querier Timeout................ 0
Older Version 2 Querier Timeout................ 00::00:00
Proxy Start Frequency.............................. 1
```

10.5.5 show ip igmp-proxy interface

This command displays a detailed list of the host interface status parameters. It displays the following parameters only when you enable IGMP Proxy.

Format	`show ip igmp-proxy interface`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface Index	The *`slot/port`* of the IGMP proxy.

The column headings of the table associated with the interface are as follows:

Term	Definition
Ver	The IGMP version.
Query Rcvd	Number of IGMP queries received.
Report Rcvd	Number of IGMP reports received.
Report Sent	Number of IGMP reports sent.
Leaves Rcvd	Number of IGMP leaves received. Valid for version 2 only.
Leaves Sent	Number of IGMP leaves sent on the Proxy interface. Valid for version 2 only.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ip igmp-proxy interface

Interface Index................................ 0/1

Ver  Query Rcvd  Report Rcvd  Report Sent  Leave Rcvd  Leave Sent
-----------------------------------------------------------------
1      0            0            0          -----         -----
2      0            0            0            0             0
3      0            0            0          -----         -----
```

10.5.6 show ip igmp-proxy groups

This command displays information about the subscribed multicast groups that IGMP Proxy reported. It displays a table of entries with the following as the fields of each column.

Format	`show ip igmp-proxy groups`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface	The interface number of the IGMP Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of host that last sent a membership report for the current group on the network attached to the IGMP Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed since last created.
Member State	The status of the entry. Possible values are IDLE_MEMBER or DELAY_MEMBER. • IDLE_MEMBER - interface has responded to the latest group membership query for this group. • DELAY_MEMBER - interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are Include or Exclude.
Sources	The number of sources attached to the multicast group.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ip igmp-proxy groups

Interface Index................................ 0/1

Group Address    Last Reporter    Up Time   Member State  Filter Mode  Sources
-------------     -------------- ---------- ------------- ------------- -------
225.4.4.4         5.5.5.48          00:02:21  DELAY_MEMBER       Include       3

226.4.4.4         5.5.5.48          00:02:21  DELAY_MEMBER       Include       3

227.4.4.4         5.5.5.48          00:02:21  DELAY_MEMBER       Exclude       0

228.4.4.4         5.5.5.48          00:02:21  DELAY_MEMBER       Include       3
```

10.5.7 show ip igmp-proxy groups detail

This command displays complete information about multicast groups that IGMP Proxy reported. It displays a table of entries with the following as the fields of each column.

Format	`show ip igmp-proxy groups detail`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Interface	The interface number of the IGMP Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of host that last sent a membership report for the current group, on the network attached to the IGMP-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed since last created.
Member State	The status of the entry. Possible values are IDLE_MEMBER or DELAY_MEMBER. • IDLE_MEMBER - interface has responded to the latest group membership query for this group. • DELAY_MEMBER - interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are Include or Exclude.
Sources	The number of sources attached to the multicast group.
Group Source List	The list of IP addresses of the sources attached to the multicast group.
Expiry Time	Time left before a source is deleted.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ip igmp-proxy groups

Interface Index................................ 0/1

Group Address    Last Reporter    Up Time   Member State Filter Mode  Sources
-------------     -------------- ----------- ------------ ------------ ---------
225.4.4.4         5.5.5.48           00:02:21  DELAY_MEMBER       Include         3

Group Source List            Expiry Time
-----------------            -----------------
5.1.2.3                         00:02:21
6.1.2.3                         00:02:21
7.1.2.3                         00:02:21

226.4.4.4         5.5.5.48           00:02:21  DELAY_MEMBER       Include         3

Group Source List            Expiry Time
------------------            ---------------
2.1.2.3                         00:02:21
6.1.2.3                         00:01:44
8.1.2.3                         00:01:44

227.4.4.4         5.5.5.48           00:02:21  DELAY_MEMBER       Exclude        0



228.4.4.4         5.5.5.48           00:03:21  DELAY_MEMBER       Include         3

Group Source List            Expiry Time
------------------            ---------------
9.1.2.3                         00:03:21
6.1.2.3                         00:03:21
7.1.2.3                         00:03:21
```

11/ IPv6 Multicast Commands

This chapter describes the IPv6 Multicast commands available in the FASTPATH CLI

NOTICE There is no specific IP multicast enable for IPv6. Enabling of multicast at global config is common for both IPv4 and IPv6.

This chapter contains the following sections:

NOTICE The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

11.1 IPv6 Multicast Forwarder

11.1.1 ipv6 mroute

This command configures an IPv6 Multicast Static Route for a source.

Default	No MRoute is configured on the system.
Format	ipv6 mroute *src-ip-addr src-mask rpf-addr* [interface] *preference*
Mode	Global Config

Parameter	Description
src-ip-addr	The IP address of the multicast source network.
src-mask	The IP mask of the multicast data source.
rpf-ip-addr	The IP address of the RPF next-hop router toward the source.
interface	Specify the interface if the RPF Address is a link-local address.
preference	The administrative distance for this Static MRoute, that is, the preference value. The range is 1 to 255.

11.1.1.1 no ipv6 mroute

This command removes the configured IPv6 Multicast Static Route.

Format no ip mroute *src-ip-addr*

Mode Global Config

11.1.2 show ipv6 mroute

NOTICE There is no specific IP multicast enable for IPv6. Enabling of multicast at global config is common for both IPv4 and IPv6.

Use this command to show the mroute entries specific for IPv6. (This command is the IPv6 equivalent of the IPv4 `show ip mroute` command.)

Format

```
show ipv6 mroute {[detail] | [summary] | [group {group-address} [detail | summary]]
| [source {source-address} [grpaddr | summary ]]}
```

Modes

- Privileged EXEC
- User EXEC

If you use the ***detail*** parameter, the command displays the following Multicast Route Table fields:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the ***summary*** parameter, the command displays the following fields:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which the entry was created.
Incoming Interface	The interface on which the packet for the source/group arrives.
Outgoing Interface List	The list of outgoing interfaces on which the packet is forwarded.

11.1.3 show ipv6 mroute group

This command displays the multicast configuration settings specific to IPv6 such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given group IPv6 address ***group-address***.

Format

```
show ipv6 mroute group group-address {detail | summary}
```

Modes

- Privileged EXEC
- User EXEC

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this group arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

11.1.4 show ipv6 mroute source

This command displays the multicast configuration settings specific to IPv6 such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given source IP address or source IP address and group IP address pair.

Format	`show ipv6 mroute source` *`source-address`* `{`*`grpaddr`* `| summary}`
Modes	- Privileged EXEC - User EXEC

If you use the ***groupipaddr*** parameter, the command displays the following column headings in the output table:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the ***summary*** parameter, the command displays the following column headings in the output table:

Term	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this source arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

11.1.5 show ipv6 mroute static

Use the `show ipv6 mroute static` command in Privileged EXEC or User EXEC mode to display all the configured IPv6 multicast static routes.

Format	`show ipv6 mroute static [`*`source-address`*`]`
Modes	- Privileged EXEC - User EXEC

Parameter	Description
Source Address	IP address of the multicast source network.
Source Mask	The subnetwork mask pertaining to the sourceIP.
RPF Address	The IP address of the RPF next-hop router toward the source.
Interface	The interface that is used to reach the RPF next-hop. This is valid if the RPF address is a link-local address.
Preference	The administrative distance for this Static MRoute.

11.1.6 clear ipv6 mroute

This command deletes all or the specified IPv6 multicast route entries.

NOTICE This command only clears dynamic mroute entries. It does not clear static mroutes.

Format `clear ipv6 mroute {*|group-address[source-address]}`

Modes Privileged EXEC

Parameter	Description
*****	Deletes all IPv6 entries from the IPv6 multicast routing table.
group-address	IPv6 address of the multicast group.
source-address	The IPv6 address of a multicast source that is sending multicast traffic to the group.

Example: The following deletes all entries from the IPv6 multicast routing table:

```
(Broadcom FASTPATH Routing) # clear ipv6 mroute *
```

Example: The following deletes all entries from the IPv6 multicast routing table that match the given multicast group address (FF4E::1), irrespective of which source is sending for this group:

```
(Broadcom FASTPATH Routing) # clear ipv6 mroute FF4E::1
```

Example: The following deletes all entries from the IPv6 multicast routing table that match the given multicast group address (FF4E::1) and the multicast source address (2001::2):

```
(Broadcom FASTPATH Routing) # clear ip mroute FF4E::1 2001::2
```

11.2 IPv6 PIM Commands

This section describes the commands you use to configure Protocol Independent Multicast -Dense Mode (PIM-DM) and Protocol Independent Multicast - Sparse Mode (PIM-SM) for IPv6 multicast routing. PIM-DM and PIM-SM are multicast routing protocols that provides scalable inter-domain multicast routing across the Internet, independent of the mechanisms provided by any particular unicast routing protocol. Only one PIM mode can be operational at a time.

11.2.1 ipv6 pim dense

This command enables the administrative mode of PIM-DM in the router.

Default	disabled
Format	`ipv6 pim dense`
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ipv6 pim dense
```

11.2.1.1 no ipv6 pim dense

This command disables the administrative mode of PIM-DM in the router.

Format	`no ipv6 pim dense`
Mode	Global Config

11.2.2 ipv6 pim sparse

This command enables the administrative mode of PIM-SM in the router.

Default	disabled
Format	`ipv6 pim sparse`
Mode	Global Config

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ipv6 pim sparse
```

11.2.2.1 no ipv6 pim sparse

This command disables the administrative mode of PIM-SM in the router.

Format	`no ipv6 pim sparse`
Mode	Global Config

11.2.3 ipv6 pim

This command administratively enables PIM on an interface or range of interfaces.

Default	disabled
Format	`ipv6 pim`
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(FASTPATH) (Interface 0/1) #ipv6 pim
```

11.2.3.1 no ipv6 pim

This command sets the administrative mode of PIM on an interface to disabled.

Format	`no ipv6 pim`
Mode	Interface Config

11.2.4 ipv6 pim hello-interval

Use this command to configure the PIM hello interval for the specified router interface or range of interfaces. The hello-interval is specified in seconds and is in the range 0–18000.

Default	30
Format	`ipv6 pim hello-interval` *`0-18000`*
Mode	Interface Config

Example: The following shows an example of the command.

```
(FASTPATH) (Interface 0/1) #ipv6 pim hello-interval 50
```

11.2.4.1 no ipv6 pim hello-interval

Use this command to set the PIM hello interval to the default value.

Format	`no ipv6 pim hello-interval`
Mode	Interface Config

11.2.5 ipv6 pim bsr-border

Use this command to prevent bootstrap router (BSR) messages from being sent or received on the specified interface.

NOTICE This command takes effect only when PIM-SM is enabled in the Global mode.

Default	disabled
Format	`ipv6 pim bsr-border`
Mode	Interface Config

Example: The following shows an example of the command.

```
(FASTPATH) (Interface 0/1) #ipv6 pim bsr-border
```

11.2.5.1 no ipv6 pim bsr-border

Use this command to disable the setting of BSR border on the specified interface.

Format	`no ipv6 pim bsr-border`
Mode	Interface Config

11.2.6 ipv6 pim bsr-candidate

This command is used to configure the router to announce its candidacy as a bootstrap router (BSR). The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	Disabled
Format	`ipv6 pim bsr-candidate interface {`*`slot/port`*`|vlan `*`1-4093`*`}` *`hash-mask-length [bsr-priority] [interval interval]`*
Mode	Global Config

Parameters	Description
slot/port	Interface number on this router from which the BSR address is derived, to make it a candidate. This interface must be enabled with PIM.
hash-mask-length	Length of a mask (32 bits maximum) that is to be ANDed with the group address before the hash function is called. All groups with the same seed hash correspond to the same RP. For example, if this value was 24, only the first 24 bits of the group addresses matter. This allows you to get one RP for multiple groups.
bsr-priority	Priority of the candidate BSR. The range is an integer from 0 to 255. The BSR with the larger priority is preferred. If the priority values are the same, the router with the larger IPv6 address is the BSR. The default value is 0.
interval	[Optional] Indicates the BSR candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(FASTPATH) (Config) #ip pim bsr-candidate interface 0/1 32 5
(FASTPATH) (Config) #ip pim bsr-candidate interface 0/1 32 5 interval 100
```

11.2.6.1 no ipv6 pim bsr-candidate

This command is used to remove the configured PIM Candidate BSR router.

Format	`no ipv6 pim bsr-candidate interface {`*`slot/port`*`|vlan `*`1-4093`*`}` *`hash-mask-length [priority]`*
Mode	Global Config

11.2.7 ipv6 pim dr-priority

Use this command to set the priority value for which a router is elected as the designated router (DR).

NOTICE This command takes effect only when PIM-SM is enabled in the Global mode.

Default	1
Format	`ipv6 pim dr-priority` *`0-2147483647`*
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(FASTPATH) (Interface 0/1) #ipv6 pim dr-priority 10
```

11.2.7.1 no ipv6 pim dr-priority

Use this command to return the DR Priority on the specified interface to its default value.

Format	`no ipv6 pim dr-priority`
Mode	Interface Config

11.2.8 ipv6 pim join-prune-interval

This command is used to configure the join/prune interval for the PIM-SM router on an interface or range of interfaces. The join/prune interval is specified in seconds. This parameter can be configured to a value from 0 to 18000.

NOTICE This command takes effect only when PIM-SM is enabled in the Global mode.

Default	60
Format	`ipv6 pim join-prune-interval` *`0-18000`*
Mode	Interface Config

Example: The following shows examples of the command.

```
(FASTPATH) (Interface 0/1) #ipv6 pim join-prune-interval 90
```

11.2.8.1 no ipv6 pim join-prune-interval

Use this command to set the join/prune interval on the specified interface to the default value.

Format	`no ipv6 pim join-prune-interval`
Mode	Interface Config

11.2.9 ipv6 pim rp-address

This command defines the address of a PIM Rendezvous point (RP) for a specific multicast group range.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	0
Format	`ipv6 pim rp-address` *`rp-address group-address/prefix-length`* `[override]`
Mode	Global Config

Parameter	Description
rp-address	The IPv6 address of the RP.
group-address	The group address supported by the RP.
group-mask	The group mask for the group address.
override	[Optional] Indicates that if there is a conflict, the RP configured with this command prevails over the RP learned by BSR.

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ip pim rp-address 192.168.10.1
   224.1.2.0 255.255.255.0
```

11.2.9.1 no ipv6 pim rp-address

This command is used to remove the address of the configured PIM Rendezvous point (RP) for the specified multicast group range.

Format	`no ipv6 pim rp-address` *`rp-address group-address group-mask`* `[override]`
Mode	Global Config

11.2.10 ipv6 pim rp-candidate

This command is used to configure the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR) for a specific multicast group range. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

Default	Disabled
Format	`ipv6 pim rp-candidate interface {`*`slot/port`*`|vlan `*`1-4093`*`}` *`group-address group-mask [interval interval]`*
Mode	Global Config

Parameter	Description
slot/port	The IP address associated with this interface type and number is advertised as a candidate RP address. This interface must be enabled with PIM.
group-address	The multicast group address that is advertised in association with the RP address.
group-mask	The multicast group prefix that is advertised in association with the RP address.
interval	[Optional] Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(FASTPATH) (Config) #ipv6 pim rp-candidate interface 0/1 224.1.2.0 255.255.255.0
(FASTPATH) (Config) #ipv6 pim rp-candidate interface 0/1 224.1.2.0 255.255.255.0 interval 200
```

11.2.10.1 no ipv6 pim rp-candidate

This command is used to disable the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR).

Format	`no ipv6 pim rp-candidate interface {`*`slot/port`*`|vlan `*`1-4093`*`}` *`group-address group-mask`*
Mode	Global Config

11.2.11 ipv6 pim ssm

Use this command to define the Source Specific Multicast (SSM) range of IPv6 multicast addresses on the router.

NOTICE This command takes effect only when PIM-SM is configured as the PIM mode.

NOTICE Some FASTPATH platforms do not support a non-zero data threshold rate. For these platforms, only a “Switch on First Packet” policy is supported.

Default disabled

Format `ipv6 pim ssm {default | group-address group-mask}`

Mode Global Config

Parameter	Description
default-range	Defines the SSM range access list FF3x::/32.

Example: The following shows an example of the command.

```
(FASTPATH) (Config) #ipv6 pim ssm default
(FASTPATH) (Config) #ipv6 pim ssm 232.1.2.0 255.255.255.0
```

11.2.11.1 no ipv6 pim ssm

Use this command to remove the Source Specific Multicast (SSM) range of IP multicast addresses on the router.

Format `no ipv6 pim ssm {default | group-address group-mask}`

Mode Global Config

11.2.12 show ipv6 pim

This command displays the system-wide information for PIM-DM or PIM-SM.

Format `show ipv6 pim`

Modes
- Privileged EXEC
- User EXEC

NOTICE If the PIM mode is PIM-DM (dense), some of the fields in the following table do not display in the command output because they are applicable only to PIM-SM.

Term	Definition
PIM Mode	Indicates whether the PIM mode is dense (PIM-DM) or sparse (PIM-SM)
Interface	*slot/port*
Interface Mode	Indicates whether PIM is enabled or disabled on this interface.
Operational Status	The current state of PIM on this interface: Operational or Non-Operational.

Example: The following shows example CLI display output for the command.

Example #1: PIM Mode - Dense

```
(FASTPATH) #show ip pim

PIM Mode       Dense

InterfaceInterface-ModeOperational-Status
---------    --------------    ------------------
0/1          Enabled           Operational
0/3          Disabled          Non-Operational
```

Example #2: PIM Mode - Sparse

```
(FASTPATH) #show ip pim

PIM Mode       Sparse

InterfaceInterface-ModeOperational-Status
---------    --------------    ------------------
0/1          Enabled           Operational
0/3          Disabled          Non-Operational
```

Example #3: PIM Mode - None

```
(FASTPATH) #show ip pim

PIM Mode       None

None of the routing interfaces are enabled for PIM.
```

11.2.13 show ipv6 pim ssm

This command displays the configured source specific IPv6 multicast addresses. If no SSM Group range is configured, this command output is `No SSM address range is configured`.

Format	`show ipv6 pim ssm`
Modes	• Privileged EXEC • User EXEC

Term	Definition
Group Address	The IPv6 multicast address of the SSM group.
Prefix Length	The network prefix length.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ip pim ssm

Group Address/Prefix Length
----------------------------
232.0.0.0/8
```

If no SSM Group range is configured, this command displays the following message:

```
No SSM address range is configured.
```

11.2.14 show ipv6 pim interface

This command displays the interface information for PIM on the specified interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format. If no interface is specified, the command displays the status parameters for all PIM-enabled interfaces.

Format	`show ipv6 pim interface [{`*`slot/port`*`|vlan `*`1-4093`*`}]`
Modes	- Privileged EXEC - User EXEC

Term	Definition
Interface	*slot/port*
Mode	Indicates whether the PIM mode enabled on the interface is dense or sparse.
Hello Interval	The frequency at which PIM hello messages are transmitted on this interface. By default, the value is 30 seconds.
Join Prune Interval	The join/prune interval for the PIM router. The interval is in seconds.
DR Priority	The priority of the Designated Router configured on the interface. This field is not applicable if the interface mode is Dense
BSR Border	Identifies whether this interface is configured as a bootstrap router border interface.
Neighbor Count	The number of PIM neighbors learned on this interface. This is a dynamic value and is shown only when a PIM interface is operational.
Designated Router	The IP address of the elected Designated Router for this interface. This is a dynamic value and will only be shown when a PIM interface is operational. This field is not applicable if the interface mode is Dense

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ipv6 pim interface

Interface.......................................0/1
  Mode..........................................Sparse
  Hello Interval (secs).........................30
  Join Prune Interval (secs)....................60
  DR Priority...................................1
  BSR Border....................................Disabled
  Neighbor Count................................1
  Designated Router.............................192.168.10.1

Interface.......................................0/2
  Mode..........................................Sparse
  Hello Interval (secs).........................30
  Join Prune Interval (secs)....................60
  DR Priority...................................1
  BSR Border....................................Disabled
  Neighbor Count................................1
  Designated Router.............................192.168.10.1
```

If none of the interfaces are enabled for PIM, the following message is displayed:

```
None of the routing interfaces are enabled for PIM.
```

11.2.15 show ipv6 pim neighbor

This command displays PIM neighbors discovered by PIMv2 Hello messages. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format. If the interface number is not specified, this command displays the neighbors discovered on all the PIM-enabled interfaces.

Format	`show ipv6 pim neighbor [{slot/port|vlan 1-4093}]`
Modes	Privileged EXEC User EXEC

Term	Definition
Neighbor Address	The IPv6 address of the PIM neighbor on an interface.
Interface	*slot/port*
Up Time	The time since this neighbor has become active on this interface.
Expiry Time	Time remaining for the neighbor to expire.
DR Priority	The DR Priority configured on this Interface (PIM-SM only). ***Note:*** DR Priority is applicable only when sparse-mode configured routers are neighbors. Otherwise, NA is displayed in this field.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ipv6 pim neighbor

Neighbor Addr       Interface  Uptime      Expiry Time
                              (HH:MM::SS) (HH:MM::SS)
---------------    ---------  ----------- -----------
2001:DB8:39::/32   0/1        00:02:55     00:01:15
2001:DB8:A3::/32   0/2        00:03:50     00:02:10
```

If no neighbors have been learned on any of the interfaces, the following message is displayed:

```
No neighbors are learnt on any interface.
```

11.2.16 show ipv6 pim bsr-router

This command displays the bootstrap router (BSR) information.

Format	`show ipv6 pim bsr-router {candidate	elected}`
Mode	Privileged EXEC User EXEC

Term	Definition
BSR Address	IPv6 address of the BSR.
BSR Priority	Priority as configured in the `ipv6 pim bsr-candidate` command.
BSR Hash Mask Length	Length of a mask (maximum 32 bits) that is to be ANDed with the group address before the hash function is called. This value is configured in the `ipv6 pim bsr-candidate` command.
C-BSR Advertisement Interval	Indicates the configured C-BSR Advertisement interval with which the router, acting as a C-BSR, will periodically send the C-BSR advertisement messages.
Next Bootstrap Message	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ipv6 pim bsr-router candidate
```

Example #1:

```
(FASTPATH) #show ip pim bsr-router elected

BSR Address.................................. 192.168.10.1
  BSR Priority............................... 0
  BSR Hash Mask Length....................... 30
  Next Bootstrap message (hh:mm:ss).......... 00:00:24
```

Example #2:

```
(FASTPATH) #show ip pim bsr-router candidate

BSR Address.................................. 192.168.10.1
  BSR Priority............................... 0
  BSR Hash Mask Length....................... 30
  C-BSR Advertisement Interval (secs)........ 60
  Next Bootstrap message (hh:mm:ss).......... NA
```

If no configured or elected BSRs exist on the router, the following message is displayed:

```
No BSR's exist/learned on this router.
```

11.2.17 show ipv6 pim rp-hash

This command displays which rendezvous point (RP) is being used for a specified group.

Format	`show ipv6 pim rp-hash` *`group-address`*
Modes	Privileged EXEC User EXEC

Term	Definition
RP Address	The IPv6 address of the RP for the group specified.
Type	Indicates the mechanism (BSR or static) by which the RP was selected.

Example: The following shows example CLI display output for the command.

```
(FASTPATH) #show ip pim rp-hash 224.1.2.0

RP Address192.168.10.1
   TypeStatic
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist/learned on this router.
```

11.2.18 show ipv6 pim rp mapping

Use this command to display the mapping for the PIM group to the active Rendezvous points (RP) of which the router is a aware (either configured or learned from the bootstrap router (BSR)). Use the optional parameters to limit the display to a specific RP address or to view group-to-candidate RP or group to Static RP mapping information.

Format	`show ipv6 pim rp mapping [{`*`rp-address`*` | candidate | static}]`
Modes	Privileged EXEC User EXEC

Term	Definition
RP Address	The IPv6 address of the RP for the group specified.
Group Address	The IPv6 address and prefix length of the multicast group.

Term	Definition
Origin	Indicates the mechanism (BSR or static) by which the RP was selected.
C-RP Advertisement Interval	Indicates the configured C-RP Advertisement interval with which the router acting as a Candidate RP will periodically send the C-RP advertisement messages to the elected BSR.

Example: The following show examples of CLI display output for the command.

Example #1:

```
(FASTPATH) #show ipv6 pim rp mapping 192.168.10.1

RP Address192.168.10.1
   Group Address224.1.2.1
   Group Mask255.255.255.0
   OriginStatic
```

Example #2:

```
 (FASTPATH) #show ipv6 pim rp mapping

RP Address192.168.10.1
   Group Address224.1.2.1
   Group Mask255.255.255.0
   OriginStatic

RP Address192.168.20.1
   Group Address229.2.0.0
   Group Mask255.255.0.0
   OriginStatic
```

Example #3:

```
(FASTPATH) # show ipv6 pim rp mapping candidate

RP Address.................................... 192.168.10.1
   Group Address............................. 224.1.2.1
   Group Mask................................ 255.255.0.0
   Origin.................................... BSR
   C-RP Advertisement Interval (secs)......... 60
   Next Candidate RP Advertisement (hh:mm:ss). 00:00:15
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist on this router.
```

11.3 IPv6 MLD Commands

IGMP/MLD Snooping is Layer 2 functionality but IGMP/MLD are Layer 3 multicast protocols. It requires that in a network setup there should be a multicast router (which can act as a querier) to be present to solicit the multicast group registrations. However some network setup does not need a multicast router as multicast traffic is destined to hosts within the same network. In this situation, FASTPATH has an IGMP/MLD Snooping Querier running on one of the switches and Snooping enabled on all the switches. For more information, see “IGMP Snooping Configuration Commands” on page 442 and “MLD Snooping Commands” on page 453.

11.3.1 ipv6 mld router

Use this command, in the administrative mode of the router, to enable MLD in the router.

Default	Disabled
Format	`ipv6 mld router`
Mode	Global Config

11.3.1.1 no ipv6 mld router

Use this command, in the administrative mode of the router, to disable MLD in the router.

Default	Disabled
Format	`no ipv6 mld router`
Mode	Global Config

11.3.2 ipv6 mld query-interval

Use this command to set the MLD router's query interval for the interface or range of interfaces. The query-interval is the amount of time between the general queries sent when the router is the querier on that interface. The range for ***query-interval*** is 1 to 3600 seconds.

Default	125
Format	`ipv6 mld query-interval` *`query-interval`*
Mode	Interface Config

11.3.2.1 no ipv6 mld query-interval

Use this command to reset the MLD query interval to the default value for that interface.

Format	`no ipv6 mld query-interval`
Mode	Interface Config

11.3.3 ipv6 mld query-max-response-time

Use this command to set the MLD querier's maximum response time for the interface or range of interfaces and this value is used in assigning the maximum response time in the query messages that are sent on that interface. The range for ***query-max-response-time*** is 0 to 65535 milliseconds.

Default	10000 milliseconds
Format	`ipv6 mld query-max-response-time` *`query-max-response-time`*
Mode	Interface Config

11.3.3.1 no ipv6 mld query-max-response-time

This command resets the MLD query max response time for the interface to the default value.

Format	`no ipv6 mld query-max-response-time`
Mode	Interface Config

11.3.4 ipv6 mld last-member-query-interval

Use this command to set the last member query interval for an MLD interface or range of interfaces, which is the value of the maximum response time parameter in the group specific queries sent out of this interface. The range for ***last-member-query-interval*** is 0 to 65535 milliseconds.

Default	1000 milliseconds
Format	`ipv6 mld last-member-query-interval` *`last-member-query-interval`*
Mode	Interface Config

11.3.4.1 no ipv6 mld last-member-query-interval

Use this command to reset the *`last-member-query-interval`* parameter of the interface to the default value.

Format	`no ipv6 mld last-member-query-interval`
Mode	Interface Config

11.3.5 ipv6 mld last-member-query-count

Use this command to set the number of listener-specific queries sent before the router assumes that there are no local members on an interface or range of interfaces. The range for *`last-member-query-count`* is 1 to 20.

Default	2
Format	`ipv6 mld last-member-query-count` *`last-member-query-count`*
Mode	Interface Config

11.3.5.1 no ipv6 mld last-member-query-count

Use this command to reset the *`last-member-query-count`* parameter of the interface to the default value.

Format	`no ipv6 mld last-member-query-count`
Mode	Interface Config

11.3.6 ipv6 mld version

Use this command to configure the MLD version that the interface uses.

Default	2
Format	`ipv6 mld version { 1 | 2 }`
Mode	Interface Config

11.3.6.1 no ipv6 mld version

This command resets the MLD version used by the interface to the default value.

Format	`no ipv6 mld`
Mode	Interface Config

11.3.7 show ipv6 mld groups

Use this command to display information about multicast groups that MLD reported. The information is displayed only when MLD is enabled on at least one interface. If MLD was not enabled on even one interface, there is no group information to be displayed. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format	`show ipv6 mld groups {`*`slot/port`*`|vlan `*`1-4093`*`|`*`group-address`*`}`
Mode	• Privileged EXEC • User EXEC

The following fields are displayed as a table when *slot/port is specified.*

Field	Description
Group Address	The address of the multicast group.
Interface	Interface through which the multicast group is reachable.
Up Time	Time elapsed in hours, minutes, and seconds since the multicast group has been known.
Expiry Time	Time left in hours, minutes, and seconds before the entry is removed from the MLD membership table.

When *group-address* is specified, the following fields are displayed for each multicast group and each interface.

Field	Description
Interface	Interface through which the multicast group is reachable.
Group Address	The address of the multicast group.
Last Reporter	The IP Address of the source of the last membership report received for this multicast group address on that interface.
Filter Mode	The filter mode of the multicast group on this interface. The values it can take are *include* and *exclude*.
Version 1 Host Timer	The time remaining until the router assumes there are no longer any MLD version-1 Hosts on the specified interface.
Group Compat Mode	The compatibility mode of the multicast group on this interface. The values it can take are *MLDv1* and *MLDv2*.

The following table is displayed to indicate all the sources associated with this group.

Field	Description
Source Address	The IP address of the source.
Uptime	Time elapsed in hours, minutes, and seconds since the source has been known.
Expiry Time	Time left in hours, minutes, and seconds before the entry is removed.

Example: The following shows examples of CLI display output for the commands.

```
(FASTPATH Routing) #show ipv6 mld groups ?

group-address           Enter Group Address Info.
<slot/port>             Enter interface in slot/port format.


(FASTPATH Routing) #show ipv6 mld groups 0/1

Group Address.................................. FF43::3
Interface...................................... 0/1
Up Time (hh:mm:ss)............................. 00:03:04
Expiry Time (hh:mm:ss)......................... ------


(FASTPATH Routing) #show ipv6 mld groups ff43::3

Interface...................................... 0/1
Group Address.................................. FF43::3
Last Reporter.................................. FE80::200:FF:FE00:3
Up Time (hh:mm:ss)............................. 00:02:53
Expiry Time (hh:mm:ss)......................... ------
Filter Mode.................................... Include
Version1 Host Timer............................ ------
Group compat mode.............................. v2
Source Address    ExpiryTime
-----------------  -----------
```

```
2003::10        00:04:17
2003::20        00:04:17
```

11.3.8 show ipv6 mld interface

Use this command to display MLD-related information for the interface. The argument *slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of in a *slot/port* format.

Format	`show ipv6 mld interface {`*`slot/port`*`|vlan `*`1-4093`*`}`
Mode	- Privileged EXEC - User EXEC

The following information is displayed for each of the interfaces or for only the specified interface.

Field	Description
Interface	The interface number in *`slot/port`* format.
MLD Mode	Displays the configured administrative status of MLD.
Operational Mode	The operational status of MLD on the interface.
MLD Version	Indicates the version of MLD configured on the interface.
Query Interval	Indicates the configured query interval for the interface.
Query Max Response Time	Indicates the configured maximum query response time (in seconds) advertised in MLD queries on this interface.
Robustness	Displays the configured value for the tuning for the expected packet loss on a subnet attached to the interface.
Startup Query interval	This valued indicates the configured interval between General Queries sent by a Querier on startup.
Startup Query Count	This value indicates the configured number of Queries sent out on startup, separated by the Startup Query Interval.
Last Member Query Interval	This value indicates the configured Maximum Response Time inserted into Group-Specific Queries sent in response to Leave Group messages.
Last Member Query Count	This value indicates the configured number of Group-Specific Queries sent before the router assumes that there are no local members.

The following information is displayed if the operational mode of the MLD interface is enabled.

Field	Description
Querier Status	This value indicates whether the interface is an MLD querier or non-querier on the subnet it is associated with.
Querier Address	The IP address of the MLD querier on the subnet the interface is associated with.
Querier Up Time	Time elapsed in seconds since the querier state has been updated.
Querier Expiry Time	Time left in seconds before the Querier loses its title as querier.
Wrong Version Queries	Indicates the number of queries received whose MLD version does not match the MLD version of the interface.
Number of Joins	The number of times a group membership has been added on this interface.
Number of Leaves	The number of times a group membership has been removed on this interface.
Number of Groups	The current number of membership entries for this interface.

11.3.9 show ipv6 mld traffic

Use this command to display MLD statistical information for the router.

Format `show ipv6 mld traffic`

Mode

- Privileged EXEC
- User EXEC

Field	Description
Valid MLD Packets Received	The number of valid MLD packets received by the router.
Valid MLD Packets Sent	The number of valid MLD packets sent by the router.
Queries Received	The number of valid MLD queries received by the router.
Queries Sent	The number of valid MLD queries sent by the router.
Reports Received	The number of valid MLD reports received by the router.
Reports Sent	The number of valid MLD reports sent by the router.
Leaves Received	The number of valid MLD leaves received by the router.
Leaves Sent	The number of valid MLD leaves sent by the router.
Bad Checksum MLD Packets	The number of bad checksum MLD packets received by the router.
Malformed MLD Packets	The number of malformed MLD packets received by the router.

11.3.10 clear ipv6 mld counters

Use this command to reset the MLD counters to zero on the specified interface.

Format `clear ipv6 mld` *`slot/port`*

Mode Privileged EXEC

11.3.11 clear ipv6 mld traffic

Use this command to clear all entries in the MLD traffic database.

Format `clear ipv6 mld` *`slot/port`*

Mode Privileged EXEC

11.4 IPv6 MLD-Proxy Commands

MLD-Proxy is the IPv6 equivalent of IGMP-Proxy. MLD-Proxy commands allow you to configure the network device as well as to view device settings and statistics using either serial interface or telnet session. The operation of MLD-Proxy commands is the same as for IGMP-Proxy: MLD is for IPv6 and IGMP is for IPv4.MGMD is a term used to refer to both IGMP and MLD.

11.4.1 ipv6 mld-proxy

Use this command to enable MLD-Proxy on the interface or range of interfaces. To enable MLD-Proxy on the interface, you must enable multicast forwarding. Also, make sure that there are no other multicast routing protocols enabled n the router.

Format `ipv6 mld-proxy`

Mode Interface Config

11.4.1.1 no ipv6 mld-proxy

Use this command to disable MLD-Proxy on the router.

Format	`no ipv6 mld-proxy`
Mode	Interface Config

11.4.2 ipv6 mld-proxy unsolicit-rprt-interval

Use this command to set the unsolicited report interval for the MLD-Proxy interface or range of interfaces. This command is only valid when you enable MLD-Proxy on the interface. The value of *interval* is 1-260 seconds.

Default	`1`
Format	`ipv6 mld-proxy unsolicit-rprt-interval interval`
Mode	Interface Config

11.4.2.1 no ipv6 mld-proxy unsolicited-report-interval

Use this command to reset the MLD-Proxy router's unsolicited report interval to the default value.

Format	`no ipv6 mld-proxy unsolicit-rprt-interval`
Mode	Interface Config

11.4.3 ipv6 mld-proxy reset-status

Use this command to reset the host interface status parameters of the MLD-Proxy interface or range of interfaces. This command is only valid when you enable MLD-Proxy on the interface.

Format	`ipv6 mld-proxy reset-status`
Mode	Interface Config

11.4.4 show ipv6 mld-proxy

Use this command to display a summary of the host interface status parameters.

Format	`show ipv6 mld-proxy`
Mode	• Privileged EXEC • User EXEC

The command displays the following parameters only when you enable MLD-Proxy.

Field	Description
Interface Index	The interface number of the MLD-Proxy.
Admin Mode	Indicates whether MLD-Proxy is enabled or disabled. This is a configured value.
Operational Mode	Indicates whether MLD-Proxy is operationally enabled or disabled. This is a status parameter.
Version	The present MLD host version that is operational on the proxy interface.
Number of Multicast Groups	The number of multicast groups that are associated with the MLD-Proxy interface.
Unsolicited Report Interval	The time interval at which the MLD-Proxy interface sends unsolicited group membership report.
Querier IP Address on Proxy Interface	The IP address of the Querier, if any, in the network attached to the upstream interface (MLD-Proxy interface).

Field	Description
Older Version 1 Querier Timeout	The interval used to timeout the older version 1 queriers.
Proxy Start Frequency	The number of times the MLD-Proxy has been stopped and started.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ipv6 mld-proxy
Interface Index............................................ 0/3
Admin Mode................................................ Enable
Operational Mode.......................................... Enable
Version..................................................... 3
Num of Multicast Groups............................. 0
Unsolicited Report Interval......................... 1
Querier IP Address on Proxy Interface........ fe80::1:2:5
Older Version 1 Querier Timeout................ 00:00:00
Proxy Start Frequency.................................
```

11.4.5 show ipv6 mld-proxy interface

This command displays a detailed list of the host interface status parameters. It displays the following parameters only when you enable MLD-Proxy.

Format `show ipv6 mld-proxy interface`

Modes
- Privileged EXEC
- User EXEC

Term	Definition
Interface Index	The *slot/port* of the MLD-proxy.

The column headings of the table associated with the interface are as follows:

Term	Definition
Ver	The MLD version.
Query Rcvd	Number of MLD queries received.
Report Rcvd	Number of MLD reports received.
Report Sent	Number of MLD reports sent.
Leaves Rcvd	Number of MLD leaves received. Valid for version 2 only.
Leaves Sent	Number of MLD leaves sent on the Proxy interface. Valid for version 2 only.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ipv6 mld-proxy interface

Interface Index............................... 0/1

Ver  Query Rcvd  Report Rcvd  Report Sent  Leave Rcvd  Leave Sent
------------------------------------------------------------------
1      2             0             0             0             2
2      3             0             4           -----         -----
```

11.4.6 show ipv6 mld-proxy groups

Use this command to display information about multicast groups that the MLD-Proxy reported.

Format	`show ipv6 mld-proxy groups`
Mode	• Privileged EXEC • User EXEC

Field	Description
Interface	The interface number of the MLD-Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of the host that last sent a membership report for the current group, on the network attached to the MLD-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed in seconds since last created.
Member State	Possible values are: • Idle_Member. The interface has responded to the latest group membership query for this group. • Delay_Member. The interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are Include or Exclude.
Sources	The number of sources attached to the multicast group.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ipv6 mld-proxy groups

Interface Index................................ 0/3

Group Address    Last Reporter    Up Time   Member State                 Filter Mode  Sources
-------------    -------------- ---------- ----------------- -------------- -------
FF1E::1           FE80::100:2.3    00:01:40  DELAY_MEMBER            Exclude         2

FF1E::2           FE80::100:2.3    00:02:40  DELAY_MEMBER            Include         1

FF1E::3           FE80::100:2.3    00:01:40  DELAY_MEMBER            Exclude         0

FF1E::4           FE80::100:2.3    00:02:44  DELAY_MEMBER          Include           4
```

11.4.7 show ipv6 mld-proxy groups detail

Use this command to display information about multicast groups that MLD-Proxy reported.

Format	`show ipv6 mld-proxy groups detail`
Mode	• Privileged EXEC • User EXEC

Field	Description
Interface	The interface number of the MLD-Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of the host that last sent a membership report for the current group, on the network attached to the MLD-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed in seconds since last created.

Field	Description
Member State	Possible values are: • Idle_Member. The interface has responded to the latest group membership query for this group. • Delay_Member. The interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are Include or Exclude.
Sources	The number of sources attached to the multicast group.
Group Source List	The list of IP addresses of the sources attached to the multicast group.
Expiry Time	The time left for a source to get deleted.

Example: The following shows example CLI display output for the command.

```
(FASTPATH Routing) #show ipv6 igmp-proxy groups

Interface Index................................ 0/3

Group Address    Last Reporter    Up Time   Member State                Filter Mode  Sources
-------------   ---------------- ----------- ----------------- ------------- -------
FF1E::1           FE80::100:2.3         244        DELAY_MEMBER      Exclude         2

Group Source List             Expiry Time
------------------            ---------------
2001::1                          00:02:40
2001::2                          --------

FF1E::2           FE80::100:2.3        243      DELAY_MEMBER   Include         1

Group Source List             Expiry Time
------------------            ---------------
3001::1                          00:03:32
3002::2                          00:03:32


FF1E::3           FE80::100:2.3        328      DELAY_MEMBER   Exclude        0

FF1E::4        FE80::100:2.3        255       DELAY_MEMBER   Include         4

Group Source List             Expiry Time
------------------            ---------------
4001::1                                  00:03:40
5002::2                                  00:03:40
4001::2                                  00:03:40
5002::2                                  00:03:40
```

12 / FASTPATH Log Messages

This chapter lists common log messages that are provided by FASTPATH, along with information regarding the cause of each message. There is no specific action that can be taken per message. When there is a problem being diagnosed, a set of these messages in the event log, along with an understanding of the system configuration and details of the problem will assist Broadcom in determining the root cause of such a problem. The most recent log messages are displayed first.

NOTICE This chapter is not a complete list of all syslog messages.

The Log Messages chapter includes the following sections:

12.1 Core

Table 15: BSP Log Messages

Component	Message	Cause
BSP	Event(0xaaaaaaaa)	Switch has restarted.
BSP	Starting code...	BSP initialization complete, starting FASTPATH application.

Table 16: NIM Log Messages

Component	Message	Cause
NIM	NIM: L7_ATTACH out of order for interface unit x slot x port x	Interface creation out of order.
NIM	NIM: Failed to find interface at unit x slot x port x for event(x)	There is no mapping between the USP and Interface number.
NIM	NIM: L7_DETACH out of order for interface unit x slot x port x	Interface creation out of order.
NIM	NIM: L7_DELETE out of order for interface unit x slot x port x	Interface creation out of order.
NIM	NIM: event(x),intf(x),component(x), in wrong phase	An event was issued to NIM during the wrong configuration phase (probably Phase 1, 2, or WMU).
NIM	NIM: Failed to notify users of interface change	Event was not propagated to the system.
NIM	NIM: failed to send message to NIM message Queue.	NIM message queue full or non-existent.

Table 16: NIM Log Messages (Continued)

Component	Message	Cause
NIM	NIM: Failed to notify the components of L7_CREATE event	Interface not created.
NIM	NIM: Attempted event (x), on USP x.x.x before phase 3	A component issued an interface event during the wrong initialization phase.
NIM	NIM: incorrect phase for operation	An API call was made during the wrong initialization phase.
NIM	NIM: Component(x) failed on event(x) for interface	A component responded with a fail indication for an interface event.
NIM	NIM: Timeout event(x), interface remainingMask = xxxx	A component did not respond before the NIM timeout occurred.

Table 17: SIM Log Message

Component	Message	Cause
SIM	IP address conflict on service port/network port for IP address x.x.x.x. Conflicting host MAC address is xx:xx:xx:xx:xx:xx	This message appears when an address conflict is detected in the LAN for the service port/network port IP.

Table 18: System Log Messages

Component	Message	Cause
SYSTEM	Configuration file fastpath.cfg size is 0 (zero) bytes	The configuration file could not be read. This message may occur on a system for which no configuration has ever been saved or for which configuration has been erased.
SYSTEM	could not separate SYSAPI_CONFIG_FILENAME	The configuration file could not be read. This message may occur on a system for which no configuration has ever been saved or for which configuration has been erased.
SYSTEM	Building defaults for file *file name* version *version num*	Configuration did not exist or could not be read for the specified feature or file. Default configuration values will be used. The file name and version are indicated.

Table 18: System Log Messages (Continued)

Component	Message	Cause
SYSTEM	File *filename*: same version (*version num*) but the sizes (*version size* – *expected version size*) differ	The configuration file which was loaded was of a different size than expected for the version number. This message indicates the configuration file needed to be migrated to the version number appropriate for the code image. This message may appear after upgrading the code image to a more current release.
SYSTEM	Migrating config file *filename* from version *version num* to *version num*	The configuration file identified was migrated from a previous version number. Both the old and new version number are specified. This message may appear after upgrading the code image to a more current release.
SYSTEM	Building Defaults	Configuration did not exist or could not be read for the specified feature. Default configuration values will be used.
SYSTEM	sysapiCfgFileGet failed size = *expected size of file* version = *expected version*	Configuration did not exist or could not be read for the specified feature. This message is usually followed by a message indicating that default configuration values will be used.

12.2 Utilities

Table 19: Trap Mgr Log Message

Component	Message	Cause
Trap Mgr	Link Up/Down: slot/port	An interface changed link state.

Table 20: DHCP Filtering Log Messages

Component	Message	Cause
DHCP Filtering	Unable to create r/w lock for DHCP Filtering	Unable to create semaphore used for dhcp filtering configuration structure.
DHCP Filtering	Failed to register with nv Store.	Unable to register save and restore functions for configuration save.
DHCP Filtering	Failed to register with NIM	Unable to register with NIM for interface callback functions.
DHCP Filtering	Error on call to sysapiCfgFileWrite file	Error on trying to save configuration.

Table 21: NVStore Log Messages

Component	Message	Cause
NVStore	Building defaults for file XXX	A component's configuration file does not exist or the file's checksum is incorrect so the component's default configuration file is built.
NVStore	Error on call to osapiFsWrite routine on file XXX	Either the file cannot be opened or the OS's file I/O returned an error trying to write to the file.
NVStore	File XXX corrupted from file system. Checksum mismatch.	The calculated checksum of a component's configuration file in the file system did not match the checksum of the file in memory.
NVStore	Migrating config file XXX from version Y to Z	A configuration file version mismatch was detected so a configuration file migration has started.

Table 22: RADIUS Log Messages

Component	Message	Cause
RADIUS	RADIUS: Invalid data length - xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Failed to send the request	A problem communicating with the RADIUS server.
RADIUS	RADIUS: Failed to send all of the request	A problem communicating with the RADIUS server during transmit.
RADIUS	RADIUS: Could not get the Task Sync semaphore!	Resource issue with RADIUS Client service.
RADIUS	RADIUS: Buffer is too small for response processing	RADIUS Client attempted to build a response larger than resources allow.
RADIUS	RADIUS: Could not allocate accounting requestInfo	Resource issue with RADIUS Client service.
RADIUS	RADIUS: Could not allocate requestInfo	Resource issue with RADIUS Client service.
RADIUS	RADIUS: osapiSocketRecvFrom returned error	Error while attempting to read data from the RADIUS server.
RADIUS	RADIUS: Accounting-Response failed to validate, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: User (xxx) needs to respond for challenge	An unexpected challenge was received for a configured user.
RADIUS	RADIUS: Could not allocate a buffer for the packet	Resource issue with RADIUS Client service.
RADIUS	RADIUS: Access-Challenge failed to validate, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Failed to validate Message-Authenticator, id = xxx	The RADIUS Client received an invalid message from the server.

Table 22: RADIUS Log Messages (Continued)

Component	Message	Cause
RADIUS	RADIUS: Access-Accept failed to validate, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Invalid packet length – xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Response is missing Message-Authenticator, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Server address doesn't match configured server	RADIUS Client received a server response from an unconfigured server.

Table 23: TACACS+ Log Messages

Component	Message	Cause
TACACS+	TACACS+: authentication error, no server to contact	TACACS+ request needed, but no servers are configured.
TACACS+	TACACS+: connection failed to server x.x.x.x	TACACS+ request sent to server x.x.x.x but no response was received.
TACACS+	TACACS+: no key configured to encrypt packet for server x.x.x.x	No key configured for the specified server.
TACACS+	TACACS+: received invalid packet type from server.	Received packet type that is not supported.
TACACS+	TACACS+: invalid major version in received packet.	Major version mismatch.
TACACS+	TACACS+: invalid minor version in received packet.	Minor version mismatch.

Table 24: LLDP Log Message

Component	Message	Cause
LLDP	lldpTask(): invalid message type:xx. xxxxxx:xx	Unsupported LLDP packet received.

Table 25: SNTP Log Message

Component	Message	Cause
SNTP	SNTP: system clock synchronized on %s UTC	Indicates that SNTP has successfully synchronized the time of the box with the server.

Table 26: DHCPv6 Client Log Messages

Component	Message	Cause
DHCP6 Client	ip6Map dhcp add failed.	This message appears when the update of a DHCP leased IP address to IP6Map fails.
DHCP6 Client	osapiNetAddrV6Add failed on interface xxx.	This message appears when the update of a DHCP leased IP address to the kernel IP Stack fails.
DHCP6 Client	Failed to add DNS Server xxx to DNS Client.	This message appears when the update of a DNS6 Server address given by the DHCPv6 Server to the DNS6 Client fails.
DHCP6 Client	Failed to add Domain name xxx to DNS Client.	This message appears when the update of a DNS6 Domain name info given by the DHCPv6 Server to the DNS6 Client fails.

Table 27: DHCPv4 Client Log Messages

Component	Message	Cause
DHCP4 Client	Unsupported subOption (xxx) in Vendor Specific Option in received DHCP pkt	This message appears when a message is received from the DHCP Server that contains an un-supported Vendor Option.
DHCP4 Client	Failed to acquire an IP address on xxx; DHCP Server did not respond.	This message appears when the DHCP Client fails to lease an IP address from the DHCP Server.
DHCP4 Client	DNS name server entry add failed.	This message appears when the update of a DNS Domain name server info given by the DHCP Server to the DNS Client fails.
DHCP4 Client	DNS domain name list entry addition failed.	This message appears when the update of a DNS Domain name list info given by the DHCP Server to the DNS Client fails.
DHCP4 Client	Interface xxx Link State is Down. Connect the port and try again.	This message appears when the Network protocol is configured with DHCP without any active links in the Management VLAN.

12.3 Management

Table 28: SNMP Log Message

Component	Message	Cause
SNMP	EDB Callback: Unit Join: x.	A new unit has joined the stack.

Table 29: EmWeb Log Messages

Component	Message	Cause
EmWeb	EMWEB (Telnet): Max number of Telnet login sessions exceeded	A user attempted to connect via telnet when the maximum number of telnet sessions were already active.
EmWeb	EMWEB (SSH): Max number of SSH login sessions exceeded	A user attempted to connect via SSH when the maximum number of SSH sessions were already active.
EmWeb	Handle table overflow	All the available EmWeb connection handles are being used and the connection could not be made.
EmWeb	*ConnectionType* EmWeb socket accept() failed: errno	Socket accept failure for the specified connection type.
EmWeb	ewsNetHTTPReceive failure in NetReceiveLoop() - closing connection.	Socket receive failure.
EmWeb	EmWeb: connection allocation failed	Memory allocation failure for the new connection.
EmWeb	EMWEB TransmitPending: EWOULDBLOCK error sending data	Socket error on send.
EmWeb	ewaNetHTTPEnd: internal error - handle not in Handle table	EmWeb handle index not valid.
EmWeb	ewsNetHTTPReceive:recvBufCnt exceeds MAX_QUEUED_RECV_BUFS!	The receive buffer limit has been reached. Bad request or DoS attack.
EmWeb	EmWeb accept: XXXX	Accept function for new SSH connection failed. XXXX indicates the error info.

Table 30: CLI_UTIL Log Messages

Component	Message	Cause
CLI_UTIL	Telnet Send Failed errno = 0x%x	Failed to send text string to the telnet client.
CLI_UTIL	osapiFsDir failed	Failed to obtain the directory information from a volume's directory.

Table 31: WEB Log Messages

Component	Message	Cause
WEB	Max clients exceeded	This message is shown when the maximum allowed java client connections to the switch is exceeded.
WEB	Error on send to sockfd XXXX, closing connection	Failed to send data to the java clients through the socket.
WEB	# (XXXX) Form Submission Failed. No Action Taken.	The form submission failed and no action is taken. XXXX indicates the file under consideration.
WEB	ewaFormServe_file_download() - WEB Unknown return code from tftp download result	Unknown error returned while downloading file using TFTP from web interface.
WEB	ewaFormServe_file_upload() - Unknown return code from tftp upload result	Unknown error returned while uploading file using TFTP from web interface.
WEB	Web UI Screen with unspecified access attempted to be brought up	Failed to get application-specific authorization handle provided to EmWeb/Server by the application in ewsAuthRegister(). The specified web page will be served in read-only mode.

Table 32: CLI_WEB_MGR Log Messages

Component	Message	Cause
CLI_WEB_MGR	File size is greater than 2K	The banner file size is greater than 2K bytes.
CLI_WEB_MGR	No. of rows greater than allowed maximum of XXXX	When the number of rows exceeds the maximum allowed rows.

Table 33: SSHD Log Messages

Component	Message	Cause
SSHD	SSHD: Unable to create the global (data) semaphore	Failed to create semaphore for global data protection.
SSHD	SSHD: Msg Queue is full, event = XXXX	Failed to send the message to the SSHD message queue as message queue is full. XXXX indicates the event to be sent.
SSHD	SSHD: Unknown UI event in message, event = XXXX	Failed to dispatch the UI event to the appropriate SSHD function as it's an invalid event. XXXX indicates the event to be dispatched.
SSHD	sshdApiCnfgrCommand: Failed calling sshdIssueCmd.	Failed to send the message to the SSHD message queue.

Table 34: SSLT Log Messages

Component	Message	Cause
SSLT	SSLT: Exceeded maximum, ssltConnectionTask	Exceeded maximum allowed SSLT connections.
SSLT	SSLT: Error creating Secure server socket6	Failed to create secure server socket for IPV6.
SSLT	SSLT: Can't connect to unsecure server at XXXX, result = YYYY, errno = ZZZZ	Failed to open connection to unsecure server. XXXX is the unsecure server socket address. YYYY is the result returned from connect function and ZZZZ is the error code.
SSLT	SSLT: Msg Queue is full, event = XXXX	Failed to send the received message to the SSLT message queue as message queue is full. XXXX indicates the event to be sent.
SSLT	SSLT: Unknown UI event in message, event = XXXX	Failed to dispatch the received UI event to the appropriate SSLT function as it's an invalid event. XXXX indicates the event to be dispatched.
SSLT	ssltApiCnfgrCommand: Failed calling ssltIssueCmd.	Failed to send the message to the SSLT message queue.
SSLT	SSLT: Error loading certificate from file XXXX	Failed while loading the SSLcertificate from specified file. XXXX indicates the file from where the certificate is being read.
SSLT	SSLT: Error loading private key from file	Failed while loading private key for SSL connection.
SSLT	SSLT: Error setting cipher list (no valid ciphers)	Failed while setting cipher list.
SSLT	SSLT: Could not delete the SSL semaphores	Failed to delete SSL semaphores during cleanup.of all resources associated with the OpenSSL Locking semaphores.

Table 35: User_Manager Log Messages

Component	Message	Cause
User_Manager	User Login Failed for XXXX	Failed to authenticate user login. XXXX indicates the username to be authenticated.
User_Manager	Access level for user XXXX could not be determined. Setting to Level 1.	Invalid access level specified for the user. The access level is set to Level 1. XXXX indicates the username.
User_Manager	Could not migrate config file XXXX from version YYYY to ZZZZ. Using defaults.	Failed to migrate the config file. XXXX is the config file name. YYYY is the old version number and ZZZZ is the new version number.

12.4 Switching

Table 36: Protected Ports Log Messages

Component	Message	Cause
Protected Ports	Protected Port: failed to save configuration	This appears when the protected port configuration cannot be saved.
Protected Ports	protectedPortCnfgrInitPhase1Process: Unable to create r/w lock for protected Port	This appears when protectedPortCfgRWLock Fails.
Protected Ports	protectedPortCnfgrInitPhase2Process: Unable to register for VLAN change callback	This appears when nimRegisterIntfChange with VLAN fails.
Protected Ports	Cannot add interface xxx to group yyy	This appears when an interface could not be added to a particular group.
Protected Ports	unable to set protected port group	This appears when a dtl call fails to add interface mask at the driver level.
Protected Ports	Cannot delete interface xxx from group yyy	This appears when a dtl call to delete an interface from a group fails.
Protected Ports	Cannot update group YYY after deleting interface XXX	This message appears when an update group for a interface deletion fails.
Protected Ports	Received an interface change callback while not ready to receive it	This appears when an interface change call back has come before the protected port component is ready.

Table 37: IP Subnet VLANS Log Messages

Component	Message	Cause
IP subnet VLANs	ERROR vlanIpSubnetSubnetValid:Invalid subnet	This occurs when an invalid pair of subnet and netmask has come from the CLI.
IP subnet VLANs	IP Subnet Vlans: failed to save configuration	This message appears when save configuration of subnet vlans failed.
IP subnet VLANs	vlanIpSubnetCnfgrInitPhase1Process: Unable to create r/w lock for vlanIpSubnet	This appears when a read/write lock creations fails.
IP subnet VLANs	vlanIpSubnetCnfgrInitPhase2Process: Unable to register for VLAN change callback	This appears when this component unable to register for vlan change notifications.
IP subnet VLANs	vlanIpSubnetCnfgrFiniPhase1Process: could not delete avl semaphore	This appears when a semaphore deletion of this component fails.
IP subnet VLANs	vlanIpSubnetDtlVlanCreate: Failed	This appears when a dtl call fails to add an entry into the table.
IP subnet VLANs	vlanIpSubnetSubnetDeleteApply: Failed	This appears when a dtl fails to delete an entry from the table.
IP subnet VLANs	vlanIpSubnetVlanChangeCallback: Failed to add an Entry	This appears when a dtl fails to add an entry for a vlan add notify event.
IP subnet VLANs	vlanIpSubnetVlanChangeCallback: Failed to delete an Entry	This appears when a dtl fails to delete an entry for an vlan delete notify event.

Table 38: Mac-based VLANs Log Messages

Component	Message	Cause
MAC based VLANs	MAC VLANs: Failed to save configuration	This message appears when save configuration of Mac vlans failed.
MAC based VLANs	vlanMacCnfgrInitPhase1Process: Unable to create r/w lock for vlanMac	This appears when a read/write lock creations fails.
MAC based VLANs	Unable to register for VLAN change callback	This appears when this component unable to register for vlan change notifications.
MAC based VLANs	vlanMacCnfgrFiniPhase1Process: could not delete avl semaphore	This appears when a semaphore deletion of this component fails.
MAC based VLANs	vlanMacAddApply: Failed to add an entry	This appears when a dtl call fails to add an entry into the table.
MAC based VLANs	vlanMacDeleteApply: Unable to delete an Entry	This appears when a dtl fails to delete an entry from the table.
MAC based VLANs	vlanMacVlanChangeCallback: Failed to add an entry	This appears when a dtl fails to add an entry for a vlan add notify event.
MAC based VLANs	vlanMacVlanChangeCallback: Failed to delete an entry	This appears when a dtl fails to delete an entry for an vlan delete notify event.

Table 39: 802.1X Log Messages

Component	Message	Cause
802.1X	*function*: Failed calling dot1xIssueCmd	802.1X message queue is full.
802.1X	*function:* EAP message not received from server	RADIUS server did not send required EAP message.
802.1X	*function*: Out of System buffers	802.1X cannot process/transmit message due to lack of internal buffers.
802.1X	*function*: could not set state to *authorized/ unauthorized*, intf xxx	DTL call failed setting authorization state of the port.
802.1X	dot1xApplyConfigData: Unable to *enable/ disable* dot1x in driver	DTL call failed enabling/disabling 802.1X.
802.1X	dot1xSendRespToServer: dot1xRadiusAccessRequestSend failed	Failed sending message to RADIUS server.
802.1X	dot1xRadiusAcceptProcess: error calling radiusAccountingStart, ifIndex = xxx	Failed sending accounting start to RADIUS server.
802.1X	*function*: failed sending terminate cause, intf xxx	Failed sending accounting stop to RADIUS server.

Table 40: IGMP Snooping Log Messages

Component	Message	Cause
IGMP Snooping	*function*: osapiMessageSend failed	IGMP Snooping message queue is full.
IGMP Snooping	Failed to set global igmp snooping mode to xxx	Failed to set global IGMP Snooping mode due to message queue being full.
IGMP Snooping	Failed to set igmp snooping mode xxx for interface yyy	Failed to set interface IGMP Snooping mode due to message queue being full.
IGMP Snooping	Failed to set igmp mrouter mode xxx for interface yyy	Failed to set interface multicast router mode due to IGMP Snooping message queue being full.
IGMP Snooping	Failed to set igmp snooping mode xxx for vlan yyy	Failed to set VLAN IGM Snooping mode due to message queue being full.
IGMP Snooping	Failed to set igmp mrouter mode%d for interface xxx on Vlan yyy	Failed to set VLAN multicast router mode due to IGMP Snooping message queue being full.
IGMP Snooping	snoopCnfgrInitPhase1Process: Error allocating small buffers	Could not allocate buffers for small IGMP packets.
IGMP Snooping	snoopCnfgrInitPhase1Process: Error allocating large buffers	Could not allocate buffers for large IGMP packets.

Table 41: GARP/GVRP/GMRP Log Messages

Component	Message	Cause
GARP/GVRP/ GMRP	garpSpanState, garpIfStateChange, GarpIssueCmd, garpDot1sChangeCallBack, garpApiCnfgrCommand, garpLeaveAllTimerCallback, garpTimerCallback: QUEUE SEND FAILURE:	The garpQueue is full, logs specifics of the message content like internal interface number, type of message, etc.
GARP/GVRP/ GMRP	GarpSendPDU: QUEUE SEND FAILURE	The garpPduQueue is full, logs specific of the GPDU, internal interface number, vlan id, buffer handle, etc.
GARP/GVRP/ GMRP	garpMapIntfIsConfigurable, gmrpMapIntfIsConfigurable: Error accessing GARP/ GMRP config data for interface %d in garpMapIntfIsConfigurable.	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.
GARP/GVRP/ GMRP	garpTraceMsgQueueUsage: garpQueue usage has exceeded fifty/eighty/ninety percent	Traces the build up of message queue. Helpful in determining the load on GARP.
GARP/GVRP/ GMRP	gid_destroy_port: Error Removing port %d registration for vlan-mac %d - %02X:%02X:%02X:%02X:%02X:%02X	Mismatch between the gmd (gmrp database) and MFDB.
GARP/GVRP/ GMRP	gmd_create_entry: GMRP failure adding MFDB entry: vlan %d and address %s	MFDB table is full.

Table 42: 802.3ad Log Messages

Component	Message	Cause
802.3ad	dot3adReceiveMachine: received default event %x	Received a LAG PDU and the RX state machine is ignoring this LAGPDU.
802.3ad	dot3adNimEventCompletionCallback, dot3adNimEventCreateCompletionCallback: DOT3AD: notification failed for event(%d), intf(%d), reason(%d)	The event sent to NIM was not completed successfully.

Table 43: FDB Log Message

Component	Message	Cause
FDB	fdbSetAddressAgingTimeOut: Failure setting fid %d address aging timeout to %d	Unable to set the age time in the hardware.

Table 44: Double VLAN Tag Log Message

Component	Message	Cause
Double Vlan Tag	dvlantagIntfIsConfigurable: Error accessing dvlantag config data for interface %d	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.

Table 45: IPv6 Provisioning Log Message

Component	Message	Cause
IPV6 Provisioning	ipv6ProvIntfIsConfigurable: Error accessing IPv6 Provisioning config data for interface %d	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.

Table 46: MFDB Log Message

Component	Message	Cause
MFDB	mfdbTreeEntryUpdate: entry does not exist	Trying to update a non existing entry.

Table 47: 802.1Q Log Messages

Component	Message	Cause
802.1Q	dot1qIssueCmd: Unable to send message %d to dot1qMsgQueue for vlan %d - %d msgs in queue	dot1qMsgQueue is full.
802.1Q	dot1qVlanCreateProcess: Attempt to create a vlan with an invalid vlan id %d ; VLAN %d not in range,	This accommodates for reserved vlan ids. i.e. 4094 - x.
802.1Q	dot1qMapIntfIsConfigurable: Error accessing DOT1Q config data for interface %d in dot1qMapIntfIsConfigurable.	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.
802.1Q	dot1qVlanDeleteProcess: Deleting the default VLAN	Typically encountered during clear Vlan and clear config.
802.1Q	dot1qVlanMemberSetModify, dot1qVlanTaggedMemberSetModify: Dynamic entry %d can only be modified after it is converted to static	If this vlan is a learnt via GVRP then we cannot modify its member set via management.
802.1Q	dtl failure when adding ports to vlan id %d - portMask = %s	Failed to add the ports to VLAN entry in hardware.
802.1Q	dtl failure when deleting ports from vlan id %d - portMask = %s	Failed to delete the ports for a VLAN entry from the hardware.
802.1Q	dtl failure when adding ports to tagged list for vlan id %d - portMask = %s	Failed to add the port to the tagged list in hardware.
802.1Q	dtl failure when deleting ports from tagged list for vlan id %d - portMask = %s"	Failed to delete the port to the tagged list from the hardware.
802.1Q	dot1qTask: unsuccessful return code on receive from dot1qMsgQueue: %08x"	Failed to receive the dot1q message from dot1q message queue.
802.1Q	Unable to apply VLAN creation request for VLAN ID %d, Database reached MAX VLAN count!	Failed to create VLAN ID, VLAN Database reached maximum values.
802.1Q	Attempt to create a vlan (%d) that already exists	Creation of the existing Dynamic VLAN ID from the CLI.
802.1Q	DTL call to create VLAN %d failed with rc %d"	Failed to create VLAN ID in hardware.
802.1Q	Problem unrolling data for VLAN %d	Failed to delete VLAN from the VLAN database after failure of VLAN hardware creation.
802.1Q	VLan %d does not exist	Failed to delete VLAN entry.
802.1Q	VLan %d requestor type %d does not exist	Failed to delete dynamic VLAN ID if the given requestor is not valid.
802.1Q	Can not delete the VLAN, Some unknown component has taken the ownership!	Failed to delete, as some unknown component has taken the ownership.
802.1Q	Not valid permission to delete the VLAN %d requestor %d	Failed to delete the VLAN ID as the given requestor and VLAN entry status are not same.
802.1Q	VLAN Delete Call failed in driver for vlan %d	Failed to delete VLAN ID from the hardware.
802.1Q	Problem deleting data for VLAN %d	Failed to delete VLAN ID from the VLAN database.
802.1Q	Dynamic entry %d can only be modified after it is converted to static	Failed to modify the VLAN group filter
802.1Q	Cannot find vlan %d to convert it to static	Failed to convert Dynamic VLAN to static VLAN. VLAN ID not exists.

Table 47: 802.1Q Log Messages (Continued)

Component	Message	Cause
802.1Q	Only Dynamically created VLANs can be converted	Error while trying to convert the static created VLAN ID to static.
802.1Q	Cannot modify tagging of interface %s to non existence vlan %d"	Error for a given interface sets the tagging property for all the VLANs in the vlan mask.
802.1Q	Error in updating data for VLAN %d in VLAN database	Failed to add VLAN entry into VLAN database.
802.1Q	DTL call to create VLAN %d failed with rc %d	Failed to add VLAN entry in hardware.
802.1Q	Not valid permission to delete the VLAN %d	Failed to delete static VLAN ID. Invalid requestor.
802.1Q	Attempt to set access vlan with an invalid vlan id %d	Invalid VLAN ID.
802.1Q	Attempt to set access vlan with (%d) that does not exist	VLAN ID not exists.
802.1Q	VLAN create currently underway for VLAN ID %d	Creating a VLAN which is already under process of creation.
802.1Q	VLAN ID %d is already exists as static VLAN	Trying to create already existing static VLAN ID.
802.1Q	Cannot put a message on dot1q msg Queue, Returns:%d	Failed to send Dot1q message on Dot1q message Queue.
802.1Q	Invalid dot1q Interface: %s	Failed to add VLAN to a member of port.
802.1Q	Cannot set membership for user interface %s on management vlan %d	Failed to add VLAN to a member of port.
802.1Q	Incorrect tagmode for vlan tagging. tagmode: %d Interface: %s	Incorrect tagmode for VLAN tagging.
802.1Q	Cannot set tagging for interface %d on non existent VLAN %d"	The VLAN ID does not exist.
802.1Q	Cannot set tagging for interface %d which is not a member of VLAN %d	Failure in Setting the tagging configuration for a interface on a range of VLAN.
802.1Q	VLAN create currently underway for VLAN ID %d"	Trying to create the VLAN ID which is already under process of creation.
802.1Q	VLAN ID %d already exists	Trying to create the VLAN ID which is already exists.
802.1Q	Failed to delete, Default VLAN %d cannot be deleted	Trying to delete Default VLAN ID.
802.1Q	Failed to delete, VLAN ID %d is not a static VLAN	Trying to delete Dynamic VLAN ID from CLI.
802.1Q	Requestor %d attempted to release internal VLAN %d: owned by %d	-

Table 48: 802.1S Log Messages

Component	Message	Cause
802.1S	dot1sIssueCmd: Dot1s Msg Queue is full!!!!Event: %u, on interface: %u, for instance: %u	The message Queue is full.
802.1S	dot1sStateMachineRxBpdu(): Rcvd BPDU Discarded	The current conditions, like port is not enabled or we are currently not finished processing another BPDU on the same interface, does not allow us to process this BPDU.
802.1S	dot1sBpduTransmit(): could not get a buffer	Out of system buffers.

Table 49: Port Mac Locking Log Message

Component	Message	Cause
Port Mac Locking	pmlMapIntfIsConfigurable: Error accessing PML config data for interface %d in pmlMapIntfIsConfigurable.	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.

Table 50: Protocol-based VLANs Log Messages

Component	Message	Cause
Protocol Based VLANs	pbVlanCnfgrInitPhase2Process: Unable to register NIM callback	Appears when nimRegisterIntfChange fails to register pbVlan for link state changes.
Protocol Based VLANs	pbVlanCnfgrInitPhase2Process: Unable to register pbVlan callback with VLANs	Appears when VLANRegisterForChange fails to register pbVlan for VLAN changes.
Protocol Based VLANs	pbVlanCnfgrInitPhase2Process: Unable to register pbVlan callback with nvStore	Appears when nvStoreRegister fails to register save and restore functions for configuration save.

12.5 QoS

Table 51: ACL Log Messages

Component	Message	Cause
ACL	Total number of ACL rules (x) exceeds max (y) on intf i.	The combination of all ACLs applied to an interface has resulted in requiring more rules than the platform supports.
ACL	ACL *name*, rule *x*: This rule is not being logged	The ACL configuration has resulted in a requirement for more logging rules than the platform supports. The specified rule is functioning normally except for the logging action.
ACL	aclLogTask: error logging ACL rule trap for correlator *number*	The system was unable to send an SNMP trap for this ACL rule which contains a logging attribute.
ACL	IP ACL *number*: Forced truncation of one or more rules during config migration	While processing the saved configuration, the system encountered an ACL with more rules than is supported by the current version. This may happen when code is updated to a version supporting fewer rules per ACL than the previous version.

Table 52: CoS Log Message

Component	Message	Cause
COS	cosCnfgrInitPhase3Process: Unable to apply saved config -- using factory defaults	The COS component was unable to apply the saved configuration and has initialized to the factory default settings.

Table 53: DiffServ Log Messages

Component	Message	Cause
DiffServ	diffserv.c 165: diffServRestore Failed to reset DiffServ. Recommend resetting device	While attempting to clear the running configuration an error was encountered in removing the current settings. This may lead to an inconsistent state in the system and resetting is advised.
DiffServ	Policy invalid for service intf: policy *name*, interface *x*, direction *y*	The DiffServ policy definition is not compatible with the capabilities of the interface specified. Check the platform release notes for information on configuration limitations.

12.6 Routing/IPv6 Routing

Table 54: DHCP Relay Log Messages

Component	Message	Cause
DHCP relay	REQUEST hops field more than config value	The DHCP relay agent has processed a DHCP request whose HOPS field is larger than the maximum value allowed. The relay agent will not forward a message with a hop count greater than 4.
DHCP relay	Request's seconds field less than the config value	The DHCP relay agent has processed a DHCP request whose SECS field is larger than the configured minimum wait time allowed.
DHCP relay	processDhcpPacket: invalid DHCP packet type: %u\n	The DHCP relay agent has processed an invalid DHCP packet. Such packets are discarded by the relay agent.

Table 55: OSPFv2 Log Messages

Component	Message	Cause
OSPFv2	Best route client deregistration failed for OSPF Redist	OSPFv2 registers with the IPv4 routing table manager ("RTO") to be notified of best route changes. There are cases where OSPFv2 deregisters more than once, causing the second deregistration to fail. The failure is harmless.
OSPFv2	XX_Call() failure in _checkTimers for thread 0x869bcc0	An OSPFv2 timer has fired but the message queue that holds the event has filled up. This is normally a fatal error.
OSPFv2	Warning: OSPF LSDB is 90% full (22648 LSAs).	OSPFv2 limits the number of Link State Advertisements (LSAs) that can be stored in the link state database (LSDB). When the database becomes 90 or 95 percent full, OSPFv2 logs this warning. The warning includes the current size of the database.
OSPFv2	The number of LSAs, 25165, in the OSPF LSDB has exceeded the LSDB memory allocation.	When the OSPFv2 LSDB becomes full, OSPFv2 logs this message. OSPFv2 reoriginates its router LSAs with the metric of all non-stub links set to the maximum value to encourage other routers to not compute routes through the overloaded router.
OSPFv2	Dropping the DD packet because of MTU mismatch	OSPFv2 ignored a Database Description packet whose MTU is greater than the IP MTU on the interface where the DD was received.
OSPFv2	LSA Checksum error in LsUpdate, dropping LSID 1.2.3.4 checksum 0x1234.	OSPFv2 ignored a received link state advertisement (LSA) whose checksum was incorrect.

Table 56: OSPFv3 Log Messages

Component	Message	Cause
OSPFv3	Best route client deregistration failed for OSPFv3 Redist	OSPFv3 registers with the IPv6 routing table manager ("RTO6") to be notified of best route changes. There are cases where OSPFv3 deregisters more than once, causing the second deregistration to fail. The failure is harmless.
OSPFv3	Warning: OSPF LSDB is 90% full (15292 LSAs).	OSPFv3 limits the number of Link State Advertisements (LSAs) that can be stored in the link state database (LSDB). When the database becomes 90 or 95 percent full, OSPFv3 logs this warning. The warning includes the current size of the database.
OSPFv3	The number of LSAs, 16992, in the OSPF LSDB has exceeded the LSDB memory allocation.	When the OSPFv3 LSDB becomes full, OSPFv3 logs this message. OSPFv3 reoriginates its router LSAs with the R-bit clear indicating that OSPFv3 is overloaded.
OSPFv3	LSA Checksum error detected for LSID 1.2.3.4 checksum 0x34f5. OSPFv3 Database may be corrupted.	OSPFv3 periodically verifies the checksum of each LSA in memory. OSPFv3 logs this.

Table 57: Routing Table Manager Log Messages

Component	Message	Cause
RTO	RTO is no longer full. Routing table contains xxx best routes, xxx total routes, xxx reserved local routes.	When the number of best routes drops below full capacity, RTO logs this notice. The number of bad adds may give an indication of the number of route adds that failed while RTO was full, but a full routing table is only one reason why this count is incremented.
RTO	RTO is full. Routing table contains xxx best routes, xxx total routes, xxx reserved local routes. The routing table manager stores a limited number of best routes. The count of total routes includes alternate routes, which are not installed in hardware.	The routing table manager, also called "RTO," stores a limited number of best routes, based on hardware capacity. When the routing table becomes full, RTO logs this alert. The count of total routes includes alternate routes, which are not installed in hardware.

Table 58: VRRP Log Messages

Component	Message	Cause
VRRP	VRRP packet of size xxx dropped. Min VRRP packet size is xxx; Max VRRP packet size is xxx.	This message appears when there is flood of VRRP messages in the network.
VRRP	VR xxx on interface xxx started as xxx.	This message appears when the Virtual router is started in the role of a Master or a Backup.
VRRP	This router is the IP address owner for virtual router xxx on interface xxx. Setting the virtual router priority to xxx.	This message appears when the address ownership status for a specific VR is updated. If this router is the address owner for the VR, set the VR's priority to MAX priority (as per RFC 3768). If the router is no longer the address owner, revert the priority.

Table 59: ARP Log Message

Component	Message	Cause
ARP	IP address conflict on interface xxx for IP address yyy. Conflicting host MAC address is zzz.	When an address conflict is detected for any IP address on the switch upon reception of ARP packet from another host or router.

Table 60: RIP Log Message

Component	Message	Cause
RIP	RIP: discard response from xxx via unexpected interface	When RIP response is received with a source address not matching the incoming interface's subnet.

12.7 Multicast

Table 61: IGMP/MLD Log Messages

Component	Message	Cause
IGMP/MLD	MGMD Protocol Heap Memory Init Failed; Family – xxx.	MGMD Heap memory initialization Failed for the specified address family. This message appears when trying to enable MGMD Protocol.
IGMP/MLD	MGMD Protocol Heap Memory De-Init Failed; Family – xxx.	MGMD Heap memory de-initialization Failed for the specified address family. This message appears when trying to disable MGMD (IGMP/MLD) Protocol. As a result of this, the subsequent attempts to enable/ disable MGMD will also fail.
IGMP/MLD	MGMD Protocol Initialization Failed; Family – xxx.	MGMD protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable MGMD Protocol.
IGMP/MLD	MGMD All Routers Address - xxx Set to the DTL Mcast List Failed; Mode – xxx, intf – xxx.	This message appears when trying to enable/disable MGMD Protocol.
IGMP/MLD	MGMD All Routers Address - xxx Add to the DTL Mcast List Failed.	MGMD All Routers Address addition to the local multicast list Failed. As a result of this, MGMD Multicast packets with this address will not be received at the application.
IGMP/MLD	MGMD All Routers Address – xxx Delete from the DTL Mcast List Failed.	MGMD All Routers Address deletion from the local multicast list Failed. As a result of this, MGMD Multicast packets are still received at the application though MGMD is disabled.
IGMP/MLD	MLDv2 GroupAddr-[FF02::16] Enable with Interpeak Stack Failed; rtrIfNum - xxx, intf – xxx.	Registration of this Group address with the Interpeak stack failed. As a result of this, MLDv2 packets will not be received at the application.
IGMP/MLD	MGMD Group Entry Creation Failed; grpAddr - xxx, rtrIfNum – xxx.	The specified Group Address registration on the specified router interface failed.
IGMP/MLD	MGMD Socket Creation/Initialization Failed for addrFamily – xxx.	MGMD Socket Creation/options Set Failed. As a result of this, the MGMD Control packets cannot be sent out on an interface.

Table 62: IGMP-Proxy Log Messages

Component	Message	Cause
IGMP-Proxy/ MLD-Proxy	MGMD-Proxy Protocol Initialization Failed; Family – xxx.	MGMD-Proxy protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable MGMD-Proxy Protocol.
IGMP-Proxy/ MLD-Proxy	MGMD-Proxy Protocol Heap Memory De-Init Failed; Family – xxx.	MGMD-Proxy Heap memory de-initialization is Failed for the specified address family. This message appears when trying to disable MGMD-Proxy Protocol. As a result of this, the subsequent attempts to enable/ disable MGMD-Proxy will also fail.
IGMP-Proxy/ MLD-Proxy	MGMD Proxy Route Entry Creation Failed; grpAddr - xxx, srcAddr – xxx, rtrIfNum – xxx.	Registration of the Multicast Forwarding entry for the specified Source and Group Address Failed when MGMD-Proxy is used.

Table 63: PIM-SM Log Messages

Component	Message	Cause
PIMSM	Non-Zero SPT/Data Threshold Rate – xxx is currently Not Supported on this platform.	This message appears when the user tries to configure the PIMSM SPT threshold value.
PIMSM	PIMSM Protocol Heap Memory Init Failed; Family – xxx.	PIMSM Heap memory initialization Failed for the specified address family. This message appears when trying to enable PIMSM Protocol.
PIMSM	PIMSM Protocol Heap Memory De-Init Failed; Family –xxx.	PIMSM Heap memory de-initialization Failed for the specified address family. This message appears when trying to disable PIMSM Protocol. As a result of this, the subsequent attempts to enable/disable PIMSM will also fail.
PIMSM	PIMSM Protocol Initialization Failed; Family –xxx.	PIMSM protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable PIMSM Protocol.
PIMSM	PIMSM Protocol De-Initialization Failed; Family – xxx.	PIMSM protocol de-initialization sequence Failed. This message appears when trying to disable PIMSM Protocol.
PIMSM	PIMSM SSM Range Table is Full.	PIMSM SSM Range Table is Full. This message appears when the protocol cannot accommodate new SSM registrations.
PIMSM	PIM All Routers Address – xxx Delete from the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address deletion from the local multicast list Failed. As a result of this, PIM Multicast packets are still received at the application though PIM is disabled.

Table 63: PIM-SM Log Messages (Continued)

Component	Message	Cause
PIMSM	PIM All Routers Address - xxx Add to the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address addition to the local multicast list Failed. As a result of this, PIM Multicast packets with this address will not be received at the application.
PIMSM	Mcast Forwarding Mode Disable Failed for intf – xxx.	Multicast Forwarding Mode Disable Failed. As a result of this, Multicast packets are still received at the application though no protocol is enabled.
PIMSM	Mcast Forwarding Mode Enable Failed for intf – xxx.	Multicast Forwarding Mode Enable Failed. As a result of this, Multicast packets will not be received at the application though a protocol is enabled.
PIMSM	PIMSMv6 Socket Memb'ship Enable Failed for rtrIfNum - xxx.	PIMSMv6 Socket Creation/options Set with Kernel IP Stack Failed. As a result of this, the PIM Control packets cannot be received on the interface.
PIMSM	PIMSMv6 Socket Memb'ship Disable Failed for rtrIfNum – xxx.	PIMSMv6 Socket Creation/options Disable with Kernel IP Stack Failed. As a result of this, the PIM Control packets are still received on the interface at the application though no protocol is enabled.
PIMSM	PIMSM (S,G,RPt) Table Max Limit – xxx Reached; Cannot accommodate any further routes.	PIMSM Multicast Route table (S,G,RPt) has reached maximum capacity and cannot accommodate new registrations anymore.
PIMSM	PIMSM (S,G) Table Max Limit - xxx Reached; Cannot accommodate any further routes.	PIMSM Multicast Route table (S,G) has reached maximum capacity and cannot accommodate new registrations anymore.
PIMSM	PIMSM (*,G) Table Max Limit - xxx Reached; Cannot accommodate any further routes.	PIMSM Multicast Route table (*,G) has reached maximum capacity and cannot accommodate new registrations anymore.

Table 64: PIM-DM Log Messages

Component	Message	Cause
PIMDM	PIMDM Protocol Heap Memory Init Failed; Family – xxx.	PIMDM Heap memory initialization Failed for the specified address family. This message appears when trying to enable PIMDM Protocol.
PIMDM	PIMDM Protocol Heap Memory De-Init Failed; Family –xxx.	PIMDM Heap memory de-initialization Failed for the specified address family. This message appears when trying to disable PIMDM Protocol. As a result of this, the subsequent attempts to enable/disable PIMDM will also fail.
PIMDM	PIMDM Protocol Initialization Failed; Family –xxx.	PIMDM protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable PIMDM Protocol.
PIMDM	PIMDM Protocol De-Initialization Failed; Family – xxx.	PIMDM protocol de-initialization sequence Failed. This message appears when trying to disable PIMDM Protocol.

Table 64: PIM-DM Log Messages (Continued)

Component	Message	Cause
PIMDM	PIM All Routers Address – xxx Delete from the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address deletion from the local multicast list Failed. As a result of this, PIM Multicast packets are still received at the application though PIM is disabled.
PIMDM	PIM All Routers Address - xxx Add to the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address addition to the local multicast list Failed. As a result of this, PIM Multicast packets with this address will not be received at the application.
PIMDM	Mcast Forwarding Mode Disable Failed for intf – xxx.	Multicast Forwarding Mode Disable Failed. As a result of this, Multicast packets are still received at the application though no protocol is enabled.
PIMDM	Mcast Forwarding Mode Enable Failed for intf – xxx.	Multicast Forwarding Mode Enable Failed. As a result of this, Multicast packets will not be received at the application though a protocol is enabled.
PIMDM	PIMDMv6 Socket Memb'ship Enable Failed for rtrIfNum - xxx.	PIMDMv6 Socket Creation/options Set with Kernel IP Stack Failed. As a result of this, the PIM Control packets cannot be received on the interface.
PIMDM	PIMDMv6 Socket Memb'ship Disable Failed for rtrIfNum – xxx.	PIMDMv6 Socket Creation/options Disable with Kernel IP Stack Failed. As a result of this, the PIM Control packets are still received on the interface at the application though no protocol is enabled.
PIMDM	PIMDM FSM Action Invoke Failed; rtrIfNum - xxx Out of Bounds for Event – xxx.	The PIMDM FSM Action invocation Failed due to invalid Routing interface number. In such cases, the FSM Action routine can never be invoked which may result in abnormal behavior. The failed FSM-name can be identified from the specified Event name.
PIMDM	PIMDM Socket Initialization Failed for addrFamily - xxx.	PIMDM Socket Creation/options Set Failed. As a result of this, the PIM Control packets cannot be sent out on an interface.
PIMDM	PIMDMv6 Socket Memb'ship Enable Failed for rtrIfNum - xxx.	Socket options Set to enable the reception of PIMv6 packets Failed. As a result of this, the PIMv6 packets will not be received by the application.
PIMDM	PIMDMv6 Socket Memb'ship Disable Failed for rtrIfNum – xxx.	PIMDMv6 Socket Creation/options Disable with Kernel IP Stack Failed. As a result of this, the PIMv6 Control packets are still received on the interface at the application though no protocol is enabled.
PIMDM	PIMDM MRT Table Max Limit - xxx Reached; Cannot accommodate any further routes.	PIMDM Multicast Route table (S,G) has reached maximum capacity and cannot accommodate new registrations anymore.

Table 65: DVMRP Log Messages

Component	Message	Cause
DVMRP	DVMRP Heap memory initialization is Failed for the specified address family.	This message appears when trying to enable DVMRP Protocol
DVMRP	DVMRP Heap memory de-initialization is Failed for the specified address family.	This message appears when trying to disable DVMRP Protocol. As a result of this, the subsequent attempts to enable/disable DVMRP will also fail.
DVMRP	DVMRP protocol initialization sequence Failed.	This could be due to the non-availability of some resources. This message appears when trying to enable DVMRP Protocol.
DVMRP	DVMRP All Routers Address - xxx Delete from the DTL Mcast List Failed for intf – xxx.	DMVRP All Routers Address deletion from the local multicast list Failed. As a result of this, DVMRP Multicast packets are still received at the application though DVMRP is disabled.
DVMRP	Mcast Forwarding Mode Disable Failed for intf – xxx.	The Multicast Forwarding mode Disable Failed for this routing interface.
DVMRP	DVMRP All Routers Address - xxx Add to the DTL Mcast List Failed for intf – xxx.	DMVRP All Routers Address addition to the local multicast list Failed. As a result of this, DVMRP Multicast packets with this address will not be received at the application.
DVMRP	Mcast Forwarding Mode Enable Failed for intf – xxx.	The Multicast Forwarding mode Enable Failed for this routing interface. As a result of this, the ability to forward Multicast packets does not function on this interface.
DVMRP	DVMRP Probe Control message Send Failed on rtrIfNum – xxx.	DVMRP Probe control message send failed. This could mostly be because of a Failure return status of the socket call sendto(). As a result of this, the DVMRP neighbor could be lost in the neighboring DVMRP routers.
DVMRP	DVMRP Prune Control message Send Failed; rtrIfNum – xxx.	Neighbor - %s, SrcAddr - %s, GrpAddr - %s DVMRP Prune control message send failed. This could mostly be because of a Failure return status of the socket call sendto(). As a result of this, the unwanted multicast traffic is still received and forwarded.
DVMRP	DVMRP Probe Control message Send Failed on rtrIfNum –xxx.	DVMRP Probe control message send failed. This could mostly be because of a Failure return status of the socket call sendto(). As a result of this, the DVMRP neighbor could be lost in the neighboring DVMRP routers.

12.8 Stacking

Table 66: EDB Log Message

Component	Message	Cause
EDB	EDB Callback: Unit Join: *num*.	Unit *num* has joined the stack.

12.9 Technologies

Table 67: Broadcom Error Messages

Component	Message	Cause
Broadcom	Invalid USP unit = x, slot = x, port = x	A port was not able to be translated correctly during the receive.
Broadcom	In hapiBroadSystemMacAddress call to 'bcm_l2_addr_add' - FAILED : x	Failed to add an L2 address to the MAC table. This should only happen when a hash collision occurs or the table is full.
Broadcom	Failed installing mirror action - rest of the policy applied successfully	A previously configured probe port is not being used in the policy. The release notes state that only a single probe port can be configured.
Broadcom	Policy x does not contain rule x	The rule was not added to the policy due to a discrepancy in the rule count for this specific policy. Additionally, the message can be displayed when an old rule is being modified, but the old rule is not in the policy.
Broadcom	ERROR: policy x, tmpPolicy x, size x, data x x x x x x x x	An issue installing the policy due to a possible duplicate hash.
Broadcom	ACL x not found in internal table	Attempting to delete a non-existent ACL.
Broadcom	ACL internal table overflow	Attempting to add an ACL to a full table.
Broadcom	In hapiBroadQosCosQueueConfig, Failed to configure minimum bandwidth. Available bandwidth x	Attempting to configure the bandwidth beyond it's capabilities.
Broadcom	USL: failed to put sync response on queue	A response to a sync request was not enqueued. This could indicate that a previous sync request was received after it was timed out.
Broadcom	USL: failed to sync ipmc table on unit = x	Either the transport failed or the message was dropped.
Broadcom	usl_task_ipmc_msg_send(): failed to send with x	Either the transport failed or the message was dropped.
Broadcom	USL: No available entries in the STG table	The Spanning Tree Group table is full in USL.
Broadcom	USL: failed to sync stg table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: A Trunk doesn't exist in USL	Attempting to modify a Trunk that doesn't exist.
Broadcom	USL: A Trunk being created by bcmx already existed in USL	Possible synchronization issue between the application, hardware, and sync layer.
Broadcom	USL: A Trunk being destroyed doesn't exist in USL	Possible synchronization issue between the application, hardware, and sync layer.
Broadcom	USL: A Trunk being set doesn't exist in USL	Possible synchronization issue between the application, hardware, and sync layer.
Broadcom	USL: failed to sync trunk table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: Mcast entry not found on a join	Possible synchronization issue between the application, hardware, and sync layer.
Broadcom	USL: Mcast entry not found on a leave	Possible synchronization issue between the application, hardware, and sync layer.

Table 67: Broadcom Error Messages (Continued)

Component	Message	Cause
Broadcom	USL: failed to sync dVLAN data on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync policy table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync VLAN table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	Invalid LAG id x	Possible synchronization issue between the BCM driver and HAPI.
Broadcom	Invalid uport calculated from the BCM uport bcmx_l2_addr->lport = x	Uport not valid from BCM driver.
Broadcom	Invalid USP calculated from the BCM uport\nbcmx_l2_addr->lport = x	USP not able to be calculated from the learn event for BCM driver.
Broadcom	Unable to insert route R/P	Route R with prefix P could not be inserted in the hardware route table. A retry will be issued.
Broadcom	Unable to Insert host H	Host H could not be inserted in hardware host table. A retry will be issued.
Broadcom	USL: failed to sync L3 Intf table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync L3 Host table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync L3 Route table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync initiator table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync terminator table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Broadcom	USL: failed to sync ip-multicast table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.

12.10 O/S Support

Table 68: Linux BSP Log Message

Component	Message	Cause
Linux BSP	rc = 10	Second message logged at bootup, right after *Starting code....* *Always* logged.

Table 69: OSAPI Linux Log Messages

Component	Message	Cause
OSAPI Linux	osapiNetLinkNeighDump: could not open socket! - or – ipstkNdpFlush: could not open socket! – or – osapiNetlinkDumpOpen: unable to bind socket! errno = XX	Couldn't open a netlink socket. Make sure "ARP Daemon support" (CONFIG_ARPD) is enabled in the Linux kernel, if the reference kernel binary is not being used.
OSAPI Linux	ipstkNdpFlush: sending delete failed	Failed when telling the kernel to delete a neighbor table entry (the message is incorrect).
OSAPI Linux	unable to open /proc/net/ipv6/conf/default/hop_limit	IPv6 MIB objects read, but /proc file system is not mounted, or running kernel does not have IPV6 support.
OSAPI Linux	osapimRouteEntryAdd, errno XX adding 0xYY to ZZ – or – osapimRouteEntryDelete, errno XX deleting 0xYY from ZZ	Error adding or deleting an IPv4 route (listed in hex as YY), on the interface with Linux name ZZ Error code can be looked up in errno.h.
OSAPI Linux	l3intfAddRoute: Failed to Add Route – or – l3intfDeleteRoute: Failed to Delete Route	Error adding or deleting a default gateway in the kernel's routing table (the function is really osapiRawMRouteAdd()/Delete()).
OSAPI Linux	osapiNetIfConfig: ioctl on XX failed: addr: 0xYY, err: ZZ – or – osapiNetIPSet: ioctl on XX failed: addr: 0x%YY	Failed trying to set the IP address (in hex as YY) of the interface with Linux name XX, and the interface does not exist. Sometimes this is a harmless race condition (e.g. we try to set address 0 when DHCPing on the network port (dtl0) at bootup, before it's created using TAP).
OSAPI Linux	ping: sendto error	Trouble sending an ICMP echo request packet for the UI ping command. Maybe there was no route to that network.
OSAPI Linux	Failed to Create Interface	Out of memory at system initialization time.
OSAPI Linux	TAP Unable to open XX	The /dev/tap file is missing, or, if not using the reference kernel binary, the kernel is missing "Universal TUN/TAP device driver support" (CONFIG_TUN).
OSAPI Linux	Tap monitor task is spinning on select failures – then – Tap monitor select failed: XX	Trouble reading the /dev/tap device, check the error message XX for details.

Table 69: OSAPI Linux Log Messages (Continued)

Component	Message	Cause
OSAPI Linux	Log_Init: log file error - creating new log file	This pertains to the “event log” persistent file in flash. Either it did not exist, or had a bad checksum.
OSAPI Linux	Log_Init: Flash (event) log full; erasing	Event log file has been cleared; happens at boot time.
OSAPI Linux	Log_Init: Corrupt event log; erasing	Event log file had a non-blank entry after a blank entry; therefore, something was messed up.
OSAPI Linux	Failed to Set Interface IP Address – or – IP Netmask – or – Broadcast Address – or – Flags – or – Hardware Address – or – Failed to Retrieve Interface Flags	Trouble adding VRRP IP or MAC address(es) to a Linux network interface.

APPENDIX A: List of Commands

About Kontron

Kontron, a global leader in embedded computing technology and trusted advisor in IoT, works closely with its customers, allowing them to focus on their core competencies by offering a complete and integrated portfolio of hardware, software and services designed to help them make the most of their applications.

With a significant percentage of employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms; bringing to life numerous technologies and applications that touch millions of lives. The result is an accelerated time-to-market, reduced total-cost-of-ownership, product longevity and the best possible overall application with leading-edge, highest reliability embedded technology.

Kontron is a listed company. Its shares are traded in the Prime Standard segment of the Frankfurt Stock Exchange and on other exchanges under the symbol "KBC". For more information, please visit: http://www.kontron.com/

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