CLI GUIDE

Cisco Small Business 300 1.1 Series Managed Switch Administration Guide

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1 Introduction

This section describes how to use the Command Line Interface (CLI). It contains the following topics:

- **User (Privilege) Levels**
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- **Editing Features**
- **Interface Naming Conventions**
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Overview

The CLI is divided into various modes. Each mode has a group of commands available in it. These modes are described in **CLI Command Modes**.

Users are assigned privilege levels. Each privilege level can access the CLI modes permitted to that level. User privilege levels are described in the section below.

User (Privilege) Levels

Users may be created with one of the following user levels:

- **Level 1** — Users with this level can only run User EXEC mode commands. Users at this level cannot access the web GUI.
- **Level 7** — Users with this level can run commands in the User EXEC mode and a subset of commands in the Privileged EXEC mode. Users at this level cannot access the web GUI.
- **Level 15** — Users with this level can run all commands. Only users at this level can access the web GUI.

A system administrator (user with level 15) can create passwords that allow a lower level user to temporarily become a higher level user. For example, the user may go from level 1 to level 7, level 1 to 15, or level 7 to level 15.

The passwords for each level are set (by an administrator) using the following command:

enable password [*level privilege-level*] {*password* | *encrypted encrypted-password*}

Users with a lower level can raise their level by entering the command: **enable** and the password for level 7 or 15. A user can go from level 1 to level 7 or directly to level 15. The higher level holds only for the current session.

The **disable** command returns the user to a lower level.

To create a user and assign it a user level, use the **username** command. Only users with command level 15, can create users at this level.

Example — Create passwords for level 7 and 15 (by the administrator)

```
switchxxxxxx#configure
switchxxxxxx<conf># enable password level 7 level7@abc
switchxxxxxx<conf># enable password level 15 level15@abc
switchxxxxxx<conf>#
```

Create a user with user level 1:

```
switchxxxxxx#configure
switchxxxxxx<conf> username john password john1234
privilege 1
switchxxxxxx<conf>
```

Example 2— Switch between Level 1 to Level 15. The user must know the password.

```
switchxxxxxx#

switchxxxxxx# enable

Enter Password: ****** (this is the password for level 15
- level15@abc)

switchxxxxxx#
```

NOTE If authentication of passwords is performed on RADIUS or TACACS+ servers, the passwords assigned to user level 7 and user level 15 must be configured on the external server and associated with the $enable7$ and $enable15$ user names, respectively. See the **Authentication, Authorization and Accounting (AAA) Commands** chapter for details.

CLI Command Modes

The Command Line Interface (CLI) is divided into four command modes. The command modes are (in the order in which they are accessed):

- User EXEC mode
- Privileged EXEC mode
- Global Configuration mode
- Interface Configuration mode

Each command mode has its own unique console prompt and set of CLI commands. Entering a question mark at the console prompt displays a list of available commands for the current mode and for the level of the user. Specific commands are used to switch from one mode to another.

Users are assigned privilege levels that determine the modes and commands available to them. User levels are described in **User (Privilege) Levels**.

User EXEC Mode

Users with level 1 initially log into User EXEC mode. User EXEC mode is used for tasks that do not change the configuration, such as performing basic tests and listing system information.

The user-level prompt consists of the switch host name followed by a #. The default host name is **switchxxxxxx** where xxxxxx is the last six digits of the device's MAC address, as shown below

```
switchxxxxxx#
```

The default host name can be changed via the **hostname** command in Global Configuration mode.

Privileged EXEC Mode

A user with level 7 or 15 automatically logs into Privileged EXEC mode.

Users with level 1 can enter Privileged Exec mode by entering the **enable** command, and when prompted, the password for level 15.

To return from the Privileged EXEC mode to the User EXEC mode, use the **disable** command.

Global Configuration Mode

The Global Configuration mode is used to run commands that configure features at the system level, as opposed to the interface level.

Only users with command level of 7 or 15 can access this mode.

To access Global Configuration mode from Privileged EXEC mode, enter the **configure** command at the Privileged EXEC mode prompt and press **Enter**. The Global Configuration mode prompt, consisting of the device host name followed by **(config)#**, is displayed:

```
switchxxxxxx(config)#
```

Use any of the following commands to return from Global Configuration mode to the Privileged EXEC mode:

- exit
- end
- Ctrl+Z

The following example shows how to access Global Configuration mode and return to Privileged EXEC mode:

```
switchxxxxxx#

switchxxxxxx# configure

switchxxxxxx(config)# exit

switchxxxxxx#
```

Interface or Line Configuration Modes

Various submodes may be entered from Global Configuration mode. These submodes enable performing commands on a group of interfaces or lines.

For instance to perform several operations on a specific port or range of ports, you can enter the Interface Configuration mode for that interface.

The following example enters Interface Configuration mode for ports gi1-5 and then sets their speed:

```
switchxxxxxx#

switchxxxxxx# configure

switchxxxxxx(config)# interface range gi1-5

switchxxxxxx(config-if)#speed 10

switchxxxxxx(config-if)#exit

switchxxxxxx(config)#
```

The **exit** command returns to Global Configuration mode.

The following submodes are available:

- **Interface —** Contains commands that configure a specific interface (port, VLAN, port channel, or tunnel) or range of interfaces. The Global Configuration mode command interface is used to enter the Interface

Configuration mode. The **interface** Global Configuration command is used to enter this mode.

- **Line Interface —** Contains commands used to configure the management connections for the console, Telnet and SSH. These include commands such as line timeout settings, etc. The **line** Global Configuration command is used to enter the Line Configuration command mode.
- **VLAN Database —** Contains commands used to configure a VLAN as a whole. The **vlan database** Global Configuration mode command is used to enter the VLAN Database Interface Configuration mode.
- **Management Access List —** Contains commands used to define management access-lists. The **management access-list** Global Configuration mode command is used to enter the Management Access List Configuration mode.
- **Port Channel —** Contains commands used to configure port-channels; for example, assigning ports to a port-channel. Most of these commands are the same as the commands in the Ethernet interface mode, and are used to manage the member ports as a single entity. The **interface port-channel** Global Configuration mode command is used to enter the Port Channel Interface Configuration mode.
- **QoS —** Contains commands related to service definitions. The **qos** Global Configuration mode command is used to enter the QoS services configuration mode.
- **MAC Access-List —** Configures conditions required to allow traffic based on MAC addresses. The **mac access-list** Global Configuration mode command is used to enter the MAC access-list configuration mode.

To return from any Interface Configuration mode to the Global Configuration mode, use the **exit** command.

Accessing the CLI

The Command Line Interface (CLI) can be accessed from a terminal or computer by performing one of the following tasks:

- Running a terminal application, such as HyperTerminal, on a computer that is directly connected to the switch's console port,

—or—

- Running a Telnet session from a command prompt on a computer with a network connection to the switch.
- Using SSH.

NOTE Telnet and SSH are disabled by default on the switch.

If access is via a Telnet connection, ensure that the following conditions are met before using CLI commands:

- The switch has a defined IP address.
- Corresponding management access is granted.
- There is an IP path such that the computer and the switch can reach each other.

Using HyperTerminal over the Console Interface

NOTE When using HyperTerminal with Microsoft® Windows® 2000, ensure that Windows® 2000 Service Pack 2 or later is installed on your computer. The arrow keys will not function properly using HyperTerminal's VT100 emulation in Windows® 2000 prior to Service Pack 2. For information on Windows® 2000 service packs, go to www.microsoft.com.

The switch's RS-232 serial console port provides a direct connection to a computer's serial port using a standard DB-9 null-modem or crossover cable. Once the computer and switch are connected, run a terminal application to access the Command Line Interface.

To access the Command Line Interface using the HyperTerminal application, perform the following steps:

STEP 1 Click the **Start** button.

STEP 2 Select **All Programs** > **Accessories** > **Communications** > **HyperTerminal**.

Figure 1 Start > All Programs > Accessories > Communications > HyperTerminal

STEP 3 Enter a name for this connection. Select an icon for the application, then click **OK**.

STEP 4 Select a port to communicate with the switch. Select **COM1** or **COM2**.

STEP 5 Set the serial port settings, then click **OK**.

STEP 6 When the *Command Line Interface* appears, enter **cisco** at the *User Name* prompt and press **Enter**.

The **`switchxxxxxx#`** prompt is displayed. You can now enter CLI commands to manage the switch. For detailed information on CLI commands, refer to the appropriate chapter(s) of this reference guide.

Using Telnet over an Ethernet Interface

Telnet provides a method of connecting to the Command Line Interface over an IP network.

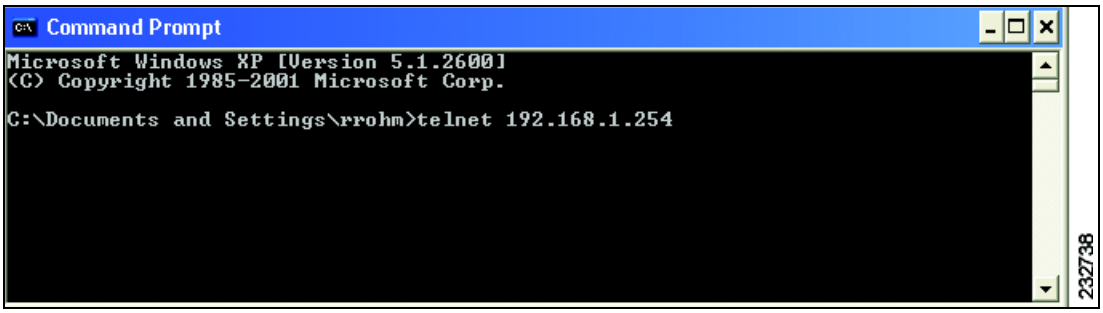
To establish a telnet session from the command prompt, perform the following steps:

STEP 1 Click **Start**, then select **All Programs** > **Accessories** > **Command Prompt** to open a command prompt.

Figure 2 Start > All Programs > Accessories > Command Prompt

STEP 2 At the prompt, enter **telnet 1<IP address of switch>**, then press **Enter**.

Figure 3 Command Prompt



STEP 3 The *Command Line Interface* will be displayed.

CLI Command Conventions

When entering commands there are certain command entry standards that apply to all commands. The following table describes the command conventions.

Convention	Description
`[ ]`	In a command line, square brackets indicate an optional entry.
`{ }`	In a command line, curly brackets indicate a selection of compulsory parameters separated the **|** character. One option must be selected. For example, **flowcontrol {auto|on|off}** means that for the flowcontrol command, either auto, on, or off must be selected.
parameter	Italic text indicates a parameter.
press **key**	Names of keys to be pressed are shown in **bold**.
Ctrl+F4	Keys separated by the + character are to be pressed simultaneously on the keyboard
`Screen Displa`y	Fixed-width font indicates CLI prompts, CLI commands entered by the user, and system messages displayed on the console.
all	When a parameter is required to define a range of ports or parameters and all is an option, the default for the command is **all** when no parameters are defined. For example, the command **interface range port-channel** has the option of either entering a range of channels, or selecting all. When the command is entered without a parameter, it automatically defaults to all.

Editing Features

Entering Commands

A CLI command is a series of keywords and arguments. Keywords identify a command, and arguments specify configuration parameters. For example, in the command **show interfaces status Gigabitethernet 1**, *show*, *interfaces* and *status* are keywords, *Gigabitethernet* is an argument that specifies the interface type, and *1* specifies the port.

To enter commands that require parameters, enter the required parameters after the command keyword. For example, to set a password for the administrator, enter:

```
switchxxxxxx(config)# username admin password alansmith
```

When working with the CLI, the command options are not displayed. The standard command to request help is ?.

There are two instances where help information can be displayed:

- Keyword lookup — The character **?** is entered in place of a command. A list of all valid commands and corresponding help messages are is displayed.
- Partial keyword lookup — If a command is incomplete and or the character **?** is entered in place of a parameter, the matched keyword or parameters for this command are displayed.

To assist in using the CLI, there is an assortment of editing features. The following features are described:

- **Terminal Command Buffer**
- **Command Completion**
- **Interface Naming Conventions**
- **Keyboard Shortcuts**

Terminal Command Buffer

Every time a command is entered in the CLI, it is recorded on an internally managed Command History buffer. Commands stored in the buffer are maintained on a First In First Out (FIFO) basis. These commands can be recalled, reviewed, modified, and reissued. This buffer is not preserved across device resets.

Keyword	Description
Up-Arrow key Ctrl+P	Recalls commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.
Down-Arrow key	Returns to more recent commands in the history buffer after recalling commands with the up-arrow key. Repeating the key sequence will recall successively more recent commands.

By default, the history buffer system is enabled, but it can be disabled at any time. For more information on enabling or disabling the history buffer, refer to the **history** command.

There is a standard default number of commands that are stored in the buffer. The standard number of 10 commands can be increased to 216. By configuring 0, the effect is the same as disabling the history buffer system. For more information on configuring the command history buffer, refer to the **history size** command.

To display the history buffer, refer to the **show history** command.

Negating the Effect of Commands

For many configuration commands, the prefix keyword **no** can be entered to cancel the effect of a command or reset the configuration to the default value. This Reference Guide provides a description of the negation effect for each CLI command.

Command Completion

If the command entered is incomplete, invalid or has missing or invalid parameters, then the appropriate error message is displayed. This assists in entering the correct command. By pressing **Tab** after an incomplete command is entered, the system will attempt to identify and complete the command. If the characters already entered are not enough for the system to identify a single matching command, press **?** to display the available commands matching the characters already entered.

Keyboard Shortcuts

The CLI has a range of keyboard shortcuts to assist in editing the CLI commands. The following table describes the CLI shortcuts.

Keyboard Key	Description
Up-arrow	Recalls commands from the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.
Down-arrow	Returns the most recent commands from the history buffer after recalling commands with the up arrow key. Repeating the key sequence will recall successively more recent commands.
Ctrl+A	Moves the cursor to the beginning of the command line.
Ctrl+E	Moves the cursor to the end of the command line.
Ctrl+Z / End	Returns back to the Privileged EXEC mode from any configuration mode.
Backspace	Deletes one character left to the cursor position.

Copying and Pasting Text

Up to 1000 lines of text (or commands) can be copied and pasted into the device.

NOTE It is the user's responsibility to ensure that the text copied into the device consists of legal commands only.

When copying and pasting commands from a configuration file, make sure that the following conditions exist:

- A device Configuration mode has been accessed.

The commands contain no encrypted data, like encrypted passwords or keys. Encrypted data cannot be copied and pasted into the device except for encrypted passwords where the keyword encrypted is used before the encrypted data (for instance in the **enable password** command).

Interface Naming Conventions

Interface ID

Within the CLI, interfaces are denoted by concatenating the following elements:

- **Type of interface:** The following types of interfaces are found on the various types of devices:
  - **Fast Ethernet (10/100 bits) -** This can be written as **FastEthernet** or **fa**.
  - **Gigabit Ethernet ports (10/100/1000 bits) -** This can be written either **Gigabit Ethernet** or **gi** or **GE.**
  - **LAG (Port Channel) -** This can be written as either **Port-Channel** or **po.**
  - **VLAN -** This is written as **VLAN**
  - **Tunnel -** This is written as **tunnel** or **tu**
- **Interface Number: Port, LAG, tunnel or VLAN ID**

The syntax for this is:

```
{<port-type>[ ]<port-number>}|{port-channel | po }[
]<port-channel-number> | {tunnel | tu}[ ]<tunnel-number> |
vlan[ ]<vlan-id>
```

Sample of these various options are shown in the example below:

```
switchxxxxxx#configure
switchxxxxxx(config)#interface GigabitEthernet 1
switchxxxxxx(config)#interface GE 1
switchxxxxxx(config-if)#interface gi1
switchxxxxxx(config)#interface FastEthernet 1
switchxxxxxx(config)#interface fa1
switchxxxxxx(config-if)#interface po1
switchxxxxxx(config-if)# interface vlan 1
```

Interface Range

Interfaces may be described on an individual basis or within a range. The interface range command has the following syntax:

```
<interface-range> ::=
{<port-type>[ ][<first-port-number>[ - <last-port-number]}|
port-channel[ ]<first-port-channel-number>[ -
<last-port-channel-number>] |
tunnel[ ]<first-tunnel-number>[ - <last-tunnel-number>] |
vlan[ ]<first-vlan-id>[ - <last-vlan-id>]
```

A sample of this command is shown in the example below:

```
switchxxxxxx#configure
switchxxxxxx(config)#interface range gi1-5
switchxxxxxx(config-if)#interface range gi1-5
```

Interface List

A combination of interface types can be specified in the **interface range** command in the following format:

<range-list> ::= <interface-range> | <range-list>, < interface-range>

Up to five ranges can be included.

NOTE Range lists can contain either ports and port-channels or VLANs. Combinations of port/port-channels and VLANs are not allowed

The space after the comma is optional.

When a range list is defined, a space after the first entry and before the comma (,) must be entered.

A sample of this command is shown in the example below:

```
switchxxxxxx#configure

switchxxxxxx(config)#interface range gi1-5

switchxxxxxx(config-if)#
```

IPv6z Address Conventions

The following describes how to write an IPv6z address, which is a link-local IPv6 address.

The format is: <*ipv6-link-local-address*>%<**egress-interface**>

where:

egress-interface (zone) = **vlan**<*integer*> | **ch**<*integer*> | **isatap**<*integer*> | **port**<*integer*> | 0

egress-port = Designated egress interface, for example gi16.

If the egress interface (zone) is not specified, the default interface is selected. Specifying egress interface = 0 is equal to not defining an egress interface.

The following combinations are possible:

- **ipv6_address%egress-interface** - Refers to the IPv6 address on the interface specified.
- **ipv6_address%0** - Refers to the IPv6 address on the single interface on which an IPv6 address is defined.

- **ipv6_address** - Refers to the IPv6 address on the single interface on which an IPv6 address is defined.

Layer 2 and Layer 3

The switch can operate in Switch mode (Layer 2) or Router mode (Layer 3).

The default mode is Switch mode (Layer 2 mode). To change the mode of the switch to Router mode (Layer 3 mode), use the **set system mode** command.

This command performs a system reboot.

In Layer 2 mode, the switch forwards packets as a VLAN-aware bridge. In Layer 3 mode, the switch performs both IPv4 routing and VLAN-aware bridging.

If Layer 2 mode is selected, a single IP address is supported on the default VLAN. The user also must configure a default gateway.

If Layer 3 mode is selected, the user can manage the device on any IP interface configured on the device, as long as a default route is configured. In Layer 3 mode, the switch routes traffic between IP VLANs, and bridges traffic with VLANs.

When the switch operates in Layer 3 mode, the following features are not supported:

- Protocol-based VLANs
- MAC-based VLANs
- VLAN Rate Limit
- DVA, Multicast TV VLAN
- Per flow policing

2 User Interface Commands

2.1 enable

The **enable** EXEC mode command enters the Privileged EXEC mode.

Syntax

enable [*privilege-level*]

Parameters

privilege-level—Specifies the privilege level at which to enter the system. (Range: 1, 7, 15)

Default Configuration

The default privilege level is 15.

Command Mode

EXEC mode

Example

The following example enters privilege level 7.

```
switchxxxxxx#  enable 7
enter password:**********
switchxxxxxx#Accepted
```

The following example enters privilege level 15.

```
switchxxxxxx#  enable
enter password:**********
switchxxxxxx#Accepted
```

2.2 disable

The **disable** Privileged EXEC mode command leaves the Privileged EXEC mode and returns to the User EXEC mode.

Syntax

disable [*privilege-level*]

Parameters

privilege-level—Reduces the privilege level to the specified privileged level. If privilege level is left blank, the level is reduce to 1.

Default Configuration

The default privilege level is 1.

Command Mode

Privileged EXEC mode

Example

The following example returns the user to user level 7.

```
switchxxxxxx# disable 7

switchxxxxxx#
```

2.3 login

The **login** EXEC mode command enables changing the user that is logged in. When this command is logged in, the user is prompted for a username/password.

Syntax

login

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example enters Privileged EXEC mode and logs in with the required username ‘bob’.

```
switchxxxxxx#  login

User Name:bob

Password:*****

switchxxxxxx#
```

2.4 configure

The **configure** Privileged EXEC mode command enters the Global Configuration mode.

Syntax

configure [*terminal*]

Parameters

terminal—Enter the Global Configuration mode with or without the keyword terminal.

Command Mode

Privileged EXEC mode

Example

The following example enters Global Configuration mode.

```
switchxxxxxx# configure

switchxxxxxx(config)#
```

2.5 exit (Configuration)

The **exit** command exits any mode and brings the user to the next higher mode in the CLI mode hierarchy.

Syntax

exit

Parameters

N/A

Default Configuration

N/A

Command Mode

All.

Examples

The following examples change the configuration mode from Interface Configuration mode to Privileged EXEC mode.

```
switchxxxxxx(config-if)# exit

switchxxxxxx(config)# exit
```

2.6 exit (EXEC)

The **exit** EXEC mode command closes an active terminal session by logging off the device.

Syntax

exit

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example closes an active terminal session.

```
switchxxxxxx#  exit
```

2.7 end

The **end** command ends the current configuration session and returns to the Privileged EXEC mode.

Syntax

end

Parameters

N/A

Default Configuration

N/A

Command Mode

All

Example

The following example ends the Global Configuration mode session and returns to the Privileged EXEC mode.

```
switchxxxxxx(config)# end
switchxxxxxx#
```

2.8 help

The **help** command displays a brief description of the Help system.

Syntax

help

Parameters

N/A

Default Configuration

N/A

Command Mode

All

Example

The following example describes the Help system.

```
switchxxxxxx# help

Help may be requested at any point in a command by entering a question mark
'?'. If nothing matches the currently entered incomplete command, the help
list is empty. This indicates that there is no command matching the input as
it currently appears. If the request is within a command, press the Backspace
key and erase the entered characters to a point where the request results in
a match.

Help is provided when:

1. There is a valid command and a help request is made for entering a
parameter or argument (e.g. 'show ?'). All possible parameters or arguments
for the entered command are then displayed.

2. An abbreviated argument is entered and a help request is made for
arguments matching the input (e.g. 'show pr?').
```

2.9 history

The **history** Line Configuration mode command enables saving commands that have been entered. Use the **no** form of this command to disable the command.

Syntax

history

no history

Parameters

N/A

Default Configuration

Enabled.

Command Mode

Line Configuration mode

User Guidelines

This command enables saving user-entered commands for a specified line. You can return to previous lines by using the up or down arrows.

It is effective from the next time that the user logs in via console/telnet/ssh.

The following are related commands:

- Use the terminal history size EXEC mode command to enable or disable this command for the current terminal session.
- Use the history size Line Configuration mode command to set the size of the command history buffer.

Example

The following example enables the command for Telnet.

```
switchxxxxxx(config)# line telnet
switchxxxxxx(config-line)# history
```

2.10 history size

The **history size** Line Configuration mode command changes the maximum number of user commands that are saved in the history buffer for a particular line. Use the **no** form of this command to reset the command history buffer size to the default value.

Syntax

history size *number-of-commands*

no history size

Parameters

number-of-commands—Specifies the number of commands the system records in its history buffer. (Range: 10–207)

Default Configuration

The default command history buffer size is 10 commands.

Command Mode

Line Configuration mode

User Guidelines

This command configures the command history buffer size for a particular line. It is effective from the next time that the user logs in via console/telnet/ssh.

Use the **terminal history size** EXEC mode command to configure the command history buffer size for the current terminal session.

The allocated command history buffer is per terminal user, and is taken from a shared buffer. If there is not enough space available in the shared buffer, the command history buffer size cannot be increased above the default size.

Example

The following example changes the command history buffer size to 100 entries for Telnet.

```
switchxxxxxx(config)# line telnet
switchxxxxxx(config-line)# history size 100
```

2.11 terminal history

The **terminal history** EXEC mode command enables the command history function for the current terminal session, meaning it is not stored in the Running Configuration file. Use the **no** form of this command to disable the command.

Syntax

terminal history

terminal no history

Default Configuration

The default configuration for all terminal sessions is defined by the history Line Configuration mode command.

Command Mode

EXEC mode

User Guidelines

The command enables the command history for the current session. The default is determined by the history Line Configuration mode command.

This command is effective immediately.

Example

The following example disables the command history function for the current terminal session.

```
switchxxxxxx#  terminal no history
```

2.12 terminal history size

The **terminal history size** EXEC mode command changes the command history buffer size for the current terminal session, meaning it is not stored in the Running Configuration file. Use the **no** form of this command to reset the command history buffer size to the default value.

Syntax

terminal history size *number-of-commands*

terminal no history size

Parameters

number-of-commands—Specifies the number of commands the system maintains in its history buffer. (Range: 10–207)

Default Configuration

The default configuration for all terminal sessions is defined by the history size Line Configuration mode command.

Command Mode

EXEC mode

User Guidelines

The **terminal history size** EXEC command changes the command history buffer size for the current terminal session. Use the history Line Configuration mode command to change the default history buffer size.

The maximum number of commands in all buffers is 207.

Example

The following example sets the command history buffer size to 20 commands for the current terminal session.

```
switchxxxxxx#terminal history size 20
```

2.13 terminal datadump

The **terminal datadump** EXEC mode command enables dumping all the output of a show command without prompting. Use the **no** form of this command to disable dumping.

Syntax

terminal datadump

no terminal datadump

Parameters

N/A

Default Configuration

When printing, dumping is disabled and printing is paused every 24 lines.

Command Mode

EXEC mode

User Guidelines

By default, a **More** prompt is displayed when the output contains more than 24 lines. Pressing the **Enter** key displays the next line; pressing the **Spacebar** displays the next screen of output.

The **terminal datadump** command enables dumping all output immediately after entering the show command by removing the pause.

The width is currently not limited (previously the limit was 77 chars), and the width of the line being printed on the terminal is based on the terminal itself.

This command is relevant only for the current session.

Example

The following example dumps all output immediately after entering a show command.

```
switchxxxxxx#  terminal datadump
```

2.14 show history

The **show history** EXEC mode command lists commands entered in the current session.

Syntax

show history

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

User Guidelines

The buffer includes executed and unexecuted commands.

Commands are listed from the first to the most recent command.

The buffer remains unchanged when entering into and returning from configuration modes.

Example

The following example displays all the commands entered while in the current Privileged EXEC mode.

```
switchxxxxxx# show version

SW version 3.131 (date 23-Jul-2005 time 17:34:19)

HW version 1.0.0

switchxxxxxx# show clock

15:29:03 Jun 17 2005

switchxxxxxx# show history

show version

show clock

show history

3 commands were logged (buffer size is 10)
```

2.15 show privilege

The **show privilege** EXEC mode command displays the current privilege level.

Syntax

show privilege

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays the privilege level for the user logged on.

```
switchxxxxxx# show privilege

Current privilege level is 15
```

2.16 do

The **do** command executes an EXEC-level command from Global Configuration mode or any configuration submode.

Syntax

do *command*

Parameters

command—Specifies the EXEC-level command to execute.

Command Mode

All configuration modes

Example

The following example executes the **show vlan** Privileged EXEC mode command from Global Configuration mode.

Example

```
switchxxxxxx(config)# do show vlan

Vlan  Name        Ports                  Type         Authorization

---- ----       ---------------------    --------     -------------

 1    1          gi1-39,Po1,Po2,        other        Required

 2    2          gi1                    dynamicGvrp  Required

 10   v0010      gi1                    permanent    Not Required

 11   V0011      gi1,gi3                permanent    Required

 20   20         gi1                    permanent    Required

 30   30         gi1,gi3                permanent    Required

 31   31         gi1                    permanent    Required

 91   91         gi1,gi4                permanent    Required

 4093 guest-vlan gi1,gi3                permanent    Guest

switchxxxxxx(config)#
```

2.17 banner login

Use the **banner login** command in Global Configuration mode to specify a message to be displayed before the username and password login prompts. This banner is applied automatically on all the CLI interfaces: Console, Telnet and SSH and also on the WEB GUI. Use the **no** form of this command to delete the existing login banner.

Syntax

banner login *d message-text d*

no banner login

Parameters

- **d**—Delimiting character of user's choice—a pound sign (**#**), for example. You cannot use the delimiting character in the banner message.
- **message-text**—Message text. The message must start on a new line. You can enter multi-line messages. You can include tokens in the form of **$(token)** in the message text. Tokens are replaced with the corresponding configuration variable (see User Guidelines). The message can contain up

to 1000 characters (after every 510 characters, you must press <Enter> to continue).

Default Configuration

Disabled (no Login banner is displayed).

Command Mode

Global Configuration mode

User Guidelines

Follow this command with one or more blank spaces and a delimiting character of your choice. Then enter one or more lines of text, terminating the message with the second occurrence of the delimiting character.

Use tokens in the form of **$(token)** in the message text to customize the banner. The tokens are described in the table below:

Token	Information displayed in the banner
$(hostname)	Displays the host name for the device.
$(domain)	Displays the domain name for the device.
$(bold)	Indicates that the next text is a bold text. Using this token again indicates the end of the bold text.
$(inverse)	Indicates that the next text is an inverse text. Using this token again indicates the end of the inverse text.
$(contact)	Displays the system contact string.
$(location)	Displays the system location string.
$(mac-address)	Displays the base MAC address of the device.

Use the **no banner login** Line Configuration command to disable the Login banner on a particular line or lines.

Example

The following example sets a Login banner that uses tokens. The percent sign (**%**) is used as a delimiting character. Note that the **$(token)** syntax is replaced by the corresponding configuration variable.

```
switchxxxxxx(config)# banner login %

Enter TEXT message. End with the character '%'.
```

```
You have entered $(hostname).$(domain)

%

When the login banner is executed, the user will see the following banner:

You have entered host123.ourdomain.com
```

2.18 show banner

Use the **show banner** commands in EXEC mode to display the banners that have been defined.

Syntax

show banner login

Parameters

This command has no arguments or keywords.

Command Mode

EXEC mode

Examples

```
switchxxxxxx# show banner login

------------------------------------------------------------

Banner: Login

Line SSH: Enabled

Line Telnet: Enabled

Line Console: Enabled
```

3 Macro Commands

3.1 macro name

Use the **macro name** Global Configuration mode command to define a macro. There are two types of macros that can be defined:

- Global macros define a group of CLI commands that can be run at any time.
- Smartport macros are associated with Smartport types (Section 43 "Smartport Commands"). For each Smartport macro there must be an anti macro (a macro whose name is concatenated with **no_**). The anti macro reverses the action of the macro.

If a macro with this name already exists, it overrides the previously-defined one.

Use the **no** form of this command to delete the macro definition.

Syntax

macro name *[macro-name]*

no macro name *[macro-name]*

Parameters

macro-name—Name of the macro. Macro names are case sensitive.

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

A macro is a script that contains CLI commands and is assigned a name by the user. It can contain up to 3000 characters and 200 lines.

Keywords

Macros may contain keywords (parameters). The following describes keywords:

- A macro can contain up to three keywords.

- All matching occurrences of the keyword are replaced by the corresponding value specified in macro apply.
- Keyword matching is case-sensitive
- Applying a macro with keywords does not change the state of the original macro definition.

User Feedback

The behavior of a macro command requiring user feedback is the same as if the command is entered from terminal: it sends its prompt to the terminal and accepts the user reply.

Creating a Macro

Use the following guidelines to create a macro:

- Use **macro name** to create the macro with the specified name.
- Enter one macro command per line.
- Use the **@** character to end the macro.
- Use the **#** character at the beginning of a line to enter a comment in the macro.

  In addition, # is used to identify certain preprocessor commands that can only be used within a macro. There are two possible preprocessor commands:

  - **#macro key description -** Each macro can be configured with up to 3 keyword/description pairs. The keywords and descriptions are displayed in the GUI pages when the macro is displayed.

  The syntax for this preprocessor command is as follows:

  #macro key description $*keyword1 description1 $keyword2 description2 $keyword3 description3*

  A keyword must be prefixed with '$'.

  - **#macro keywords** - This instruction enables the device to display the keywords as part of the CLI help. It accepts up to 3 keywords. The command creates a CLI help string with the keywords for the macro. The help string will be displayed if help on the macro is requested from the **macro apply** and **macro global** commands. The GUI also uses the keywords specified in the command as the parameter names for the macro. See Example 2 and 3 below for a description of how this command is used in the CLI.

The syntax for this preprocessor command is as follows:

#macro keywords $*keyword1* $*keyword2* $*keyword3*

where $keyword-n is the name of the keyword.

Editing a Macro

Macros cannot be edited. Modify a macro by creating a new macro with the same name as the existing macro. The newer macro overwrites the existing macro.

The exceptions to this are the built-in macros and corresponding anti-macros for the Smartport feature. You cannot override a Smartport macro. To change a Smartport macro, create a new macro (my_macro) and an anti macro (no_my_macro) and associate it with the Smartport type using macro auto user smartport macro.

Scope of Macro

It is important to consider the scope of any user-defined macro. Because of the potential hazards of applying unintended configurations, do not change configuration modes within the macro by using commands such as **exit**, **end**, or **interface** *interface-id*. With a few exceptions, there are other ways of executing macros in the various configuration modes. Macros may be executed in Privileged Exec mode, Global Configuration mode, and Interface Configuration mode (when the interface is NOT a VLAN.)

Examples

Example 1 - The following example shows how to create a macro that configures the duplex mode of a port.

```
switchxxxxxx(config)#  macro name dup

Enter macro commands one per line. End with the character '@'.

#macro description dup

duplex full

negotiation

@
```

Example 2 -The following example shows how to create a macro with the parameters: DUPLEX and SPEED. When the macro is run, the values of DUPLEX and SPEED must be provided by the user. The **#macro keywords** command enables the user to receive help for the macro as shown in Example 3.

```
switchxxxxxx(config) #  macro name duplex
```

```
Enter macro commands one per line. End with the character '@'.
duplex $DUPLEX
no negotiation
speed $SPEED
#macro keywords $DUPLEX $SPEED
@
```

Example 3 -The following example shows how to display the keywords using the help character ? (as defined by the **macro keywords** command above) and then run the macro on the port. The **#macro keywords** command entered in the macro definition enables the user to receive help for the macro, as shown after the words e.g. below.

```
switchxxxxxx(config-if)#interface gi1
switchxxxxxx(config-if)#macro apply duplex ?
    WORD <1-32>  Keyword to replace with value e.g. $DUPLEX, $SPEED
    <cr>
switchxxxxxx(config-if)#macro apply duplex $DUPLEX ?
    WORD<1-32>  First parameter value
    <cr>
switchxxxxxx(config-if)#macro apply duplex $DUPLEX full $SPEED ?
    WORD<1-32>  Second parameter value
switchxxxxxx(config-if)#macro apply duplex $DUPLEX full $SPEED 100
```

3.2 macro apply

Use the **macro apply/trace** Interface Configuration command to either:

- Apply a macro to an interface without displaying the actions being performed
- Apply a macro to the interface while displaying the actions being performed

Syntax

macro {***apply*** | ***trace***} *macro-name [parameter-name1 {value}] [parameter-name2 {value}] [parameter-name3 {value}]*

Parameters

- **apply**—Apply a macro to the specific interface.
- **trace**—Apply and trace a macro to the specific interface.
- **macro-name**—Name of the macro.
- **parameter-name** *value*—(Optional) For each parameter defined in the macro, specify its name and value. You can enter up to three parameter-value pairs. Parameter keyword matching is case sensitive. All matching occurrences of the parameter name in the macro are replaced with the corresponding value.

Default Configuration

The command has no default setting.

Command Mode

Interface Configuration mode

User Guidelines

The **macro apply** command hides the commands of the macro from the user while it is being run. The **macro trace** command displays the commands along with any errors which are generated by them as they are executed. This is used to debug the macro and find syntax or configuration errors.

When you run a macro, if a line in it fails because of a syntax or configuration error, the macro continues to apply the remaining commands to the interface.

If you apply a macro that contains parameters in its commands, the command fails if you do not provide the values for the parameters. You can use the **macro apply** *macro-name* with a '**?**' to display the help string for the macro keywords (if you have defined these with the **#macro keywords** preprocessor command).

Parameter (keyword) matching is case sensitive. All matching occurrences of the parameter are replaced with the provided value. Any full match of a keyword, even if it is part of a large string, is considered a match and replaced by the corresponding value.

When you apply a macro to an interface, the switch automatically generates a macro description command with the macro name. As a result, the macro name is appended to the macro history of the interface. The show parser macro command displays the macro history of an interface.

A macro applied to an interface range behaves the same way as a macro applied to a single interface. When a macro is applied to an interface range, it is applied

sequentially to each interface within the range. If a macro command fails on one interface, it is nonetheless attempted to be applied and may fail or succeed on the remaining interfaces.

Examples.

Example 1 - The following is an example of a macro being applied to an interface with the trace option.

```
switchxxxxxx(config) #  interface gi2

switchxxxxxx<config-if> #   macro trace dup $DUPLEX full $SPEED 100

  Applying command…  'duplex full'

  Applying command…  'speed 100'

switchxxxxxx<config-if> #
```

Example 2 - The following is an example of a macro being applied without the trace option.

```
switchxxxxxx(config) # interface gi2

switchxxxxxx<config-if> #  macro apply dup $DUPLEX full $SPEED 100

switchxxxxxx<config-if> #
```

Example 3 - The following is an example of an incorrect macro being applied.

```
switchxxxxxx(config-if)#macro trace dup

Applying command...'duplex full'

Applying command...'speed auto'

% bad parameter value
```

3.3 macro description

Use the **macro description** Interface Configuration mode command to append a description, for example, a macro name, to the macro history of an interface. Use the **no** form of this command to clear the macro history of an interface. When the macro is applied to an interface, the switch automatically generates a macro description command with the macro name. As a result, the name of the macro is appended to the macro history of the interface.

Syntax

macro description *text*

no macro description

Parameters

text—Description text. The text can contain up to 160 characters. The text must be double quoted if it contains multiple words.

Default Configuration

The command has no default setting.

Command Mode

Interface Configuration mode

User Guidelines

When multiple macros are applied on a single interface, the description text is a concatenation of texts from a number of previously-applied macros.

To verify the settings created by this command, run **show parser macro**.

Example

```
switchxxxxxx(config)#interface gi2

switchxxxxxx(config-if)#macro apply dup

switchxxxxxx(config-if)#exit

switchxxxxxx(config)#interface gi3

switchxxxxxx(config-if)#macro apply duplex $DUPLEX full $SPEED 100

switchxxxxxx(config-if)#macro description dup

switchxxxxxx(config-if)#macro description duplex

switchxxxxxx(config-if)#end

switchxxxxxx#show parser macro description

Global Macro(s):

Interface      Macro Description(s)

------------   -------------------------------------------------

gi2             dup
```

```
gi3             duplex | dup | duplex

------------------------------------------------------------

switchxxxxxx#configure

switchxxxxxx(config)#interface gi2

switchxxxxxx(config-if)#no macro description

switchxxxxxx(config-if)#end

switchxxxxxx#show parser macro description

Global Macro(s):

Interface      Macro Description(s)

---------      ----------------------------------------------------

gi3            duplex | dup | duplex

------------------------------------------------------------

switchxxxxxx#
```

3.4 macro global

Use the **macro global** Global Configuration command to apply a macro to a switch (with or without the trace option).

Syntax

macro global {***apply*** | ***trace***} *macro-name [parameter-name1 {value}] [parameter-name2 {value}] [parameter -name3 {value}]*

Parameters

- **apply**—Apply a macro to the switch.
- **trace**—Apply and trace a macro to the switch.
- **macro-name**—Specify the name of the macro.
- **parameter-name** *value*—(Optional) Specify the parameter values required for the switch. You can enter up to three parameter-value pairs. Parameter keyword matching is case sensitive. All matching occurrences of the parameters are replaced with the corresponding value.

Default Configuration

The command has no default setting.

Command Mode

Global Configuration mode

User Guidelines

If a command fails because of a syntax error or a configuration error when you apply a macro, the macro continues to apply the remaining commands to the switch.

Keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value. Any full match of a keyword, even if it is part of a large string, is considered a match and replaced by the corresponding value.

If you apply a macro that contains keywords in its commands, the command fails if you do not specify the proper values for the keywords when you apply the macro. You can use this command with a '?' to display the help string for the macro keywords. You define the keywords in the help string using the preprocessor command **#macro keywords** when you define a macro.

When you apply a macro in Global Configuration mode, the switch automatically generates a global macro description command with the macro name. As a result, the macro name is appended to the global macro history. Use **show parser macro** to display the global macro history.

Example.

The following is an example of a macro being defined and then applied to the switch with the trace option.

```
switchxxxxxx(config)#  macro name console-timeout

Enter macro commands one per line. End with the character '@'.

line console

exec-timeout $timeout-interval

@

switchxxxxxx(config)#  macro global trace console-timeout $timeout-interval 100

  Applying command…  'line console'

  Applying command…  'exec-timeout 100'

switchxxxxxx(config)#
```

3.5 macro global description

Use the **macro global description** Global Configuration command to enter a description which is used to indicate which macros have been applied to the switch. Use the **no** form of this command to remove the description.

Syntax

macro global description *text*

no macro global description

Parameters

text—Description text. The text can contain up to 160 characters.

Default Configuration

The command has no default setting.

Command Mode

Global Configuration mode

User Guidelines

When multiple global macros are applied to a switch, the global description text is a concatenation of texts from a number of previously applied macros.

You can verify your settings by entering the **show parser macro description** privileged EXEC mode command.

Examples

```
switchxxxxxx(conf)#  macro global description "set console timeout interval"
```

3.6 show parser macro

Use the **show parser macro** User EXEC mode command to display the parameters for all configured macros or for one macro on the switch.

Syntax

show parser macro [*{**brief** | **description** [**interface** interface-id] | **name** macro-name}*]

Parameters

- **brief**—Display the name of all macros.
- **description** [**interface** *interface-id*]—Display the macro descriptions for all interfaces or if an interface is specified, display the macro descriptions for that interface.
- **name** *macro-name*—Display information about a single macro identified by the macro name.

Command Mode

User EXEC mode

Examples

Example 1 - This is a partial output example from the **show parser macro** command.

```
switchxxxxxx#  show parser macro

Total number of macros = 6

------------------------------------------------------------------

Macro name : cisco-global

Macro type : default global

# Enable dynamic port error recovery for link state

# failures
```

<output truncated>

```
------------------------------------------------------------------

Macro name : cisco-desktop

Macro type : default interface

# macro keywords $AVID

# Basic interface - Enable data VLAN only

# Recommended value for access vlan (AVID) should not be 1

switchport access vlan $AVID

switchport mode access
```

<output truncated>

Example 2 - This is an example of output from the **show parser macro name** command.

```
switchxxxxxx#  show parser macro standard-switch10
Macro name : standard-switch10
Macro type : customizable
macro description standard-switch10
# Trust QoS settings on VOIP packets
auto qos voip trust
# Allow port channels to be automatically formed
channel-protocol pagp
```

Example 3 - This is an example of output from the **show parser macro brief** command.

```
switchxxxxxx#  show parser macro brief
default global : cisco-global
default interface: cisco-desktop
default interface: cisco-phone
default interface: cisco-switch
default interface: cisco-router
customizable : snmp
```

This is an example of output from the **show parser macro description** command.

```
switchxxxxxx#  show parser macro description
Global Macro(s): cisco-global
```

Example 4 - This is an example of output from the **show parser macro description interface** command.

```
switchxxxxxx#  show parser macro description interface gi2

Interface Macro Description

---------------------------------------------------------------

gi2 this is test macro

---------------------------------------------------------------
```

4 RSA and Certificate Commands

4.1 crypto key generate dsa

The **crypto key generate dsa** Global Configuration mode command generates a public and private DSA key (DSA key pair).

Syntax

crypto key generate dsa

Parameters

N/A

Default Configuration

DSA key pairs do not exist.

Command Mode

Global Configuration mode

User Guidelines

DSA keys are generated in pairs - one public DSA key and one private DSA key.

If the device already has DSA keys, a warning is displayed with a prompt to replace the existing keys with new keys.

This command is not saved in the Running configuration file. However, the keys generated by this command are saved in a private configuration (which is never displayed to the user or backed up to another device).

Example

The following example generates a DSA key pair.

```
switchxxxxxx(config)# crypto key generate dsa

The SSH service is generating a private DSA key.

This may take a few minutes, depending on the key size.

.....
```

4.2 crypto key generate rsa

The **crypto key generate rsa** Global Configuration mode command generates RSA key pairs.

Syntax

crypto key generate rsa

Parameters

N/A

Default Configuration

RSA key paris do not exist.

Command Mode

Global Configuration mode

User Guidelines

RSA keys are generated in pairs - one public RSA key and one private RSA key.

If the device already has RSA keys, a warning is displayed with a prompt to replace the existing keys with new keys.

This command is not saved in the Running configuration file; however, the keys generated by this command are saved in a private configuration (which is never displayed to the user or backed up to another device).

Example

The following example generates RSA key pairs where a RSA key already exists.

```
switchxxxxxx(config)# crypto key generate rsa

Replace Existing RSA Key [y/n]? N

switchxxxxxx(config)#
```

4.3 show crypto key mypubkey

The **show crypto key mypubkey** Privileged EXEC mode command displays the device's SSH public keys.

Syntax

show crypto key mypubkey *[rsa | dsa]*

Parameters

- **rsa**—Displays the RSA key.
- **dsa**—Displays the DSA key.

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the SSH public RSA keys on the device.

```
switchxxxxxx# show crypto key mypubkey dsa
 dsa key data:
ssh-dss AAAAB3NzaC1kc3MAAACBAOY/PhBgItVP5tFgDS7PA6Sdsvg5zq6c
k0VoWb0Pckj5mXy86jPrUdCAFsdwHubfDVr1qJUSz+0e5LfQtu2Sf9mUoyRG
DeC8PYRurARrP0t9OFNYk+PZazJRjgy/X4V+9YL2etj+OrYm3f3YqLESlzJS
6IIycU1fEGNcZXL5JqM7AAAAFQD3UDWQ/9dXAGhFWy+u1sEqv/6b4wAAAIAs
jjSG4hq0RFdK5ooMKfB8lHAIOF8pI1maywkaoMvJcukzBJ0x+K7DQiRLYQ+r
mrc5rOCs+ZWK8n6qK6Nvlli36mrc5uNM/C/ZcT/T3xu5TpHoujgByaxR+EKA
HSg4lIJagCQjM6TlnhDyLQYpsKdV1yovpSavjhM/gHcGjnwUKwAAAIEAp4RE
oR9ylQwtdiZHQcNXZhkN8eyfV1mirxLfnGiQhX48FdHGLLEQcZZBUFSkTvGr
Te0y3nh2mZwnmKKeu49B6oEFGGVIr/Df2u1igxidHKTdhNqcpMjClZKk3roz
DI7/i4KHlRpaSByY4P7906k/QLDA6vcELMfUw1XH6FwNuNY=
Fingerprint(hex): e5:2e:39:43:e6:a3:3b:8a:9d:c7:62:9f:fc:c6:86:d1
Fingerprint(bubbleBabble): xesit-mupyd-kihod-cuzem-cigot-zogyr-gafyn-vileg-kunen
-felac-kuxyx
```

4.4 crypto certificate generate

The **crypto certificate generate** Global Configuration mode command generates a self-signed certificate for HTTPS.

Syntax

crypto certificate *number* **generate** *[**key-generate** [length]] [**passphrase** string] [**cn** common- name] [**ou** organization-unit] [**or** organization] [**loc** location] [**st** state] [**cu** country] [**duration** days*]

Parameters

- **number**—Specifies the certificate number. (Range: 1–2)
- **key-generate** *length*—Regenerates SSL RSA key and specifies the SSL's RSA key length. (Range: 512–2048)
- **passphrase** *string*—Specifies the passphrase used for exporting the certificate in PKCS12 file format. (Length: 8–96 characters)
- The following elements can be associated with the key. When the key is displayed, they are also displayed.
  - **cn** *common- name*—Specifies the fully qualified device URL or IP address. (Length: 1–64 characters). If unspecified, defaults to the lowest IP address of the device (when the certificate is generated).
  - **ou** *organization-unit*—Specifies the organization-unit or department name. (Length: 1–64 characters)
  - **or** *organization*—Specifies the organization name. (Length: 1–64 characters)
  - **loc** *location*—Specifies the location or city name. (Length: 1–64 characters)
  - **st** *state*—Specifies the state or province name. (Length: 1–64 characters)
  - **cu** *country*—Specifies the country name. (Length: 2 characters)
- **duration** *days*—Specifies the number of days a certification is valid. (Range: 30–3650)

Default Configuration

The default SSL's RSA key length is 1024.

If **passphrase** *string* is not specified, the certificate is not exportable.

If **cn** *common- name* is not specified, it defaults to the device's lowest static IPv6 address (when the certificate is generated), or to the device's lowest static IPv4 address if there is no static IPv6 address, or to 0.0.0.0 if there is no static IP address.

If **duration** *days* is not specified, it defaults to 365 days.

Command Mode

Global Configuration mode

User Guidelines

This command is not saved in the Running configuration file. However, the certificate and keys generated by this command are saved in a private configuration (which is never displayed to the user or backed up to another device).

When exporting a RSA key pair to a PKCS#12 file, the RSA key pair is as secure as the passphrase. Keep the passphrase secure.

If the RSA key does not exist, you must use the parameter **key-generate**.

If both certificates 1 and 2 have been generated, use ip https certificate to active one of them.

Example

The following example generates a self-signed certificate for HTTPS whose length is 100 bytes.

```
switchxxxxxx# crypto certificate generate key-generate 100
```

4.5 crypto certificate request

The **crypto certificate request** Privileged EXEC mode command generates and displays a certificate request for HTTPS.

Syntax

crypto certificate *number* **request** *[**cn** common- name] [**ou** organization-unit] [**or** organization] [**loc** location] [**st** state] [**cu** country]*

Parameters

- **number**—Specifies the certificate number. (Range: 1–2)
- The following elements can be associated with the key. When the key is displayed, they are also displayed.
  - **cn** *common- name*—Specifies the fully qualified device URL or IP address. (Length: 1–64 characters). If unspecified, defaults to the lowest IP address of the device (when the certificate is generated).
  - **ou** *organization-unit*—Specifies the organization-unit or department name. (Length: 1–64 characters)
  - **or** *organization*—Specifies the organization name. (Length: 1–64 characters)
  - **loc** *location*—Specifies the location or city name. (Length: 1–64 characters)
  - **st** *state*—Specifies the state or province name. (Length: 1–64 characters)
  - **cu** *country*—Specifies the country name. (Length: 2 characters)

Default Configuration

If **cn common-name** is not specified, it defaults to the device's lowest static IPv6 address (when the certificate is generated), or to the device's lowest static IPv4 address if there is no static IPv6 address, or to 0.0.0.0 if there is no static IP address.

Command Mode

Privileged EXEC mode

User Guidelines

Use this command to export a certificate request to a Certification Authority. The certificate request is generated in Base64-encoded X.509 format.

Before generating a certificate request, first generate a self-signed certificate using the crypto certificate generateGlobal Configuration mode command to generate the keys. The certificate fields must be re-entered.

After receiving the certificate from the Certification Authority, use the crypto certificate import Global Configuration mode command to import the certificate into the device. This certificate replaces the self-signed certificate.

Example

The following example displays the certificate request for HTTPS.

```
switchxxxxxx# crypto certificate 1 request

-----BEGIN CERTIFICATE REQUEST-----

MIwTCCASoCAQAwYjELMAkGA1UEBhMCUFAxCzAJBgNVBAgTAkNDMQswCQYDVQQH

EwRDEMMAoGA1UEChMDZGxkMQwwCgYDVQQLEwNkbGQxCzAJBgNVBAMTAmxkMRAw

DgKoZIhvcNAQkBFgFsMIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQC8ecwQ

HdML0831i0fh/F0MV/Kib6Sz5p+3nUUenbfHp/igVPmFM+1nbqTDekb2ymCu6K

aKvEbVLF9F2LmM7VPjDBb9bb4jnxkvwW/wzDLvW2rsy5NPmH1QVl+8Ubx3GyCm

/oW93BSOFwxwEsP58kf+sPYPy+/8wwmoNtDwIDAQABoB8wHQYJKoZIhvcNAQkH

MRDjEyMwgICCAgICAICAgIMA0GCSqGSIb3DQEBBAUAA4GBAGb8UgIx7rB05m+2

m5ZZPhIwl8ARSPXwhVdJexFjbnmvcacqjPG8pIiRV6LkxryGF2bVU3jKEipcZa

g+uNpyTkDt3ZVU72pjz/fa8TF0n3

-----END CERTIFICATE REQUEST-----

CN= router.gm.com

0= General Motors

C= US
```

4.6 crypto certificate import

The **crypto certificate import** Global Configuration mode command imports a certificate signed by a Certification Authority for HTTPS.

Syntax

crypto certificate *number* **import**

Parameters

number—Specifies the certificate number. (Range: 1–2)

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

To end the session (return to the command line to enter the next command), enter a blank line.

The imported certificate must be based on a certificate request created by the crypto certificate request privileged EXEC command.

If the public key found in the certificate does not match the device's SSL RSA key, the command fails.

This command is not saved in the Running configuration file. However, the certificate imported by this command is saved in the private configuration (which is never displayed to the user or backed up to another device).

Example

The following example imports a certificate signed by the Certification Authority for HTTPS.

```
switchxxxxxx(config)#exit

switchxxxxxx#crypto certificate

  <1-2>               Specifies the certificate number.

switchxxxxxx#crypto certificate 1 request
```

```
-----BEGIN CERTIFICATE REQUEST-----
MIIBkzCB/QIBADBUMQswCQYDVQQGEwIgIDEKMAgGA1UECBMBIDEKMAgGA1UEBxMB
IDEVMBMGA1UEAxMMMTAuNS4yMzQuMjA5MQowCAYDVQQKEwEgMQowCAYDVQQLEwEg
MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQDK+beogIcke73sBSL7tC2DMZrY
OOg9XM1AxfOiqLlQJHd4xP+BHGZWwfkjKjUDBpZn52LxdDu1KrpB/h0+TZP0Fv38
7mIDqtnoF1NLsWxkVKRM5LPka0L/ha1pYxp7EWAt5iDBzSw5sO4lv0bSN7oaGjFA
6t4SW2rrnDy8JbwjWQIDAQABoAAwDQYJKoZIhvcNAQEEBQADgYEAuqYQiNJst6hI
XFDxe7I8Od3Uyt3Dmf7KE/AmUV0Pif2yUluy/RuxRwKhDp/lGrK12tzLQz+s5Ox7
Klft/IcjzbBYXLvih45ASWG3TRv2WVKyWs89rPPXu5hKxggEeTvWqpuS+gXrIqjW
WVZd0n1fXhMacoflgnnEmweIzmrqXBs=
-----END CERTIFICATE REQUEST-----
switchxxxxxx(config)# crypto certificate 1 import
Please paste the input now, add a period (.) on a separate line after the
input,and press Enter.
-----BEGIN CERTIFICATE-----
MIIBkzCB/QIBADBUMQswCQYDVQQGEwIgIDEKMAgGA1UECBMBIDEKMAgGA1UEBxMB
IDEVMBMGA1UEAxMMMTAuNS4yMzQuMjA5MQowCAYDVQQKEwEgMQowCAYDVQQLEwEg
MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQDK+beogIcke73sBSL7tC2DMZrY
OOg9XM1AxfOiqLlQJHd4xP+BHGZWwfkjKjUDBpZn52LxdDu1KrpB/h0+TZP0Fv38
7mIDqtnoF1NLsWxkVKRM5LPka0L/ha1pYxp7EWAt5iDBzSw5sO4lv0bSN7oaGjFA
6t4SW2rrnDy8JbwjWQIDAQABoAAwDQYJKoZIhvcNAQEEBQADgYEAuqYQiNJst6hI
XFDxe7I8Od3Uyt3Dmf7KE/AmUV0Pif2yUluy/RuxRwKhDp/lGrK12tzLQz+s5Ox7
Klft/IcjzbBYXLvih45ASWG3TRv2WVKyWs89rPPXu5hKxggEeTvWqpuS+gXrIqjW
WVZd0n1fXhMacoflgnnEmweIzmrqXBs=
.
-----END CERTIFICATE-----
Certificate imported successfully.
Issued by : C=  , ST= , L= , CN=0.0.0.0, O= , OU=
 Valid From: Jan 24 18:41:24 2011 GMT
Valid to: Jan 24 18:41:24 2012 GMT
Subject: C=US , ST= , L= , CN=router.gm.com, O= General Motors, OU=
```

```
SHA1 Finger print: DC789788 DC88A988 127897BC BB789788
```

4.7 show crypto certificate mycertificate

The **show crypto certificate mycertificate** Privileged EXEC mode command displays the device SSL certificates.

Syntax

show crypto certificate mycertificate [*number*]

Parameters

number—Specifies the certificate number. (Range: 1–2)

Default Configuration

Certificate number 1.

Command Mode

Privileged EXEC mode

Example

The following example displays SSL certificate # 1 present on the device.

```
switchxxxxxx# show crypto certificate mycertificate

-----BEGIN CERTIFICATE-----

dHmUgUm9vdCBDZXJ0aWZpZXIwXDANBgkqhkiG9w0BAQEFAANLADBIAkEAp4HS

nnH/xQSGA2ffkRBwU2XIxb7n8VPsTm1xyJ1t11a1GaqchfMqqe0kmfhcoHSWr

yf1FpD0MWOTgDAwIDAQABo4IBojCCAZ4wEwYJKwYBBAGCNxQCBAYeBABDAEEw

CwR0PBAQDAgFGMA8GA1UdEwEB/wQFMAMBAf8wHQYDVR0OBBYEFAf4MT9BRD47

ZvKBAEL9Ggp+6MIIBNgYDVR0fBIIBLTCCASkwgdKggc+ggcyGgclsZGFwOi8v

L0VByb3h5JTIwU29mdHdhcmUlMjBSb290JTIwQ2VydGlmaWVyLENOPXNlcnZl

-----END CERTIFICATE-----

Issued by: www.verisign.com

Valid from: 8/9/2003 to 8/9/2004

Subject: CN= router.gm.com, 0= General Motors, C= US
```

```
Finger print: DC789788 DC88A988 127897BC BB789788
```

5 System Management Commands

5.1 ping

Use the **ping** EXEC mode command to send ICMP echo request packets to another node on the network.

Syntax

ping [ip] *{ipv4-address | hostname}* ***[size*** *packet_size]* ***[count*** *packet_count]* ***[timeout*** *time_out]*

ping ipv6 *{ipv6-address | hostname}* ***[size*** *packet_size]* ***[count*** *packet_count]* ***[timeout*** *time_out]*

Parameters

- **ip**—Use IPv4 to check the network connectivity.
- **ipv6**—Use IPv6 to check the network connectivity.
- **ipv4-address**—IPv4 address to ping.
- **ipv6-address**—Unicast or Multicast IPv6 address to ping. When the IPv6 address is a Link Local address (IPv6Z address), the outgoing interface name must be specified. See IPv6z Address Conventions.
- **hostname**—Hostname to ping (Length: 1-160 characters. Maximum label size for each part of the host name: 63.)
- **size** ***packet_size***—Number of bytes in the packet not including the VLAN tag. The default is 64 bytes. (IPv4:64–1518, IPv6: 68–1518)
- **count** ***packet_count***—Number of packets to send, from 1 to 65535 packets. The default is 4 packets. If 0 is entered, it pings until stopped (0–65535).
- **time** ***time-out***—Timeout in milliseconds to wait for each reply, from 50 to 65535 milliseconds. The default is 2000 milliseconds (50–65535).

Default Usage

N/A

Command Mode

EXEC mode

User Guidelines

Press **Esc** to stop pinging. Following are sample results of the ping command:

- **Destination does not respond**—If the host does not respond, a "no answer from host" appears within 10 seconds.
- **Destination unreachable**—The gateway for this destination indicates that the destination is unreachable.
- **Network or host unreachable**—The switch found no corresponding entry in the route table.

See IPv6z Address Conventions.

When using the ping **ipv6** command to check network connectivity of a directly attached host using its link local address, the egress interface may be specified in the **IPv6Z** format. If the egress interface is not specified, the default interface is selected.

When using the ping **ipv6** command with a Multicast address, the information displayed is taken from all received echo responses.

Examples

Example 1 - Ping an IP address.

```
switchxxxxxx# ping ip 10.1.1.1

Pinging 10.1.1.1 with 64 bytes of data:

64 bytes from 10.1.1.1: icmp_seq=0. time=11 ms

64 bytes from 10.1.1.1: icmp_seq=1. time=8 ms

64 bytes from 10.1.1.1: icmp_seq=2. time=8 ms

64 bytes from 10.1.1.1: icmp_seq=3. time=7 ms

----10.1.1.1 PING Statistics----

4 packets transmitted, 4 packets received, 0% packet loss

round-trip (ms) min/avg/max = 7/8/11
```

Example 2 - Ping a site.

```
switchxxxxxx# ping ip yahoo.com

Pinging yahoo.com [66.218.71.198] with 64 bytes of data:

64 bytes from 10.1.1.1: icmp_seq=0. time=11 ms
```

```
64 bytes from 10.1.1.1: icmp_seq=1. time=8 ms
64 bytes from 10.1.1.1: icmp_seq=2. time=8 ms
64 bytes from 10.1.1.1: icmp_seq=3. time=7 ms
----10.1.1.1 PING Statistics----
4 packets transmitted, 4 packets received, 0% packet loss
round-trip (ms) min/avg/max = 7/8/11
```

Example 3 - Ping an IPv6 address.

```
switchxxxxxx# ping ipv6 3003::11
Pinging 3003::11 with 64 bytes of data:
64 bytes from 3003::11: icmp_seq=1. time=0 ms
64 bytes from 3003::11: icmp_seq=2. time=50 ms
64 bytes from 3003::11: icmp_seq=3. time=0 ms
64 bytes from 3003::11: icmp_seq=4. time=0 ms
----3003::11 PING Statistics----
4 packets transmitted, 4 packets received, 0% packet loss
round-trip (ms) min/avg/max = 0/12/50
```

```
switchxxxxxx# ping ipv6 FF02::1
Pinging FF02::1 with 64 bytes of data:
64 bytes from 3003::11: icmp_seq=1. time=0 ms
64 bytes from 3003::33: icmp_seq=1. time=70 ms
64 bytes from 3003::11: icmp_seq=2. time=0 ms
64 bytes from 3003::55: icmp_seq=1. time=1050 ms
64 bytes from 3003::33: icmp_seq=2. time=70 ms
64 bytes from 3003::55: icmp_seq=2. time=1050 ms
64 bytes from 3003::11: icmp_seq=3. time=0 ms
64 bytes from 3003::33: icmp_seq=3. time=70 ms
64 bytes from 3003::11: icmp_seq=4. time=0 ms
64 bytes from 3003::55: icmp_seq=3. time=1050 ms
64 bytes from 3003::33: icmp_seq=4. time=70 ms
```

```
64 bytes from 3003::55: icmp_sq=4. time=1050 ms

---- FF02::1 PING Statistics----

4 packets transmitted, 12 packets received
```

5.2 traceroute

To display the routes that packets will take when traveling to their destination, use the **traceroute** EXEC mode command.

Syntax

traceroute ip *{ipv4-address | hostname}* ***[size*** *packet_size] [**ttl** max-ttl] [**count** packet_count] [**timeout** time_out] [**source** ip-address] [**tos** tos*]

traceroute ipv6 *{ipv6-address | hostname}* ***[size*** *packet_size] [**ttl** max-ttl] [**count** packet_count] [**timeout** time_out] [**source** ip-address] [**tos** tos*]

Parameters

- **ip**—Use IPv4 to discover the route.
- **ipv6**—Use IPv6 to discover the route.
- **ipv4-address**—IPv4 address of the destination host.
- **ipv6-address**—IPv6 address of the destination host.
- **hostname**—Hostname of the destination host. (Length: 1-160 characters. Maximum label size for each part of the host name: 63.)
- **size** *packet_size*—Number of bytes in the packet not including the VLAN tag. The default is 64 bytes. (IPv4:64-1518, IPv6: 68-1518)
- **ttl** *max-ttl*—The largest TTL value that can be used. The default is 30. The **traceroute** command terminates when the destination is reached or when this value is reached. (Range: 1–255)
- **count** *packet_count*—The number of probes to be sent at each TTL level. The default count is 3. (Range: 1–10)
- **timeout** *time_out*—The number of seconds to wait for a response to a probe packet. The default is 3 seconds. (Range: 1–60)
- **source** *ip-address*—One of the interface addresses of the device to use as a source address for the probes. The device selects the optimal source address by default. (Range: Valid IP address)

- **tos** *tos*—The Type-Of-Service byte in the IP Header of the packet. (Range: 0–255)

Default Usage

N/A

Command Mode

EXEC mode

User Guidelines

The traceroute command works by taking advantage of the error messages generated by routers when a datagram exceeds its time-to-live (TTL) value.

The traceroute command starts by sending probe datagrams with a TTL value of one. This causes the first router to discard the probe datagram and send back an error message. The traceroute command sends several probes at each TTL level and displays the round-trip time for each.

The traceroute command sends out one probe at a time. Each outgoing packet can result in one or two error messages. A "time exceeded" error message indicates that an intermediate router has seen and discarded the probe. A "destination unreachable" error message indicates that the destination node has received the probe and discarded it because it could not deliver the packet. If the timer goes off before a response comes in, the traceroute command prints an asterisk (*).

The traceroute command terminates when the destination responds, when the maximum TTL is exceeded, or when the user interrupts the trace with Esc.

The traceroute command is not relevant to IPv6 link local addresses.

Example

```
switchxxxxxx# traceroute ip umaxp1.physics.lsa.umich.edu

Type Esc to abort.

Tracing the route to umaxp1.physics.lsa.umich.edu (141.211.101.64)

1 i2-gateway.stanford.edu (192.68.191.83)  0 msec 0 msec 0 msec

2 STAN.POS.calren2.NET (171.64.1.213) 0 msec 0 msec 0 msec

3 SUNV--STAN.POS.calren2.net (198.32.249.73) 1 msec 1 msec 1 msec

4 Abilene--QSV.POS.calren2.net (198.32.249.162)  1 msec 1 msec 1 msec

5 kscyng-snvang.abilene.ucaid.edu (198.32.8.103)  33 msec 35 msec 35 msec
```

```
6 iplsng-kscyng.abilene.ucaid.edu (198.32.8.80)   47 msec 45 msec 45 msec

7 so-0-2-0x1.aa1.mich.net (192.122.183.9)  56 msec  53 msec 54 msec

8 atm1-0x24.michnet8.mich.net (198.108.23.82)  56 msec 56 msec 57 msec

9 * * *

10 A-ARB3-LSA-NG.c-SEB.umnet.umich.edu(141.211.5.22)58 msec 58msec 58 msec

11 umaxp1.physics.lsa.umich.edu (141.211.101.64)  62 msec 63 msec 63 msec

Trace completed
```

The following table describes the significant fields shown in the display:

Field	Description
1	Indicates the sequence number of the router in the path to the host.
i2-gateway.stanford.edu	Host name of this router.
192.68.191.83	IP address of this router.
1 msec 1 msec 1 msec	Round-trip time for each of the probes that are sent.

The following are characters that can appear in the traceroute command output:

Field	Description
*	The probe timed out.
?	Unknown packet type.
A	Administratively unreachable. Usually, this output indicates that an access list is blocking traffic.
F	Fragmentation required and DF is set.
H	Host unreachable.
N	Network unreachable.
P	Protocol unreachable.
Q	Source quench.
R	Fragment reassembly time exceeded
S	Source route failed.
U	Port unreachable.

5.3 telnet

The **telnet** EXEC mode command enables logging on to a host that supports Telnet.

Syntax

telnet {*ip-address* | *hostname*} [*port*] [*keyword*...]

Parameters

- **ip-address**—Specifies the destination host IP address (IPv4 or IPv6).
- **hostname**—Specifies the destination host name. (Length: 1-160 characters. Maximum label size for each part of the host name: 63.)
- **port**—Specifies the decimal TCP port number or one of the keywords listed in the Ports table in the User Guidelines.
- **keyword**—Specifies the one or more keywords listed in the Keywords table in the User Guidelines.

Default Configuration

The default port is the Telnet port (23) on the host.

By default, Telnet is disabled.

Command Mode

EXEC mode

User Guidelines

Telnet software supports special Telnet commands in the form of Telnet sequences that map generic terminal control functions to operating system-specific functions. To enter a Telnet sequence, press the escape sequence keys (Ctrl-shift-6) followed by a Telnet command character.

Special Telnet Sequences

Telnet Sequence	Purpose
Ctrl-shift-6-b	Break
Ctrl-shift-6-c	Interrupt Process (IP)
Ctrl-shift-6-h	Erase Character (EC)
Ctrl-shift-6-o	Abort Output (AO)

Telnet Sequence	Purpose
Ctrl-shift-6-t	Are You There? (AYT)
Ctrl-shift-6-u	Erase Line (EL)

At any time during an active Telnet session, available Telnet commands can be listed by pressing the `?/help` keys at the system prompt.

A sample of this list follows.

```
switchxxxxxx# ?/help

[Special telnet escape help]

^^ B sends telnet BREAK

^^ C sends telnet IP

^^ H sends telnet EC

^^ O sends telnet AO

^^ T sends telnet AYT

^^ U sends telnet EL

?/help suspends the session (return to system command prompt)
```

Several concurrent Telnet sessions can be opened, enabling switching between the sessions. To open a subsequent session, the current connection has to be suspended by pressing the escape sequence keys (Ctrl-shift-6) and x to return to the system command prompt. Then open a new connection with the telnet EXEC mode command.

This command lists concurrent Telnet connections to remote hosts that were opened by the current Telnet session to the local device. It does not list Telnet connections to remote hosts that were opened by other Telnet sessions.

Keywords Table

Options	Description
/echo	Enables local echo.
/quiet	Prevents onscreen display of all messages from the software.
/source-interface	Specifies the source interface.

Options	Description
/stream	Turns on stream processing, which enables a raw TCP stream with no Telnet control sequences. A stream connection does not process Telnet options and can be appropriate for connections to ports running UNIX-to-UNIX Copy Program (UUCP) and other non-Telnet protocols.
Ctrl-shift-6 x	Returns to the System Command Prompt.

Ports Table

Keyword	Description	Port Number
BGP	Border Gateway Protocol	179
chargen	Character generator	19
cmd	Remote commands	514
daytime	Daytime	13
discard	Discard	9
domain	Domain Name Service	53
echo	Echo	7
exec	Exec	512
finger	Finger	79
ftp	File Transfer Protocol	21
ftp-data	FTP data connections	20
gopher	Gopher	70
hostname	NIC hostname server	101
ident	Ident Protocol	113
irc	Internet Relay Chat	194
klogin	Kerberos login	543
kshell	Kerberos shell	544
login	Login	513
lpd	Printer service	515
nntp	Network News Transport Protocol	119
pim-auto-rp	PIM Auto-RP	496
pop2	Post Office Protocol v2	109
pop3	Post Office Protocol v3	110

Keyword	Description	Port Number
smtp	Simple Mail Transport Protocol	25
sunrpc	Sun Remote Procedure Call	111
syslog	Syslog	514
tacacs	TAC Access Control System	49
talk	Talk	517
telnet	Telnet	23
time	Time	37
uucp	Unix-to-Unix Copy Program	540
whois	Nickname	43
www	World Wide Web	80

Example

The following example displays logging in to IP address 176.213.10.50 via Telnet.

```
switchxxxxxx# telnet 176.213.10.50
```

5.4 resume

The **resume** EXEC mode command enables switching to another open Telnet session.

Syntax

resume [*connection*]

Parameters

connection—Specifies the connection number. (Range: 1-4 connections.)

Default Configuration

The default connection number is that of the most recent connection.

Command Mode

EXEC mode

Example

The following command switches to open Telnet session number 1.

```
switchxxxxxx# resume 1
```

5.5 hostname

The **hostname** Global Configuration mode command specifies or modifies the device host name. Use the **no** form of the command to remove the existing host name.

Syntax

hostname *name*

no hostname

Parameters

Name—Specifies the device host name. (Length: 1-160 characters. Maximum label size for each part of the host name: 63). The hostname must start with a letter, end with a letter or digit, and have as interior characters only letters, digits, and hyphens.

Default Configuration

No host name is defined.

Command Mode

Global Configuration mode

Example

The following example specifies the device host name as ‘enterprise’.

```
switchxxxxxx(config)# hostname enterprise

enterprise(config)#
```

5.6 reload

The **reload** Privileged EXEC mode command reloads the operating system.

Syntax

reload

Parameters

N/A

Default Usage

N/A

Command Mode

Privileged EXEC mode

Example

The following example reloads the operating system.

```
switchxxxxxx# reload

This command will reset the whole system and disconnect your current session.
Do you want to continue? (y/n) [Y]
```

5.7 service cpu-utilization

The **service cpu-utilization** Global Configuration mode command enables measuring CPU utilization. Use the **no** form of this command to restore the default configuration.

Syntax

service cpu-utilization

no service cpu-utilization

Parameters

N/A

Default Configuration

Measuring CPU utilization is disabled.

Command Mode

Global Configuration mode

User Guidelines

Use the **service cpu utilization** command to measure information on CPU utilization.

Example

The following example enables measuring CPU utilization.

```
switchxxxxxx(config)# service cpu-utilization
```

5.8 show cpu utilization

The **show cpu utilization** Privileged EXEC mode command displays information about CPU utilization.

Syntax

show cpu utilization

Parameters

N/A

Default Usage

N/A

Command Mode

Privileged EXEC mode

User Guidelines

Use the **show cpu-utilization** command to enable measuring CPU utilization.

Example

The following example displays CPU utilization information.

```
switchxxxxxx# show cpu utilization

CPU utilization service is on.

CPU utilization

-------------------------------------------------

five seconds: 5%; one minute: 3%; five minutes: 3%
```

5.9 show users

The **show users** EXEC mode command displays information about the active users.

Syntax

show users

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Example

The following example displays information about the active users.

```
switchxxxxxx# show users
Username            Protocol         Location
----------          -----------      ------------
Bob                 Serial
John                SSH              172.16.0.1
Robert              HTTP             172.16.0.8
Betty               Telnet           172.16.1.7
Sam                                  172.16.1.6
```

5.10 show sessions

The **show sessions** EXEC mode command displays open Telnet sessions.

Syntax

show sessions

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

User Guidelines

The **show sessions** command displays Telnet sessions to remote hosts opened by the current Telnet session to the local device. It does not display Telnet sessions to remote hosts opened by other Telnet sessions to the local device.

Example

The following example displays open Telnet sessions.

```
switchxxxxxx# show sessions

Connection    Host             Address      Port    Byte
----------    -------------    ----------   -----   ----
1             Remote router    172.16.1.1   23      89
2             172.16.1.2       172.16.1.2   23      8
```

The following table describes significant fields shown above.

Field	Description
Connection	The connection number.
Host	The remote host to which the device is connected through a Telnet session.
Address	The remote host IP address.
Port	The Telnet TCP port number.
Byte	The number of unread bytes for the user to see on the connection.

5.11 show system

The **show system** EXEC mode command displays system information.

Syntax

show system

Parameters

N/A.

Command Mode

EXEC mode

Example

The following example displays the system information.

```
switchxxxxxx# show system

System Description:                          20-port Gigabit Managed Switch

System Up Time (days,hour:min:sec):          03,02:27:46

System Contact:

System Name:                                 switch151400

System Location:

System MAC Address:                          00:24:ab:15:14:00

System Object ID:                            1.3.6.1.4.1.9.6.1.83.20.1
```

5.12 show version

The **show version** EXEC mode command displays system version information.

Syntax

show version md5

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Example

The following example displays system version information.

```
switchxxxxxx# show version

SW Version      1.1.0.5 ( date  15-Sep-2010 time  10:31:33 )
```

```
Boot Version    1.1.0.2 ( date  04-Sep-2010 time  21:51:53 )

HW Version      V01
```

5.13 show version md5

Use the **show version md5** EXEC mode command to display external MD5 digest of firmware.

Syntax

show version md5

Parameters

Default Usage

N/A

Command Mode

EXEC mode

Example

```
switchxxxxxx# show version md5

Filename      Status        MD5  Digest

--------      -------       ----------------------------------

image1        Active        23FA000012857D8855AABC7577AB5562

image2        Not Active    23FA000012857D8855AABEA7451265456

boot                        23FA000012857D8855AABC7577AB8999

image1        Not Active    23FA000012857D8855AABC757FE693844

image2        Active        23FA000012857D8855AABC7577AB5562

boot                        23FA000012857D8855AABC7577AC9999
```

5.14 system resources routing

The **system resources routing** Global Configuration mode command configures the routing table maximum size. Use the **no** form of this command to return to the default size.

Syntax

system resources routing *routes hosts interfaces*

no system resources routing

Parameters

- **routes**—Specifies the maximum number of remote networks in the routing table.
- **hosts**—Specifies the maximum number of directly attached hosts.
- **interfaces**—Specifies the maximum number of IP interfaces.

Default Configuration

Hosts: 2-100, default = 100

Routes: 1-32, default = 32

IP Interfaces: 2-32, default = 32

Command Mode

Global Configuration mode

User Guidelines

The settings are effective after reboot.

Example

The following example configures the routing table maximum size.

```
switchxxxxxx# system resources routing 20 23 5
```

5.15 show system resources

The **show system resources routings** EXEC mode command displays system routing and tcam resource information.

Syntax

show system resources {*routing*| *tcam*}

Parameters

routing—Displays the number of hosts, routers and IP interfaces that are available.

tcam—Displays the number of TCAM rules that are available.

Command Mode

EXEC mode

Examples

Example 1 - The following example displays the system routing resources information. The values in the Current Value column show what resources are currently available. The values in the After Reboot Value column show what resources will be available after reboot as a result of system resources routing command.

```
switchxxxxxx# show system resources routing
Parameters          Current Value         After Reboot Value
--------------      ----------------      -------------------
Hosts:              100                   100
Routes:             32                    32
IP Interfaces:      32                    32
```

Example 2 - The following example displays the system routing resources information. The values in the Current Value column show what resources are currently available. The values in the After Reboot Value column show what resources will be available after reboot as a result of system resources routing command.

```
switchxxxxxx# show system resources tcam
TCAM resources
--------------
Maximum number of miscellaneous TCAM rules:314
Used number of miscellaneous TCAM rules:        34
Maximum number of routing TCAM rules:           196
Used number of routing TCAM rules:              3
```

5.16 set system mode

The **set system mode** Privileged EXEC mode command puts the device into switch mode (Layer 2 mode) or router mode (Layer 3 mode).

Syntax

set system mode {*router* / *switch*}

Parameters

- **router**—Specifies that the device functions as a switch-router.
- **switch**—Specifies that the device functions as a switch.

Default Configuration

The default configuration is switch mode (Layer 2).

Command Mode

Privileged EXEC mode

User Guidelines

After executing the command, the Startup Configuration file is deleted and the device is rebooted. It is highly recommended to back up the Startup Configuration file before executing this command.

Example

The following example configures the device to function as a switch-router (Layer 3), with QoS and Policy based VLANs.

```
switchxxxxxx# set system mode router
```

5.17 show system mode

The **show system mode** EXEC mode command displays information on features control.

Syntax

show system mode

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Example

The following example displays system mode information.

```
switchxxxxxx#  show system mode
Feature                    State
-------------------       ---------
Mode:                      Router
Qos:                       Active
Policy-based-vlans:      Active
```

5.18 show system languages

The **show system languages** EXEC mode command displays the list of supported languages.

Syntax

show system languages

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Example

The following example displays the languages configured on the device. Number of Sections indicates the number of languages permitted on the device.

```
switchxxxxxx# show system languages

 Language Name   Unicode Name   Code  Num of Sections

--------------- -------------- ------ -------------

    English         English     en-US        2

   Japanese       µùÑµ£¼F¬P    ja-JP        2
```

5.19 show system tcam utilization

The **show system tcam utilization** EXEC mode command displays the Ternary Content Addressable Memory (TCAM) utilization.

Syntax

show system tcam utilization

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Example

The following example displays TCAM utilization information.

```
switchxxxxxx#  show system tcam utilization

TCAM utilization: 58%
```

5.20 show services tcp-udp

Use the **show services tcp-udp** Privileged EXEC mode command to display information about the active TCP and UDP services.

Syntax

show services tcp-udp

Parameters

This command has no arguments or keywords.

Command Mode

Privileged EXEC mode

User Guidelines

The output does not show sessions where the device is a TCP/UDP client.

Examples

```
switchxxxxxx# show services tcp-udp

Type   Local IP Address  Remote IP address    Service Name  State

---------------------- ------------------ ------------- -----------

TCP    All:22                               SSH           LISTEN

TCP    All:23                               Telnet        LISTEN

TCP    All:80                               HTTP          LISTEN

TCP    All:443                              HTTPS         LISTEN

TCP    172.16.1.1:23 172.16.1.18:8789       Telnet        ESTABLISHED

TCP6   All-23                               Telnet        LISTEN

TCP6   fe80::200:b0ff:fe00:0-23             Telnet

       fe80::200:b0ff:fe00:0-8999                         ESTABLISHED

UDP    All:161                              SNMP

UDP6A  ll-161                               SNMP
```

5.21 show tech-support

Use the **show tech-support** EXEC mode command to display system and configuration information that can be provided to the Technical Assistance Center when reporting a problem.

Syntax

show tech-support [*config*] [*memory*]

Parameters

Memory—Displays memory and processor state data.

Config—Displays switch configuration within the CLI commands supported on the device.

Default Configuration

By default, this command displays the output for technical-support-related show commands. Use keywords to specify the type of information to be displayed. If you do not specify any parameters, the system displays all configuration and memory data.

Command Types

Switch command.

Command Mode

EXEC mode

User Guidelines

Caution: Avoid running multiple **show tech-support** commands on a switch or multiple switches on the network segment. Doing so may cause starvation of some time sensitive protocols, like STP.

The show tech-support command may timeout if the configuration file output takes longer to display than the configured session timeout time. If this happens, enter a set logout timeout value of **0** to disable automatic disconnection of idle sessions or enter a longer timeout value.

The show tech-support command output is continuous, it does not display one screen at a time. To interrupt the output, press Esc.

If you specify the **config** keyword, the show tech-support command displays a list of the commands supported on the device.

If the user specifies the memory keyword, the show tech-support command displays the following output:

- Flash info (dir if existed, or flash mapping)
- Output of command **show bootvar**
- Buffers info (like print os buff)
- Memory info (like print os mem)
- Proc info (like print os tasks)
- Versions of software components
- Output of command **show cpu utilization**

5.22 show system id

The **show system id** EXEC mode command displays the system identity information.

Syntax

show system id

Parameters

N/A.

Command Mode

EXEC mode

Example

The following example displays the system identity information.

```
switchxxxxxx# show system id

serial number 114
```

5.23 service cpu-input-rate

The **show cpu input rate** Global Configuration mode command enables counting the rate of input frames to the CPU in packets per seconds (pps).

Syntax

service cpu-input-rate

Command Mode

Global Configuration mode

Example

The following example displays CPU input rate information.

```
switchxxxxxx(conf)# service cpu-input-rate
```

5.24 show cpu input rate

The **show cpu input rate** EXEC mode command displays the rate of input frames to the CPU in packets per seconds (pps).

Syntax

show cpu input rate

Command Mode

EXEC mode

Example

The following example displays CPU input rate information.

```
switchxxxxxx# show cpu input rate

Input Rate to CPU is 1030 pps.
```

5.25 menu

The **menu** EXEC mode command opens the boot menu.

Syntax

menu

Command Mode

EXEC mode

Example

```
switchxxxxxx# menu
```

6 Clock Commands

6.1 clock set

The **clock set** Privileged EXEC mode command manually sets the system clock.

Syntax

clock set *hh:mm:ss* {[*day month*] | [*month day*]} *year*

Parameters

- **hh:mm:ss**—Specifies the current time in hours (military format), minutes, and seconds. (Range: hh: 0-23, mm: 0-59, ss: 0-59)
- **day**—Specifies the current day of the month. (Range: 1-31)
- **month**—Specifies the current month using the first three letters of the month name. (Range: Jan–Dec)
- **year**—Specifies the current year. (Range: 2000–2037)

Command Mode

Privileged EXEC mode

User Guidelines

It is recommended that the user enter the local clock time and date.

Example

The following example sets the system time to 13:32:00 on March 7th, 2005.

```
switchxxxxxx# clock set 13:32:00 7 Mar 2005
```

6.2 clock source

The **clock source** Global Configuration mode command configures an external time source for the system clock. Use the **no** form of this command to disable the external time source.

Syntax

clock source {**sntp**}

no clock source

Parameters

sntp—Specifies that an SNTP server is the external clock source.

Default Configuration

There is no external clock source.

Command Mode

Global Configuration mode

Example

The following example configures an SNTP server as an external time source for the system clock.

```
switchxxxxxx(config)# clock source sntp
```

6.3 clock timezone

Use the **clock timezone** Global Configuration command to set the time zone for display purposes. Use the **no** form of this command to set the time to Coordinated Universal Time (UTC) or Greenwich Mean Time (GMT), which is the same.

Syntax

clock timezone *zone hours-offset [minutes-offset]*

no clock timezone

Parameters

- **zone**—The acronym of the time zone.(Range: Up to 4 characters)
- **hours-offset**—Hours difference from UTC. (Range: (-12)–(+13))
- **minutes-offset**—Minutes difference from UTC. (Range: 0–59)

Default Configuration

Offsets are **0**.

Acronym is empty.

Command Mode

Global Configuration mode

User Guidelines

The system internally keeps time in UTC, so this command is used only for display purposes and when the time is manually set.

Example

```
switchxxxxxx(config)# clock timezone abc +2 minutes 32
```

6.4 clock summer-time

Use one of the formats of the **clock summer-time** Global Configuration command to configure the system to automatically switch to summer time (Daylight Saving Time). Use the **no** form of this command to configure the software not to automatically switch to summer time.

Syntax

clock summer-time *zone* ***recurring*** *{**usa** | **eu** | {week day month hh:mm week day month hh:mm}} [offset]*

clock summer-time *zone* ***date*** *day month year hh:mm date month year hh:mm [offset]*

clock summer-time *zone* ***date*** *month day year hh:mm month day year hh:mm [offset]*

no clock summer-time

Parameters

- **zone**—The acronym of the time zone to be displayed when summer time is in effect. (Range: up to 4 characters)

- **recurring**—Indicates that summer time starts and ends on the corresponding specified days every year.
- **date**—Indicates that summer time starts on the first date listed in the command and ends on the second date in the command.
- **usa**—The summer time rules are the United States rules.
- **eu**—The summer time rules are the European Union rules.
- **week**—Week of the month. Can be 1–4, first, last.
- **day**—Day of the week (first three characters by name, such as Sun).
- **date**—Date of the month. (Range: 1–31)
- **month**—Month (first three characters by name, such as Feb).
- **year**—year (no abbreviation). (Range: 2000–2097)
- **hh:mm**—Time (military format) in hours and minutes. (Range: hh:mmhh: 0-23, mm: 0-59)
- **offset**—Number of minutes to add during summer time (default is 60). (Range: 1440)

Default Configuration

Summer time is disabled.

Command Mode

Global Configuration mode

User Guidelines

In both the **date** and **recurring** forms of the command, the first part of the command specifies when summer time begins, and the second part specifies when it ends. All times are relative to the local time zone. The start time is relative to standard time. The end time is relative to summer time. If the starting month is chronologically after the ending month, the system assumes that you are in the southern hemisphere.

USA rules for Daylight Saving Time:

- From 2007:
  - Start: Second Sunday in March
  - End: First Sunday in November

- Time: 2 AM local time

- Before 2007:
  - Start: First Sunday in April
  - End: Last Sunday in October
  - Time: 2 AM local time

EU rules for Daylight Saving Time:

- Start: Last Sunday in March
- End: Last Sunday in October
- Time: 1.00 am (01:00) Greenwich Mean Time (GMT)

Example

```
switchxxxxxx(config)# clock summer-time abc date apr 1 2010 09:00 aug 2 2010
09:00
```

6.5 clock dhcp timezone

Use the **clock dhcp timezone** Global Configuration command to specify that the timezone and the Summer Time (Daylight Saving Time) of the system can be taken from the DHCP Timezone option. Use the **no** form of this command disable this option.

Syntax

clock dhcp timezone

no clock dhcp timezone

Parameters

N/A

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

The TimeZone taken from the DHCP server has precedence over the static TimeZone. If the TimeZone does not exist in the DHCP-TimeZone option, the static configuration will be active.

The Summer Time taken from the DHCP server has precedence over static SummerTime. If the Summer Time does not exist in the DHCP-TimeZone option, the static configuration will be active.

The TimeZone and SummerTime remain effective after the IP address lease time has expired.

The TimeZone and SummerTime that are taken from the DHCP server are cleared after reboot.

When the user disables taking the TimeZone and Summer Time from the DHCP server, the dynamic Time Zone and Summer Time from the DHCP server are cleared.

In case of multiple DHCP-enabled interfaces, the last accepted DHCP-Time Zone option overrides any previous DHCP-Time Zone option. This means that the last accepted DHCP-Time Zone option overrides the previous Time Zone and the Summer Time, even if it includes only one of them.

Disabling the DHCP client from where the DHCP-TimeZone option was taken, clears the dynamic Time Zone and Summer Time configuration.

Example

```
switchxxxxxx(config)# clock dhcp timezone
```

6.6 sntp authentication-key

The **sntp authentication-key** Global Configuration mode command defines an authentication key for Simple Network Time Protocol (SNTP). Use the **no** form of this command to remove the authentication key for SNTP.

Syntax

sntp authentication-key *key-number* **md5** *key-value*

no sntp authentication-key *key-number*

Parameters

- **key-number**—Specifies the key number. (Range: 1–4294967295)

- **md5** *key-value*—Specifies the key value. (Length: 1–8 characters)

Default Configuration

No authentication key is defined.

Command Mode

Global Configuration mode

Examples

The following example defines the authentication key for SNTP.

```
switchxxxxxx(config)# sntp authentication-key 8 md5 ClkKey
switchxxxxxx(config)# sntp authentication-key 8 md5 ClkKey
switchxxxxxx(config)# sntp trusted-key 8
switchxxxxxx(config)# sntp authenticate
```

6.7 sntp authenticate

The **sntp authenticate** Global Configuration mode command enables authentication for received SNTP traffic from servers. Use the **no** form of this command to disable the feature.

Syntax

sntp authenticate

no sntp authenticate

Parameters

N/A

Default Configuration

Authentication is disabled.

Command Mode

Global Configuration mode

User Guidelines

The command is relevant for both Unicast and Broadcast.

Examples

The following example enables authentication for received SNTP traffic and sets the key and encryption key.

```
switchxxxxxx(config)# sntp authenticate

switchxxxxxx(config)# sntp authentication-key 8 md5 ClkKey

switchxxxxxx(config)# sntp trusted-key 8
```

6.8 sntp trusted-key

The **sntp trusted-key** Global Configuration mode command authenticates the identity of the system with which SNTP synchronizes. Use the **no** form of this command to disable system identity authentication.

Syntax

sntp trusted-key *key-number*

no sntp trusted-key *key-number*

Parameters

key-number—Specifies the key number of the authentication key to be trusted. (Range: 1–4294967295)

Default Configuration

No keys are trusted.

Command Mode

Global Configuration mode

User Guidelines

The command is relevant for both received unicast and broadcast.

Examples

The following example authenticates key 8.

```
switchxxxxxx(config)# sntp trusted-key 8
switchxxxxxx(config)# sntp authentication-key 8 md5 ClkKey
switchxxxxxx(config)# sntp trusted-key 8
switchxxxxxx(config)# sntp authenticate
```

6.9 sntp broadcast client enable

The **sntp broadcast client enable** Global Configuration mode command enables SNTP Broadcast clients. Use the no form of this command to disable SNTP Broadcast clients.

Syntax

sntp broadcast client enable

no sntp broadcast client enable

Default Configuration

The SNTP Broadcast client is disabled.

Command Mode

Global Configuration mode

User Guidelines

Use the **sntp broadcast client enable** Interface Configuration mode command to enable the SNTP Broadcast client on a specific interface.

After entering this command, you must enter clock source snmp for the command to be run. If this command is not run, the switch will not synchronize with Broadcast servers.

Example

The following example enables SNTP Broadcast clients.

```
switchxxxxxx(config)# sntp broadcast client enable
```

6.10 sntp client enable (Interface)

To enable the SNTP Broadcast and Anycast client on an interface, use the **sntp client enable** Interface Configuration command. Use the **no** form of this command to disable the SNTP client.

This command enables the SNTP Broadcast and Anycast client on an interface. Use the **no** form of this command to disable the SNTP client.

Syntax

sntp client enable

no sntp client enable

Parameters

N/A

Default Configuration

The SNTP client is disabled on an interface.

Command Mode

Interface Configuration (Ethernet, Port-channel, VLAN) mode

User Guidelines

The sntp broadcast client enable Global Configuration mode command globally enables Broadcast clients.

Example

The following example enables the SNTP broadcast and anycast client on an interface.

```
switchxxxxxx(config-if)# sntp client enable
```

6.11 sntp unicast client enable

The **sntp unicast client enable** Global Configuration mode command enables the device to use Simple Network Time Protocol (SNTP)-predefined Unicast clients. Use the **no** form of this command to disable the SNTP Unicast clients.

Syntax

sntp unicast client enable

no sntp unicast client enable

Parameters

N/A

Default Configuration

The SNTP unicast client is disabled.

Command Mode

Global Configuration mode

User Guidelines

Use the sntp server Global Configuration mode command to define SNTP servers.

Example

The following example enables the device to use SNTP Unicast clients.

```
switchxxxxxx(config)# sntp unicast client enable
```

6.12 sntp server

The **sntp server** Global Configuration mode command configures the device to use the SNTP to request and accept Network Time Protocol (NTP) traffic from a specified server (meaning to accept system time from an SNTP server). Use the **no** form of this command to remove a server from the list of SNTP servers.

Syntax

sntp server {*ip-address* | *hostname*} [***poll***] [***key*** *keyid*]

no sntp server {*ip-address* | *hostname*}

Parameters

- **ip-address**—Specifies the server IP address. This can be an IPv4, IPv6 or IPv6z address. See IPv6z Address Conventions:
- **hostname**—Specifies the server hostname. Only translation to IPv4 addresses is supported. (Length: 1–158 characters. Maximum label length for each part of the hostname: 63 characters)
- **poll**—Enables polling.
- **key** *keyid*—Specifies the Authentication key to use when sending packets to this peer. (Range:1–4294967295)

Default Configuration

No servers are defined.

Command Mode

Global Configuration mode

User Guidelines

Up to 8 SNTP servers can be defined.

The sntp unicast client enable Global Configuration mode command enables predefined Unicast clients.

Example

The following example configures the device to accept SNTP traffic from the server on 192.1.1.1 with polling.

```
switchxxxxxx(config)# sntp server 192.1.1.1 poll
```

6.13 show clock

The **show clock** EXEC mode command displays the time and date from the system clock.

Syntax

show clock [*detail*]

Parameters

detail—Displays the time zone and summer time configuration.

Command Mode

EXEC mode

Examples

Example 1 - The following example displays the system time and date.

```
switchxxxxxx# show clock
15:29:03 PDT(UTC-7) Jun 17 2002
Time source is SNTP
```

Example 2 - The following example displays the system time and date along with the time zone and summer time configuration.

```
switchxxxxxx# show clock detail
15:29:03 PDT(UTC-7) Jun 17 2002
Time source is SNTP
Time zone:
Acronym is PST
Offset is UTC-8
Summertime:
Acronym is PDT
Recurring every year.
Begins at first Sunday of April at 2:00.
Ends at last Sunday of October at 2:00.
Offset is 60 minutes.
DHCP timezone: Disabled
```

6.14 show sntp configuration

The **show sntp configuration** Privileged EXEC mode command displays the SNTP configuration on the device.

Syntax

show sntp configuration

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the device's current SNTP configuration.

```
switchxxxxxx# show sntp configuration

SNTP port : 123 .

Polling interval: 1024 seconds.

No MD5 authentication keys.

Authentication is not required for synchronization.

No trusted keys.


Unicast Clients: Enabled

Unicast Clients Polling: Enabled

Server       Polling   Encryption Key

------------ -------   --------------

1.1.1.121    Disabled     Disabled

Broadcast Clients: disabled

Anycast Clients: disabled
```

```
No Broadcast Interfaces.

switchxxxxxx#
```

6.15 show sntp status

The **show sntp status** Privileged EXEC mode command displays the SNTP servers status.

Syntax

show sntp status

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the SNTP servers status.

```
switchxxxxxx# show sntp status

Clock is synchronized, stratum 4, reference is 176.1.1.8, unicast
Reference time is AFE2525E.70597B34 (00:10:22.438 PDT Jul 5 1993)

Unicast servers:
Server          Status        Last response                Offset      Delay
                                                           [mSec]      [mSec]
----------      -------       ---------------------        ------      ------
176.1.1.8       Up            19:58:22.289 PDT Feb 19      7.33        117.79
176.1.8.179     Unknown       2005                         8.98        189.19
                              12:17.17.987 PDT Feb 19
                              2005

Anycast server:
```

```
Server          Interface     Status     Last response      Offset     Delay
----------      ---------     ------     ------------       [mSec]     [mSec]
176.1.11.8      VLAN 118      Up         9:53:21.789 PDT    ------     ------
                                         Feb 19 2005        7.19       119.89

Broadcast:
Server          Interface                Last response
---------       ---------                -----------------
176.9.1.1       VLAN 119                 19:17:59.792
                                         PDT Feb 19 2002
```

7 Configuration and Image File Commands

7.1 copy

The **copy** Privileged EXEC mode command copies a source file to a destination file.

Syntax

copy *source-url destination-url [**snmp**]*

Parameters

- **source-url**—Specifies the source file URL or source file reserved keyword to be copied. (Length: 1–160 characters)
- **destination-url**—Specifies the destination file URL or destination file reserved keyword. (Length: 1–160 characters).
- **snmp**—Specifies that the destination/source file is in SNMP format. Used only when copying from/to the Startup Configuration file.

The following table displays the URL options.

Keyword	Source or Destination
flash://	Source or destination URL for flash memory. This is the default URL If a URL is specified without a prefix.
running-config	Currently running configuration file. This cannot be the destination file.
startup-config **flash://startup-config**	Startup configuration file.
image **flash://image**	Image file. If specified as the source file, it is the active image file. If specified as the destination file, it is the non-active image file.
boot	Boot file.
tftp://	Source or destination URL for a TFTP network server. The syntax for this alias is *tftp://host/[directory]/filename*. The host can be either an IP address or a host name.
xmodem:	Source for the file from a serial connection that uses the Xmodem protocol.

Keyword	Source or Destination
null:	Null destination for copies or files. A remote file can be copied to null to determine its size. For instance **copy running-conf null** returns the size of the running configuration file.
backup-config	Backup configuration file. A configuration file can be downloaded to this file (without giving a file name). This can then be copied to the running-conf or startup-conf files.
mirror-config	Mirrored configuration file. If the running config and the startup config have been identical for 24 hours, the startup config is automatically copied to the mirror-conf file by the system. It can then be copied to the startup or running conf if required.
localization	This enables copying a language dictionary file to the secondary language file, such as in **copy tftp://10.5.234.203/french.txt localization.** This creates French as the second language. the file **french.txt** is the French dictionary.
logging	Specifies the SYSLOG file.
Word<1-128>	Name of file.

Command Mode

Privileged EXEC mode

User Guidelines

The location of the file system dictates the format of the source or destination URL.

The entire copying process may take several minutes and differs from protocol to protocol and from network to network.

IPv6z Address Format

If the IPv6 address is a Link Local address (IPv6z address), the outgoing interface name must be specified. The format of an IPv6z address is: {*ipv6-link-local-address*}**%**{*interface-id*}. The subparameters are:

- **ipv6-link-local-address**—Specifies the IPv6 Link Local address.
- **interface-id**—{<port-type>[ ]<port-number>}|{port-channel | po}[]<port-channel-number> | {tunnel | tu}[ ]<tunnel-number> | vlan[ ]<vlan-id>

If the egress interface is not specified, the default interface is selected. The following combinations are possible:

- **ipv6_address%interface_id** - Refers to the IPv6 address on the interface specified.
- **ipv6_address%0 -** Refers to the IPv6 address on the single interface on which an IPv6 address is defined.
- **ipv6_address -** Refers to the IPv6 address on the single interface on which an IPv6 address is defined.

Understanding Invalid Combinations of Source and Destination

The following are invalid combinations of source and destination files:

- The source file and destination file are the same file.
- **xmodem:** is the destination file. The source file can be copied to **image**, **boot** and **null:** only.
- **tftp://** is the source file and destination file on the same copy.
- ***.prv** files cannot be copied.
- The destination file cannot be the Running Configuration file.
- **<for products with mirror-config>mirror-config** cannot be used as a destination

The following table describes the characters displayed by the system when **copy** is being run:

Character	Description
!	For network transfers, indicates that the copy process is taking place. Each exclamation point indicates successful transfer of ten packets (512 bytes each).
.	For network transfers, indicates that the copy process timed out.

Copying an Image File from a Server to Flash Memory

Use the **copy** *source-url* **flash://image** command to copy an image file from a server to flash memory. When the administrator copies an image file from the server to a device, the image file is saved to the "inactive" image. To use this image, the administrator must switch the inactive image to the active image and reboot. The device will then use this new image.

Copying a Boot File from a Server to Flash Memory

Use the **copy** *source-url* **boot** command to copy a boot file from a server to flash memory. **Copying a Configuration File from a Server to the Startup Configuration**

Use the **copy** *source-url* **startup-config** command to copy a configuration file from a network server to the device startup configuration file. The startup configuration file is replaced by the copied configuration file.

Storing the Running Config or Startup Config on a Server

Use the **copy running-config** *destination-url* command to copy the current configuration file to a network server using TFTP.

Use the **copy startup-config** *destination-url* command to copy the startup configuration file to a network server.

Saving the Running Configuration to the Startup Configuration

Use the **copy running-config startup-config** command to copy the running configuration to the startup configuration file.

-Backing Up the Running Configuration or Startup Configuration to the Backup Configuration

Use the **copy running-config backup-config** command to back up the running configuration to the backup configuration file.

Use the **copy startup-config backup-config** command to back up the startup configuration to the backup configuration file.

Restoring the Mirror Configuration File.

Use **copy mirror-config startup-config** or **copy mirror-config running-config** to copy the mirror configuration file to one of the configuration files being used.

Examples

Example 1 - The following example copies system image file1 from the TFTP server 172.16.101.101 to the non-active image file.

```
switchxxxxxx# copy tftp://172.16.101.101/file1 image

Accessing file 'file1' on 172.16.101.101...

Loading file1 from 172.16.101.101:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
! [OK]
```

```
Copy took 0:01:11 [hh:mm:ss]
```

Example 2 - Copying an Image from a Server to Flash Memory

The following example copies a system image named file1 from the TFTP server with an IP address of 172.16.101.101 to a non-active image file.

```
switchxxxxxx# copy tftp://172.16.101.101/file1 flash://image
Accessing file 'file1' on 172.16.101.101...
Loading file1 from 172.16.101.101:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! [OK]
Copy took 0:01:11 [hh:mm:ss]
```

Example 3 - Copying the mirror-config file to the startup-configuration file

The following example copies the mirror configuration file, saved by the system, to the Startup Configuration file.

```
switchxxxxxx# copy mirror-config startup-config
```

7.2 write memory

Use the **write memory** Privileged EXEC mode command to save the Running Configuration file to the Startup Configuration file.

Syntax

write memory

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Examples

This example shows how to overwrite the startup-config with the running-config.

```
switchxxxxxx# write memory

Overwrite file [startup-config] ?[Yes/press any key for no]....15-Sep-2010 11:27

:48 %COPY-I-FILECPY: Files Copy - source URL running-config destination URL

flash://startup-config

15-Sep-2010 11:27:50 %COPY-N-TRAP: The copy operation was completed successfully

Copy succeeded
```

7.3 write

Use the **write** Privileged EXEC mode command to save the running configuration to the startup configuration file.

Syntax

write

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Examples

The following example shows how to overwrite the startup-config file with the running-config file with the write command.

```
switchxxxxxx# write

Overwrite file [startup-config] ?[Yes/press any key for no]....15-Sep-2010 11:27

:48 %COPY-I-FILECPY: Files Copy - source URL running-config destination URL

flash://startup-config

15-Sep-2010 11:27:50 %COPY-N-TRAP: The copy operation was completed successfully

Copy succeeded
```

7.4 delete

The **delete** Privileged EXEC mode command deletes a file from a flash memory device.

Syntax

delete *url*

Parameters

url—Specifies the location URL or reserved keyword of the file to be deleted. (Length: 1–160 characters)

The following table displays keywords and URL prefixes:

Keyword	Source or Destination
flash://	URL of the flash memory. This is the default URL if a URL is specified without a prefix.
startup-config	Startup configuration file.
WORD	Name of file.

Default Configuration

N/A

Command Mode

Privileged EXEC mode

User Guidelines

***.sys**, ***.prv**, **image-1** and **image-2** files cannot be deleted.

Example

The following example deletes the file called 'test' from the flash memory.

```
switchxxxxxx# delete flash://test

Delete flash:test? [confirm]
```

7.5 dir

The **dir** Privileged EXEC mode command displays the list of files on a flash file system.

Syntax

dir *[directory-path]*

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the list of files on a flash file system

```
Total size of flash: 33292288 bytes

Free size of flash: 20708893 bytes

switchxxxxxx# dir

Directory of flash:

File Name   Permission  Flash Size Data Size    Modified

---------   ----------  ---------- ---------    ---------

backuplo    rw          851760     525565       22-Dec-2010 10:50:32

tmp         rw          524288     104          01-Jan-2010 05:35:04

image-1     rw          10485760   10485760     01-Jan-2010 06:10:23

image-2     rw          10485760   10485760     01-Jan-2010 05:43:54

dhcpsn.prv  --          262144     --           01-Jan-2010 05:25:07

sshkeys.prv    --       262144      --           04-Jan-2010 06:05:00

syslog1.sys    r-       524288      --           01-Jan-2010 05:57:00

syslog2.sys    r-       524288      --           01-Jan-2010 05:57:00

directry.prv   --       262144      --           01-Jan-2010 05:25:07

startup-config rw       786432     1081         01-Jan-2010 10:05:34

Total size of flash: 66322432 bytes

Free size of flash: 42205184 bytes
```

7.6 more

The **more** Privileged EXEC mode command displays a file.

Syntax

more *url*

Parameters

url—Specifies the location URL or reserved keyword of the source file to be displayed. (Length: 1–160 characters).

The following table displays options for the URL parameter:

Keyword	Source or Destination
flash://	Source or destination URL for flash memory. If a URL is specified without a prefix, this is the default URL.
running-config	Current running configuration file.
startup-config	Startup configuration file.
mirror-config	Mirrored configuration file.

Default Configuration

N/A

Command Mode

Privileged EXEC mode

User Guidelines

Files are displayed in ASCII format, except for the images, which are displayed in a hexadecimal format.

***.prv** files cannot be displayed.

Example

The following example displays the running configuration file contents.

```
switchxxxxxx# more running-config

no spanning-tree
```

```
interface range gi1-48

speed 1000

exit

no lldp run

line console

exec-timeout 0
```

7.7 boot system

The **boot system** Privileged EXEC mode command specifies the active system image file that will be loaded by the device at startup.

Syntax

boot system *{image-1 | image-2}*

Parameters

- **image-1**—Specifies that image-1 is loaded as the system image during the next device startup.
- **image-2**—Specifies that image-2 is loaded as the system image during the next device startup.

Default Configuration

This command has no default configuration.

Command Mode

Privileged EXEC mode

User Guidelines

Use the show bootvar command to display the active image.

Example

The following example specifies that **image-1** is the active system image file loaded by the device at startup. The results of this command is displayed in show bootvar.

```
switchxxxxxx# boot system image-1

switchxxxxxx#show bootvar

Image  Filename   Version     Date                    Status

-----  ---------  ---------   --------------------    -----------

1      image-1    1.1.0.73    19-Jun-2011  18:10:49   Not active*

2      image-2    1.1.0.73    19-Jun-2011  18:10:49   Active


"*" designates that the image was selected for the next boot
```

7.8 show bootvar

Use the **show bootvar** EXEC mode command to display the active system image file that is loaded by the device at startup.

Syntax

show bootvar

Parameters

N/A

Command Mode

EXEC mode

Example

The following example displays the active system image file that is loaded by the device at startup.

```
switchxxxxxx# show bootvar

Image   filename   Version     Date                      Status

-----   --------   -------     -----------               -----------

1       image-1    1.1.04      23-Jul-2010               Active

2       image-2    1.1.0.5     22-Jan-2010               Not active*


"*": Designates that the image was selected for the next boot.
```

7.9 show running-config

The **show running-config** Privileged EXEC mode command displays the entire current Running Configuration file contents or the contents of the file for the specified interface(s).

Syntax

show running-config *[**interface** interface-id-list]*

Parameters

***interface** interface-id-list*—Specifies a list of interface IDs. The interface IDs can be one of the following types: Ethernet port, Port-channel or VLAN.

Command Mode

Privileged EXEC mode

User Guidelines

The Running Configuration file does not contain all the information that can be displayed in the output. Only non-default configurations are displayed.

Example

The following example displays the Running Configuration file contents.

Example 1 - Show the entire Running Configuration file.

```
switchxxxxxx# show running-config
no spanning-tree
interface range gi1-48
speed 1000
exit
no lldp run
interface vlan 1
ip address 1.1.1.1 255.0.0.0
exit
line console
exec-timeout 0
```

```
exit
switchxxxxxx#
```

Example 2 - Show the entire Running Configuration file for ports 1 and 2.

```
switchxxxxxx# show running-config interface fastethernet 1-2
interface fastethernet 1
 back-pressure
 duplex half
 spee 10
 flowcontrol on
 negotiation 10h 100h 100f
 dot1x max-req 8
 description "Hello World String"
 lacp timeout short
 lacp port-priority 1234
 garp timer join 100
 garp timer leave 300
 port security max 111
 port security mode max-addresses
 spanning-tree disable
 spanning-tree portfast auto
 spanning-tree link-type point-to-point
 spanning-tree cost 200000
 spanning-tree port-priority 224
 spanning-tree guard root
 spanning-tree mst 2 port-priority 64
 spanning-tree mst 2 cost 2222
 spanning-tree mst 4 port-priority 80
 qos cos 6
 traffic-shape 12345
 switchport mode general
```

```
 switchport general allowed vlan add 12,14-20 tagged
 switchport general allowed vlan add 2-11,13,100,3000,3002,3004,3006,3008
untagged
 switchport general map macs-group 1 vlan 111
 switchport general ingress-filtering disable
 switchport general acceptable-frame-type untagged-only
 switchport general pvid 111
interface fastethernet 2
 ip address 1.100.100.100 255.0.0.0
 switchport mode trunk
 switchport general map macs-group 1 vlan 111
 switchport general map subnets-group 1 vlan 113
 switchport general map protocols-group 1 vlan 112
 switchport general ingress-filtering disable
 switchport general acceptable-frame-type untagged-only
 switchport general pvid 111
 switchport trunk native vlan 22
```

7.10 show startup-config

The **show startup-config** Privileged EXEC mode command displays the startup configuration file contents.

Syntax

show startup-config *[**interface** interface-id-list]*

Parameters

interface *interface-id-list*—Specifies list of interface IDs. The interface IDs can be one of the following types: Ethernet port, Port-channel or VLAN.

Command Mode

Privileged EXEC mode

User Guidelines

The Startup Configuration file does not contain all the information that can be displayed in the output. Only non-default configurations are displayed.

Examples

Example 1 - The following example displays the Startup Configuration file contents.

```
switchxxxxxx# show startup-config
no spanning-tree
interface range gi1-48
speed 1000
exit
no lldp run
interface vlan 1
ip address 1.1.1.1 255.0.0.0
exit
line console
exec-timeout 0
exit
switchxxxxxx#
```

Example 2 - The following example displays the Startup Configuration file contents for ports 1 and 2.

```
switchxxxxxx# show startup-config interface gi1-2
interface gi1
 back-pressure
 duplex half
 speed 10
 flowcontrol on
 negotiation 10h 100h 100f
 dot1x max-req 8
```

```
 description "Hello World String"
 lacp timeout short
 lacp port-priority 1234
 garp timer join 100
 garp timer leave 300
 port security max 111
 port security mode max-addresses
 spanning-tree disable
 spanning-tree portfast auto
 spanning-tree link-type point-to-point
 spanning-tree cost 200000
 spanning-tree port-priority 224
 spanning-tree guard root
 spanning-tree mst 2 port-priority 64
 spanning-tree mst 2 cost 2222
 spanning-tree mst 4 port-priority 80
 qos cos 6
 traffic-shape 12345
 switchport mode general
 switchport general allowed vlan add 12,14-20 tagged
 switchport general allowed vlan add 2-11,13,100,3000,3002,3004,3006,3008
untagged
 switchport general map macs-group 1 vlan 111
 switchport general ingress-filtering disable
 switchport general acceptable-frame-type untagged-only
 switchport general pvid 111
interface fastethernet 2
 ip address 1.100.100.100 255.0.0.0
 switchport mode trunk
 switchport general map macs-group 1 vlan 111
 switchport general map subnets-group 1 vlan 113
```

```
switchport general map protocols-group 1 vlan 112
switchport general ingress-filtering disable
switchport general acceptable-frame-type untagged-only
switchport general pvid 111
switchport trunk native vlan 22
```

8 Auto-Configuration

8.1 boot host auto-config

Use the **boot host auto-config** Global Configuration mode command to enable auto configuration via DHCP. Use the **no** form of this command to disable DHCP auto configuration.

Syntax

boot host auto-config

no boot host auto-config

Parameters

N/A

Default Configuration

Enabled by default.

Command Mode

Global Configuration mode

Default Configuration

Enabled by default.

Example

```
switchxxxxxx(conf)# boot host auto-config
```

8.2 show boot

Use the **show boot** Privilege EXEC mode command to show the status of the IP DHCP Auto Config process.

Syntax

show boot

Parameters

N/A

Default Configuration

N/A

Command Mode

Privilege EXEC mode

Examples

```
switchxxxxxx show boot

Auto Config

-----------

Config Download via DHCP: enabled

SCP is supported

SCP Mode is Extension

SCP extension is scp

Next Boot Config Download via DHCP: default
```

8.3 ip dhcp tftp-server ip address

Use the **ip dhcp tftp-server ip address** Global Configuration mode command to set the TFTP server's IP address. This address server as the default address used by a switch when it has not been received from the DHCP server.

Use the **no** form of this command to remove the address.

Syntax

ip dhcp tftp-server ip address *ip-addr*

no ip dhcp tftp-server ip address

Parameters

ip addr *ip-addr*—Address of TFTP server

Default Configuration

No IP address

Command Mode

Global Configuration mode

Examples

```
switchxxxxxx(conf)# ip dhcp tftp-server ip address 10.5.234.232
```

8.4 ip dhcp tftp-server file

Use the **ip dhcp tftp-server file** Global Configuration mode command to set the full file name of the configuration file to be downloaded on the TFTP server when it has not been received from the DHCP server. This serves as the default configuration file.

Use the **no** form of this command to remove the name.

Syntax

ip dhcp tftp-server file *file-path*

no ip dhcp tftp-server file

Parameters

file-path—Full file path and name of the configuration file on TFTP server

Default Configuration

No file name

Command Mode

Global Configuration mode

Examples

```
switchxxxxxx(conf)# ip dhcp tftp-server file conf/conf-file
```

8.5 show ip dhcp tftp-server

Use the **show ip dhcp tftp-server** EXEC mode command to display information about the TFTP server.

Syntax

show ip dhcp tftp-server

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC

Example

```
switchxxxxxx# show ip dhcp tftp server
tftp server address
active     1.1.1.1 from sname
manual     2.2.2.2
file path on tftp server
active     conf/conf-file from option 67
```

9 Management ACL Commands

9.1 management access-list

The **management access-list** Global Configuration mode command configures a management access list (ACL) and enters the Management Access-List Configuration command mode. Use the **no** form of this command to delete an ACL

Syntax

management access-list *name*

no management access-list *name*

Parameters

name—Specifies the ACL name. (Length: 1–32 characters)

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

Use this command to configure a management access list. This command enters the Management Access-List Configuration mode, where the denied or permitted access conditions are defined with the **deny** and **permit** commands.

If no match criteria are defined, the default value is **deny**.

When re-entering the access-list context, the new rules are entered at the end of the access list.

Use the management access-class command to select the active access list.

The active management list cannot be updated or removed.

For IPv6 management traffic that is tunneled in IPv4 packets, the management ACL is applied first on the external IPv4 header (rules with the service field are ignored), and then again on the inner IPv6 header.

Example

Example 1 - The following example creates a management access list called **mlist**, configures management `gi1` and `gi9`, and makes the new access list the active list.

```
switchxxxxxx(config)# management access-list mlist
switchxxxxxx(config-macl)# permit gi1
switchxxxxxx(config-macl)# permit gi9
switchxxxxxx(config-macl)# exit
switchxxxxxx(config)# management access-class mlist
```

Example 2 - The following example creates a management access list called 'mlist', configures all interfaces to be management interfaces except `gi1 and 9`, and makes the new access list the active list.

```
switchxxxxxx(config)# management access-list mlist
switchxxxxxx(config-macl)# deny gi1
switchxxxxxx(config-macl)# deny gi9
switchxxxxxx(config-macl)# permit
switchxxxxxx(config-macl)# exit
switchxxxxxx(config)# management access-class mlist
```

9.2 permit (Management)

The **permit** Management Access-List Configuration mode command sets permit rules (ACEs) for the management access list (ACL).

Syntax

permit *[interface-id] [service service]*

permit ip-source {*ipv4-address* | *ipv6-address*/*ipv6-prefix-length*} ***[mask*** *{mask | prefix-length}] [interface-id]* ***[service*** *service]*

Parameters

- **interface-id**:—Specify an interface ID. The interface ID can be one of the following types: Ethernet port, Port-channel or VLAN
- **service** *service* — Specifies the service type. Possible values are: Telnet, SSH, HTTP, HTTPS and SNMP.
- **ipv4-address**— Specifies the source IPv4 address.
- **ipv6-address/ipv6-prefix-length**— Specifies the source IPv6 address and source IPv6 address prefix length. The prefix length must be preceded by a forward slash (/). The parameter is optional.
- **mask** *mask* — Specifies the source IPv4 address network mask. This parameter is relevant only to IPv4 addresses.
- **mask** *prefix-length* — Specifies the number of bits that comprise the source IPv4 address prefix. The prefix length must be preceded by a forward slash (/). This parameter is relevant only to IPv4 addresses. (Range: 0–32)

Default Configuration

No rules are configured.

Command Mode

Management Access-List Configuration mode

User Guidelines

Rules with Ethernet, VLAN, and port-channel parameters are valid only if an IP address is defined on the appropriate interface.

Example

The following example permits all ports in the ACL called **mlist**

```
switchxxxxxx(config)# management access-list mlist

switchxxxxxx(config-macl)# permit
```

9.3 deny (Management)

The **deny** Management Access-List Configuration mode command sets permit rules (ACEs) for the management access list (ACL).

Syntax

deny *[interface-id] [**service** service]*

deny ip-source *{ipv4-address | ipv6-address/ipv6-prefix-length} [**mask** {mask | prefix-length}] [interface-id] [**service** service]*

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, Port-channel or VLAN
- **service** *service*—Specifies the service type. Possible values are: Telnet, SSH, HTTP, HTTPS and SNMP.
- **ipv4-address**—Specifies the source IPv4 address.
- **ipv6-address/ipv6-prefix-length**—Specifies the source IPv6 address and source IPv6 address prefix length. The prefix length must be preceded by a forward slash (**/**). The parameter is optional.
- **mask** *mask*—Specifies the source IPv4 address network mask. The parameter is relevant only to IPv4 addresses.
- **mask** *prefix-length*—Specifies the number of bits that comprise the source IPv4 address prefix. The prefix length must be preceded by a forward slash (**/**). The parameter is relevant only to IPv4 addresses. (Range: 0–32)

Default Configuration

No rules are configured.

Command Mode

Management Access-List Configuration mode

User Guidelines

Rules with ethernet, VLAN, and port-channel parameters are valid only if an IP address is defined on the appropriate interface.

Example

The following example denies all ports in the ACL called **mlist**.

```
switchxxxxxx(config)# management access-list mlist

switchxxxxxx(config-macl)# deny
```

9.4 management access-class

The **management access-class** Global Configuration mode command restricts management connections by defining the active management access list (ACL). To disable management connection restrictions, use the **no** form of this command.

Syntax

management access-class {**console-only** | *name*}

no management access-class

Parameters

- **console-only**—Specifies that the device can be managed only from the console.
- **name**—Specifies the ACL name to be used. (Length: 1–32 characters)

Default Configuration

The default configuration is no management connection restrictions.

Command Mode

Global Configuration mode

Example

The following example defines an access list called **mlist** as the active management access list.

```
switchxxxxxx(config)# management access-class mlist
```

9.5 show management access-list

The **show management access-list** Privileged EXEC mode command displays management access lists (ACLs).

Syntax

show management access-list [*name*]

Parameters

name—Specifies the name of a management access list to be displayed. (Length: 1–32 characters)

Default Configuration

All management ACLs are displayed.

Command Mode

Privileged EXEC mode

Example

The following example displays the **mlist** management ACL.

```
switchxxxxxx# show management access-list mlist

-only

------------

deny

! (Note: all other access implicitly denied)

mlist

-----

permit gi1

permit gi9

! (Note: all other access implicitly denied)

switchxxxxxx#
```

9.6 show management access-class

The **show management access-class** Privileged EXEC mode command displays information about the active management access list (ACLs).

Syntax

show management access-class

Command Mode

Privileged EXEC mode

Example

The following example displays the active management ACL information.

```
switchxxxxxx# show management access-class

Management access-class is enabled, using access list mlist
```

10 Network Management Protocol (SNMP) Commands

10.1 snmp-server community

Use the **snmp-server community** Global Configuration mode command to set the community access string (password) that permits access to SNMP commands (v1 and v2). This is used for SNMP commands, such as GETs and SETs.

This command configures both SNMP v1 and v2.

Use the **no** form of this command to remove the specified community string.

Syntax

snmp-server community *community-string [**ro** | **rw** | **su**]* [*ip-address* | *ipv6-address*] *[**mask** mask* | **prefix** *prefix-length] [**view** view-name]*

snmp-server community-group *community-string group-name [ip-address | ipv6-address] [**mask** mask* | **prefix** *prefix-length]*

no snmp-server community *community-string [ip-address]*

Parameters

- **community-string**—Define the password that permits access to the SNMP protocol. (Range: 1–20 characters). This string is used as an input parameter to snmp-server user for SNMP v3.
- **ro**—Specifies read-only access (default)
- **rw**—Specifies read-write access
- **su**—Specifies SNMP administrator access
- **view** *view-name*—Specifies the name of a view configured using the command snmp-server view (no specific order of the command configurations is imposed on the user). The view defines the objects available to the community. It is not relevant for **su**, which has access to the whole MIB. If unspecified, all the objects, except the community-table and SNMPv3 user and access tables, are available. (Range: 1–30 characters)
- **ip-address**—Management station IP address. The default is all IP addresses. This can be an IPv4 address, IPv6 or IPv6z address. See IPv6z Address Conventions.

- **mask**—Specifies the mask of the IPv4 address. This is not a network mask, but rather a mask that defines which bits of the packet's source address are compared to the configured IP address. If unspecified, it defaults to 255.255.255.255. The command returns an error if the mask is specified without an IPv4 address.
- **prefix-length**—Specifies the number of bits that comprise the IPv4 address prefix. If unspecified, it defaults to 32. The command returns an error if the prefix-length is specified without an IPv4 address.
- **group-name**—This is the name of a group configured using snmp-server group with v1 or v2 (no specific order of the two command configurations is imposed on the user). The group defines the objects available to the community. (Range: 1–30 characters)

Default Configuration

No community is defined

Command Mode

Global Configuration mode

User Guidelines

Use **snmp-server community-group** to configure access rights to a user group. The group must exist in order to be able to specify the access rights. Otherwise, the community-group will not be useful.

A *view-name* cannot be specified for **su**, which has access to the whole MIB tree.

The logical key of the command is the pair (community, ip-address). If ip-address is omitted then the key is (community, All-IPs). This means that there cannot be two commands with the same community, ip address pair.

The *view-name* is used to restrict the access rights of a community string. When a view-name is specified, the software:

- Generates an internal security-name.
- Maps the internal security-name for SNMPv1 and SNMPv2 security models to an internal group-name.
- Maps the internal group-name for SNMPv1 and SNMPv2 security models to view-name (read-view and notify-view always, and for rw for write-view also),

The *group-name* is used to restrict the access rights of a community string. When a group-name is specified, the software:

- Generates an internal security-name.
- Maps the internal security-name for SNMPv1 and SNMPv2 security models to the group-name.

Examples

Example 1 - Defines a password for administrator access to the management station at IP address 1.1.1.121 and mask 255.0.0.0.

```
switchxxxxxx(config)# snmp-server community abcd su 1.1.1.121 mask 255.0.0.0
```

Example 2 - Defines a password *tom* for the group *abcd* that enables this group to access the management station 1.1.1.121 with prefix 8.

```
switchxxxxxx(config)# snmp-server community-group tom abcd 1.1.1.122 prefix 8
```

10.2 snmp-server view

The **snmp-server view** Global Configuration mode command creates or updates an SNMP view. Use the **no** form of this command to remove an SNMP view.

Syntax

snmp-server view *view-name oid-tree {**included** | **excluded**}*

no snmp-server view *view-name* [*oid-tree*]

Parameters

- **view-name**—Specifies the name for the view that is being created or updated. (Length: 1–30 characters)
- **oid-tree**—Specifies the ASN.1 subtree object identifier to be included or excluded from the view. To identify the subtree, specify a text string consisting of numbers, such as 1.3.6.2.4, or a word, such as System and, optionally, a sequence of numbers. Replace a single sub-identifier with the asterisk (*) wildcard to specify a subtree family; for example 1.3.*.4. This parameter depends on the MIB being specified.
- **included**—Specifies that the view type is included.

- **excluded**—Specifies that the view type is excluded.

Default Configuration

The following views are created by default:

- **Default** - Contains all MIBs except for those that configure the SNMP parameters themselves.
- **DefaultSuper** - Contains all MIBs.

Command Mode

Global Configuration mode

User Guidelines

This command can be entered multiple times for the same view.

The command's logical key is the pair (view-name, oid-tree). Therefore there cannot be two commands with the same view-name and oid-tree.

The number of views is limited to 64.

Default and DefaultSuper views are reserved for internal software use and cannot be deleted or modified.

Example

The following example creates a view that includes all objects in the MIB-II system group except for sysServices (System 7) and all objects for interface 1 in the MIB-II interface group (this format is specified on the parameters specified in ifEntry).

```
switchxxxxxx(config)# snmp-server view user-view system included
switchxxxxxx(config)# snmp-server view user-view system.7 excluded
switchxxxxxx(config)# snmp-server view user-view ifEntry.*.1 included
```

10.3 show snmp views

Use the **show snmp views** Privileged EXEC mode command to display the SNMP views.

Syntax

show snmp views [*viewname*]

Parameters

viewname—Specifies the view name. (Length: 1–30 characters)

Default Configuration

If viewname is not specified, all views are displayed.

Command Mode

Privileged EXEC mode

Example

The following example displays the configured SNMP views.

```
switchxxxxxx# show snmp views

Name                OID Tree                Type
----------------    ----------------------  ----------
Default             iso                     Included
Default             snmpNotificationMIB     Excluded
DefaultSuper        iso                     Included
```

10.4 snmp-server group

Use the **snmp-server group** Global Configuration mode command to configure an SNMP group. Groups are used to map SNMP users to SNMP views (using snmp-server user). Use the **no** form of this command to remove an SNMP group.

Syntax

snmp-server group *groupname* {***v1*** | ***v2*** | ***v3*** {***noauth*** | ***auth*** | ***priv***} [***notify*** *notifyview*]} [***read*** *readview*] [***write*** *writeview*]

no snmp-server group *groupname* {***v1*** | ***v2*** | ***v3*** [***noauth*** | ***auth*** | ***priv***]}

Parameters

- **group** *groupname*—Specifies the group name. (Length: 1–30 characters)
- **v1**—Specifies the SNMP Version 1 security model.

- **v2**—Specifies the SNMP Version 2 security model.
- **v3**—Specifies the SNMP Version 3 security model.
- **noauth**—Specifies that no packet authentication will be performed. Applicable only to the SNMP version 3 security model.
- **auth**—Specifies that packet authentication without encryption will be performed. Applicable only to the SNMP version 3 security model.
- **priv**—Specifies that packet authentication with encryption will be performed. Applicable only to the SNMP version 3 security model. Note that creation of SNMPv3 users with both authentication and privacy must be done in the GUI. All other users may be created in the CLI.
- **notify** *notifyview*—Specifies the view name that enables generating informs or a traps. An inform is a trap that requires acknowledgement. Applicable only to the SNMP version 3 security model. (Length: 1–30 characters)
- **read** *readview*—Specifies the view name that enables viewing only. (Length: 1–30 characters)
- **write** *writeview*—Specifies the view name that enables configuring the agent. (Length: 1–30 characters)

Default Configuration

No group entry exists.

If *notifyview* is not specified, the notify view is not defined.

If *readview* is not specified, all objects except for the community-table and SNMPv3 user and access tables are available for retrieval.

If *writeview* is not specified, the write view is not defined.

Command Mode

Global Configuration mode

User Guidelines

The group defined in this command is used in snmp-server user to map users to the group. These users are then automatically mapped to the views defined in this command.

The command logical key is (**groupname, snmp-version, security-level**). For snmp-version v1/v2 the security-level is always **noauth**.

Example

The following example attaches a group called *user-group* to SNMPv3, assigns the encrypted security level to the group, and limits the access rights of a view called *user-view* to read-only. User *tom* is then assigned to *user-group*. So that user *tom* has the rights assigned in *user-view*.

```
switchxxxxxx(config)# snmp-server group user-group v3 priv read user-view

switchxxxxxx(config)# snmp-server user tom user-group v3
```

10.5 show snmp groups

Use the **show snmp groups** Privileged EXEC mode command to display the configured SNMP groups.

Syntax

show snmp groups [*groupname*]

Parameters

groupname—Specifies the group name. (Length: 1–30 characters)

Default Configuration

Display all groups.

Command Mode

Privileged EXEC mode

Example

The following example displays the configured SNMP groups.

```
switchxxxxxx# show snmp groups

Name                    Security                Views
                Model     Level        Read      Write      Notify
--------------  -----     ----         -------   -------    -------
user-group      V3        priv         Default   ""         ""
managers-group  V3        priv         Default   Default    ""
```

The following table describes significant fields shown above.

Field		Description
Name		Group name.
Security	Model	SNMP model in use (v1, v2 or v3).
Security	Level	Packet authentication with encryption. Applicable to SNMP v3 security only.
Views	Read	View name enabling viewing the agent contents. If unspecified, all objects except the community-table and SNMPv3 user and access tables are available.
	Write	View name enabling data entry and managing the agent contents.
	Notify	View name enabling specifying an inform or a trap.

10.6 snmp-server user

Use the **snmp-server user** Global Configuration mode command to configure a new SNMP Version user. Use the **no** form of the command to remove a user.

Syntax

snmp-server user *username groupname {**v1** | **v2c** | [**remote** host] **v3** [**auth** { **md5** | **sha**} auth-password]}*

no snmp-server user *username [**remote** host]*

Parameters

- **username**—Define the name of the user on the host that connects to the agent. (Range: Up to 20 characters). For SNMP v1 or v2c, this username must match the community string entered in snmp-server host.
- **groupname**—The name of the group to which the user belongs. The group should be configured using the command snmp-server group with v1 or v2c parameters (no specific order of the 2 command configurations is imposed on the user). (Range: Up to 30 characters)
- **remote** *host*—IPaddress (IPv4, IPv6 or IPv6z) or host name of the remote SNMP host. See IPv6z Address Conventions.
- **v1**—Specifies that the user is a v1 user.

- **v2c**—Specifies that the user is a v2c user.
- **v3**—Specifies that the user is a v3 user.
- **auth**—Specifies which authentication level is to be used.
- **md5**—Specifies the HMAC-MD5-96 authentication level.
- **Sha**—Specifies the HMAC-SHA-96 authentication level.

auth-password—Specifies the authentication password. Range: Up to 32 characters.**Default Configuration**

No group entry exists.

Command Mode

Global configuration

User Guidelines

For SNMP v1 and v2, this performs the same actions as **snmp-server community-group**, except that **snmp-server community-group** configures both v1 and v2 at the same time. With this command, you must perform it once for v1 and once for v2.

When you enter a **show running-config** command, you do not see a line for this SNMP user. To see if this user has been added to the configuration, type the **show snmp user** command.

An SNMP EngineID must be defined in order to add SNMPv3 users to the device (in the snmp-server engineID remote commands).

Changing or removing the value of **snmpEngineID** deletes the SNMPv3 users' database.

The logical key of the command is username.

Configuring a remote host is required in order to send informs to that host, because an inform is a trap that requires acknowledgement. A configured remote host is also able to manage the device (besides getting the informs)

To configure a remote user, specify the IP address for the remote SNMP agent of the device where the user resides. Also, before you configure remote users for a particular agent, configure the SNMP engine ID, using the snmp-server engineID remote command. The remote agent's SNMP engine ID is needed when computing the authentication and privacy digests from the password. If the remote engine ID is not configured first, the configuration command fails.

Since the same group may be defined several times, each time with different version or different access level (noauth, auth or auth & priv), when defining a user it is not sufficient to specify the group name, rather you must specify group name, version and access level for complete determination of how to handle packets from this user.

Example

This example assigns user *tom* to group *abcd* using SNMP v1 and v2c. The default is assigned as the engineID. User *tom* is assigned to group *abcd* using SNMP v1 and v2c

```
switchxxxxxx(config)# snmp-server user tom acbd v1

switchxxxxxx(config)# snmp-server user tom acbd v2c

switchxxxxxx(config)# snmp-server user tom acbd v3
```

10.7 show snmp users

Use the **show snmp users** Privileged EXEC mode command to display the configured SNMP users.

Syntax

show snmp users [*username*]

Parameters

username—Specifies the user name. (Length: 1–30 characters)

Default Configuration

Display all users.

Command Mode

Privileged EXEC mode

Example

The following example displays the configured SNMP users.

```
switchxxxxxx# show snmp users
                        Auth
Name      Group name    Method     Remote
-------   -----------   -------    ----------------------
John      user-group    md5
John      user-group    md5        08009009020C0B099C07-5879
```

10.8 snmp-server filter

The **snmp-server filter** Global Configuration mode command creates or updates an SNMP server notification filter. Use the **no** form of this command to remove a notification filter.

Syntax

snmp-server filter *filter-name oid-tree {**included** | **excluded**}*

no snmp-server filter *filter-name* [*oid-tree*]

Parameters

- **filter-name**—Specifies the label for the filter record that is being updated or created. The name is used to reference the filter in other commands. (Length: 1–30 characters)
- **oid-tree**—Specifies the ASN.1 subtree object identifier to be included or excluded from the view. To identify the subtree, specify a text string consisting of numbers, such as 1.3.6.2.4, or a word, such as System. Replace a single sub-identifier with the asterisk (*) wildcard to specify a subtree family; for example, 1.3.*.4.
- **included**—Specifies that the filter type is included.
- **excluded**—Specifies that the filter type is excluded.

Default Configuration

No view entry exists.

Command Mode

Global Configuration mode

User Guidelines

This command can be entered multiple times for the same filter. If an object identifier is included in two or more lines, later lines take precedence.The command's logical key is the pair (filter-name, oid-tree).

Example

The following example creates a filter that includes all objects in the MIB-II system group except for sysServices (System 7) and all objects for interface 1 in the MIB-II interfaces group (this format depends on the parameters define din ifEntry).

```
switchxxxxxx(config)# snmp-server filter f1 system included
switchxxxxxx(config)# snmp-server filter f2 system.7 excluded
switchxxxxxx(config)# snmp-server filter f3 ifEntry.*.1 included
```

10.9 show snmp filters

Use the **show snmp filters** Privileged EXEC mode command to display the defined SNMP filters.

Syntax

show snmp filters [*filtername*]

Parameters

filtername—Specifies the filter name. (Length: 1–30 characters)

Default Configuration

If filtername is not defined, all filters are displayed.

Command Mode

Privileged EXEC mode

Example

The following example displays the configured SNMP filters.

```
switchxxxxxx# show snmp filters user-filter
Name             OID Tree                    Type
------------     ---------------------       ---------
user-filter      1.3.6.1.2.1.1               Included
user-filter      1.3.6.1.2.1.1.7             Excluded
user-filter      1.3.6.1.2.1.2.2.1.*.1       Included
```

10.10 snmp-server host

Use the **snmp-server host** Global Configuration mode command to configure the host for SNMP notifications: (traps/informs). Use the **no** form of this command to remove the specified host.

Syntax

snmp-server host *{host-ip | hostname} [**traps** | **informs**] [**version** {1 | 2c | 3 [**auth** | **noauth** | **priv**]}] community-string [**udp-port** port] [**filter** filtername] [**timeout** seconds] [**retries** retries]*

no snmp-server host *{ip-address | hostname} [**traps** | **informs**] [**version** {**1** | **2c** | **3**}]*

Parameters

- **host-ip**—IP address of the host (the targeted recipient). The default is all IP addresses. This can be an IPv4 address, IPv6 or IPv6z address. See IPv6z Address Conventions.
- **hostname**—Hostname of the host (the targeted recipient). (Range: 1–158 characters. Maximum label size of each part of the host name: 63)
- **trap**—Sends SNMP traps to this host (default).
- **informs**—Sends SNMP informs to this host. An inform is a trap that requires acknowledgement. Not applicable to SNMPv1.
- **1**—SNMPv1 traps are used.
- **2c**—SNMPv2 traps or informs are used
- **3**—SNMPv2 traps or informs are used

- **community-string**—Password-like community string sent with the notification operation. (Range: 1–20 characters). For v1 and v2, any community string can be entered here. For v3, the community string must match the user name defined in snmp-server user for v3.
- Authentication options are available for SNMP v3 only. The following options are available:
  - **noauth**—Specifies no authentication of a packet.
  - **auth**—Specifies authentication of a packet without encryption.
  - **priv**—Specifies authentication of a packet with encryption.
- **udp-port** *port*—UDP port of the host to use. The default is 162. (Range: 1–65535)
- **filter** *filtername*—Filter for this host. If unspecified, nothing is filtered. The filter is defined using snmp-server filter (no specific order of commands is imposed on the user). (Range: Up to 30 characters)
- **timeout** *seconds*—(For informs only) Number of seconds to wait for an acknowledgment before resending informs. The default is 15 seconds. (Range: 1–300)
- **retries** *retries*—(For informs only) Maximum number of times to resend an inform request, when a response is not received for a generated message. The default is 3. (Range: 0–255)

Default Configuration

Version: SNMP V1

Type of notification: Traps

udp-port: 162

If informs are specified, the default for retries: 3

Timeout: 15

Command Mode

Global Configuration mode

User Guidelines

The logical key of the command is the pair (ip-address/hostname, traps/informs, version).

When configuring SNMP v1 or v2 notifications recipient, the software automatically generates a notification view for that recipient for all MIBs.

For SNMPv3 the software does not automatically create a user or a notify view.

Use the commands snmp-server user, snmp-server group and snmp-server view to create a user, a group or a notification group, respectively.

Example

The following defines a host at the IP address displayed.

```
switchxxxxxx(config)# snmp-server host 1.1.1.121 abc
```

10.11 snmp-server engineID remote

To specify the SNMP engine ID of a remote SNMP device, use the **snmp-server engineID remote** Global Configuration mode command. Use the **no** form of this command to remove the configured engine ID.

Syntax

snmp-server engineID remote *{ip-address} engineid-string*

no snmp-server engineID remote *{ip-address}*

Parameters

- **ip-address** —IPv4, IPv6 or IPv6z address of the remote device. See IPv6z Address Conventions.
- **engineid-string**—The character string that identifies the engine ID. The engine ID is a concatenated hexadecimal string. Each byte in hexadecimal character strings is two hexadecimal digits. Each byte can be separated by a period or colon. If the user enters an odd number of hexadecimal digits, the system automatically prefixes the hexadecimal string with a zero. (Range: engineid-string5–32 characters. 9–64 hexadecimal digits)

Default Configuration

The remote engineID is not configured by default.

Command Mode

Global Configuration mode

User Guidelines

A remote engine ID is required when an SNMP version 3 inform is configured. The remote engine ID is used to compute the security digest for authenticating and encrypting packets sent to a user on the remote host.

10.12 show snmp engineID

Use the **show snmp engineID** Privileged EXEC mode command to display the local SNMP engine ID.

Syntax

show snmp engineID

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the SNMP engine ID.

```
switchxxxxxx # show snmp engineID
Local SNMP engineID: 08009009020C0B099C075878
IP address     Remote SNMP engineID
-----------    ------------------------------
172.16.1.1     08009009020C0B099C075879
```

10.13 snmp-server enable traps

Use the **snmp-server enable traps** Global Configuration mode command to enable the device to send all SNMP traps. Use the **no** form of the command to disable all SNMP traps.

Syntax

snmp-server enable traps

no snmp-server enable traps

Default Configuration

SNMP traps are enabled.

Command Mode

Global Configuration mode

User Guidelines

If **no snmp-server enable traps** has been entered, you can enable failure traps by using snmp-server trap authentication as shown in the example.

Example

The following example enables SNMP traps except for SNMP failure traps.

```
switchxxxxxx(config)# snmp-server enable traps
switchxxxxxx(config)# no snmp-server trap authentication
```

10.14 snmp-server trap authentication

Use the **snmp-server trap authentication** Global Configuration mode command to enable the device to send SNMP traps when authentication fails. Use the **no** form of this command to disable SNMP failed authentication traps.

Syntax

snmp-server trap authentication

no snmp-server trap authentication

Parameters

N/A

Default Configuration

SNMP failed authentication traps are enabled.

Command Mode

Global Configuration mode

User Guidelines

The command snmp-server enable traps enables all traps including failure traps. Therefore, if that command is enabled (it is enabled by default), this command is not necessary.

Example

The following example disables all SNMP traps and enables only failed authentication traps.

```
switchxxxxxx(config)# no snmp-server enable traps

switchxxxxxx(config)# snmp-server trap authentication
```

10.15 snmp-server contact

Use the **snmp-server contact** Global Configuration mode command to set the value of the system contact (sysContact) string. Use the **no** form of the command to remove the system contact information.

Syntax

snmp-server contact *text*

no snmp-server contact

Parameters

text—Specifies system contact information. (Length: 1–168 characters)

Default Configuration

N/A

Command Mode

Global Configuration mode

Example

The following example sets the system contact information to Technical_Support.

```
switchxxxxxx(config)# snmp-server contact Technical_Support
```

10.16 snmp-server location

Use the **snmp-server location** Global Configuration mode command to set the value of the system location string. Use the **no** form of this command to remove the location string.

Syntax

snmp-server location *text*

no snmp-server location

Parameters

text—Specifies the system location information. (Length: 1–160 characters)

Default Configuration

N/A

Command Mode

Global Configuration mode

Example

The following example sets the device location to New_York.

```
switchxxxxxx(config)# snmp-server location New_York
```

10.17 snmp-server set

Use the **snmp-server set** Global Configuration mode command to define SNMP MIB commands in the configuration file if a MIB performs an action for which there is no corresponding CLI command.

Syntax

snmp-server set *variable-name name value* [*name2 value2...*]

Parameters

- **variable-name**—Specifies an SNMP MIB variable name, which must be a valid string.
- **name** *value*—Specifies a list of names and value pairs. Each name and value must be a valid string. In the case of scalar MIBs, there is only a single name-value pair. In the case of an entry in a table, there is at least one name-value pair, followed by one or more fields.

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

Although the CLI can set any required configuration, there might be a situation where an SNMP user sets a MIB variable that does not have an equivalent CLI command. To generate configuration files that support those situations, the system uses snmp-server set. This command is not intended for the end user.

Example

The following example configures the scalar MIB sysName with the value TechSupp.

```
switchxxxxxx(config)# snmp-server set sysName sysname TechSupp
```

10.18 show snmp

Use the **show snmp** Privileged EXEC mode command to display the SNMP status.

Syntax

show snmp

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the SNMP communications status.

```
switchxxxxxx# show snmp
SNMP is enabled

Community-String     Community-Access      View name          IP Address          Mask
-----------------    -----------------     ------------       ----------          ----
public               read only             user-view          All
private              read write            Default            172.16.1.1/10
private              su                    DefaultSuper       172.16.1.1
Community-string     Group name            IP Address         Mask       Type
-----------------    ----------            ----------                    ------
public               user-group            All                           Router
Traps are enabled.
Authentication trap is enabled.
Version 1,2 notifications
Target Address       Type      Community    Version     UDP     Filter     TO       Retries
                                                        Port    Name       Sec
-----------          ----      --------     -------     ----    ------     ---      -------
192.122.173.42       Trap      public       2           162                15       3
192.122.173.42       Inform    public       2           162                15       3
Version 3 notifications
Target Address       Type      Username     Security    UDP     Filter     TO       Retries
                                            Level       Port    name       Sec
-----------          ----      --------     -------     ----    -----      ---      -------
192.122.173.42       Inform    Bob          Priv        162                15       3
System Contact: Robert
System Location: Marketing
```

The following table describes the significant fields shown in the display.

Field	Description
Community-string	The community access string permitting access to SNMP.
Community-access	The permitted access type—read-only, read-write, super access.
IP Address	The management station IP Address.
Target Address	The IP address of the targeted recipient.
Version	The SNMP version for the sent trap.

11 Web Server Commands

11.1 ip http server

Use the **ip http server** Global Configuration mode command to enable configuring and monitoring the device from a web browser. Use the **no** form of this command to disable this function.

Syntax

ip http server

no ip http server

Parameters

N/A

Default Configuration

HTTP server is enabled.

Command Mode

Global Configuration mode

Example

The following example enables configuring the device from a web browser.

```
switchxxxxxx(config)# ip http server
```

11.2 ip http timeout-policy

Use the **ip http timeout-policy** Global Configuration mode command to set the interval for the system to wait for user input in http/https sessions before automatic logoff. Use the **no** form of this command to return to the default value.

Syntax

ip http timeout-policy *idle-seconds* [**http-only** | **https-only**]

no ip http timeout-policy

Parameters

idle-seconds—Specifies the maximum number of seconds that a connection is kept open if no data is received or response data cannot be sent out. (Range: 0–86400)

http-only —The timeout is specified only for http

https-only— The timeout is specified only for https

Default Configuration

600 seconds

Command Mode

Global Configuration mode

User Guidelines

To specify no timeout, enter the **ip http timeout-policy 0** command.

Example

The following example configures the http timeout to be 1000 seconds.

```
switchxxxxxx(config)# ip http timeout-policy 1000
```

11.3 ip http secure-server

Use the **ip http secure-server** Global Configuration mode command to enable the device to be configured or monitored securely from a browser. Use the **no** form of this command to disable this function.

Syntax

ip http secure-server

no ip http secure-server

Parameters

N/A

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

After this command is used, you must generate a certificate using crypto certificate generate. If no certificate is generated, this command has no effect.

Example

```
switchxxxxxx(config)# ip http secure-server
```

11.4 ip https certificate

Use the **ip https certificate** Global Configuration mode command to configure the active certificate for HTTPS. Use the **no** form of this command to restore the default configuration.

Syntax

ip https certificate *number*

no ip https certificate

Parameters

number—Specifies the certificate number. (Range: 1–2)

Default Configuration

The default certificate number is 1.

Command Mode

Global Configuration mode

User Guidelines

First, use crypto certificate generate to generate one or two HTTPS certificates. Then use this command to specify which is the active certificate.

Example

The following example configures the active certificate for HTTPS.

```
switchxxxxxx(config)# ip https certificate 2
```

11.5 show ip http

The **show ip http** EXEC mode command displays the HTTP server configuration.

Syntax

show ip http

Command Mode

EXEC mode

Example

The following example displays the HTTP server configuration.

```
switchxxxxxx# show ip http

HTTP server enabled

Port: 80

Interactive timeout: 10 minutes
```

11.6 show ip https

The **show ip https** Privileged EXEC mode command displays the HTTPS server configuration.

Syntax

show ip https

Command Mode

Privileged EXEC mode

Example

The following example displays the HTTPS server configuration.

```
switchxxxxxx# show ip https
HTTPS server enabled
Port: 443
Interactive timeout: Follows the HTTP interactive timeout (10 minutes)
Certificate 1 is active
Issued by: www.verisign.com
Valid from: 8/9/2003 to 8/9/2004
Subject: CN= router.gm.com, 0= General Motors, C= US
Finger print: DC789788 DC88A988 127897BC BB789788
Certificate 2 is inactive
Issued by: self-signed
Valid from: 8/9/2003 to 8/9/2004
Subject: CN= router.gm.com, 0= General Motors, C= US
Finger print: 1873B936 88DC3411 BC8932EF 782134BA
```

12 Teletype Network (Telnet), Secure Shell (SSH) and Secure Login (Slogin) Commands

12.1 ip telnet server

Use the **ip telnet server** Global Configuration mode command to enable the device to be configured from a Telnet server. Use the **no** form of this command to disable the device configuration from a Telnet server.

Syntax

ip telnet server

no ip telnet server

Default Configuration

Configuration from a Telnet server is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

The device can be configured from an SSH server or Telnet (or both).

Example

The following example enables the device to be configured from a Telnet server.

```
switchxxxxxx(config)# ip telnet server
```

12.2 ip ssh server

The **ip ssh server** Global Configuration mode command enables the device to be configured from an SSH server. Use the **no** form of this command to disable the device configuration from an SSH server.

Syntax

ip ssh server

no ip ssh server

Default Configuration

Device configuration from an SSH server is disabled.

Command Mode

Global Configuration mode

User Guidelines

The device can be configured from an SSH server or Telnet (or both). To control the device configuration by SSH, use the ip telnet server Global Configuration mode command

If encryption keys are not generated, the SSH server is in standby until the keys are generated. To generate SSH server keys, use the crypto key generate dsa and crypto key generate rsa Global Configuration mode commands.

Example

The following example enables configuring the device from an SSH server.

```
switchxxxxxx(config)# ip ssh server
```

12.3 crypto key pubkey-chain ssh

The **crypto key pubkey-chain ssh** Global Configuration mode command enters the SSH Public Key-chain Configuration mode. This mode is used to manually specify device public keys, such as SSH client public keys.

Syntax

crypto key pubkey-chain ssh

Default Configuration

Keys do not exist.

Command Mode

Global Configuration mode

User Guidelines

Use this command when you want to manually specify SSH client's public keys.

Example

The following example enters the SSH Public Key-chain Configuration mode and manually configures the RSA key pair for SSH public key-chain to the user 'bob'.

```
switchxxxxxx(config)# crypto key pubkey-chain ssh
switchxxxxxx(config-pubkey-chain)# user-key bob
switchxxxxxx(config-pubkey-key)# key-string rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCvTnRwPWl
Al4kpqIw9GBRonZQZxjHKcqKL6rMlQ+
ZNXfZSkvHG+QusIZ/76ILmFT34v7u7ChFAE+
Vu4GRfpSwoQUvV35LqJJk67IOU/zfwOl1g
kTwml75QR9gHujS6KwGN2QWXgh3ub8gDjTSq
muSn/Wd05iDX2IExQWu08licglk02LYciz
+Z4TrEU/9FJxwPiVQOjc+KBXuR0juNg5nFYsY
0ZCk0N/W9a/tnkm1shRE7Di71+w3fNiOA
6w9o44t6+AINEICBCCA4YcF6zMzaT1wefWwX6f+
Rmt5nhhqdAtN/4oJfce166DqVX1gWmN
zNR4DYDvSzg0lDnwCAC8Qh
Fingerprint: a4:16:46:23:5a:8d:1d:b5:37:59:eb:44:13:b9:33:e9
```

12.4 user-key

The **user-key** SSH Public Key-string Configuration mode command associates a username with an SSH public key that was manually configured. Use the **no** form of this command to remove an SSH public key.

Syntax

user-key *username {**rsa** | **dsa**}*

no user-key *username*

Parameters

- **username**—Specifies the remote SSH client username. (Length: 1–48 characters)
- **rsa**—Specifies that the RSA key pair is manually configured.
- **dsa**—Specifies that the DSA key pair is manually configured.

Default Configuration

No SSH public keys exist.

Command Mode

SSH Public Key-string Configuration mode

User Guidelines

Follow this command with key-string to specify the key.

Note that after entering this command, the existing key is deleted even if no new key is defined by key-string.

Example

The following example enables manually configuring an SSH public key for SSH public key-chain **bob**.

```
switchxxxxxx(config)# crypto key pubkey-chain ssh
switchxxxxxx(config-pubkey-chain)# user-key bob rsa
switchxxxxxx(config-pubkey-key)# key-string row
AAAAB3NzaC1yc2EAAAADAQABAAABAQCvTnRwPWl
```

12.5 key-string

The **key-string** SSH Public Key-string Configuration mode command manually specifies an SSH public key.

Syntax

key-string *[**row** key-string]*

Parameters

- **row**—Specifies the SSH public key row by row.
- **key-string**—Specifies the key in UU-encoded DER format. UU-encoded DER format is the same format as in the authorized_keys file used by OpenSSH. (Length:0–160)

Default Configuration

Keys do not exist.

Command Mode

SSH Public Key-string Configuration mode

User Guidelines

Use the **key-string** SSH Public Key-string Configuration mode command without the **row** parameter to specify which SSH public key is to be interactively configured next. Enter a row with no characters to complete the command.

Use the **key-string row** SSH Public Key-string Configuration mode command to specify the SSH public key, row by row. Each row must begin with a **key-string row** command.

The UU-encoded DER format is the same format as in the authorized_keys file used by OpenSSH.

Example

The following example enters public key strings for SSH public key client ‘bob’.

```
switchxxxxxx(config)# crypto key pubkey-chain ssh
switchxxxxxx(config-pubkey-chain)# user-key bob rsa
switchxxxxxx(config-pubkey-key)# key-string
AAAAB3NzaC1yc2EAAAADAQABAAABAQCvTnRwPWl
Al4kpqIw9GBRonZQZxjHKcqKL6rMlQ+
ZNXfZSkvHG+QusIZ/76ILmFT34v7u7ChFAE+
Vu4GRfpSwoQUvV35LqJJk67IOU/zfwOl1g
kTwml75QR9gHujS6KwGN2QWXgh3ub8gDjTSq
muSn/Wd05iDX2IExQWu08licglk02LYciz
```

```
+Z4TrEU/9FJxwPiVQOjc+KBXuR0juNg5nFYsY
0ZCk0N/W9a/tnkm1shRE7Di71+w3fNiOA
6w9o44t6+AINEICBCCA4YcF6zMzaT1wefWwX6f+
Rmt5nhhqdAtN/4oJfce166DqVX1gWmN
zNR4DYDvSzg0lDnwCAC8Qh
Fingerprint: a4:16:46:23:5a:8d:1d:b5:37:59:eb:44:13:b9:33:e9
switchxxxxxx(config)# crypto key pubkey-chain ssh
switchxxxxxx(config-pubkey-chain)# user-key bob rsa
switchxxxxxx(config-pubkey-key)# key-string row AAAAB3Nza
switchxxxxxx(config-pubkey-key)# key-string row C1yc2
```

12.6 show ip ssh

The **show ip ssh** Privileged EXEC mode command displays the SSH server configuration.

Syntax

show ip ssh

Command Mode

Privileged EXEC mode

Example

The following example displays the SSH server configuration.

```
switchxxxxxx# show ip ssh
SSH server enabled. Port: 22
RSA key was generated.
DSA (DSS) key was generated.
SSH Public Key Authentication is enabled.
Active incoming sessions:
IP Address   SSH Username    Version       Cipher     Auth Code
---------    -----------     -------       ------     ----------
172.16.0.1   John Brown      1.5           3DES       HMAC-SHA1
```

The following table describes the significant fields shown in the display.

Field	Description
IP Address	The client address
SSH Username	The user name
Version	The SSH version number
Cipher	The encryption type (3DES, Blowfish, RC4)
Auth Code	The authentication Code (HMAC-MD5, HMAC-SHA1)

12.7 show crypto key pubkey-chain ssh

The **show crypto key pubkey-chain ssh** Privileged EXEC mode command displays SSH public keys stored on the device.

Syntax

show crypto key pubkey-chain ssh *[**username** username] [**fingerprint** {**bubble-babble** | **hex**}]*

Parameters

- **username** *username*—Specifies the remote SSH client username. (Length: 1–48 characters)
- **fingerprint** {**bubble-babble** | **hex**}—Specifies the fingerprint display format. The possible values are:
  - **bubble-babble**—Specifies that the fingerprint is displayed in Bubble Babble format.
  - **hex**—Specifies that the fingerprint is displayed in hexadecimal format.

Default Configuration

The default fingerprint format is hexadecimal.

Command Mode

Privileged EXEC mode

Example

The following examples display SSH public keys stored on the device.

```
switchxxxxxx# show crypto key pubkey-chain ssh
Username
--------
bob
john
Fingerprint
-----------------------------------------------
9A:CC:01:C5:78:39:27:86:79:CC:23:C5:98:59:F1:86
98:F7:6E:28:F2:79:87:C8:18:F8:88:CC:F8:89:87:C8
switchxxxxxx# show crypto key pubkey-chain ssh username bob
Username: bob
Key: 005C300D 06092A86 4886F70D 01010105 00034B00 30480241 00C5E23B 55D6AB22
04AEF1BA A54028A6 9ACC01C5 129D99E4
Fingerprint: 9A:CC:01:C5:78:39:27:86:79:CC:23:C5:98:59:F1:86
```

13 Line Commands

13.1 line

The **line** Global Configuration mode command identifies a specific line for configuration and enters the Line Configuration command mode.

Syntax

line *{console | telnet | ssh}*

Parameters

- **console**—Enters the terminal line mode.
- **telnet**—Configures the device as a virtual terminal for remote access (Telnet).
- **ssh**—Configures the device as a virtual terminal for secured remote access (SSH).

Command Mode

Global Configuration mode

Example

The following example configures the device as a virtual terminal for remote (Telnet) access.

```
switchxxxxxx(config)# line telnet

switchxxxxxx(config-line)#
```

13.2 speed

The **speed** Line Configuration mode command sets the line baud rate. Use the **no** form of this command to restore the default configuration.

Syntax

speed *bps*

no speed

Parameters

bps—Specifies the baud rate in bits per second (bps). Possible values are 2400, 4800, 9600, 19200, 38400, 57600, and 115200.

Default Configuration

The default speed is 115200 bps.

Command Mode

Line Configuration mode

User Guidelines

The configured speed is applied when Autobaud is disabled. This configuration applies to the current session only.

Example

The following example configures the line baud rate as 9600 bits per second.

```
switchxxxxxx(config-line)# speed 9600
```

13.3 exec-timeout

The **exec-timeout** Line Configuration mode command sets the session idle time interval, during which the system waits for user input before automatic logoff. Use the **no** form of this command to restore the default configuration.

Syntax

exec-timeout *minutes* [*seconds*]

no exec-timeout

Parameters

- **minutes**—Specifies the number of minutes. (Range: 0-65535)
- **seconds**—Specifies the number of seconds. (Range: 0-59)

Default Configuration

The default idle time interval is 10 minutes.

Command Mode

Line Configuration mode

Example

The following example sets the HTTP session idle time interval before automatic logoff to 20 minutes and 10 seconds.

```
switchxxxxxx(config)# line
switchxxxxxx(config-line)# exec-timeout 20 10
```

13.4 show line

The **show line** EXEC mode command displays line parameters.

Syntax

show line *[console | telnet | ssh]*

Parameters

- **console**—Displays the configuration.
- **telnet**—Displays the Telnet configuration.
- **ssh**—Displays the SSH configuration.

Default Configuration

If the line is not specified, all line configuration parameters are displayed.

Command Mode

EXEC mode

Example

The following example displays the line configuration.

```
switchxxxxxx# show line
 configuration:
Interactive timeout: Disabled
```

```
History: 10
Baudrate: 9600
Databits: 8
Parity: none
Stopbits: 1
Telnet configuration:
Telnet is enabled.
Interactive timeout: 10 minutes 10 seconds
History: 10
SSH configuration:
SSH is enabled.
Interactive timeout: 10 minutes 10 seconds
History: 10
```

14 Bonjour Commands

14.1 bonjour enable

Use the **bonjour enable** Global Configuration mode command to enable Bonjour globally. Use the **no** format of the command to disable globally.

Syntax

bonjour enable

no bonjour enable.

Default Configuration

Enable

Command Mode

Global Configuration mode

Examples

```
switchxxxxxx(conf)# bonjour enable
```

14.2 bonjour interface range

Use the **bonjour interface range** Global Configuration mode command to add L2 interfaces to the Bonjour L2 Interface List. Use the **no** format of the command to remove L2 interfaces from the list.

Syntax

bonjour interface range {*interface-list*}

Parameters

interface-list—Specifies a list of interfaces, which can be of the following types:

- Ethernet port
- Port-channel
- VLAN

Default Configuration

The list is empty.

Command Mode

Global Configuration mode

User Guidelines

This command can only be used if the device is in Layer 3 (router) mode.

Examples

```
switchxxxxxx(config)# bonjour interface range gi1-3
```

14.3 show bonjour

Use the **show bonjour** Privileged EXEC mode command to display Bonjour information

Syntax

show bonjour [*interface-id*]

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types:

- Ethernet port
- Port-channel
- VLAN

Command Mode

Privileged EXEC mode

Examples

Layer 2:

```
switchxxxxxx# show bonjour
```

```
Bonjour status: enabled

L2 interface status: Up

IP Address: 10.5.226.46

Service     Admin Status     Oper Status

-------     ------------     --------------

csco-sb     enabled              enabled

http        enabled              enabled

https       enabled              disabled

ssh         enabled              disabled

telnet      enabled              disabled
```

Layer 3:

```
switchxxxxxx# show bonjour

Bonjour global status: enabled

Bonjour L2 interfaces port list: vlans 1

Service    Admin Status          Oper Status

---------    ---------------              ----------

csco-sb  enabled                 enabled

http     enabled                 enabled

https    enabled                 disabled

ssh      enabled                 disabled

telnet   enabled                 disabled
```

15 Authentication, Authorization and Accounting (AAA) Commands

15.1 aaa authentication login

Use the **aaa authentication login** Global Configuration mode command to set one or more authentication methods to be applied during login. A list of authentication methods may be assigned a list name, and this list name can be used in aaa authentication enable. Use the **no** form of this command to restore the default authentication method.

Syntax

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

aaa authentication login *list-name method1 method2...*

no aaa authentication login *{**default** | list-name}*

Parameters

- **default**—Uses the authentication methods that follow this argument as the default method list when a user logs in (this list is unnamed).
- **list-name**—Specifies a name of a list of authentication methods activated when a user logs in. (Length: 1–12 characters)
- **method1 [method2...]**—Specifies a list of methods that the authentication algorithm tries (in the given sequence). Each additional authentication method is 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. Select one or more methods from the following list::

Keyword	Description
enable	Uses the enable password for authentication.
line	Uses the line password for authentication.
local	Uses the locally-defined usernames 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.

Default Configuration

If no methods are specified, the default are the locally-defined users and passwords. This is the same as entering the command **aaa authentication login local**.

NOTE If no authentication method is defined, console users can log in without any authentication verification.

Command Mode

Global Configuration mode

User Guidelines

Create a list of authentication methods by entering this command with the *list-name* parameter where *list-name* is any character string. The method arguments identifies the list of methods that the authentication algorithm tries, in the given sequence.

The default and list names created with this command are used with aaa authentication enable.

no aaa authentication login *list-name* deletes a list-name only if it has not been referenced by another command.

Example

The following example sets the authentication login methods for the console.

```
switchxxxxxx (config)# aaa authentication login authen-list radius local none
switchxxxxxx (config)#line console
switchxxxxxx (config-line)#login authentication authen-list
```

15.2 aaa authentication enable

The **aaa authentication enable** Global Configuration mode command sets one or more authentication methods for accessing higher privilege levels. A user, who logons with a lower privilege level, must pass these authentication methods to access a higher level.

To restore the default authentication method, use the **no** form of this command.

Syntax

aaa authentication enable *{**default** | list-name}* *method* [*method2...*]

no aaa authentication enable *{**default** | list-name}*

Parameters

- **default**—Uses the listed authentication methods that follow this argument as the default method list, when accessing higher privilege levels.
- **list-name** —Specifies a name for the list of authentication methods activated when a user accesses higher privilege levels. (Length: 1–12 characters)
- **method [method2...]**—Specifies a list of methods that the authentication algorithm tries, in the given sequence. The additional authentication methods are used only if the previous method returns an error, not if it fails. Specify **none** as the final method in the command line to ensure that the authentication succeeds, even if all methods return an error. Select one or more methods from the following list:

Keyword	Description
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. Uses username "$enabx$." where x is the privilege level.
tacacs	Uses the list of all TACACS servers for authentication. Uses username "$enabx$." where x is the privilege level.

Default Configuration

The enable password command defines the default authentication login method. This is the same as entering the command **aaa authentication enable default enable**.

On a console, the enable password is used if a password exists. If no password is set, authentication still succeeds. This is the same as entering the command **aaa authentication enable default enable none**.

Command Mode

Global Configuration mode

User Guidelines

Create a list by entering the **aaa authentication enable** *list-name method1 [method2...]* 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.

All **aaa authentication enable default** requests sent by the device to a RADIUS or TACACS+ server include the username **$enabx$**., where **x** is the requested privilege level.

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

no aaa authentication enable *list-name* deletes list-name if it has not been referenced.

Example

The following example sets the enable password for authentication for accessing higher privilege levels.

```
switchxxxxxx(config)# aaa authentication enable enable-list radius none

switchxxxxxx(config)# line console

switchxxxxxx(config-line)# enable authentication enable-list
```

15.3 login authentication

The **login authentication** Line Configuration mode command specifies the login authentication method list for a remote Telnet or console session. Use the **no** form of this command to restore the default authentication method.

Syntax

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

no login authentication

Parameters

- **default**—Uses the default list created with the **aaa authentication login** command.
- **list-name**—Uses the specified list created with aaa authentication login.

Default Configuration

The default is the aaa authentication login command default.

Command Mode

Line Configuration mode

Examples

Example 1 - The following example specifies the login authentication method as the default method for a console session.

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

Example

Example 2 - The following example sets the authentication login methods for the console as a list of methods.

```
switchxxxxxx (config)# aaa authentication login authen-list radius local none
switchxxxxxx (config)#line console
switchxxxxxx (config-line)#login authentication authen-list
```

15.4 ip http authentication

The **ip http authentication** Global Configuration mode command specifies authentication methods for HTTP server access. Use the **no** form of this command to restore the default authentication method.

Syntax

ip http authentication aaa login-authentication *method1 [method2...]*

no ip http authentication aaa login-authentication

Parameters

method [method2...]—Specifies a list of methods that the authentication algorithm tries, in the given sequence. The additional authentication methods are used only if the previous method returns an error, not if it fails. Specify **none** as the final method

in the command line to ensure that the authentication succeeds, even if all methods return an error. Select one or more methods from the following list:

Keyword	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.

Default Configuration

The local user database is the default authentication login method. This is the same as entering the **ip http authentication local** command.

Command Mode

Global Configuration mode

User Guidelines

The command is relevant for HTTP and HTTPS server users.

Example

The following example specifies the HTTP access authentication methods.

```
switchxxxxxx(config)# ip http authentication aaa login-authentication radius
local none
```

15.5 show authentication methods

The **show authentication methods** Privileged EXEC mode command displays information about the authentication methods.

Syntax

show authentication methods

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the authentication configuration.

```
switchxxxxxx# show authentication methods
Login Authentication Method Lists
---------------------------------
Default: Radius, Local, Line
Console_Login: Line, None
Enable Authentication Method Lists
----------------------------------
Default: Radius, Enable
Console_Enable: Enable, None
Line                    Login Method List     Enable Method List
--------------          -----------------     ------------------
Console                 Console_Login         Console_Enable
Telnet                  Default               Default
SSH                     Default               Default
HTTP: Radius, local
HTTPS: Radius, local
Dot1x: Radius
```

15.6 password

Use the **password** Line Configuration mode command to specify a password on a line (also known as an access method, such as a console or Telnet). Use the **no** form of this command to return to the default password.

Syntax

password *password* ***[encrypted]***

no password

Parameters

- **password**—Specifies the password for this line. (Length: 0–159 characters)
- **encrypted**—Specifies that the password is encrypted and copied from another device configuration.

Default Configuration

No password is defined.

Command Mode

Line Configuration mode

Example

The following example specifies the password 'secret' on a console.

```
switchxxxxxx(config)# line console
switchxxxxxx(config-line)# password secret
```

15.7 enable password

Use the **enable password** Global Configuration mode command to set a local password to control access to normal and privilege levels. Use the **no** form of this command to return to the default password.

When the administrator configures a new **enable** password, this password is encrypted automatically and saved to the configuration file. No matter how the password was entered, it appears in the configuration file with the keyword **encrypted** and the encrypted value.

If the administrator wants to manually copy a password that was configured on one switch (for instance, switch B) to another switch (for instance, switch A), the administrator must add **encrypted** in front of this encrypted password when entering the **enable** command in switch A. In this way, the two switches will have the same password.

Syntax

enable password ***[level*** *privilege-level] {unencrypted-password* / ***encrypted*** *encrypted-password}*

no enable password ***[level*** *level]*

Parameters

- **level** *privilege-level*—Level for which the password applies. If not specified the level is 15. (Range: 1–15)
- **password** *unencrypted-password*—Password for this level. (Range: 0–159 chars)
- **password encrypted** *encrypted-password*—Specifies that the password is encrypted. Use this keyword to enter a password that is already encrypted (for instance that you copied from another the configuration file of another device). (Range: 1–40)

Default Configuration

Default for **level** is 15.

Passwords are encrypted by default.

Command Mode

Global Configuration mode

User Guidelines

Passwords are encrypted by default. You only are required to use the **encrypted** keyword when you are actually entering an encrypted keyword.

Example

The first command sets an unencrypted password for level 7 (it will be encrypted in the configuration file).

The second command sets a password that has already been encrypted. It will copied to the configuration file just as it is entered. To use it, the user must know its unencrypted form.

```
switchxxxxxx(config)# enable password level 7 let-me-in

switchxxxxxx(config)# enable password level 15 encrypted
4b529f21c93d4706090285b0c10172eb073ffebc4
```

15.8 username

Use the **username** Global Configuration mode command to establish a username-based authentication system. Use the **no** form to remove a user name.

Syntax

username *name {**nopassword** | **password** password | **privilege** privilege-level | unencrypted-password | **encrypted** encrypted-password}*

username *name*

no username *name*

Parameters

- **name**—The name of the user. (Range: 1–20 characters)
- **nopassword**—No password is required for this user to log in.
- **unencrypted-password**—The authentication password for the user. (Range: 1–159)
- **encrypted** *encrypted-password*—Specifies that the password is encrypted. Use this keyword to enter a password that is already encrypted (for instance that you copied from another the configuration file of another device). (Range: 1–40)
- **privilege** *privilege-level* —Privilege level for which the password applies. If not specified the level is 15. (Range: 1–15).

Default Configuration

No user is defined.

Command Mode

Global Configuration mode

Usage Guidelines

See "User (Privilege) Levels" for an explanation of privilege levels.

Examples

Example 1 - Sets an unencrypted password for user tom (level 15). It will be encrypted in the configuration file.

```
switchxxxxxx(config)# username tom privilege 15 password 1234
```

Example 2 - Sets a password for user jerry (level 15) that has already been encrypted. It will be copied to the configuration file just as it is entered. To use it, the user must know its unencrypted form.

```
switchxxxxxx(config)# username jerry privilege 15 encrypted
4b529f21c93d4706090285b0c10172eb073ffebc4
```

15.9 show user accounts

The **show user accounts** Privileged EXEC mode command displays information about the users local database.

Syntax

show user accounts

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays information about the users local database.

```
switchxxxxxx# show user accounts

Username         Privilege
--------         ---------
Bob              15
Robert           15
Smith            15
```

The following table describes the significant fields shown in the display:

Field	Description
Username	The user name.
Privilege	The user's privilege level.

15.10 passwords complexity enable

Use the **passwords complexity enable** Global Configuration mode command to enforce minimum password complexity. The **no** form of this command disables enforcing password complexity.

Syntax

passwords complexity enable

no passwords complexity enable

Parameters

Parameters

N/A

Default Configuration

Enabled

Command Mode

Global Configuration mode

User Guidelines

If password complexity is enabled **by default**, the user is forced to enter a password that:

- Has a minimum length of 8 characters.
- Contains characters from at least 3 character classes (uppercase letters, lowercase letters, numbers, and special characters available on a standard keyboard).
- Are different from the current password.
- Contains no character that is repeated more than 3 times consecutively.

- Does not repeat or reverse the user name or any variant reached by changing the case of the characters.
- Does not repeat or reverse the manufacturer's name or any variant reached by changing the case of the characters.

You can control the above attributes of password complexity with specific commands described in this section.

If you have previously configured other complexity settings, then those settings are used. This command does not wipe out the other settings. It works only as a toggle.

Example

The following example configures requiring complex passwords that fulfill the minimum requirements specified in the User Guidelines above.

```
switchxxxxxx(config)# passwords complexity enable

switchxxxxxx#show passwords configuration

Passwords aging is enabled with aging time 180 days.

Passwords complexity is enabled with the following attributes:

Minimal length: 3 characters

Minimal classes: 3

New password must be different than the current: Enabled

Maximum consecutive same characters: 3

New password must be different than the user name: Enabled

New password must be different than the manufacturer name: Enabled

switchcc293e#
```

15.11 passwords complexity <attributes>

Use the **passwords complexity <attributes>** Global Configuration mode commands to control the minimum requirements from a password when password complexity is enabled. Use the **no** form of these commands to return to default.

Syntax

passwords complexity ***min-length*** *number*

no passwords complexity ***min-length***

passwords complexity ***min-classes*** *number*

no passwords complexity ***min-classes***

passwords complexity ***not-current***

no passwords complexity ***not-current***

passwords complexity ***no-repeat*** *number*

no password complexity ***no-repeat***

passwords complexity ***not-username***

no passwords complexity ***not-username***

passwords complexity ***not-manufacturer-name***

no passwords complexity ***not-manufacturer-name***

Parameters

- **min-length** *number*—Sets the minimal length of the password. (Range: 0–64)
- **min-classes** *number*—Sets the minimal character classes (uppercase letters, lowercase letters, numbers, and special characters available on a standard keyboard). (Range: 0–4)
- **not-current**—Specifies that the new password cannot be the same as the current password.
- **no-repeat** *number*—Specifies the maximum number of characters in the new password that can be repeated consecutively. Zero specifies that there is no limit on repeated characters. (Range: 0–16)
- **not-username**—Specifies that the password cannot repeat or reverse the user name or any variant reached by changing the case of the characters.
- **not-manufacturer-name**—Specifies that the password cannot repeat or reverse the manufacturer's name or any variant reached by changing the case of the characters.

Default Configuration

The minimal length is 8.

The number of classes is 3.

The default for no-repeat is 3.

All the other controls are enabled by default.

Command Mode

Global Configuration mode

Example

The following example configures the minimal required password length to 8 characters.

```
switchxxxxxx (config)# passwords complexity min-length 8
```

15.12 passwords aging

Use the **passwords aging** Global Configuration mode command to enforce password aging. Use the **no** form of this command to return to default.

Syntax

passwords aging *days*

no passwords aging

Parameters

days—Specifies the number of days before a password change is forced. You can use 0 to disable aging. (Range: 0–365)

Default Configuration

Enabled and the number of days is 180.

Command Mode

Global Configuration mode

User Guidelines

Aging is relevant only to users of the local database with privilege level 15 and to "enable" a password of privilege level 15.

To disable password aging, use **passwords aging 0**. Using **no passwords aging** sets the aging time to the default.

Example

The following example configures the aging time to be 24 days.

```
switchxxxxxx (config)# passwords aging 24
```

15.13 show passwords configuration

The **show passwords configuration** Privileged EXEC mode command displays information about the password management configuration.

Syntax

show passwords configuration

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx#show passwords configuration

Passwords aging is enabled with aging time 180 days.

Passwords complexity is enabled with the following attributes:

Minimal length: 3 characters

Minimal classes: 3
```

```
New password must be different than the current: Enabled

Maximum consecutive same characters: 3

New password must be different than the user name: Enabled

New password must be different than the manufacturer name: Enabled

switchcc293e#
```

The following table describes the significant fields shown in the display:

Field	Description
Minimal length	The minimal length required for passwords in the local database.
Minimal character classes	The minimal number of different types of characters (special characters, integers and so on) required to be part of the password.
Maximum number of repeated characters	The maximum number of times a singe character can be repeated in the password.
Level	The applied password privilege level.
Aging	The password aging time in days.

16 Remote Authentication Dial-In User Service (RADIUS) Commands

16.1 radius-server host

Use the **radius-server host** Global Configuration mode command to configure a RADIUS server host. Use the no form of the command to delete the specified RADIUS server host.

Syntax

radius-server host *{ip-address | hostname}* ***[auth-port*** *auth-port-number]* ***[timeout*** *timeout]* ***[retransmit*** *retries]* ***[deadtime*** *deadtime]* ***[key*** *key-string]* ***[source*** *{source-ip}]* ***[priority*** *priority]* ***[usage*** *{login | 802.1x | all}]*

no radius-server host {*ip-address* | *hostname*}

Parameters

- **ip-address**—Specifies the RADIUS server host IP address. The IP address can be an IPv4, IPv6 or IPv6z address. See IPv6z Address Conventions
- **hostname**—Specifies the RADIUS server host name. Translation to IPv4 addresses only is supported. (Length: 1–158 characters. Maximum label length of each part of the hostname: 63 characters)
- **auth-port** *auth-port-number*—Specifies the port number for authentication requests. If the port number is set to 0, the host is not used for authentication. (Range: 0–65535)
- **timeout** *timeout*—Specifies the timeout value in seconds. (Range: 1–30)
- **retransmit** *retries*—Specifies the retransmit value. (Range: 1–10)
- **deadtime** *deadtime*—Specifies the length of time in minutes during which a RADIUS server is skipped over by transaction requests. (Range: 0–2000)
- **key** *key-string*—Specifies the authentication and encryption key for all RADIUS communications between the device and the RADIUS server. This key must match the encryption used on the RADIUS daemon. To specify an empty string, enter "". (Length: 0–128 characters)
- **source** *source-ip*—Specifies the source IPv4 or IPv6 address to use for communication. 0.0.0.0 is interpreted as a request to use the IP address of the outgoing IP interface.

- **priority** *priority*—Specifies the order in which servers are used, where 0 has the highest priority. (Range: 0–65535)
- **usage** {**login** | **802.1x** | **all**}—Specifies the RADIUS server usage type. The possible values are:
  - **login**—Specifies that the RADIUS server is used for user login parameters authentication.
  - **802.1x**—Specifies that the RADIUS server is used for 802.1x port authentication.
  - **all**—Specifies that the RADIUS server is used for user login authentication and 802.1x port authentication.

Default Configuration

The default authentication port number is 1812.

If **timeout** is not specified, the global value (set in radius-server timeout) is used.

If **retransmit** is not specified, the global value (set in radius-server retransmit) is used.

If **key-string** is not specified, the global value (set in radius-server key) is used.

If the **source** value is not specified, the global value (set in radius-server source-ip or radius-server source-ipv6) is used.

If a parameter was not set in one of the above commands, the default for that command is used. For example, if a timeout value was not set in the current command or in radius-server timeout, the default timeout for radius-server timeout is used.

The default usage type is **all**.

Command Mode

Global Configuration mode

User Guidelines

To specify multiple hosts, this command is used for each host.

The **source** parameter address type (IPv4 or IPv6) must be the same as that of the **host** IP address type.

Example

The following example specifies a RADIUS server host with IP address 192.168.10.1, authentication request port number 20, and a 20-second timeout period.

```
switchxxxxxx(config)# radius-server host 192.168.10.1 auth-port 20 timeout 20
```

16.2 radius-server key

Use the **radius-server key** Global Configuration mode command to set the authentication and encryption key for RADIUS communications between the device and the RADIUS daemon. Use the **no** form of this command to restore the default configuration.

Syntax

radius-server key [*key-string*]

no radius-server key

Parameters

key-string—Specifies the authentication and encryption key for all RADIUS communications between the device and the RADIUS server. This key must match the encryption used on the RADIUS daemon. (Range: 0–128 characters)

Default Configuration

The key-string is an empty string.

Command Mode

Global Configuration mode

Example

The following example defines the authentication and encryption key for all RADIUS communications between the device and the RADIUS daemon.

```
switchxxxxxx(config)# radius-server key enterprise-server
```

16.3 radius-server retransmit

Use the **radius-server retransmit** Global Configuration mode command to specify the number of times the software searches the list of RADIUS server hosts. Use the no form of this command to restore the default configuration.

Syntax

radius-server retransmit *retries*

no radius-server retransmit

Parameters

retransmit *retries*—Specifies the retransmit value. (Range: 1–10)

Default Configuration

The software searches the list of RADIUS server hosts 3 times.

Command Mode

Global Configuration mode

Example

The following example configures the number of times the software searches all RADIUS server hosts as 5.

```
switchxxxxxx(config)# radius-server retransmit 5
```

16.4 radius-server source-ip

Use the **radius-server source-ip** Global Configuration mode command to specify the source IP address used for communication with RADIUS servers. Use the no form of this command to restore the default configuration.

Syntax

radius-server source-ip {*source-ip-address*}

no radius-server source-ip {*source-ip-address*}

Parameters

source-ip-address—Specifies the source IP address.

Default Configuration

The source IP address is the IP address of the outgoing IP interface.

Command Mode

Global Configuration mode

User Guidelines

If there is no available IP interface of the configured IP source address, an error message is issued when attempting to communicate with the IP address.

Example

The following example configures the source IP address used for communication with all RADIUS servers to 10.1.1.1.

```
switchxxxxxx(config)# radius-server source-ip 10.1.1.1
```

16.5 radius-server source-ipv6

Use the **radius-server source-ipv6** Global Configuration mode command to specify the source IPv6 address used for communication with RADIUS servers. Use the no form of this command to restore the default configuration.

Syntax

radius-server source-ipv6 {*source*}

no radius-server source-ipv6 {*source*}

Parameters

source—Specifies the source IPv6 address.

Default Configuration

The source IP address is the IP address of the outgoing IP interface.

Command Mode

Global Configuration mode

User Guidelines

If there is no available IP interface of the configured IP source address, an error message is issued when attempting to communicate with the IP address.

Example

The following example configures the source IP address used for communication with all RADIUS servers to 3ffe:1900:4545:3:200:f8ff:fe21:67cf.

```
switchxxxxxx(config)# radius-server source-ipv6
3ffe:1900:4545:3:200:f8ff:fe21:67cf
```

16.6 radius-server timeout

Use the **radius-server timeout** Global Configuration mode command to set how long the device waits for a server host to reply. Use the **no** form of this command to restore the default configuration.

Syntax

radius-server timeout *timeout-seconds*

no radius-server timeout

Parameters

timeout *timeout-seconds*—Specifies the timeout value in seconds. (Range: 1–30)

Default Configuration

The default timeout value is 3 seconds.

Command Mode

Global Configuration mode

Example

The following example sets the timeout interval on all RADIUS servers to 5 seconds.

```
switchxxxxxx(config)# radius-server timeout 5
```

16.7 radius-server deadtime

Use the **radius-server deadtime** Global Configuration mode command to configure how long unavailable RADIUS servers are skipped over by transaction requests. This improves RADIUS response time when servers are unavailable. Use the **no** form of this command to restore the default configuration.

Syntax

radius-server deadtime *deadtime*

no radius-server deadtime

Parameters

deadtime—Specifies the time interval in minutes during which a RADIUS server is skipped over by transaction requests. (Range: 0–2000)

Default Configuration

The default deadtime interval is 0.

Command Mode

Global Configuration mode

Example

The following example sets all RADIUS server deadtimes to 10 minutes.

```
switchxxxxxx(config)# radius-server deadtime 10
```

16.8 show radius-servers

Use the **show radius-servers** Privileged EXEC mode command to display the RADIUS server settings.

Syntax

show radius-servers

Command Mode

Privileged EXEC mode

Example

The following example displays RADIUS server settings..

```
switchxxxxxx# show radius-servers

            Port   Time                    Dead     Source
IP address  Auth   Out      Retransmision  time     IP       Priority  Usage
----------  ----   -----    -------------  ------   ------   --------  -----
172.16.1.1  1812   Global   Global         Global   Global   1         All
172.16.1.2  1812   11       8              Global   Global   2         All
Global values
--------------
TimeOut: 3
Retransmit: 3
Deadtime: 0
Source IP: 172.16.8.1
```

17 Terminal Access Controller Access-Control System Plus (TACACS+) Commands

17.1 tacacs-server host

Use the **tacacs-server host** Global Configuration mode command to specify a TACACS+ host. Use the **no** form of this command to delete the specified TACACS+ host.

Syntax

tacacs-server host {*ip-address* | *hostname*} *[single-connection] [**port** port-number] [**timeout** timeout] [**key** key-string] [**source** {source-ip}] [**priority** priority]*

no tacacs-server host {*ip-address* | *hostname*}

Parameters

- **host** *ip-address*—Specifies the TACACS+ server host IP address.
- **host** *hostname*—Specifies the TACACS+ server host name. (Length: 1?158 characters. Maximum label length of each part of the host name: 63 characters)
- **single-connection**—Specifies that a single open connection is maintained between the device and the daemon, instead of the device opening and closing a TCP connection to the daemon each time it communicates.
- **port** *port-number*—Specifies the TACACS server TCP port number. If the port number is 0, the host is not used for authentication. (Range: 0-65535)
- **timeout** *timeout*—Specifies the timeout value in seconds. (Range: 1-30)
- **key** *key-string*—Specifies the authentication and encryption key for all TACACS+ communications between the device and the TACACS+ server. This key must match the encryption used on the TACACS+ daemon. To specify an empty string, enter "". (Length: 0-128 characters). This key is set in tacacs-server key.
- **source** *source-ip*—Specifies the source IP address to use for the communication. 0.0.0.0 indicates a request to use the outgoing IP interface IP address.
- **priority** *priority*—Specifies the order in which the TACACS+ servers are used, where 0 is the highest priority. (Range: 0-65535)

Default Configuration

No TACACS+ host is specified.

The default **port-number** is 49.

The default authentication port number is 1812.

If **timeout** is not specified, the global value (set in tacacs-server timeout) is used.

If **key-string** is not specified, the global value (set in tacacs-server key) is used.

If the **source** value is not specified, the global value (set in tacacs-server source-ip) is used.

If a parameter was not set in one of the above commands, the default for that command is used. For example, if a timeout value was not set in the current command or in tacacs-server timeout, the default timeout for tacacs-server timeout is used.

Command Mode

Global Configuration mode

User Guidelines

Multiple **tacacs-server host** commands can be used to specify multiple hosts.

Example

The following example specifies a TACACS+ host.

```
switchxxxxxx(config)# tacacs-server host 172.16.1.1
```

17.2 tacacs-server key

Use the **tacacs-server key** Global Configuration mode command to set the authentication encryption key used for all TACACS+ communications between the device and the TACACS+ daemon. Use the **no** form of this command to disable the key.

Syntax

tacacs-server key *key-string*

no tacacs-server key

Parameters

key-string—Specifies the authentication and encryption key for all TACACS+ communications between the device and the TACACS+ server. This key must match the encryption used on the TACACS+ daemon. (Length: 0–128 characters)

Default Configuration

The default key is an empty string.

Command Mode

Global Configuration mode

Example

The following example sets Enterprise as the authentication encryption key for all TACACS+ servers.

```
switchxxxxxx(config)# tacacs-server key enterprise
```

17.3 tacacs-server timeout

Use the **tacacs-server timeout** Global Configuration mode command to set the interval during which the device waits for a TACACS+ server to reply. Use the **no** form of this command to restore the default configuration.

Syntax

tacacs-server timeout *timeout*

no tacacs-server timeout

Parameters

timeout—Specifies the timeout value in seconds. (Range: 1-30)

Default Configuration

The default timeout value is 5 seconds.

Command Mode

Global Configuration mode

Example

The following example sets the timeout value to 30 for all TACACS+ servers.

```
switchxxxxxx(config)# tacacs-server timeout 30
```

17.4 tacacs-server source-ip

Use the **tacacs-server source-ip** Global Configuration mode command to configure the source IP address to be used for communication with TACACS+ servers. Use the no form of this command to restore the default configuration.

Syntax

tacacs-server source-ip {*source*}

no tacacs-server source-ip {*source*}

Parameters

source—Specifies the source IP address. (Range: Valid IP address)

Default Configuration

The default source IP address is the outgoing IP interface address.

Command Mode

Global Configuration mode

User Guidelines

If the configured IP source address has no available IP interface, an error message is issued when attempting to communicate with the IP address.

Example

The following example specifies the source IP address for all TACACS+ servers.

```
switchxxxxxx(config)# tacacs-server source-ip 172.16.8.1
```

17.5 show tacacs

Use the **show tacacs** Privileged EXEC mode command to display configuration and statistical information for a TACACS+ server.

Syntax

show tacacs [*ip-address*]

Parameters

ip-address—Specifies the TACACS+ server name or IP address.

Default Configuration

If **ip-address** is not specified, information for all TACACS+ servers is displayed.

Command Mode

Privileged EXEC mode

Example

The following example displays configuration and statistical information for all TACACS+ servers.

```
switchxxxxxx# show tacacs

IP address     Status      Port   Single       Time     Source   Priority
                                  Connection   Out      IP
----------     ------      ----   ----------   -----    -----    ------
172.16.1.1     Connected   49     No           Global   Global   1
Global values
-------------
Time Out: 3
Source IP: 172.16.8.1
```

18 Syslog Commands

18.1 logging on

Use the **logging on** Global Configuration mode command to control error message logging. This command sends debug or error messages asynchronously to designated locations. Use the **no** form of this command to disable the logging.

Syntax

logging on

no logging on

Parameters

N/A

Default Configuration

Message logging is enabled.

Command Mode

Global Configuration mode

User Guidelines

The logging process controls the logging messages distribution at various destinations, such as the logging buffer, logging file or SYSLOG server. Logging on and off at these destinations can be individually configured using the logging buffered, logging file, and logging on Global Configuration mode commands. However, if the logging on command is disabled, no messages are sent to these destinations. Only the console receives messages.

Example

The following example enables logging error messages.

```
switchxxxxxx(config)# logging on
```

18.2 logging host

Use the **logging host** Global Configuration command to log messages to the specified SYSLOG server. Use the **no** form of this command to delete the SYSLOG server with the specified address from the list of SYSLOG servers.

Syntax

logging host *{ip-address | ipv6-address | hostname}* ***[port** port]* ***[severity** level]* ***[facility** facility]* ***[description** text]*

no logging host *{ipv4-address | ipv6-address | hostname}*

Parameters

- **ip-address**—IP address of the host to be used as a SYSLOG server. The IP address can be an IPv4, IPv6 or Ipv6z address. See IPv6z Address Conventions.
- **hostname**—Hostname of the host to be used as a SYSLOG server. Only translation to IPv4 addresses is supported. (Range: 1–158 characters. Maximum label size for each part of the host name: 63)
- ***port** port*—Port number for SYSLOG messages. If unspecified, the port number defaults to 514. (Range: 1–65535)
- ***severity** level*—Limits the logging of messages to the SYSLOG servers to a specified level: emergencies, alerts, critical, errors, warnings, notifications, informational, debugging.
- ***facility** facility*—The facility that is indicated in the message. It can be one of the following values: local0, local1, local2, local3, local4, local5, local 6, local7. If unspecified, the port number defaults to local7.
- ***description** text*—Description of the SYSLOG server. (Range: Up to 64 characters)

Default Configuration

No messages are logged to a SYSLOG server.

if unspecified, the **severity level** defaults to Informational.

Command Mode

Global Configuration mode

User Guidelines

You can use multiple SYSLOG servers.

Examples

```
switchxxxxxx(config)# logging host 1.1.1.121
```

```
switchxxxxxx(config)# logging host 3000::100/SYSLOG1
```

18.3 logging console

Use the **logging console** Global Configuration mode command to limit messages logged to the console to messages to a specific severity level. Use the **no** form of this command to restore the default.

Syntax

logging console *level*

no logging console

Parameters

level—Specifies the severity level of logged messages displayed on the console. The possible values are: emergencies, alerts, critical, errors, warnings, notifications, informational and debugging.

Default Configuration

Informational.

Command Mode

Global Configuration mode

Example

The following example limits logging messages displayed on the console to messages with severity level **errors**.

```
switchxxxxxx(config)# logging console errors
```

18.4 logging buffered

Use the **logging buffered** Global Configuration mode command to limit the SYSLOG message display to messages with a specific severity level, and to define the buffer size (number of messages that can be stored). Use the **no** form of this command to cancel displaying the SYSLOG messages, and to return the buffer size to default.

Syntax

logging buffered [*buffer-size*] [*severity-level* | *severity-level-name*]

no logging buffered

Parameters

- **buffer-size**—Specifies the maximum number of messages stored in the history table. (Range: 20–400)
- **severity-level**—Specifies the severity level of messages logged in the buffer. The possible values are: 1-7.
- **severity-level-name**—Specifies the severity level of messages logged in the buffer. The possible values are: emergencies, alerts, critical, errors, warnings, notifications, informational and debugging.

Default Configuration

The default severity level is informational.

The default buffer size is 200.

Command Mode

Global Configuration mode

User Guidelines

All the SYSLOG messages are logged to the internal buffer. This command limits the messages displayed to the user.

Example

The following example shows two ways of limiting the SYSLOG message display from an internal buffer to messages with severity level **debugging**. In the second example, the buffer size is set to 100.

```
switchxxxxxx(config)# logging buffered debugging

switchxxxxxx(config)# logging buffered 100 7
```

18.5 clear logging

Use the **clear logging** Privileged EXEC mode command to clear messages from the internal logging buffer.

Syntax

clear logging

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example clears messages from the internal logging buffer.

```
switchxxxxxx# clear logging

Clear logging buffer [confirm]
```

18.6 logging file

Use the **logging file** Global Configuration mode command to limit SYSLOG messages sent to the logging file to messages with a specific severity level. Use the **no** form of this command to cancel sending messages to the file.

Syntax

logging file */level/*

no logging file

Parameters

level—Specifies the severity level of SYSLOG messages sent to the logging file. The possible values are: emergencies, alerts, critical, errors, warnings, notifications, informational and debugging.

Default Configuration

The default severity level is **errors**.

Command Mode

Global Configuration mode

Example

The following example limits SYSLOG messages sent to the logging file to messages with severity level **alerts**.

```
switchxxxxxx(config)# logging file alerts
```

18.7 clear logging file

Use the **clear logging file** Privileged EXEC mode command to clear messages from the logging file.

Syntax

clear logging file

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example clears messages from the logging file.

```
switchxxxxxx# clear logging file

Clear Logging File [y/n]
```

18.8 file-system logging

Use the **file-system logging** Global Configuration mode command to enable logging file system events. Use the **no** form of this command to disable logging file system events.

Syntax

file-system logging *{copy | delete-rename}*

no file-system logging *{copy | delete-rename}*

Parameters

- **copy**—Specifies logging messages related to file copy operations.
- **delete-rename**—Specifies logging messages related to file deletion and renaming operations.

Default Configuration

Enabled.

Command Mode

Global Configuration mode

Example

The following example enables logging messages related to file copy operations.

```
switchxxxxxx(config)# file-system logging copy
```

18.9 logging aggregation on

Use the **logging aggregation on** Global Configuration mode command to control aggregation of SYSLOG messages. If aggregation is enabled, logging messages are displayed every time interval (according to the aging time specified by logging aggregation aging-time). Use the **no** form of this command to disable aggregation of SYSLOG messages.

Syntax

logging aggregation on

no logging aggregation on

Parameters

N/A

Default Configuration

Enabled.

Command Mode

Global Configuration mode

Example

To turn off aggregation of SYSLOG messages:

```
switchxxxxxx(config)# no logging aggregation on
```

18.10 logging aggregation aging-time

Use the **logging aggregation aging-time** Global Configuration mode command to configure the aging time of the aggregated SYSLOG messages. The SYSLOG messages are aggregated during the time interval set by the aging-time parameter. Use the **no** form of this command to return to the default.

Syntax

logging aggregation aging-time *sec*

no logging aggregation aging-time

Parameters

aging-time *sec*—Aging time in seconds (Range: 15–3600)

Default Configuration

300 seconds.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# logging aggregation aging-time 300
```

18.11 show logging

Use the **show logging** Privileged EXEC mode command to display the logging status and SYSLOG messages stored in the internal buffer.

Syntax

show logging

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the logging status and the SYSLOG messages stored in the internal buffer.

```
switchxxxxxx# show logging

Logging is enabled.
```

```
Console Logging: Level info. Console Messages: 0 Dropped.
Buffer Logging: Level info. Buffer Messages: 61 Logged, 61 Displayed, 200 Max.
File Logging: Level error. File Messages: 898 Logged, 64 Dropped.
4 messages were not logged
Application filtering control
Application            Event                Status
--------------------   ----------------     ---------
AAA                    Login                Enabled
File system            Copy                 Enabled
File system            Delete-Rename        Enabled
Management ACL         Deny                 Enabled
Aggregation: Disabled.
Aggregation aging time: 300 Sec
01-Jan-2010 05:29:46 :%INIT-I-Startup: Warm Startup
01-Jan-2010 05:29:02 :%LINK-I-Up:  Vlan 1
01-Jan-2010 05:29:02 :%LINK-I-Up:  SYSLOG6
01-Jan-2010 05:29:02 :%LINK-I-Up:  SYSLOG7
01-Jan-2010 05:29:00 :%LINK-W-Down:  SYSLOG8
```

18.12 show logging file

Use the **show logging file** Privileged EXEC mode command to display the logging status and the SYSLOG messages stored in the logging file.

Syntax

show logging file

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the logging status and the SYSLOG messages stored in the logging file.

```
switchxxxxxx# show logging file

Logging is enabled.

Console Logging: Level info. Console Messages: 0 Dropped.

Buffer Logging: Level info. Buffer Messages: 61 Logged, 61 Displayed, 200 Max.

File Logging: Level error. File Messages: 898 Logged, 64 Dropped.

4 messages were not logged

Application filtering control

Application             Event                  Status

-----------------       ----------------       ---------

AAA                     Login                  Enabled

File system             Copy                   Enabled

File system             Delete-Rename          Enabled

Management ACL          Deny                   Enabled

Aggregation: Disabled.

Aggregation aging time: 300 Sec

01-Jan-2010 05:57:00 :%SSHD-E-ERROR: SSH error: key_read: type mismatch: encoding
error

01-Jan-2010 05:56:36 :%SSHD-E-ERROR: SSH error: key_read: type mismatch: encoding
error

01-Jan-2010 05:55:37 :%SSHD-E-ERROR: SSH error: key_read: type mismatch: encoding
error

01-Jan-2010 05:55:03 :%SSHD-E-ERROR: SSH error: key_read: key_from_blob bgEgGnt9

z6NHgZwKI5xKqF7cBtdl1xmFgSEWuDhho5UedydAjVkKS5XR2... failed

01-Jan-2010 05:55:03 :%SSHD-E-ERROR: SSH error: key_from_blob: invalid key type.

01-Jan-2010 05:56:34 :%SSHD-E-ERROR: SSH error: bad sigbloblen 58 != SIGBLOB_LEN
```

18.13 show syslog-servers

Use the **show syslog-servers** Privileged EXEC mode command to display the SYSLOG server settings.

Syntax

show syslog-servers

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example provides information about the SYSLOG servers.

```
switchxxxxxx# show syslog-servers

Device Configuration

IP address     Port   Facility Severity  Description

-------------- ----   --------- -------- --------------

1.1.1.121      514    local7    info

3000::100      514    local7    info
```

19 Remote Network Monitoring (RMON) Commands

19.1 show rmon statistics

Use the **show rmon statistics** EXEC mode command to display RMON Ethernet statistics.

Syntax

show rmon statistics *{interface-id}*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

EXEC mode

Example

The following example displays RMON Ethernet statistics for gigabitethernet port `gi1`.

```
switchxxxxxx# show rmon statistics gi1

Port gi1

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 to 127 Octets: 1

128 to 255 Octets: 1            256 to 511 Octets: 1

512 to 1023 Octets: 0           1024 to max Octets: 0
```

The following table describes the significant fields displayed.

Field	Description
Dropped	Total number of events in which packets were dropped by the probe due to lack of resources. Note that this number is not necessarily the number of packets dropped. It is the number of times this condition was detected.
Octets	Total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).
Packets	Total number of packets (including bad packets, broadcast packets, and multicast packets) received.
Broadcast	Total number of good packets received and directed to the broadcast address. This does not include multicast packets.
Multicast	Total number of good packets received and directed to a multicast address. This number does not include packets directed to the broadcast address.
CRC Align Errors	Total number of packets received with a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but with 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).
Collisions	Best estimate of the total number of collisions on this Ethernet segment.
Undersize Pkts	Total number of packets received, less than 64 octets long (excluding framing bits, but including FCS octets) and otherwise well formed.
Oversize Pkts	Total number of packets received, longer than 1518 octets (excluding framing bits, but including FCS octets) and otherwise well formed.
Fragments	Total number of packets received, less than 64 octets in length (excluding framing bits but including FCS octets) and 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).

Field	Description
Jabbers	Total number of packets received, longer than 1518 octets (excluding framing bits, but including FCS octets), and 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).
64 Octets	Total number of packets (including bad packets) received that are 64 octets in length (excluding framing bits but including FCS octets).
65 to 127 Octets	Total number of packets (including bad packets) received that are between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
128 to 255 Octets	Total number of packets (including bad packets) received that are between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
256 to 511 Octets	Total number of packets (including bad packets) received that are between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
512 to 1023 Octets	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).
1024 to max	Total number of packets (including bad packets) received that were between 1024 octets and the maximum frame size in length inclusive (excluding framing bits but including FCS octets).

19.2 rmon collection stats

Use the **rmon collection stats** Interface Configuration mode command to enable RMON MIB collecting history statistics (in groups) on an interface. Use the **no** form of this command to remove a specified RMON history group of statistics.

Syntax

rmon collection stats index ***[owner*** *ownername]* ***[buckets*** *bucket-number]* ***[interval*** *seconds]*

no rmon collection stats *index*

Parameters

- **index**—The requested group of statistics index.(Range: 1–65535)
- **owner** *ownername*—Records the name of the owner of the RMON group of statistics. If unspecified, the name is an empty string. (Range: Valid string)
- **buckets** *bucket-number*—A value associated with the number of buckets specified for the RMON collection history group of statistics. If unspecified, defaults to 50.(Range: 1–50)
- **interval** *seconds*—The number of seconds in each polling cycle. If unspecified, defaults to 1800 (Range: 1–3600).

Command Mode

Interface Configuration (Ethernet, Port-channel) mode. Cannot be configured for a range of interfaces (range context).

19.3 show rmon collection stats

Use the **show rmon collection stats** EXEC mode command to display the requested RMON history group statistics.

Syntax

show rmon collection stats *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

EXEC mode

Example

The following example displays all RMON history group statistics.

```
switchxxxxxx# show rmon collection stats
Index   Interface   Interval   Requested   Granted     Owner
                               Samples     Samples
-----   ---------   --------   ---------   -------     -------
1       gi1         30         50          50          CLI
2       gi1         1800       50          50          Manager
```

The following table describes the significant fields shown in the display.

Field	Description
Index	An index that uniquely identifies the entry.
Interface	The sampled Ethernet interface.
Interval	The interval in seconds between samples.
Requested Samples	The requested number of samples to be saved.
Granted Samples	The granted number of samples to be saved.
Owner	The entity that configured this entry.

19.4 show rmon history

Use the **show rmon history** EXEC mode command to display RMON Ethernet history statistics.

Syntax

show rmon history *index {**throughput** | **errors** | **other**} [**period** seconds*]

Parameters

- **index**—Specifies the set of samples to display. (Range: 1–65535)
- **throughput**—Displays throughput counters.
- **errors**—Displays error counters.
- **other**—Displays drop and collision counters.

- **period** *seconds*—Specifies the period of time in seconds to display. (Range: 1–2147483647)

Command Mode

EXEC mode

Example

The following examples display RMON Ethernet history statistics for index 1

```
switchxxxxxx# show rmon history 1 throughput
Sample Set: 1                     Owner: CLI
Interface: gi1                    Interval: 1800
Requested samples: 50             Granted samples: 50
Maximum table size: 500
Time                  Octets      Packets    Broadcast   Multicast   Util
--------------------  --------    -------    ---------   ---------   ----
Jan 18 2005 21:57:00  303595962   357568     3289        7287        19%
Jan 18 2005 21:57:30  287696304   275686     2789        5878        20%
```

```
switchxxxxxx# show rmon history 1 errors
Sample Set: 1                     Owner: Me
Interface:gi1                     Interval: 1800
Requested samples: 50             Granted samples: 50
Maximum table size: 500 (800 after reset)
Time                CRC       Under
                    Align     size
------------        -------   -----     Oversize   Fragments   Jabbers
Jan 18 2005         -------   -----     --------   ---------   ----
21:57:00            1         1         0          49          0
Jan 18 2005         1         1         0          27          0
21:57:30
```

```
switchxxxxxx# show rmon history 1 other
Sample Set: 1                   Owner: Me
Interface: gi1                  Interval: 1800
Requested samples: 50           Granted samples: 50
Maximum table size: 500
Time                            Dropped   Collisions
--------------------            ------    ----------
Jan 18 2005 21:57:00            3         0
Jan 18 2005 21:57:30            3         0
```

The following table describes significant fields shown in the display:

Field	Description
Time	Date and Time the entry is recorded.
Octets	Total number of octets of data (including those in bad packets and excluding framing bits but including FCS octets) received on the network.
Packets	Number of packets (including bad packets) received during this sampling interval.
Broadcast	Number of good packets received during this sampling interval that were directed to the broadcast address.
Multicast	Number of good packets received during this sampling interval that were directed to a multicast address. This number does not include packets addressed to the broadcast address.
Utilization	Best estimate of the mean physical layer network utilization on this interface during this sampling interval, in hundredths of a percent.
CRC Align	Number of packets received during this sampling interval that had a length (excluding framing bits but including FCS octets) between 64 and 1518 octets, inclusive, but 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).
Undersize	Number of packets received during this sampling interval that were less than 64 octets long (excluding framing bits but including FCS octets) and were otherwise well formed.

Field	Description
Oversize	Number of packets received during this sampling interval that were longer than 1518 octets (excluding framing bits but including FCS octets) but were otherwise well formed.
Fragments	Total number of packets received during this sampling interval that were less than 64 octets in length (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). It is normal for etherHistoryFragments to increment because it counts both runts (which are normal occurrences due to collisions) and noise hits.
Jabbers	Number of packets received during this sampling interval 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).
Dropped	Total number of events in which packets were dropped by the probe due to lack of resources during this sampling interval. This number is not necessarily the number of packets dropped, it is the number of times this condition has been detected.
Collisions	Best estimate of the total number of collisions on this Ethernet segment during this sampling interval.

19.5 rmon alarm

Use the **rmon alarm** Global Configuration mode command to configure alarm conditions. Use the **no** form of this command to remove an alarm.

Syntax

rmon alarm *index mib-object-id interval rising-threshold falling-threshold rising-event falling-event* ***[type {absolute | delta}] [startup {rising | rising-falling | falling}] [owner*** *name]*

no rmon alarm *index*

Parameters

- **index**—Specifies the alarm index. (Range: 1–65535)

- **mib-object-id**—Specifies the object identifier of the variable to be sampled. (Valid OID)
- **interval**—Specifies the interval in seconds during which the data is sampled and compared with rising and falling thresholds. (Range: 1–4294967295)
- **rising-threshold**—Specifies the rising threshold value. (Range: 0–4294967295)
- **falling-threshold**—Specifies the falling threshold value. (Range: 0–4294967295)
- **rising-event**—Specifies the index of the event triggered when a rising threshold is crossed. (Range: 0–65535)
- **falling-event**—Specifies the index of the event triggered when a falling threshold is crossed. (Range: 0–65535)
- **type** {**absolute** | **delta**}—Specifies the method used for sampling the selected variable and calculating the value to be compared against the thresholds. The possible values are:
  - **absolute**—Specifies that the selected variable value is compared directly with the thresholds at the end of the sampling interval.
  - **delta**—Specifies that the selected variable value of the last sample is subtracted from the current value, and the difference is compared with the thresholds.
- **startup** {**rising** | **rising-falling** | **falling**}—Specifies the alarm that may be sent when this entry becomes valid. The possible values are:
  - **rising**—Specifies that if the first sample (after this entry becomes valid) is greater than or equal to **rising-threshold**, a single rising alarm is generated.
  - **rising-falling**—Specifies that if the first sample (after this entry becomes valid) is greater than or equal to ***rising-threshold***, a single rising alarm is generated. If the first sample (after this entry becomes valid) is less than or equal to **falling-threshold**, a single falling alarm is generated.
  - **falling** —Specifies that if the first sample (after this entry becomes valid) is less than or equal to **falling-threshold**, a single falling alarm is generated.
- **owner** *name*—Specifies the name of the person who configured this alarm. (Valid string)

Default Configuration

The default method type is **absolute**.

The default **startup** direction is **rising-falling**.

If the owner **name** is not specified, it defaults to an empty string.

Command Mode

Global Configuration mode

Example

The following example configures an alarm with index 1000, MIB object ID D-Link, sampling interval 360000 seconds (100 hours), rising threshold value 1000000, falling threshold value 1000000, rising threshold event index 10, falling threshold event index 10, absolute method type and rising-falling alarm.

```
switchxxxxxx(config)# rmon alarm 1000 1.3.6.1.2.1.2.2.1.10.1 360000 1000000
1000000 10 20
```

19.6 show rmon alarm-table

Use the **show rmon alarm-table** EXEC mode command to display a summary of the alarms table.

Syntax

show rmon alarm-table

Command Mode

EXEC mode

Example

The following example displays the alarms table.

```
switchxxxxxx# show rmon alarm-table
Index      OID                      Owner
-----      ----------------------   -------
1          1.3.6.1.2.1.2.2.1.10.1   CLI
2          1.3.6.1.2.1.2.2.1.10.1   Manager
3          1.3.6.1.2.1.2.2.1.10.9   CLI
```

The following table describes the significant fields shown in the display:

Field	Description
Index	An index that uniquely identifies the entry.
OID	Monitored variable OID.
Owner	The entity that configured this entry.

19.7 show rmon alarm

Use the **show rmon alarm** EXEC mode command to display alarm configuration.

Syntax

show rmon alarm *number*

Parameters

alarm *number*—Specifies the alarm index. (Range: 1–65535)

Command Mode

EXEC mode

Example

The following example displays RMON 1 alarms.

```
switchxxxxxx# show rmon alarm 1

Alarm 1
```

```
-------

OID: 1.3.6.1.2.1.2.2.1.10.1

Last sample Value: 878128

Interval: 30

Sample Type: delta

Startup Alarm: rising

Rising Threshold: 8700000

Falling Threshold: 78

Rising Event: 1

Falling Event: 1

Owner: CLI
```

The following table describes the significant fields shown in the display:

Field	Description
Alarm	Alarm index.
OID	Monitored variable OID.
Last Sample Value	Value of the statistic during the last sampling period. For example, if the sample type is **delta**, this value is the difference between the samples at the beginning and end of the period. If the sample type is **absolute**, this value is the sampled value at the end of the period.
Interval	Interval in seconds over which the data is sampled and compared with the rising and falling thresholds.
Sample Type	Method of sampling the variable and calculating the value compared against the thresholds. If the value is **absolute**, the variable value is compared directly with the thresholds at the end of the sampling interval. If the value is **delta**, the variable value at the last sample is subtracted from the current value, and the difference is compared with the thresholds.

Field	Description
Startup Alarm	Alarm that is sent when this entry is first set. If the first sample is greater than or equal to the rising threshold, and startup alarm is equal to rising or rising-falling, then a single rising alarm is generated. If the first sample is less than or equal to the falling threshold, and startup alarm is equal falling or rising-falling, then a single falling alarm is generated.
Rising Threshold	Sampled statistic rising threshold. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated.
Falling Threshold	Sampled statistic falling threshold. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated.
Rising Event	Event index used when a rising threshold is crossed.
Falling Event	Event index used when a falling threshold is crossed.
Owner	Entity that configured this entry.

19.8 rmon event

Use the **rmon event** Global Configuration mode command to configure an event. Use the **no** form of this command to remove an event.

Syntax

rmon event *index* ***{none | log | trap | log-trap}*** ***[community*** *text]* ***[description*** *text]* ***[owner*** *name]*

no rmon event *index*

Parameters

- **index**—Specifies the event index. (Range: 1–65535)
- **none**— Specifies that no notification is generated by the device for this event.

- **log**—Specifies that a notification entry is generated in the log table by the device for this event.
- **trap**—Specifies that an SNMP trap is sent to one or more management stations by the device for this event.
- **log-trap**—Specifies that an entry is generated in the log table and an SNMP trap is sent to one or more management stations by the device for this event.
- **community text**—Specifies the SNMP community (password) used when an SNMP trap is sent. (Octet string; length: 0–127 characters)
- **description text**—Specifies a comment describing this event. (Length: 0–127 characters)
- **owner name**—Specifies the name of the person who configured this event. (Valid string)

Default Configuration

If the owner name is not specified, it defaults to an empty string.

Command Mode

Global Configuration mode

Example

The following example configures an event identified as index 10, for which the device generates a notification in the log table.

```
switchxxxxxx(config)# rmon event 10 log
```

19.9 show rmon events

Use the **show rmon events** EXEC mode command to display the RMON event table.

Syntax

show rmon events

Command Mode

EXEC mode

Example

The following example displays the RMON event table.

```
switchxxxxxx# show rmon events
Index   Description    Type     Community   Owner     Last time sent
-----   -----------    ------   ---------   ------    ------------------
1       Errors         Log      router      CLI       Jan 18 2006 23:58:17
2       High           Log                  Manager   Jan 18 2006 23:59:48
        Broadcast      Trap
```

The following table describes significant fields shown in the display:

Field	Description
Index	Unique index that identifies this event.
Description	Comment describing this event.
Type	Type of notification that the device generates about this event. Can have the following values: **none**, **log**, **trap**, **log-trap**. In the case of log, an entry is made in the log table for each event. In the case of trap, an SNMP trap is sent to one or more management stations.
Community	If an SNMP trap is to be sent, it is sent with the SNMP community string specified by this octet string.
Owner	The entity that configured this event.
Last time sent	The time this entry last generated an event. If this entry has not generated any events, this value is zero.

19.10 show rmon log

Use the **show rmon log** EXEC mode command to display the RMON log table.

Syntax

show rmon log [*event*]

Parameters

event—Specifies the event index. (Range: 0–65535)

Command Mode

EXEC mode

Example

The following example displays event 1 in the RMON log table.

```
switchxxxxxx# show rmon log 1

Maximum table size: 500 (800 after reset)
Event         Description                 Time
-----         -------------          -------------------
1             MIB Var.:              Jan 18 2006 23:48:19
              1.3.6.1.2.1.2.2.1.10.
              53, Delta, Rising,
              Actual Val: 800,
              Thres.Set: 100,
              Interval (sec):1
```

19.11 rmon table-size

Use the **rmon table-size** Global Configuration mode command to configure the maximum size of RMON tables. Use the no form of this command to return to the default size.

Syntax

rmon table-size *{**history** entries* | *__log__ entries}*

no rmon table-size *{**history** | **log**}*

Parameters

- **history** *entries*—Specifies the maximum number of history table entries. (Range: 20–270)
- **log** *entries*—Specifies the maximum number of log table entries. (Range: 20–100)

Default Configuration

The default history table size is 270 entries.

The default log table size is 200 entries.

Command Mode

Global Configuration mode

User Guidelines

The configured table size takes effect after the device is rebooted.

Example

The following example configures the maximum size of RMON history tables to 100 entries.

```
switchxxxxxx(config)# rmon table-size history 100
```

20 802.1x Commands

20.1 aaa authentication dot1x

Use the **aaa authentication dot1x** Global Configuration mode command to specify how ports are authenticated when 802.1x is enabled. You can select either authentication by a RADIUS server, no authentication, or both methods. Use the **no** form of this command to restore the default configuration.

Syntax

aaa authentication dot1x default *method1* [*method2*]

no aaa authentication dot1x default

Parameters

method1 [method2]—Specify at least one method from the following:

- **radius** - Uses the list of all RADIUS servers for authentication
- **none** - Uses no authentication

Default Configuration

The default method is RADIUS.

Command Mode

Global Configuration mode

User Guidelines

You can select either authentication by a RADIUS server, no authentication (**none**), or both methods.

If you require that authentication succeeds even if the RADIUS server is not found or returns an error, specify **none** as the final method in the command line.

Example

The following example sets the 802.1X authentication mode to RADIUS server authentication. If no response is received, no authentication is performed.

```
switchxxxxxx(config)# aaa authentication dot1x default radius none
```

20.2 dot1x system-auth-control

Use the **dot1x system-auth-control** Global Configuration mode command to enable 802.1x globally. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x system-auth-control

no dot1x system-auth-control

Parameters

N/A

Default Configuration

Disabled.

Command Mode

Global Configuration mode

Example

The following example enables 802.1x globally.

```
switchxxxxxx(config)# dot1x system-auth-control
```

20.3 dot1x port-control

Use the **dot1x port-control** Interface Configuration (Ethernet) mode command to enable manual control of the port authorization state. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x port-control *{auto | force-authorized | force-unauthorized}[time-range time-range-name]*

no dot1x port-control

Parameters

- **auto**—Enables 802.1x authentication on the port and causes it to transition to the authorized or unauthorized state, based on the 802.1x authentication exchange between the device and the client.
- **force-authorized**—Disables 802.1x authentication on the interface and causes the port to transition to the authorized state without any authentication exchange required. The port resends and receives normal traffic without 802.1x-based client authentication.
- **force-unauthorized**—Denies all access through this port by forcing it to transition to the unauthorized state and ignoring all attempts by the client to authenticate. The device cannot provide authentication services to the client through this port.
- **time-range** time-range-name—Specifies a time range. When the Time Range is not in effect, the port state is Unauthorized. (Range: 1–32 characters)

Default Configuration

The port is in the force-authorized state.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

It is recommended to disable spanning tree or to enable spanning-tree PortFast mode on 802.1x edge ports (ports in **auto** state that are connected to end stations), in order to proceed to the forwarding state immediately after successful authentication.

Example

The following example sets 802.1x authentication on `gi15` to auto mode.

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# dot1x port-control auto
```

20.4 dot1x timeout reauth-period

Use the **dot1x timeout reauth-period** Interface Configuration mode command to set the number of seconds between re-authentication attempts. Use the **no** form of this command to return to the default setting.

Syntax

dot1x timeout reauth-period *seconds*

no dot1x timeout reauth-period

Parameters

reauth-period *seconds*—Number of seconds between re-authentication attempts. (Range: 300-4294967295)

Default Configuration

3600

Command Mode

Interface Configuration (Ethernet) mode

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# dot1x timeout reauth-period 5000
```

20.5 dot1x re-authenticate

The **dot1x re-authenticate** Privileged EXEC mode command manually initiates re-authentication of all 802.1x-enabled ports or the specified 802.1x-enabled port.

Syntax

dot1x re-authenticate *[interface-id]*

Parameters

interface-id—Specifies an Ethernet port ID.

Default Configuration

If no port is specified, command is applied to all ports.

Command Mode

Privileged EXEC mode

Example

The following command manually initiates re-authentication of 802.1x-enabled `gi15`.

```
switchxxxxxx# dot1x re-authenticate gi15
```

20.6 dot1x timeout quiet-period

Use the **dot1x timeout quiet-period** Interface Configuration (Ethernet) mode command to set the time interval that the device remains in a quiet state following a failed authentication exchange (for example, the client provided an invalid password). Use the **no** form of this command to restore the default configuration.

Syntax

dot1x timeout quiet-period *seconds*

no dot1x timeout quiet-period

Parameters

seconds—Specifies the time interval in seconds that the device remains in a quiet state following a failed authentication exchange with the client. (Range: 0–65535 seconds)

Default Configuration

The default quiet period is 60 seconds.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

During the quiet period, the device does not accept or initiate authentication requests.

The default value of this command should only be changed to adjust to unusual circumstances, such as unreliable links or specific behavioral problems with certain clients and authentication servers.

To provide faster response time to the user, a smaller number than the default value should be entered.

Example

The following example sets the time interval that the device remains in the quiet state following a failed authentication exchange to 10 seconds.

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# dot1x timeout quiet-period 10
```

20.7 dot1x timeout tx-period

Use the **dot1x timeout tx-period** Interface Configuration (Ethernet) mode command to set the time interval during which the device waits for a response to an Extensible Authentication Protocol (EAP) request/identity frame from the client before resending the request. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x timeout tx-period *seconds*

no dot1x timeout tx-period

Parameters

seconds—Specifies the time interval in seconds during which the device waits for a response to an EAP-request/identity frame from the client before resending the request. (Range: 30–65535 seconds)

Default Configuration

The default timeout period is 30 seconds.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The default value of this command should be changed only to adjust to unusual circumstances, such as unreliable links or specific behavioral problems with certain clients and authentication servers.

Example

The following command sets the time interval during which the device waits for a response to an EAP request/identity frame to 60 seconds.

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# dot1x timeout tx-period 60
```

20.8 dot1x max-req

Use the **dot1x max-req** Interface Configuration mode command to set the maximum number of times that the device sends an Extensible Authentication Protocol (EAP) request/identity frame (assuming that no response is received) to the client before restarting the authentication process. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x max-req *count*

no dot1x max-req

Parameters

max-req *count*—Specifies the maximum number of times that the device sends an EAP request/identity frame before restarting the authentication process. (Range: 1–10)

Default Configuration

The default maximum number of attempts is 2.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The default value of this command should be changed only to adjust to unusual circumstances, such as unreliable links or specific behavioral problems with certain clients and authentication servers.

Example

The following example sets the maximum number of times that the device sends an EAP request/identity frame to 6

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# dot1x max-req 6
```

20.9 dot1x timeout supp-timeout

Use the **dot1x timeout supp-timeout** Interface Configuration (Ethernet) mode command to set the time interval during which the device waits for a response to an Extensible Authentication Protocol (EAP) request frame from the client before resending the request. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x timeout supp-timeout *seconds*

no dot1x timeout supp-timeout

Parameters

supp-timeout *seconds*—Specifies the time interval in seconds during which the device waits for a response to an EAP request frame from the client before resending the request. (Range: 1–65535 seconds)

Default Configuration

The default timeout period is 30 seconds.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The default value of this command should be changed only to adjust to unusual circumstances, such as unreliable links or specific behavioral problems with certain clients and authentication servers.

Example

The following example sets the time interval during which the device waits for a response to an EAP request frame from the client before resending the request to 3600 seconds.

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# dot1x timeout supp-timeout 3600
```

20.10 dot1x timeout server-timeout

Use the **dot1x timeout server-timeout** Interface Configuration (Ethernet) mode command to set the time interval during which the device waits for a response from the authentication server. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x timeout server-timeout *seconds*

no dot1x timeout server-timeout

Parameters

server-timeout *seconds*—Specifies the time interval in seconds during which the device waits for a response from the authentication server. (Range: 1–65535 seconds)

Default Configuration

The default timeout period is 30 seconds.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The actual timeout period can be determined by comparing the value specified by the **dot1x timeout server-timeout** command to the result of multiplying the number of retries specified by the radius-server retransmit command by the timeout period specified by the radius-server retransmit command, and selecting the lower of the two values.

Example

The following example sets the time interval between retransmission of packets to the authentication server to 3600 seconds.

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# dot1x timeout server-timeout 3600
```

20.11 show dot1x

Use the **show dot1x** Privileged EXEC mode command to display the 802.1x device or specified interface status.

Syntax

show dot1x *[**interface** interface-id]*

Parameters

interface-id—Specify an Ethernet port ID.

Default Configuration

Display for all ports.

Command Mode

Privileged EXEC mode

Examples

Example 1 - The following example displays the status of a single 802.1x-enabled Ethernet ports.

```
switchxxxxxx# show dot1x interface gi3
802.1x is enabled.
Port        Admin         Oper            Reauth     Reauth   Username
            Mode          Mode            Control    Period
----        ----------    ------------    -------    ------   --------
gi3         Auto          Unauthorized    Ena        3600     Clark
Time-range:               work-hours (Inactive now)
Quiet period:             60 Seconds
Tx period:                30 Seconds
Max req:                  2
Supplicant timeout:       30 Seconds
Server timeout:                           30 Seconds
Session Time (HH:MM:SS):                  08:19:17
MAC Address:                              00:08:78:32:98:78
Authentication Method:                    Remote
Termination Cause:                        Supplicant logoff
Authenticator State Machine
State:                                    HELD
Backend State Machine
State:                                    IDLE
Authentication success:                   9
Authentication fails:                     1
```

Example 2 - The following example displays the status of all 802.1x-enabled Ethernet ports.

```
switchxxxxxx# show dot1x
802.1x is enabled
```

```
Port       Admin        Oper           Reauth    Reauth   Username
           Mode         Mode           Control   Period
----       ----------   ------------   -------   ------   --------
gi1        Auto         Authorized     Ena       3600     Bob
gi2        Auto         Authorized     Ena       3600     John
gi3        Auto         Unauthorized   Ena       3600     Clark
gi4        Force-auth   Authorized     Dis       3600     n/a
gi5        Force-auth   Unauthorized   Dis       3600     n/a
* Port is down or not present.
```

The following table describes the significant fields shown in the display.

Field	Description
Port	The port number.
Admin mode	The port administration (configured) mode. Possible values: Force-auth, Force-unauth, Auto.
Oper mode	The port operational (actual) mode. Possible values: Authorized, Unauthorized or Down.
Reauth Control	Reauthentication control.
Reauth Period	Reauthentication period.
Username	Username representing the supplicant identity. This field shows the username if the port control is auto. If the port is Authorized, it displays the username of the current user. If the port is Unauthorized, it displays the last user authenticated successfully.
Quiet period	Number of seconds that the device remains in the quiet state following a failed authentication exchange (for example, the client provided an invalid password).
Tx period	Number of seconds that the device waits for a response to an Extensible Authentication Protocol (EAP) request/identity frame from the client before resending the request.
Max req	Maximum number of times that the device sends an EAP request frame (assuming that no response is received) to the client before restarting the authentication process.
Supplicant timeout	Number of seconds that the device waits for a response to an EAP-request frame from the client before resending the request.

Field	Description
Server timeout	Number of seconds that the device waits for a response from the authentication server before resending the request.
Session Time	Amount of time (HH:MM:SS) that the user is logged in.
MAC address	Supplicant MAC address.
Authentication Method	Authentication method used to establish the session.
Termination Cause	Reason for the session termination.
State	Current value of the Authenticator PAE state machine and of the Backend state machine.
Authentication success	Number of times the state machine received a Success message from the Authentication Server.
Authentication fails	Number of times the state machine received a Failure message from the Authentication Server.

20.12 show dot1x users

Use the **show dot1x users** Privileged EXEC mode command to display active 802.1x authenticated users for the device.

Syntax

show dot1x users *[**username** username]*

Parameters

username—Specifies the supplicant username (Length: 1–160 characters)

Default Configuration

Display all users.

Command Mode

Privileged EXEC mode

Example

The following example displays 802.1x user with supplicant username Bob.

```
switchxxxxxx# show dot1x users username Bob
Port    Username    Session       Auth      MAC            VLAN
                    Time          Method    Address
--------- ------------------------------  -----------      ----
gi1     Bob         1d 09:07:38   Remote    0008.3b79.8787    3
```

20.13 show dot1x statistics

Use the **show dot1x statistics** Privileged EXEC mode command to display 802.1x statistics for the specified port.

Syntax

show dot1x statistics interface *interface-id*

Parameters

interface-id—Specifies an Ethernet port ID.

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays 802.1x statistics for `gi1`.

```
switchxxxxxx# show dot1x statistics interface gi1
EapolFramesRx: 11
EapolFramesTx: 12
EapolStartFramesRx: 1
EapolLogoffFramesRx: 1
EapolRespIdFramesRx: 3
```

```
EapolRespFramesRx: 6

EapolReqIdFramesTx: 3

EapolReqFramesTx: 6

InvalidEapolFramesRx: 0

EapLengthErrorFramesRx: 0

LastEapolFrameVersion: 1

LastEapolFrameSource: 00:08:78:32:98:78
```

The following table describes the significant fields shown in the display:

Field	Description
EapolFramesRx	Number of valid EAPOL frames of any type that have been received by this Authenticator.
EapolFramesTx	Number of EAPOL frames of any type that have been transmitted by this Authenticator.
EapolStartFramesRx	Number of EAPOL Start frames that have been received by this Authenticator.
EapolLogoffFramesRx	Number of EAPOL Logoff frames that have been received by this Authenticator.
EapolRespIdFramesRx	Number of EAP Resp/Id frames that have been received by this Authenticator.
EapolRespFramesRx	Number of valid EAP Response frames (other than Resp/Id frames) that have been received by this Authenticator.
EapolReqIdFramesTx	Number of EAP Req/Id frames that have been transmitted by this Authenticator.
EapolReqFramesTx	Number of EAP Request frames (other than Req/Id frames) that have been transmitted by this Authenticator.
InvalidEapolFramesRx	Number of EAPOL frames that have been received by this Authenticator for which the frame type is not recognized.

Field	Description
EapLengthErrorFramesRx	Number of EAPOL frames that have been received by this Authenticator in which the Packet Body Length field is invalid.
LastEapolFrameVersion	Protocol version number carried in the most recently received EAPOL frame.
LastEapolFrameSource	Source MAC address carried in the most recently received EAPOL frame.

20.14 clear dot1x statistics

Use the **clear dot1x statistics** Privileged EXEC mode command to clear 802.1x statistics.

Syntax

clear dot1x statistics [i*nterface-id*]

Parameters

interface-id—Specify an Ethernet port ID.

Default Configuration

Statistics on all ports are cleared.

Command Mode

Privileged EXEC

User Guidelines

The command clears the statistics displayed in the show dot1x statistics command

Example

```
switchxxxxxx# clear dot1x statistics
```

20.15 dot1x host-mode

Use the **dot1x host-mode** Interface Configuration mode command to allow a single host (client) or multiple hosts on an IEEE 802.1x-authorized port. Use the **no** form of this command to return to the default setting.

Syntax

dot1x host-mode *{multi-host | single-host | multi-sessions}*

Parameters

- **multi-host**—Enable multiple-hosts mode.
- **single-host**—Enable single-hosts mode.
- **multi-sessions**—Enable multiple-sessions mode.

Default Configuration

Default mode is multi-host.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

In multiple hosts mode only one of the attached hosts must be successfully authorized for all hosts to be granted network access. If the port becomes unauthorized, all attached clients are denied access to the network.

In multiple sessions mode each host must be successfully authorized in order to grant network access. Please note that packets are NOT encrypted, and after success full authentication filtering is based on the source MAC address only.

Port security on a port cannot be enabled in single-host mode and in multiple-sessions mode.

It is recommended to enable reauthentication when working in multiple-sessions mode in order to detect user logout for users that have not logged off.

In single host mode there is only one attached host and only this authenticated host can access the network.

Example

```
switchxxxxxx(config)# interface gi1
```

```
switchxxxxxx(config-if)# dot1x host-mode multi-host

switchxxxxxx(config-if)# dot1x host-mode single-host

switchxxxxxx(config-if)# dot1x host-mode multi-sessions
```

20.16 dot1x violation-mode

Use the **dot1x violation-mode** Interface Configuration (Ethernet) mode command to configure the action to be taken, when a station whose MAC address is not the supplicant MAC address, attempts to access the interface. Use the **no** form of this command to return to default.

Syntax

dot1x violation-mode *{**restrict** | **protect** | **shutdown**}* [**traps** *seconds*]

no dot1x violation-mode

Parameters

- **restrict**—Generates a trap when a station whose MAC address is not the supplicant MAC address, attempts to access the interface. The minimum time between the traps is 1 second. Those frames are forwarded but their source address are not learned.
- **protect**—Discard frames with source addresses not the supplicant address.
- **shutdown**—Discard frames with source addresses not the supplicant address and shutdown the port
- **trap** *seconds* - Send SNMP traps, and specifies the minimum time between consecutive traps. If seconds = 0 traps are disabled. If the parameter is not specified it defaults to 1 second for the restrict mode and 0 for the other modes.

Default Configuration

Protect

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The command is relevant only for single-host mode.

BPDU message whose MAC address is not the supplicant MAC address wouldn't be discarded in the protect mode.

BPDU message whose MAC address is not the supplicant MAC address would cause a shutdown in the shutdown mode.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# dot1x violation-mode protect
```

20.17 dot1x guest-vlan

Use the **dot1x guest-vlan** Interface Configuration (VLAN) mode command to define a guest VLAN. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x guest-vlan

no dot1x guest-vlan

Parameters

N/A

Default Configuration

No VLAN is defined as a guest VLAN.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Use the **dot1x guest-vlan enable** Interface Configuration mode command to enable unauthorized users on an interface to access the guest VLAN.

If the guest VLAN is defined and enabled, the port automatically joins the guest VLAN when the port is unauthorized and leaves it when the port becomes

authorized. To be able to join or leave the guest VLAN, the port should not be a static member of the guest VLAN.

Example

The following example defines VLAN 2 as a guest VLAN.

```
switchxxxxxx(config)# interface vlan 2

switchxxxxxx(config-if)# dot1x guest-vlan
```

20.18 dot1x guest-vlan timeout

Use the **dot1x guest-vlan timeout** Global Configuration mode command to set the time delay between enabling 802.1x (or port up) and adding a port to the guest VLAN. Use the **no** form of this command to restore the default configuration.

Syntax

dot1x guest-vlan timeout *timeout*

no dot1x guest-vlan timeout

Parameters

timeout—Specifies the time delay in seconds between enabling 802.1x (or port up) and adding the port to the guest VLAN. (Range: 30–180)

Default Configuration

The guest VLAN is applied immediately.

Command Mode

Global Configuration mode

User Guidelines

This command is relevant if the guest VLAN is enabled on the port. Configuring the timeout adds delay from enabling 802.1X (or port up) to the time the device adds the port to the guest VLAN.

Example

The following example sets the delay between enabling 802.1x and adding a port to a guest VLAN to 60 seconds.

```
switchxxxxxx(config)# dot1x guest-vlan timeout 60
```

20.19 dot1x guest-vlan enable

Use the **dot1x guest-vlan enable** Interface Configuration (Ethernet) mode command to enable unauthorized users on the interface access to the guest VLAN. Use the **no** form of this command to disable access.

Syntax

dot1x guest-vlan enable

no dot1x guest-vlan enable

Parameters

N/A

Default Configuration

The default configuration is disabled.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

A device can have only one global guest VLAN. The guest VLAN is defined using the dot1x guest-vlan Interface Configuration mode command.

Example

The following example enables unauthorized users on `gi1` to access the guest VLAN.

```
switchxxxxxx(config)# interface gi15
switchxxxxxx(config-if)# dot1x guest-vlan enable
```

20.20 dot1x mac-authentication

Use the **dot1x mac-authentication** Interface Configuration (Ethernet) mode command to enable authentication based on the station's MAC address. Use the **no** form of this command to disable this feature.

Syntax

dot1x mac-authentication {*mac-only*| *mac-and-802.1x*}

no dot1x mac-authentication

Parameters

- **mac-only**—Enables authentication based on the station's MAC address only. 802.1X frames are ignored.
- **mac-and-802.1x**—Enables 802.1X authentication and MAC address authentication on the interface.

Default Configuration

Authentication based on the station's MAC address is disabled.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The guest VLAN must be enabled when MAC authentication is enabled.

Static MAC addresses cannot be authorized. Do not change an authenticated MAC address to a static address.

It is not recommended to delete authenticated MAC addresses.

Reauthentication must be enabled when working in this mode.

Example

The following example enables authentication based on the station's MAC address on `gi1`.

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# dot1x mac-authentication mac-only
```

20.21 show dot1x advanced

Use the **show dot1x advanced** Privileged EXEC mode command to display 802.1x advanced features for the device or specified interface.

Syntax

show dot1x advanced *[interface-id]*

Parameters

interface-id—Specify an Ethernet port ID.

Command Mode

Privileged EXEC mode

Example

The following example displays 802.1x advanced features for the device.

```
switchxxxxxx# show dot1x advanced
Guest VLAN: 3978
Guest VLAN Timeout:
Unauthenticated VLANs: 91, 92
Interface Multiple Guest   MAC                        Hosts    VLAN
Authentication  ------- ---------- ------ ---------------- gi1   Disabled
Enabled MAC-and-802.1X  gi2   Enabled  Disabled Disabled
```

```
switchxxxxxx# show dot1x advanced gi1
Interface Multiple Guest   MAC                         Hosts    VLAN
Authentication
----------------- ----------------------  gi1   Disabled Enabled
MAC-and-802.1X    Legacy-Supp mode is disabled
Policy assignment resource err handling: Accept
Single host parameters
Violation action: Discard
Trap: Enabledx
Status: Single-host locked
Violations since last trap: 9
```

21 Ethernet Configuration Commands

21.1 interface

Use the **interface** Global Configuration mode command to enter Interface configuration mode in order to configure an interface.

Syntax

interface *interface-id*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, Port-channel, VLAN, range, IP interface or tunnel.

Default Configuration

N/A

Command Mode

Interface Configuration (Ethernet, Port-channel, VLAN, range, IP interface or tunnel) mode

Examples

Example 1 - For Gigabit Ethernet ports:

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)#
```

Example 2 - For Fast Ethernet ports:

```
switchxxxxxx(config)# interface fa1

switchxxxxxx(config-if)#
```

Example 3 - For port channels (LAGs):

```
switchxxxxxx(config)# interface po1

switchxxxxxx(config-if)#
```

21.2 interface range

Use the **interface range** command to execute a command on multiple ports at the same time.

Syntax

interface range *interface-id-list*

Parameters

interface-id-list—Specify list of interface IDs. The interface ID can be one of the following types: Ethernet port, VLAN, or Port-channel

Default Configuration

N/A

Command Mode

Interface Configuration (Ethernet, Port-channel, or VLAN) mode

User Guidelines

Commands under the interface range context are executed independently on each interface in the range: If the command returns an error on one of the interfaces, it does not stop the execution of the command on other interfaces.

Example

```
switchxxxxxx(config)# interface range gi1-20

switchxxxxxx(config-if-range)#
```

21.3 shutdown

Use the **shutdown** Interface Configuration (Ethernet, Port-channel) mode command to disable an interface. Use the **no** form of this command to restart a disabled interface.

Syntax

shutdown

no shutdown

Parameters

N/A

Default Configuration

The interface is enabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

Example 1 - The following example disables `gi5` operations.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# shutdown
switchxxxxxx(config-if)#
```

Example 2 - The following example restarts the disabled Ethernet port.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# no shutdown
switchxxxxxx(config-if)
```

21.4 description

Use the **description** Interface Configuration (Ethernet, Port-channel) mode command to add a description to an interface. Use the **no** form of this command to remove the description.

Syntax

description *string*

no description

Parameters

string—Specifies a comment or a description of the port to assist the user. (Length: 1–64 characters).

Default Configuration

The interface does not have a description.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example adds the description 'SW#3' to `gi5`.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# description SW#3
```

21.5 speed

Use the **speed** Interface Configuration (Ethernet, Port-channel) mode command to configure the speed of a given Ethernet interface when not using auto-negotiation. Use the **no** form of this command to restore the default configuration.

Syntax

speed *{10 / 100 / 1000}*

no speed

Parameters

- **10**—Forces10 Mbps operation.
- **100**—Forces 100 Mbps operation.
- **1000**—Forces 1000 Mbps operation.

Default Configuration

The port operates at its maximum speed capability.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

The **no speed** command in a port-channel context returns each port in the port-channel to its maximum capability.

Example

The following example configures the speed of `gi5` to 100 Mbps operation.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# speed 100
```

21.6 duplex

Use the **duplex** Interface Configuration (Ethernet, Port-channel) mode command to configure the full/half duplex operation of a given Ethernet interface when not using auto-negotiation. Use the **no** form of this command to restore the default configuration.

Syntax

duplex *{half | full}*

no duplex

Parameters

- **half**—Forces half-duplex operation.
- **full**—Forces full-duplex operation.

Default Configuration

The interface operates in full duplex mode.

Command Mode

Interface Configuration (Port-channel) mode

Example

The following example configures gi5 to operate in full duplex mode.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# duplex full
```

21.7 negotiation

Use the **negotiation** Interface Configuration (Ethernet, Port-channel) mode command to enable auto-negotiation operation for the speed and duplex parameters of a given interface. Use the **no** form of this command to disable auto-negotiation.

Syntax

negotiation [*capability* [*capability2*... *capability5*]]

no negotiation

Parameters

capability—Specifies the capabilities to advertise. (Possible values: 10h, 10f, 100h,100f, 1000f).

- **10h** - Advertise 10 half-duplex
- **10f** - Advertise 10 full-duplex
- **100h** - Advertise 100 half-duplex
- **100f** - Advertise 100 full-duplex
- **1000f** - Advertise 1000 full-duplex

Default Configuration

If capability is unspecified, defaults to list of all the capabilities of the port.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example enables auto-negotiation on gi5.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# negotiation
```

21.8 flowcontrol

Use the **flowcontrol** Interface Configuration (Ethernet, Port-channel) mode command to configure the flow control on a given interface. Use the **no** form of this command to disable flow control.

Syntax

flowcontrol *{auto | on | off}*

no flowcontrol

Parameters

- **auto**—Specifies auto-negotiation of flow control.
- **on**—Enables flow control.
- **off**—Disables flow control.

Default Configuration

Flow control is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

Use the **negotiation** command to enable **flow control auto**.

Example

The following example enables flow control on port gi1

```
switchxxxxxx(config)# interface gi1
```

```
switchxxxxxx(config-if)# flowcontrol on
```

21.9 mdix

Use the **mdix** Interface Configuration (Ethernet) mode command to enable cable crossover on a given interface. Use the **no** form of this command to disable cable crossover.

Syntax

mdix *{on | auto}*

no mdix

Parameters

- **on**—Enables manual MDIX.
- **auto**—Enables automatic MDI/MDIX.

Default Configuration

The default setting is On.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example enables automatic crossover on port `gi5`.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# mdix auto
```

21.10 back-pressure

Use the **back-pressure** Interface Configuration (Ethernet) mode command to enable back pressure on a specific interface. Use the **no** form of this command to disable back pressure.

Syntax

back-pressure

no back-pressure

Default Configuration

Back pressure is disabled.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Back-pressure cannot be enabled when EEE is enabled.

Example

The following example enables back pressure on port `gi5`.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# back-pressure
```

21.11 port jumbo-frame

Use the **port jumbo-frame** Global Configuration mode command to enable jumbo frames on the device. Use the **no** form of this command to disable jumbo frames.

Syntax

port jumbo-frame

no port jumbo-frame

Default Configuration

Jumbo frames are disabled on the device.

Command Mode

Global Configuration mode

User Guidelines

This command takes effect only after resetting the device.

Example

The following example enables jumbo frames on the device.

```
switchxxxxxx(config)# port jumbo-frame
```

21.12 clear counters

Use the **clear counters** EXEC mode command to clear counters on all or on a specific interface.

Syntax

clear counters *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

All counters are cleared.

Command Mode

EXEC mode

Example

The following example clears the statistics counters for `gi5`.

```
switchxxxxxx# clear counters gi5.
```

21.13 set interface active

Use the **set interface active** EXEC mode command to reactivate an interface that was shut down.

Syntax

set interface active *{interface-id}*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

EXEC mode

User Guidelines

This command is used to activate interfaces that were configured to be active, but were shut down by the system.

Example

The following example reactivates `gi 1`.

```
switchxxxxxx# set interface active gi1
```

21.14 show interfaces configuration

Use the **show interfaces configuration** EXEC mode command to display the configuration for all configured interfaces or for a specific interface.

Syntax

show interfaces configuration *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display all

Command Mode

EXEC mode

Example

The following example displays the configuration of all configured interfaces:

```
switchxxxxxx# show interfaces configuration

                                          Flow      Admin  Back      Mdix
Port    Type       Duplex  Speed  Neg     control   State  Pressure  Mode
------ ---------- ------  -----  -------- -------  -----  --------  ----
gi1     1G-Copper Full    10000  Disabled Off      Up     Disabled  Off
gi2     1G-Copper Full    1000   Disabled Off      Up     Disabled  Off

                                  Flow      Admin
PO      Type    Speed  Neg        Control   State
------  ------ -----  --------   -------   -----
Po1                    Disabled   Off       Up
```

21.15 show interfaces status

Use the **show interfaces status** EXEC mode command to display the status of all interfaces or of a specific interface.

Syntax

show interfaces status *[interface-id]*

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

EXEC mode

Default Configuration

Display for all interfaces.

Example

The following example displays the status of all configured interfaces.

```
switchxxxxxx# show interfaces status

                                        Flow  Link   Back     Mdix
Port   Type      Duplex Speed Neg       ctrl  State  Pressure Mode
------ --------- ------ ----- -------- ----  ------ -------- --
gi1    1G-Copper Full   1000  Disabled Off   Up     Disabled Off
gi2    1G-Copper --     --    --       --    Down   --       --

                                        Flow     Link
PO     Type      Duplex Speed  Neg      control  State
-----  -------   ------ -----  -------- ----     ------
Po1    1G        Full   10000  Disabled Off     Up
```

21.16 show interfaces advertise

Use the **show interfaces advertise** EXEC mode command to display auto-negotiation advertisement information for all configured interfaces or for a specific interface.

Syntax

show interfaces advertise *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display for all interfaces.

Command Mode

EXEC mode

Examples

The following examples display auto-negotiation information.

```
switchxxxxxx# show interfaces advertise
Port       Type         Neg       Operational Link Advertisement
----       ---------    ------    ------------------------------
gi1        1G-Copper    Enable    1000f, 100f, 10f, 10h
gi2        1G-Copper    Enable    1000f
switchxxxxxx# show interfaces advertise gi1
Port:gi1
Type: 1G-Copper
Link state: Up
Auto Negotiation: enabled
                                   10h   10f   100h   100f   1000f
                                   ---   ---   ----   ----   -----
Admin Local link Advertisement     yes   yes   yes    yes    yes
Oper Local link Advertisement      yes   yes   yes    yes    yes
Remote Local link                  no    no    yes    yes    yes
Advertisement                      -     -     -      -      yes
Priority Resolution
switchxxxxxx# show interfaces advertise gi1
Port: gi1
Type: 1G-Copper
Link state: Up
Auto negotiation: disabled.
```

21.17 show interfaces description

Use the **show interfaces description** EXEC mode command to display the description for all configured interfaces or for a specific interface.

Syntax

show interfaces description *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display description for all interfaces.

Command Mode

EXEC mode

Example

The following example displays the description of all configured interfaces.

```
switchxxxxxx# show interfaces description
Port        Descriptions
gi1         ---------------------------------------------
gi2         Port that should be used for management only
gi3
gi4
PO          Description
----        -----------
Po1         Output
```

21.18 show interfaces counters

Use the **show interfaces counters** EXEC mode command to display traffic seen by all the physical interfaces or by a specific interface.

Syntax

show interfaces counters *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display counters for all interfaces.

Command Mode

EXEC mode

Example

The following example displays traffic seen by all the physical interfaces.

```
switchxxxxxx# show interfaces counters gi1

Port       InUcastPkts  InMcastPkts  InBcastPkts    InOctets
---------- ------------ ------------ ------------ ------------
gi1           0            0            0            0
Port       OutUcastPkts OutMcastPkts OutBcastPkts  OutOctets
---------- ------------ ------------ ------------ ------------
gi1           0            1            35          7051
Alignment Errors: 0
FCS Errors: 0
Single Collision Frames: 0
Multiple Collision Frames: 0
SQE Test Errors: 0
Deferred Transmissions: 0
Late Collisions: 0
Excessive Collisions: 0
Carrier Sense Errors: 0
Oversize Packets: 0
Internal MAC Rx Errors: 0
Symbol Errors: 0
Received Pause Frames: 0
Transmitted Pause Frames: 0
```

The following table describes the fields shown in the display.

Field	Description
InOctets	Number of received octets.
InUcastPkts	Number of received unicast packets.
InMcastPkts	Number of received multicast packets.
InBcastPkts	Number of received broadcast packets.
OutOctets	Number of transmitted octets.
OutUcastPkts	Number of transmitted unicast packets.
OutMcastPkts	Nmber of transmitted multicast packets.
OutBcastPkts	Number of transmitted broadcast packets.
FCS Errors	Number of frames received that are an integral number of octets in length but do not pass the FCS check.
Single Collision Frames	Number of frames that are involved in a single collision, and are subsequently transmitted successfully.
Multiple Collision Frames	Number of frames that are involved in more than one collision and are subsequently transmitted successfully.
SQE Test Errors	Number of times that the SQE TEST ERROR is received. The SQE TEST ERROR is set in accordance with the rules for verification of the SQE detection mechanism in the PLS Carrier Sense Function as described in IEEE Std. 802.3, 2000 Edition, section 7.2.4.6.
Deferred Transmissions	Number of frames for which the first transmission attempt is delayed because the medium is busy.
Late Collisions	Number of times that a collision is detected later than one slotTime into the transmission of a packet.
Excessive Collisions	Number of frames for which transmission fails due to excessive collisions.
Oversize Packets	Number of frames received that exceed the maximum permitted frame size.
Internal MAC Rx Errors	Number of frames for which reception fails due to an internal MAC sublayer receive error.

Field	Description
Received Pause Frames	Number of MAC Control frames received with an opcode indicating the PAUSE operation.
Transmitted Pause Frames	Number of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation.

21.19 storm-control broadcast enable

Use the **storm-control broadcast enable** Interface Configuration mode command to enable storm control on a port. Use the **no** form of this command to disable storm control.

Syntax

storm-control broadcast enable

no storm-control broadcast enable

Parameters

This command has no arguments or keywords.

Default Configuration

Disabled

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

Use the storm-control include-multicast Interface Configuration command to count Multicast packets and optionally unknown Unicast packets in the storm control calculation.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# storm-control broadcast enable
```

21.20 storm-control broadcast level kbps

Use the **storm-control broadcast level** Interface Configuration mode command to configure the maximum rate of broadcast on a port. Use the **no** form of this command to return to default.

Syntax

storm-control broadcast level kbps *kbps*

no storm-control broadcast level

Parameters

kbps—Maximum of kilo bits per second of Broadcast traffic on a port. (Range 70-1000000)

Default Configuration

1000

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

Use the **storm-control broadcast enable** Interface Configuration command to enable storm control.

The calculated rate includes the 20 bytes of Ethernet framing overhead (preamble+SFD+IPG).

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# storm-control broadcast level kbps 12345
```

21.21 storm-control broadcast level

Use the **storm-control broadcast level** Interface Configuration mode command to configure the maximum rate of broadcast. Use the **no** form of this command to return to default.

Syntax

storm-control broadcast level {*level*| **kbps** *kbps*}

no storm-control broadcast level

Parameters

level - Suppression level in percentage. Block the flooding of storm packets when the value specified for level is reached. (Range 1 -100)

kbps—Maximum of kilobits per second of broadcast traffic on a port. (Range 70–10000000)

Default Configuration

level - 10%

kbps—10% of port speed in Kbps

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

Use the storm-control broadcast enable Interface Configuration command to enable storm control.

The calculated rate includes the 20 bytes of Ethernet framing overhead (preamble+SFD+IPG).

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# storm-control broadcast level 50 kbps 12345
```

21.22 storm-control include-multicast

Use the **storm-control include-multicast** Interface Configuration mode command to count Multicast packets in a Broadcast storm control. Use the **no** form of this command to disable counting of Multicast packets in the Broadcast storm control.

Syntax

storm-control include-multicast *[unknown-unicast]*

no storm-control include-multicast

Parameters

unknown-unicast—Specifies also the count of unknown unicast packets.

Default Configuration

Disabled

Command Mode

Interface Configuration mode (Ethernet)

Example

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# storm-control include-multicast
```

21.23 show storm-control

Use the **show storm-control** EXEC mode command to display the configuration of storm control for a port.

Syntax

show storm-control *[interface-id]*

Parameters

interface-id—Specifies the Ethernet port.

Default Configuration

Display for all interfaces.

Command Mode

EXEC mode

Example

```
switchxxxxxx# show storm-control

Port       State     Admin Rate     Oper Rate    Included
                                    [Kb/Sec]

--------   --------  -------------  ----------  ------------

gi1        Enabled   12345  Kb/Sec      12345   Broadcast,
                                               Multicast,
                                               Unknown Unicast

gi2        Disabled  100000 Kb/Sec      100000  Broadcast

gi3        Enabled   10%                000000  Broadcast
```

22 PHY Diagnostics Commands

22.1 show cable-diagnostics cable-length

Use the **show cable-diagnostics cable-length** EXEC mode command to display the estimated copper cable length attached to all ports or to a specific port.

Syntax

show cable-diagnostics cable-length [***interface*** *interface-id*]

Parameters

interface-id—Specifies an Ethernet port ID.

Default Configuration

All ports are displayed.

Command Mode

EXEC mode

User Guidelines

The port must be active and working at 100 M or 1000 M.

Example

The following example displays the estimated copper cable length attached to all ports.

```
switchxxxxxx# show cable-diagnostics cable-length
Port           Length [meters]
----           -----------------
gi1            < 50
gi2            Copper not active
gi3            110-140
gi4            Fiber
```

22.2 show fiber-ports optical-transceiver

Use the **show fiber-ports optical-transceiver** EXEC mode command to display the optical transceiver diagnostics.

Syntax

show fiber-ports optical-transceiver [***interface*** *interface-id*] [***detailed***]

Parameters

- **interface-id**—Specifies an Ethernet port ID.
- **detailed**—Displays detailed diagnostics.

Command Mode

EXEC mode

Example

The following examples display the optical transceiver diagnostics results.

```
switchxxxxxx# show fiber-ports optical-transceiver

   Port      Temp  Voltage Current  Output Input   LOS
                                    Power  Power

----------- ------ ------- -------  ------ -----   ---

   gi1       W       OK      OK     OK     OK      OK

   gi2       OK      OK      OK     E      OK      OK

 Temp          - Internally measured transceiver temperature

 Voltage       - Internally measured supply voltage

 Current       - Measured TX bias current

 Output Power - Measured TX output power in milliWatts

 Input Power  - Measured RX received power in milliWatts

 LOS           - Loss of signal

 N/A - Not Available, N/S - Not Supported,

 W - Warning, E - Error
```

```
switchxxxxxx# show fiber-ports optical-transceiver detailed
   Port      Temp  Voltage Current Output  Input   LOS
             [C]   [Volt]  [mA]    Power   Power
                                   [mWatt] [mWatt]
----------- ------ ------- ------- ------- ------- ---
  gi1     Copper
  gi6     Copper
  gi7      28    3.32    7.26    3.53    3.68   No
  gi8      29    3.33    6.50    3.53    3.71   No
 Temp         - Internally measured transceiver temperature
 Voltage      - Internally measured supply voltage
 Current      - Measured TX bias current
 Output Power - Measured TX output power in milliWatts
 Input Power  - Measured RX received power in milliWatts
 LOS          - Loss of signal
 N/A - Not Available, N/S - Not Supported, W - Warning, E - Error
```

23 Power over Ethernet (PoE) Commands

23.1 power inline

Use the **power inline** Interface Configuration mode command to configure the inline power administrative mode on an interface.

Syntax

power inline *{auto | never}*

Parameters

- **auto**—Turns on the device discovery protocol and applies power to the device.
- **never**—Turns off the device discovery protocol and stops supplying power to the device.

Default Configuration

The default configuration is set to auto.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example turns on the device discovery protocol on port 4.

```
switchxxxxxx(config)# interface gi4
switchxxxxxx(config-if)# power inline auto
```

23.2 power inline priority

Use the **power inline priority** Interface Configuration (Ethernet) mode command to configure the interface inline power management priority. Use the **no** form of this command to restore the default configuration.

Syntax

power inline priority *{critical | high | low}*

no power inline priority

Parameters

- **critical**—Specifies that the powered device operation is critical.
- **high**—Specifies that the powered device operation is high priority.
- **low**—Specifies that the powered device operation is low priority.

Default Configuration

The default configuration is set to low priority.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example sets the inline power management priority of `gigabitethernet` port 4 to High.

```
switchxxxxxx(config)# interface gi4
switchxxxxxx(config-if)# power inline priority high
```

23.3 power inline usage-threshold

Use the **power inline usage-threshold** Global Configuration mode command to configure the threshold for initiating inline power usage alarms. Use the **no** form of this command to restore the default configuration.

Syntax

power inline usage-threshold *percent*

no power inline usage-threshold

Parameters

percent—Specifies the threshold in percent to compare to the measured power. (Range: 1–99)

Default Configuration

The default threshold is 95 percent.

Command Mode

Global Configuration mode

Example

The following example configures the threshold for initiating inline power usage alarms to 90 percent.

```
switchxxxxxx(config)# power inline usage-threshold 90
```

23.4 power inline traps enable

Use the **power inline traps enable** Global Configuration mode command to enable inline power traps. Use the **no** form of this command to disable traps.

Syntax

power inline traps enable

no power inline traps enable

Default Configuration

Inline power traps are disabled.

Command Mode

Global Configuration mode

Example

The following example enables inline power traps.

```
switchxxxxxx(config)# power inline traps enable
```

23.5 power inline limit

Use the **power inline limit** Interface Configuration mode command to configure the power limit per port on an interface. Use the **no** form of the command to return to default.

Syntax

power inline limit *power*

no power inline limit

Parameters

power—States the port power consumption limit in Milliwatts (Range: 0-15400

Default Configuration

The default value is the maximum power allowed in the specific working mode: 15.4W.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example sets inline power on a port.

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# power inline limit 2222
```

23.6 power inline limit-mode

Use the **power inline limit-mode** Global Configuration mode command to set the power limit mode of the system. Use the **no** form of this command to return to default.

Syntax

power inline limit-mode *{class | port}*

no power inline limit-mode

Parameters

- **class**—The power limit of a port is based on the class of the PD (Power Device) as detected during the classification process
- **port**—The power limit of a port is fixed regardless of the class of the discovered PD.

Command Mode

Global Configuration mode

Example

The following example sets the power limit to class.

```
switchxxxxxx(config)# power inline limit-mode class
```

23.7 show power inline

Use the **show power inline** EXEC mode command to display information about the inline power for all interfaces or for a specific interface.

Syntax

show power inline [*interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID must be an Ethernet port.

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays information about the inline power for all ports (port power based).

```
switchxxxxxx(config)# show power inline

Port based power-limit mode

Unit  Power  Nominal    Consumed      Usage       Traps
             Power      Power         Threshold
---- ------- -------    -----------    ------     --------
 1     Off   1 Watts    0 Watts (0%)   95         Disable


Port    Powered Device        State      Status    Priority  Class
-----   --------------      -----------  --------  --------  -------
gi1     IP Phone Model A     Auto        On        High      Class0
gi2     Wireless AP Model A  Auto        On        Low       Class1
gi3                          Auto        Off       Low       N/A
```

Example

The following example displays information about the inline power for a specific port.

```
switchxxxxxx(config)# show power inline gi1


Port    Powered Device        State      Status    Priority  Class
-----   --------------      -----------  --------  --------  -------
gi1     IP Phone Model A     Auto         On       High      Class0
Power limit: 15 W
Power limit (for port power-limit mode): 15 W
```

The following table describes the fields shown in the display:

Field	Description
Power	Inline power sourcing equipment operational status.
Nominal Power	Inline power sourcing equipment nominal power in Watts.
Consumed Power	Measured usage power in Watts.
Usage Threshold	Usage threshold expressed in percent for comparing the measured power and initiating an alarm if threshold is exceeded.
Traps	Indicates if inline power traps are enabled.
Port	Ethernet port number.
Powered device	Description of the powered device type.
State	Indicates if the port is enabled to provide power. The possible values are Auto or Never.
Priority	Port inline power management priority. The possible values are Critical, High or Low.
Status	Power operational state. The possible values are On, Off, Test-Fail, Testing, Searching or Fault.
Class	Power consumption classification of the powered device.
Overload Counter	Counts the number of overload conditions detected.
Short Counter	Counts the number of short conditions detected.
Denied Counter	Counts the number of times power was denied.
Absent Counter	Counts the number of times power was removed because powered device dropout was detected.
Invalid Signature Counter	Counts the number of times an invalid signature of a powered device was detected.

```
Following is a list of port status values:

Port is off - Underload disconnect detected

Port is off - Overload detected

Port is off - Short detected

Port is off - Invalid PD resistor signature detected
```

```
Port is on - Valid PD resistor signature detected

Port is off - Power was denied

Port is on - Valid capacitor signature detected

Port is off - Backoff state has occurred

Port is off - Class error has occurred
```

23.8 show power inline consumption

Use the **show power inline consumption** EXEC mode command to display information about the inline power consumption for all interfaces or for a specific interface.

Syntax

show power inline consumption *[interface-id]*

Parameters

Interface-id—Specifies an interface ID. The interface ID must be an Ethernet port.

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays information about the inline power consumption.

```
switchxxxxxx# show power inline consumption
Port          Power Limit(W)    Power (W)    Voltage(V)   Current(mA)
----          --------------    ----------   ---------    ------------
gi1           15.4              4.115        50.8         81
gi2           15.4              4.157        50.7         82
gi3           15.4              4.021        50.9         79
```

24 EEE Commands

24.1 eee enable (global)

Use the **eee enable** Global Configuration command to enable the EEE mode globally. Use the **no** format of the command to disable the mode.

Syntax

eee enable

no eee enable

Default Configuration

EEE is enabled.

Command Mode

Global Configuration mode

User Guidelines

In order for EEE to work, the device at the other end of the link must also support EEE and have it enabled. In addition, for EEE to work properly, Auto-Negotaition must be enabled; however, if the port speed is negotiated as 1Giga, EEE always works regardless of the auto-negotiation status (meaning enable or disable).

If Auto-Negotiation is not enabled on the port and its speed is less than 1 Giga, the EEE Operational status is disabled.

Example

```
switchxxxxxx(conf)#eee enable
```

24.2 eee enable (interface)

Use the **eee enable** Interface Configuration command to enable the EEE mode on an Ethernet port. Use the **no** format of the command to disable the mode.

Syntax

eee enable

no eee enable

Parameters

N/A

Default Configuration

EEE is enabled.

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

If Auto-Negotiation is not enabled on the port and its speed is 1 Giga, the EEE Operational status is disabled.

Example

```
witchxxxxxx(conf)#interface gi1

witchxxxxxx(conf-if)#eee enable
```

24.3 eee lldp enable

Use the **eee lldp enable** Interface Configuration command to enable EEE support by LLDP on an Ethernet port. Use the **no** format of the command to disable the support.

Syntax

eee lldp enable

no eee lldp enable

Parameters

N/A

Default Configuration

Enabled

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

Enabling EEE LLDP advertisement enables devices to choose and change system wake-up times in order to get the optimal energy saving mode.

Example

```
witchxxxxxx(conf)#interface gi1

witchxxxxxx(conf-if)#eee lldp enable
```

24.4 show eee

Use the **show eee** EXEC command to display EEE information.

Syntax

show eee *[interface-id]*

Parameters

interface-id—Specify an interface ID. The interface ID must be an Ethernet port.

Defaults

N/A

Command Mode

EXEC

Examples

Example 1 - The following displays brief Information about all ports

```
switchxxxxxx>show eee

EEE globally enabled

EEE Administrate status is enabled on ports: gi1-6, gi7

EEE Operational status is enabled on ports: gi1, gi3-6, gi2, gi5
```

```
EEE LLDP Administrate status is enabled on ports: gi1-5

EEE LLDP Operational status is enabled on ports: gi1-5
```

Example 2 - The following is the information displayed when a port is in state not Present; no information is displayed if the port supports EEE.

```
switchxxxxxx> show eee gi10

Port Status: notPresent

EEE Administrate status: enabled

EEE LLDP Administrate status: enabled

EEE LLDP Administrate status: enabled
```

Example 3 - The following is the information displayed when the port is in status DOWN.

```
switchxxxxxx>show eee gi10

Port Status: DOWN

EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
      EEE Administrate status: enabled
    EEE LLDP Administrate status: enabled
```

Example 4 - The following is the information displayed when the port is in status UP and does not support EEE,

```
switchxxxxxx>show eee gi2

Port Status: UP

EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
 Current port speed: 1Gbps

EEE Administrate status: enabled

EEE LLDP Administrate status: enabled
```

Example 5 - The following is the information displayed when the neighbor does not support EEE.

```
switchxxxxxx>show eee gi5

Port Status: UP

EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
Current port speed: 1Gbps

EEE Remote status: disabled

EEE Administrate status: enabled

EEE Operational status: disabled (neighbor does not support)

EEE LLDP Administrate status: enabled

EEE LLDP Operational status: disabled
```

Example 6 - The following is the information displayed when EEE is disabled on the port.

```
Switch>show eee gi1

Port Status: UP

EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
Current port speed: 1Gbps

EEE Administrate status: disabled

EEE Operational status: disabled

EEE LLDP Administrate status: enabled

EEE LLDP Operational status: disabled
```

Example 7 - The following is the information displayed when EEE is running on the port, and EEE LLDP is disabled.

```
switchxxxxxx>show eee gi2

Port Status: UP

EEE capabilities:
```

```
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
Current port speed: 1Gbps
EEE Remote status: enabled
EEE Administrate status: enabled
EEE Operational status: enabled
EEE LLDP Administrate status: disabled
EEE LLDP Operational status: disabled
Resolved Tx Timer: 10usec
Local Tx Timer: 10 usec
Resolved Timer: 25 usec
Local Rx Timer: 20 usec
```

Example 8 - The following is the information displayed when EEE and EEE LLDP are running on the port.

```
switchxxxxxx>show eee gi3
Port Status: UP
EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
Current port speed: 1Gbps
EEE Remote status: enabled
EEE Administrate status: enabled
EEE Operational status: enabled
EEE LLDP Administrate status: enabled
EEE LLDP Operational status: enabled
Resolved Tx Timer: 10usec
Local Tx Timer: 10 usec
Remote Rx Timer: 5 usec
Resolved Timer: 25 usec
Local Rx Timer: 20 usec
```

```
Remote Tx Timer: 25 usec
```

Example 9 - The following is the information displayed when EEE is running on the port, EEE LLDP is enabled but not synchronized with remote link partner.

```
switchxxxxxx>show eee gi9

Port Status: up

EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
Current port speed: 1Gbps

EEE Remote status: enabled

EEE Administrate status: enabled

EEE Operational status: enabled

EEE LLDP Administrate status: enabled

EEE LLDP Operational status:  disabled

Resolved Tx Timer: 64

Local Tx Timer: 64

Resolved Rx Timer: 16

Local Rx Timer: 16
```

Example 10 - The following is the information displayed when EEE and EEE LLDP are running on the port.

```
switchxxxxxx>show eee gi3

Port Status: UP

EEE capabilities:
      Speed 10M: EEE not supported
      Speed 100M: EEE supported
      Speed 1G: EEE supported
Current port speed: 1Gbps

EEE Remote status: enabled

EEE Administrate status: enabled

EEE Operational status: enabled
```

```
EEE LLDP Administrate status: enabled

EEE LLDP Operational status: enabled

Resolved Tx Timer: 10usec

Local Tx Timer: 10 usec

Remote Rx Timer: 5 usec

Resolved Timer: 25 usec

Local Rx Timer: 20 usec

Remote Tx Timer: 25 usec
```

25 Green Ethernet

25.1 green-ethernet energy-detect (global)

Use the **green-ethernet energy-detect** Global Configuration mode command to enable Green-Ethernet Energy-Detect mode globally. Use the **no** form of this command to disabled it.

Syntax

green-ethernet energy-detect

no green-ethernet energy-detect

Parameters

N/A

Default Configuration

Enabled.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# green-ethernet energy-detect
```

25.2 green-ethernet energy-detect (interface)

Use the **green-ethernet energy-detect** Interface configuration mode command to enable green-ethernet Energy-Detect mode on a port. Use the no form of this command, to disable it on a port.

Syntax

green-ethernet energy-detect

no green-ethernet energy-detect

Parameters

N/A

Default Configuration

Enabled

Command Mode

Interface configuration mode (Ethernet)

User Guidelines

Energy-Detect can work only when the port is a copper port. When a port is enabled for auto selection, copper/fiber Energy-Detect cannot work.

It takes the PHY ~5 seconds to fall into sleep mode when the link is lost after normal operation.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# green-ethernet energy-detect
```

25.3 green-ethernet short-reach (global)

Use the **green-ethernet short-reach** Global Configuration mode command to enable green-ethernet short-reach mode globally. Use the **no** form of this command to disabled it.

Syntax

green-ethernet short-reach

no green-ethernet short-reach

Parameters

N/A

Default Configuration

Disabled.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# green-ethernet short-reach
```

25.4 green-ethernet short-reach (interface)

Use the **green-ethernet short-reach** Interface Configuration mode command to enable green-ethernet short-reach mode on a port. Use the **no** form of this command to disable it on a port.

Syntax

green-ethernet short-reach

no green-ethernet short-reach

Parameters

N/A

Default Configuration

Disabled.

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

When **Short-Reach** mode is enabled and is not forced, the VCT (Virtual Cable Tester) length check must be performed. The VCT length check can be performed only on a copper port operating at a speed of 1000 Mbps. If the media is not copper or the link speed is not 1000 Mbps, Short-Reach mode is not applied.

When the interface is set to enhanced mode, after the VCT length check has completed and set the power to low, an active monitoring for errors is done continuously. In the case of errors crossing a certain threshold, the PHY will be reverted to long reach.

Note that EEE cannot be enabled if the Short-Reach mode is enabled.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# green-ethernet short-reach
```

25.5 green-ethernet power-meter reset

Use the **green-ethernet power meter reset** Privileged EXEC mode command to reset the power save meter.

Syntax

green-ethernet power-meter reset

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode.

Example

```
switchxxxxxx(config)# green-ethernet power-meter reset
```

25.6 show green-ethernet

Use the **show green-ethernet** Privileged EXEC mode command to display green-ethernet configuration and information.

Syntax

show green-ethernet *[interface-id]*

Parameters

interface-id—Specifies an Ethernet port.

Default Configuration

When no port is specified, information for all ports is displayed.

Command Mode

Privileged EXEC mode

User Guidelines

The following describes the reasons for non-operation displayed by this command.

If there are a several reasons, then only the highest priority reason is displayed.

Energy-detect Non-operational Reasons		
Priority	Reason	Description
1	NP	Port is not present
2	LT	Link Type is not supported (fiber, auto media select)
3	LU	Port Link is up – NA

Short-Reach Non-operational Reasons		
Priority	Reason	Description
1	NP	Port is not present
2	LT	Link Type is not supported (fiber)
3	LS	Link Speed Is not Supported (100M,10M,10G)
4	LL	Link Length received from VCT Test exceed threshold
6	LD	Port Link is Down – NA

Example

```
switchxxxxxx# show green-ethernet

Energy-Detect mode: Enabled

Short-Reach mode: Disabled

Power Consumption: 76% (3.31W out of maximum 4.33W)

Cumulative Energy Saved: 33 [Watt*Hour]
```

```
Short-Reach cable length threshold: 50m

Port     Energy-Detect       Short-Reach           VCT Cable
      Admin Oper Reason   Admin Force Oper Reason   Length
----  ----- ---- -------  ----- ----- ---- -------  ------
gi1   on    on            off  off   off
gi2   on    off  LU        on   off   off           < 50
gi3   on    off  LU        off  off   off
```

26 Port Channel Commands

26.1 channel-group

Use the **channel-group** Interface Configuration (Ethernet) mode command to associate a port with a port-channel. Use the **no** form of this command to remove a port from a port-channel.

Syntax

channel-group *port-channel* ***mode*** *{**on** | **auto**}*

no channel-group

Parameters

- **port-channel**—Specifies the port channel number for the current port to join.
- **mode**—Specifies the mode of joining the port channel. The possible values are:
  - **on**—Forces the port to join a channel without an LACP operation.
  - **auto**—Forces the port to join a channel as a result of an LACP operation.

Default Configuration

The port is not assigned to a port-channel.

Command Mode

Interface Configuration (Ethernet) mode

Default mode is **on**.

Example

The following example forces port `gi1` to join port-channel 1 without an LACP operation.

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# channel-group 1 mode on
```

26.2 port-channel load-balance

Use the **port-channel load-balance** Global Configuration mode command to configure the load balancing policy of the port channeling. Use the **no** form of this command to reset to default.

Syntax

port-channel load-balance *{src-dst-mac| src-dst-mac-ip}*

no port-channel load-balance

Parameters

- **src-dst-mac**—Port channel load balancing is based on the source and destination MAC address.
- **src-dst-mac-ip**—Port channel load balancing is based on the source and destination of MAC and IP addresses.

Default Configuration

src-dst-mac is the default option.

Command Mode

Global Configuration mode

User Guidelines

In **src-dst-mac-ip-port** load balancing policy, fragmented packets might be reordered.

Example

```
switchxxxxxx(config)# port-channel load-balance src-dst-mac

switchxxxxxx(config)# port-channel load-balance src-dst-mac-ip
```

26.3 show interfaces port-channel

Use the **show interfaces port-channel** EXEC mode command to display port-channel information for all port channels or for a specific port channel.

Syntax

show interfaces port-channel *[interface-id]*

Parameters

interface-id—Specify an interface ID. The interface ID must be a Port Channel.

Command Mode

EXEC mode

Examples

Example 1 - The following example displays information on all port-channels.

```
switchxxxxxx# show interfaces port-channel
Load balancing: src-dst-mac.
Gathering information...
Channel  Ports
-------  -----
Po1      Active: gi1,Inactive: gi2-3
Po2      Active: gi5 Inactive: gi4
```

Example 2 - The following example displays information on port-channels containing port 1

```
switchxxxxxx# show interfaces switchport gi1
Gathering information...
Name: gi1
Switchport: enable
Administrative Mode: access
Operational Mode: down
Access Mode VLAN: 1
Access Multicast TV VLAN: none
Trunking Native Mode VLAN: 1
Trunking VLANs Enabled: 1
```

```
                        2-4094 (Inactive)
General PVID: 1
General VLANs Enabled: none
General Egress Tagged VLANs Enabled: none
General Forbidden VLANs: none
General Ingress Filtering: enabled
General Acceptable Frame Type: all
General GVRP status: disabled
Customer Mode VLAN: none
Private-vlan promiscuous-association primary VLAN: none
Private-vlan promiscuous-association Secondary VLANs Enabled: none
Private-vlan host-association primary VLAN: none
Private-vlan host-association Secondary VLAN Enabled: none
DVA: disable
```

27 Address Table Commands

27.1 bridge multicast filtering

Use the **bridge multicast filtering** Global Configuration mode command to enable the filtering of Multicast addresses. Use the **no** form of this command to disable Multicast address filtering.

Syntax

bridge multicast filtering

no bridge multicast filtering

Default Configuration

Multicast address filtering is disabled. All Multicast addresses are flooded to all ports.

Command Mode

Global Configuration mode

User Guidelines

When this feature is enabled, unregistered Multicast traffic (as opposed to registered) will still be flooded.

All registered Multicast addresses will be forwarded to the Multicast groups. There are two ways to manage Multicast groups, one is the IGMP Snooping feature, and the other is the bridge multicast forward-all command.

Example

The following example enables bridge Multicast filtering.

```
switchxxxxxx(config)# bridge multicast filtering
```

27.2 bridge multicast mode

Use the **bridge multicast mode** Interface Configuration (VLAN) mode command to configure the Multicast bridging mode. Use the **no** form of this command to return to the default configuration.

Syntax

bridge multicast mode *{mac-group | ip-group | ip-src-group}*

no bridge multicast mode

Parameters

- **mac-group**—Specifies that Multicast bridging is based on the packet's VLAN and MAC address.
- **ipv4-group**—Specifies that Multicast bridging is based on the packet's VLAN and MAC address for non-IPv4 packets, and on the packet's VLAN and IPv4 destination address for IPv4 packets.
- **ipv4-src-group**—Specifies that Multicast bridging is based on the packet's VLAN and MAC address for non-IPv4 packets, and on the packet's VLAN, IPv4 destination address and IPv4 source address for IPv4 packets.

Default Configuration

The default mode is mac-group.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Use the mac-group option when using a network management system that uses a MIB based on the Multicast MAC address. Otherwise, it is recommended to use the ipv4-group or ipv4-src-group mode, because there is no overlapping of IPv4 Multicast addresses in these modes.

For each Forwarding Data Base (FDB) mode, use different CLI commands to configure static entries in the FDB, as described in the following table:

FDB Mode	CLI Commands	
mac-group	bridge multicast address	bridge multicast forbidden address
ipv4-group	bridge multicast ip-address	bridge multicast forbidden ip-addresss
ipv4-src-group	bridge multicast source group	bridge multicast forbidden source group

The following table describes the actual data that is written to the Forwarding Data Base (FDB) as a function of the IGMP version that is used in the network:

FDB mode	IGMP version 2	IGMP version 3
mac-group	MAC group address	MAC group address
ipv4-group	IP group address	IP group address
ipv4-src-group	(*)	IP source and group addresses

(*) Note that (*,G) cannot be written to the FDB if the mode is **ipv4-src-group**. In that case, no new FDB entry is created, but the port is added to the static (S,G) entries (if they exist) that belong to the requested group. It is recommended to set the FDB mode to ipv4-group or mac-group for IGMP version 2.

If an application on the device requests (*,G), the operating FDB mode is changed to ipv4-group.

Example

The following example configures the Multicast bridging mode as an ipv4-group on VLAN 2.

```
switchxxxxxx(config)# interface vlan 2

switchxxxxxx(config-if)# bridge multicast mode ipv4-group
```

27.3 bridge multicast address

Use the **bridge multicast address** Interface Configuration (VLAN) mode command to register a MAC-layer Multicast address in the bridge table and statically add or remove ports to or from the group. Use the **no** form of this command to unregister the MAC address.

Syntax

bridge multicast address {*mac-multicast-address* | *ipv4-multicast-address*} [[***add*** | ***remove***] {***ethernet*** *interface-list* | **port-channel** *port-channel-list*}]

no bridge multicast address {*mac-multicast-address*}

Parameters

- **mac-multicast-address | ipv4-multicast-address**—Specifies the group Multicast address.

- **add**—Adds ports to the group.
- **remove**—Removes ports from the group.
- **ethernet interface-list**—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel port-channel-list**—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces; use a hyphen to designate a range of port channels.

Default Configuration

No Multicast addresses are defined.

If **ethernet interface-list** or **port-channel port-channel-list** is specified without specifying **add** or **remove**, the default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

To register the group in the bridge database without adding or removing ports or port channels, specify the **mac-multicast-address** parameter only.

Static Multicast addresses can be defined on static VLANs only.

You can execute the command before the VLAN is created.

Examples

Example 1 - The following example registers the MAC address to the bridge table:

```
switchxxxxxx(config)# interface vlan 8

switchxxxxxx(config-if)# bridge multicast address 01:00:5e:02:02:03
```

Example 2 - The following example registers the MAC address and adds ports statically.

```
switchxxxxxx(config)# interface vlan 8

switchxxxxxx(config-if)# bridge multicast address 01:00:5e:02:02:03 add gi1-2
```

27.4 bridge multicast forbidden address

Use the **bridge multicast forbidden address** Interface Configuration (VLAN) mode command to forbid adding or removing a specific Multicast address to or from specific ports. Use the **no** form of this command to restore the default configuration.

Syntax

bridge multicast forbidden address {*mac-multicast-address* | *ipv4-multicast-address*} {***add*** | ***remove***} {***ethernet*** *interface-list* | ***port-channel*** *port-channel-list*}

no bridge multicast forbidden address {*mac-multicast-address*}

Parameters

- **mac-multicast-address | ipv4-multicast-address**—Specifies the group Multicast address.
- **add**—Forbids adding ports to the group.
- **remove**—Forbids removing ports from the group.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

No forbidden addresses are defined.

Default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Before defining forbidden ports, the Multicast group should be registered, using bridge multicast address.

You can execute the command before the VLAN is created.

Example

The following example forbids MAC address 0100.5e02.0203 on port gi9 within VLAN 8.

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast address 0100.5e02.0203
switchxxxxxx(config-if)# bridge multicast forbidden address 0100.5e02.0203
add gi9
```

27.5 bridge multicast ip-address

Use the **bridge multicast ip-address** Interface Configuration (VLAN) mode command to register IP-layer Multicast addresses to the bridge table, and statically add or remove ports to or from the group. Use the no form of this command to unregister the IP address.

Syntax

bridge multicast ip-address *ip-multicast-address [[**add** | **remove**] {**ethernet** interface-list | **port-channel** port-channel-list}]*

no bridge multicast ip-address *ip-multicast-address*

Parameters

- **ip-multicast-address**—Specifies the group IP Multicast address.
- **add**—Adds ports to the group.
- **remove**—Removes ports from the group.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

No Multicast addresses are defined.

Default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

To register the group in the bridge database without adding or removing ports or port channels, specify the **ip-multicast-address** parameter only.

Static Multicast addresses can be defined on static VLANs only.

You can execute the command before the VLAN is created.

Example

The following example registers the specified IP address to the bridge table:

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast ip-address 239.2.2.2
```

The following example registers the IP address and adds ports statically.

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast ip-address 239.2.2.2 add gi9
```

27.6 bridge multicast forbidden ip-address

Use the **bridge multicast forbidden ip-address** Interface Configuration (VLAN) mode command to forbid adding or removing a specific IP Multicast address to or from specific ports. Use the no form of this command to restore the default configuration.

Syntax

bridge multicast forbidden ip-address *{ip-multicast-address}* *{**add** | **remove**}* *{**ethernet** interface-list | **port-channel** port-channel-list}*

no bridge multicast forbidden ip-address {*ip-multicast-address*}

Parameters

- **ip-multicast-address**—Specifies the group IP Multicast address.

- **add**—Forbids adding ports to the group.
- **remove**—Forbids removing ports from the group.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

No forbidden addresses are defined.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Before defining forbidden ports, the Multicast group should be registered.

You can execute the command before the VLAN is created.

Example

The following example registers IP address 239.2.2.2, and forbids the IP address on port `gi9` within VLAN 8.

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast ip-address 239.2.2.2
switchxxxxxx(config-if)# bridge multicast forbidden ip-address 239.2.2.2 add
gi9
```

27.7 bridge multicast source group

Use the **bridge multicast source group** Interface Configuration (VLAN) mode command to register a source IP address - Multicast IP address pair to the bridge table, and statically add or remove ports to or from the source-group. Use the no form of this command to unregister the source-group-pair.

Syntax

bridge multicast source *ip-address* **group** *ip-multicast-address [[**add** | **remove**] {**ethernet** interface-list | **port-channel** port-channel-list}]*

no bridge multicast source *ip-address* **group** *ip-multicast-address*

Parameters

- **ip-address**—Specifies the source IP address.
- **ip-multicast-address**—Specifies the group IP Multicast address.
- **add**—Adds ports to the group for the specific source IP address.
- **remove**—Removes ports from the group for the specific source IP address.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces; use a hyphen to designate a range of port channels.

Default Configuration

No Multicast addresses are defined.

The default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created.

Example

The following example registers a source IP address - Multicast IP address pair to the bridge table:

```
switchxxxxxx(config)# interface vlan 8

switchxxxxxx(config-if)# bridge multicast source 13.16.1.1 group 239.2.2.2
```

27.8 bridge multicast forbidden source group

Use the **bridge multicast forbidden source group** Interface Configuration (VLAN) mode command to forbid adding or removing a specific IP source address - Multicast address pair to or from specific ports. Use the no form of this command to return to the default configuration.

Syntax

bridge multicast forbidden source *ip-address* **group** *ip-multicast-address* {***add*** / ***remove***} {***ethernet*** *interface-list* / ***port-channel*** *port-channel-list*}

no bridge multicast forbidden source *ip-address* **group** *ip-multicast-address*

Parameters

- **ip-address**—Specifies the source IP address.
- **ip-multicast-address**—Specifies the group IP Multicast address.
- **add**—Forbids adding ports to the group for the specific source IP address.
- **remove**—Forbids removing ports from the group for the specific source IP address.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces; use a hyphen to designate a range of port channels.

Default Configuration

No forbidden addresses are defined.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Before defining forbidden ports, the Multicast group should be registered.

You can execute the command before the VLAN is created.

Example

The following example registers a source IP address - Multicast IP address pair to the bridge table, and forbids adding the pair to port `gi9` on VLAN 8:

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast source 13.16.1.1 group 239.2.2.2
switchxxxxxx(config-if)# bridge multicast forbidden source 13.16.1.1 group
239.2.2.2 add gi9
```

27.9 bridge multicast ipv6 mode

Use the **bridge multicast ipv6 mode** Interface Configuration (VLAN) mode command to configure the Multicast bridging mode for IPv6 Multicast packets. Use the no form of this command to return to the default configuration.

Syntax

bridge multicast ipv6 mode *{mac-group | ip-group | ip-src-group}*

no bridge multicast ipv6 mode

Parameters

- **mac-group**—Specifies that Multicast bridging is based on the packet's VLAN and MAC destination address.
- **ip-group**—Specifies that Multicast bridging is based on the packet's VLAN and IPv6 destination address for IPv6 packets.
- **ip-src-group**—Specifies that Multicast bridging is based on the packet's VLAN, IPv6 destination address and IPv6 source address for IPv6 packets.

Default Configuration

The default mode is **mac-group**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Use the **mac-group** mode when using a network management system that uses a MIB based on the Multicast MAC address.

For each Forwarding Data Base (FDB) mode, use different CLI commands to configure static entries for IPv6 Multicast addresses in the FDB, as described in the following table:

FDB Mode	CLI Commands	
mac-group	bridge multicast address	bridge multicast forbidden address
ipv6-group	bridge multicast ipv6 ip-address	bridge multicast ipv6 forbidden ip-address
ipv6-src-grou p	bridge multicast ipv6 source group	bridge multicast ipv6 forbidden source group

The following table describes the actual data that is written to the Forwarding Data Base (FDB) as a function of the MLD version that is used in the network:(*)

FDB mode	MLD version 1	MLD version 2
mac-group	MAC group address	MAC group address
ipv6-group	IPv6 group address	IPv6 group address
ipv6-src-group	(*)	IPv6 source and group addresses

Note that (*,G) cannot be written to the FDB if the mode is **ip-src-group**. In that case, no new FDB entry is created, but the port is added to the (S,G) entries (if they exist) that belong to the requested group. If an application on the device requests (*,G), the operating FDB mode is changed to **ip-group**.

You can execute the command before the VLAN is created.

Example

The following example configures the Multicast bridging mode as an **ip-group** on VLAN 2.

```
switchxxxxxx(config)# interface vlan 2

switchxxxxxx(config-if)# bridge multicast ipv6 mode ip-group
```

27.10 bridge multicast ipv6 ip-address

Use the **bridge multicast ipv6 ip-address** Interface Configuration (VLAN) mode command to register an IPv6 Multicast address to the bridge table, and statically add or remove ports to or from the group. Use the **no** form of this command to unregister the IPv6 address.

Syntax

bridge multicast ipv6 ip-address *ipv6-multicast-address [[**add** | **remove**] {**ethernet** interface-list | **port-channel** port-channel-list}]*

no bridge multicast ipv6 ip-address *ip-multicast-address*

Parameters

- **ipv6-multicast-address**—Specifies the group IPv6 multicast address.
- **add**—Adds ports to the group.
- **remove**—Removes ports from the group.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces; use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

No Multicast addresses are defined.

The default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

To register the group in the bridge database without adding or removing ports or port channels, specify the **ipv6-multicast-address** parameter only.

Static Multicast addresses can be defined on static VLANs only.

You can execute the command before the VLAN is created.

Example

Example 1 - The following example registers the IPv6 address to the bridge table:

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast ipv6 ip-address FF00:0:0:0:4:4:4:1
```

Example 2 - The following example registers the IPv6 address and adds ports statically.

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast ipv6 ip-address FF00:0:0:0:4:4:4:1
add gi1-2
```

27.11 bridge multicast ipv6 forbidden ip-address

Use the **bridge multicast ipv6 forbidden ip-address** Interface Configuration (VLAN) mode command to forbid adding or removing a specific IPv6 Multicast address to or from specific ports. To restore the default configuration, use the **no** form of this command.

Syntax

bridge multicast ipv6 forbidden ip-address {*ipv6-multicast-address*} {***add*** / ***remove***} {***ethernet*** *interface-list* / ***port-channel*** *port-channel-list*}

no bridge multicast ipv6 forbidden ip-address {*ipv6-multicast-address*}

Parameters

- **ipv6-multicast-address**—Specifies the group IPv6 Multicast address.
- **add**—Forbids adding ports to the group.
- **remove**—Forbids removing ports from the group.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.

- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

No forbidden addresses are defined.

The default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Before defining forbidden ports, the Multicast group should be registered.

You can execute the command before the VLAN is created.

Example

The following example registers an IPv6 Multicast address, and forbids the IPv6 address on port `gi9` within VLAN 8.

```
switchxxxxxx(config)# interface vlan 8
switchxxxxxx(config-if)# bridge multicast ipv6 ip-address FF00:0:0:0:4:4:4:1
switchxxxxxx(config-if)# bridge multicast ipv6 forbidden ip-address
FF00:0:0:0:4:4:4:1 add gi9
```

27.12 bridge multicast ipv6 source group

Use the **bridge multicast ipv6 source group** Interface Configuration (VLAN) mode command to register a source IPv6 address - Multicast IPv6 address pair to the bridge table, and statically add or remove ports to or from the source-group. Use the **no** form of this command to unregister the source-group-pair.

Syntax

bridge multicast ipv6 source *ipv6-source-address* **group** *ipv6-multicast-address [[**add** | **remove**] {**ethernet** interface-list | **port-channel** port-channel-list}]*

no bridge multicast ipv6 source *ipv6-address* **group** *ipv6-multicast-address*

Parameters

- **ipv6-source-address**—Specifies the source IPv6 address.
- **ipv6-multicast-address**—Specifies the group IPv6 Multicast address.
- **add**—Adds ports to the group for the specific source IPv6 address.
- **remove**—Removes ports from the group for the specific source IPv6 address.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

No Multicast addresses are defined.

The default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

Example

The following example registers a source IPv6 address - Multicast IPv6 address pair to the bridge table:

```
switchxxxxxx(config)# interface vlan 8

switchxxxxxx(config-if)# bridge multicast source 2001:0:0:0:4:4:4 group
FF00:0:0:0:4:4:4:1
```

27.13 bridge multicast ipv6 forbidden source group

Use the **bridge multicast ipv6 forbidden source group** Interface Configuration (VLAN) mode command to forbid adding or removing a specific IPv6 source address - Multicast address pair to or from specific ports. Use the **no** form of this command to return to the default configuration.

Syntax

bridge multicast ipv6 forbidden source *ipv6-source-address* **group** *ipv6-multicast-address* {***add*** | ***remove***} {**ethernet** *interface-list* | ***port-channel*** *port-channel-list*}

no bridge multicast ipv6 forbidden source *ipv6-address* **group** *ipv6-multicast-address*

Parameters

- **ipv6-source-address**—Specifies the source IPv6 address.
- **ipv6-multicast-address**—Specifies the group IPv6 multicast address.
- **add**—Forbids adding ports to the group for the specific source IPv6 address.
- **remove**—Forbids removing ports from the group for the specific source IPv6 address.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces; use a hyphen to designate a range of port channels.

Default Configuration

No forbidden addresses are defined.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Before defining forbidden ports, the Multicast group should be registered.

You can execute the command before the VLAN is created.

Example

The following example registers a source IPv6 address - Multicast IPv6 address pair to the bridge table, and forbids adding the pair to `gi9` on VLAN 8:

```
switchxxxxxx(config)# interface vlan 8

switchxxxxxx(config-if)# bridge multicast source 2001:0:0:0:4:4:4 group
FF00:0:0:0:4:4:4:1

switchxxxxxx(config-if)# bridge multicast forbidden source 2001:0:0:0:4:4:4:1
group FF00:0:0:0:4:4:4:1 add gi9
```

27.14 bridge multicast unregistered

Use the **bridge multicast unregistered** Interface Configuration (Ethernet, Port-Channel) mode command to configure forwarding unregistered Multicast addresses. Use the **no** form of this command to restore the default configuration.

Syntax

bridge multicast unregistered *{forwarding | filtering}*

no bridge multicast unregistered

Parameters

- **forwarding**—Forwards unregistered Multicast packets.
- **filtering**—Filters unregistered Multicast packets.

Default Configuration

Unregistered Multicast addresses are forwarded.

Command Mode

Interface Configuration (Ethernet, Port-Channel) mode

User Guidelines

Do not enable unregistered Multicast filtering on ports that are connected to routers, because the 224.0.0.x address range should not be filtered. Note that routers do not necessarily send IGMP reports for the 224.0.0.x range.

You can execute the command before the VLAN is created.

Example

The following example specifies that unregistered Multicast packets are filtered on `gi1`:

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# bridge multicast unregistered filtering
```

27.15 bridge multicast forward-all

Use the **bridge multicast forward-all** Interface Configuration (VLAN) mode command to enable forwarding all multicast packets for a range of ports or port channels. Use the **no** form of this command to restore the default configuration.

Syntax

bridge multicast forward-all *{**add** | **remove**} {**ethernet** interface-list | **port-channel** port-channel-list}*

no bridge multicast forward-all

Parameters

- **add**—Forces forwarding of all Multicast packets.
- **remove**—Does not force forwarding of all Multicast packets.
- **ethernet** *interface-list*—Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- **port-channel** *port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces. Use a hyphen to designate a range of port channels.

Default Configuration

Forwarding of all Multicast packets is disabled.

Command Mode

Interface Configuration (VLAN) mode

Example

The following example enables all Multicast packets on port gi8 to be forwarded.

```
switchxxxxxx(config)# interface vlan 2

switchxxxxxx(config-if)# bridge multicast forward-all add gi8
```

27.16 bridge multicast forbidden forward-all

Use the **bridge multicast forbidden forward-all** Interface Configuration (VLAN) mode command to forbid a port to dynamically join Multicast groups. Use the no form of this command to restore the default configuration.

Syntax

bridge multicast forbidden forward-all *{**add** | **remove**} {**ethernet** interface-list | **port-channel** port-channel-list}*

no bridge multicast forbidden forward-all

Parameters

- **add**—Forbids forwarding of all Multicast packets.
- **remove**—Does not forbid forwarding of all Multicast packets.
- ***ethernet** interface-list* —Specifies a list of Ethernet ports. Separate nonconsecutive Ethernet ports with a comma and no spaces. Use a hyphen to designate a range of ports.
- ***port-channel** port-channel-list*—Specifies a list of port channels. Separate nonconsecutive port-channels with a comma and no spaces; use a hyphen to designate a range of port channels.

Default Configuration

Ports are not forbidden to dynamically join Multicast groups.

The default option is **add**.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Use this command to forbid a port to dynamically join (by IGMP, for example) a Multicast group.

The port can still be a Multicast router port.

Example

The following example forbids forwarding of all Multicast packets to gi1 within VLAN 2.

```
switchxxxxxx(config)# interface vlan 2

switchxxxxxx(config-if)# bridge multicast forbidden forward-all add ethernet
gi1
```

27.17 mac address-table static

Use the **mac address-table static** Global Configuration mode command to add a MAC-layer station source address to the MAC address table. Use the **no** form of this command to delete the MAC address.

Syntax

mac address-table static *mac-address* **vlan** *vlan-id* **interface** *interface-id* [**permanent** /**delete-on-reset** /**delete-on-timeout** /**secure**]

no mac address-table static [*mac-address]* ***vlan*** *vlan-id*

Parameters

- **mac-address**— MAC address (Range: Valid MAC address)
- **vlan-id**— Specify the VLAN
- **interface-id**— Specify an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel (Range: valid ethernet port, valid port-channel)
- **permanent**— The permanent static MAC address. The keyword is applied by the default.
- **delete-on-reset**— The delete-on-reset static MAC address.
- **delete-on-timeout**— The delete-on-timeout static MAC address.

- **secure**—The secure MAC address. May be used only in a secure mode.

Default Configuration

No static addresses are defined. The default mode for an added address is permanent.

Command Mode

Global Configuration mode

User Guidelines

Use the command to add a static MAC address with given time-to-live in any mode or to add a secure MAC address in a secure mode.

Each MAC address in the MAC address table is assigned two attributes: **type** and **time-to-live**.

The following value of time-of-live is supported:

- **permanent**— a MAC address is saved until it is removed manually.
- **delete-on-reset**— a MAC address is saved until the next reboot.
- **delete-on-timeout**— a MAC address that may be removed by the aging timer.

The following types are supported:

- **static**— MAC address manually added by the command with the following keywords specifying its time-of-live:
  - **permanent**
  - **delete-on-reset**
  - **delete-on-timeout**

  A static MAC address may be added in any port mode.
- **secure**— A MAC address added manually or learned in a secure mode. Use the **mac address-table static** command with the **secure** keyword to add a secure MAC address. The MAC address cannot be relearned.

  A secure MAC address may be added only in a secure port mode.
- **dynamic**— a MAC address learned by the switch in non secure mode. A value of its **time-to-live** attribute is **delete-on-timeout**.

Examples

Example 1 - The following example adds two permanent static MAC address:

```
switchxxxxxx(conf)#mac address-table static 00:3f:bd:45:5a:b1 vlan 1 gi1
switchxxxxxx(conf)mac address-table static 00:3f:bd:45:5a:b2 vlan 1 gi1
permanent
```

Example 2 - The following example adds a deleted-on-reset static MAC address:

```
switchxxxxxx(conf)mac address-table static 00:3f:bd:45:5a:b2 vlan 1 gi1
delete-on-reset
```

Example 3 - The following example adds a deleted-on-timeout static MAC address:

```
switchxxxxxx(conf)mac address-table static 00:3f:bd:45:5a:b2 vlan 1 gi1
delete-on-timeout
```

Example 4 - The following example adds a secure MAC address:

```
switchxxxxxx(conf)mac address-table static 00:3f:bd:45:5a:b2 vlan 1 gi1 secure
```

27.18 clear mac address-table

Use the **clear mac address-table** Privileged EXEC command to remove learned or secure entries from the forwarding database (FDB).

Syntax

clear mac address-table ***dynamic [interface*** *interface-id]*

clear mac address-table ***secure interface*** *interface-id*

Parameters

- **dynamic interface** *interface-id*—Delete all dynamic (learned) addresses on the specified interface.The interface ID can be one of the following types:

Ethernet port or port-channel. If interface ID is not supplied, all dynamic addresses are deleted.

- **secure interface** *interface-id*—Delete all the secure addresses learned on the specific interface. A secure address on a MAC address learned on ports on which port security is defined.

Default Configuration

For dynamic addresses, if interface-id is not supplied, all dynamic entries are deleted.

Command Mode

Privileged EXEC mode

Examples:

Example 1 - Delete all dynamic entries from the FDB.

```
switchxxxxxx# clear mac address-table dynamic
```

Example 2 - Delete all secure entries from the FDB learned on secure port gi1.

```
switchxxxxxx# clear mac address-table secure interface gi1
```

27.19 mac address-table aging-time

Use the **mac address-table aging-time** Global configuration command to set the aging time of the address table. Use the **no** form of this command to restore the default.

Syntax

mac address-table aging-time *seconds*

no mac address-table aging-time

Parameters

seconds—Time is number of seconds. (Range:10–630)

Default Configuration

300

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# mac address-table aging-time 600
```

27.20 port security

Use the **port security** Interface Configuration (Ethernet, Port-channel) mode command to enable port security learning mode on an interface. Use the **no** form of this command to disable port security learning mode on an interface.

Syntax

port security [**forward** /**discard** /**discard**-**shutdown**] [**trap** *seconds*]

no port security

Parameters

- **forward**—Forwards packets with unlearned source addresses, but does not learn the address.
- **discard**—Discards packets with unlearned source addresses.
- **discard-shutdown**—Discards packets with unlearned source addresses and shuts down the port.
- **trap** *seconds*—Sends SNMP traps and specifies the minimum time interval in seconds between consecutive traps. (Range: 1–1000000)

Default Configuration

The feature is disabled by default.

The default mode is **discard**.

The default number of seconds is zero, but if **traps** is entered, a number of seconds must also be entered.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The command may be used only when the interface in the regular (non-secure with unlimited MAC learning) mode.

See the mac address-table static command for information about MAC address attributes (type and time-to-live) definitions.

When the **port security** command enables the **lock** mode on a port all dynamic addresses learned on the port are changed to **permanent secure** addresses.

When the **port security** command enables a mode on a port differing from the **lock** mode all dynamic addresses learned on the port are deleted.

When the **no port security** command cancels a secure mode on a port all secure addresses defined on the port are changed to **dynamic** addresses.

Additionally to set a mode, use the **port security** command to set an action that the switch should perform on a frame which source MAC address cannot be learned.

Example

The following example forwards all packets to port gi1 without learning addresses of packets from unknown sources and sends traps every 100 seconds, if a packet with an unknown source address is received.

```
switchxxxxxx(config)interface gi7
switchxxxxxx(config-if)port security mode lock
switchxxxxxx(config-if)port security forward trap 100
switchxxxxxx(config-if)exit
```

27.21 port security mode

Use the **port security mode** Interface Configuration (Ethernet, port-channel) mode command configures the port security learning mode. Use the **no** form of this command to restore the default configuration.

Syntax

port security mode {**max-addresses** | **lock**}

no port security mode

Parameters

- **max-addresses**— Non secure mode with limited learning dynamic MAC addresses. The static MAC addresses may be added on the port manually by the mac address-table static command.
- **lock**— Secure mode without MAC learning. The static and secure MAC addresses may be added on the port manually by the mac address-table static command.

Default Configuration

The default port security mode is **lock**.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The default port mode is called regular. In this mode, the port allows unlimited learning of dynamic addresses. The static MAC addresses may be added on the port manually by the mac address-table static command.

The command may be used only when the interface in the regular (non-secure with unlimited MAC learning) mode.

Use the **port security mode** command to change the default mode before the port security mode command.

Example

The following example sets the port security mode to Lock for gi7.

```
switchxxxxxx(config)interface gi7
switchxxxxxx(config-if)port security mode lock
switchxxxxxx(config-if)port security
switchxxxxxx(config-if)exit
```

27.22 port security max

Use the **port security max** Interface Configuration (Ethernet, Port-channel) mode command to configure the maximum number of addresses that can be learned on the port while the port is in port, max-addresses or secure mode. Use the **no** form of this command to restore the default configuration.

Syntax

port security max *max-addr*

no port security max

Parameters

max-addr—Specifies the maximum number of addresses that can be learned on the port. (Range: 0–256)

Default Configuration

This default maximum number of addresses is 1.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

The command may be used only when the interface in the regular (non-secure with unlimited MAC learning) mode.

Use this command to change the default value before the port security command.

Example

The following example sets the port to limited learning mode:

```
switchxxxxxx(config)#interface gi7
switchxxxxxx(config-if)port security mode max
switchxxxxxx(config-if)port security max 20
switchxxxxxx(config-if)port security
switchxxxxxx(config-if)exit
```

27.23 show mac address-table

Use the **show mac address-table** EXEC command to view entries in the MAC address table.

Syntax

show mac address-table *[**dynamic** | **static**| **secure**] [**vlan** vlan] [**interface** interface-id] [**address** mac-address]*

Parameters

- **dynamic**—Displays only dynamic MAC address table entries.
- **static**—Displays only static MAC address table entries.
- **secure**—Displays only secure MAC address table entries.
- **vlan**—Displays entries for a specific VLAN.
- **interface-id**—Displays entries for a specific interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.
- **mac-address**—Displays entries for a specific MAC address.

Default Configuration

If no parameters are entered, the entire table is displayed.

Command Mode

EXEC mode

User Guidelines

Internal usage VLANs (VLANs that are automatically allocated on routed ports) are presented in the VLAN column by a port number and not by a VLAN ID.

Example

Example 1 - Displays entire address table.

```
switchxxxxxx# show mac address-table

Aging time is 300 sec

 VLAN        MAC Address         Port       Type
```

```
--------  ---------------------  ----------  ----------
   1       00:00:26:08:13:23        0        self
   1       00:3f:bd:45:5a:b1      gi1        static
   1       00:a1:b0:69:63:f3      gi4        dynamic
   2       00:a1:b0:69:63:f3      gi5        dynamic
```

Example 2 - Displays address table entries containing the specified MAC address.

```
switchxxxxxx# show mac address-table 00:3f:bd:45:5a:b1
Aging time is 300 sec
VLAN         MAC Address          Port        Type
--------  ---------------------  ----------  ----------
1          00:3f:bd:45:5a:b1     static      gi9
```

27.24 show mac address-table count

Use the **show mac address-table count** EXEC mode command to display the number of addresses present in the Forwarding Database.

Syntax

show mac address-table count *[**vlan** vlan | **interface** interface-id]*

Parameters

- **vlan**—Specifies VLAN.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.

Command Mode

EXEC mode

Example

```
switchxxxxxx# show mac address-table count
Capacity: 8192
Free: 8083
```

```
Used: 109

Secure   : 0

Dynamic  : 25

Static   : 1

Internal : 0
```

27.25 show bridge multicast mode

Use the **show bridge multicast mode** EXEC mode command to display the Multicast bridging mode for all VLANs or for a specific VLAN.

Syntax

show bridge multicast mode *[vlan vlan-id]*

Parameters

vlan *vlan-id*—Specifies the VLAN ID.

Command Mode

EXEC mode

Example

The following example displays the Multicast bridging mode for all VLANs.

```
switchxxxxxx# show bridge multicast mode
VLAN        IPv4 Multicast Mode        IPv6 Multicast Mode
      Admin         Oper          Admin         Oper

---   ----------    -----------   -----------   ----------
1     MAC-GROUP     MAC-GROUP     MAC-GROUP     -MAC-GROUP
11    IPv4-GROUP    IPv4-GROUP    IPv6-GROUP    IPv6-GROUP
12    IPv4-SRC-     IPv4-SRC-     IPv6-SRC-     IPv6-SRC-
      GROUP         GROUP         GROUP         GROUP
```

27.26 show bridge multicast address-table

Use the **show bridge multicast address-table** EXEC mode command to display Multicast MAC addresses or IP Multicast address table information.

Syntax

show bridge multicast address-table *[**vlan** vlan-id] [**address** {mac-multicast-address | ipv4-multicast-address | ipv6-multicast-address}] [**format** {**ip** | **mac**}] [**source** {ipv4-source-address | ipv6-source-address}*]

Parameters

- **vlan-id** *vlan-id*—Display entries for specified VLAN ID.
- **address** —Display entries for specified Multicast address. The possible values are:
  - **mac-multicast-address**—Specifies the MAC Multicast address.
  - **ipv4-multicast-address**—Specifies the IPv4 Multicast address.
  - **ipv6-multicast-address**—Specifies the IPv6 Multicast address.
- **format**—(this applies if picked mac-multicast-address). then i can display it either in mac or ip format) Display entries for specified Multicast address format. The possible values are:
  - **ip**—Specifies that the Multicast address is an IP address.
  - **mac**—Specifies that the Multicast address is a MAC address.
- **source {ipv4-source-address | ipv6-source-address}**—Specifies the source address. The possible values are:
  - **ipv4-address**—Specifies the source IPv4 address.
  - **ipv6-address**—Specifies the source IPv6 address.

Default Configuration

If the **format** is not specified, it defaults to **mac** (only if mac-multicast-address was entered).

If VLAN ID is not entered, entries for all VLANs are displayed.

If MAC or IP address is not supplied, entries for all addresses are displayed.

Command Mode

EXEC mode

User Guidelines

A MAC address can be displayed in IP format only if it is within the range 0100.5e00.0000 through 0100.5e7f.ffff.

Multicast router ports (defined statically or discovered dynamically) are members in all MAC groups.

Ports that were defined via the bridge multicast forbidden forward-all command are displayed in all forbidden MAC entries.

Changing the Multicast mode can move static Multicast addresses that are written in the device FDB to a shadow configuration because of FDB hash collisions.

Example

The following example displays bridge Multicast address information.

```
switchxxxxxx# show bridge multicast address-table

Multicast address table for VLANs in MAC-GROUP bridging mode:

Vlan    MAC Address         Type           Ports

---- -----------------    --------------   -----

8    01:00:5e:02:02:03     Static          1-2



Forbidden ports for Multicast addresses:

Vlan    MAC Address         Ports

---- -----------------      -----

8    01:00:5e:02:02:03      gi9

Multicast address table for VLANs in IPv4-GROUP bridging mode:

Vlan    MAC Address         Type             Ports

---- -----------------    --------------     -----

1      224.0.0.251         Dynamic           gi2

Forbidden ports for Multicast addresses:

Vlan    MAC Address         Ports

---- -----------------      -----

1      232.5.6.5

1      233.22.2.6
```

```
Multicast address table for VLANs in IPv4-SRC-GROUP bridging mode:
Vlan  Group Address  Source address  Type        Ports
---- --------------- --------------- --------    -----
1     224.2.2.251     11.2.2.3       Dynamic     gi1
Forbidden ports for Multicast addresses:
Vlan  Group Address  Source Address   Ports
---- --------------- --------------- -------
8    239.2.2.2       *               gi9
8    239.2.2.2       1.1.1.11        gi9
Multicast address table for VLANs in IPv6-GROUP bridging mode:
VLAN  IP/MAC Address   Type      Ports
---- ----------------- --------- --------------------
8    ff02::4:4:4       Static    gi1-2, gi7, Po1
Forbidden ports for Multicast addresses:
VLAN  IP/MAC Address   Ports
---- ----------------- -----------
8    ff02::4:4:4       gi9
Multicast address table for VLANs in IPv6-SRC-GROUP bridging mode:
Vlan  Group Address  Source address  Type     Ports
---- --------------- --------------- -------- ------------------
8    ff02::4:4:4     *               Static   gi1-2,gi7,Po1
8    ff02::4:4:4     fe80::200:7ff:  Static
                     fe00:200
Forbidden ports for Multicast addresses:
Vlan  Group Address  Source address  Ports
---- --------------- --------------- ----------
8    ff02::4:4:4     *               gi9
8    ff02::4:4:4     fe80::200:7ff:f    gi9
                     e00:200
```

27.27 show bridge multicast address-table static

Use the **show bridge multicast address-table static** EXEC mode command to display the statically configured Multicast addresses.

Syntax

show bridge multicast address-table static *[**vlan** vlan-id] [**address** mac-multicast-address | ipv4-multicast-address | ipv6-multicast-address] [**source** ipv4-source-address | ipv6-source-address] [**all** | **mac** | **ip**]*

Parameters

- **vlan vlan-id**—Specifies the VLAN ID.
- **address**—Specifies the Multicast address. The possible values are:
  - **mac-multicast-address**—Specifies the MAC Multicast address.
  - **ipv4-multicast-address**—Specifies the IPv4 Multicast address.
  - **ipv6-multicast-address**—Specifies the IPv6 Multicast address.
- **source**—Specifies the source address. The possible values are:
  - **ipv4-address**—Specifies the source IPv4 address.
  - **ipv6-address**—Specifies the source IPv6 address.

Default Configuration

When **all/mac/ip** is not specified, all entries (MAC and IP) will be displayed.

Command Mode

EXEC mode

User Guidelines

A MAC address can be displayed in IP format only if it is within the range 0100.5e00.0000–- 0100.5e7f.ffff.

Example

The following example displays the statically configured Multicast addresses.

```
switchxxxxxx# show bridge multicast address-table static

MAC-GROUP table
Vlan        MAC Address         Ports
----        --------------      --------
1           0100.9923.8787      gi1, gi2
Forbidden ports for multicast addresses:
Vlan        MAC Address         Ports
----        --------------      --------
IPv4-GROUP Table
Vlan        IP Address          Ports
----        ----------          --------
1           231.2.2.3           gi1, gi2
19          231.2.2.8           gi-8
19          231.2.2.8           gi9-21
Forbidden ports for multicast addresses:
Vlan        IP Address          Ports
----        ----------          --------
1           231.2.2.3           gi8
19          231.2.2.8           gi3
IPv4-SRC-GROUP Table:
Vlan        Group Address       Source                Ports
----        ---------------     address               ------
                                ---------------
Forbidden ports for multicast addresses:
Vlan        Group Address       Source                Ports
----        ---------------     address               ------
                                ---------------
IPv6-GROUP Table
Vlan        IP Address          Ports
----        -----------------   ---------
191         FF12::8             gi1-8
```

```
Forbidden ports for multicast addresses:
Vlan       IP Address          Ports
----       -----------------   ---------
11         FF12::3             gi8
191        FF12::8             gi8
IPv6-SRC-GROUP Table:
Vlan       Group Address       Source                Ports
----       ---------------     address               ------
192        FF12::8                                   gi1-8
                               ---------------
                               FE80::201:C9A9:FE40:
                               8988
Forbidden ports for multicast addresses:
Vlan       Group Address       Source                Ports
----       ---------------     address               ------
192        FF12::3                                   gi8
                               ---------------
                               FE80::201:C9A9:FE40
                               :8988
```

27.28 show bridge multicast filtering

Use the **show bridge multicast filtering** EXEC mode command to display the Multicast filtering configuration.

Syntax

show bridge multicast filtering *vlan-id*

Parameters

vlan-id—Specifies the VLAN ID. (Range: Valid VLAN)

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays the Multicast configuration for VLAN 1.

```
switchxxxxxx# show bridge multicast filtering 1

Filtering: Enabled

VLAN: 1

Port          Forward-All

-----         Static          Status

gi1           ---------       ------

gi2           Forbidden       Filter

gi3           Forward         Forward(s)

              -               Forward(d)
```

27.29 show bridge multicast unregistered

Use the **show bridge multicast unregistered** EXEC mode command to display the unregistered Multicast filtering configuration.

Syntax

show bridge multicast unregistered *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display for all interfaces.

Command Mode

EXEC mode

Example

The following example displays the unregistered Multicast configuration.

```
switchxxxxxx# show bridge multicast unregistered
Port        Unregistered
-------     -------------
gi1         Forward
gi2         Filter
gi3         Filter
```

27.30 show ports security

Use the **show ports security** Privileged EXEC mode command to display the port-lock status.

Syntax

show ports security *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display for all interfaces.

Command Mode

Privileged EXEC mode

Example

The following example displays the port-lock status of all ports.

```
switchxxxxxx# show ports security

Port   Status     Learning    Action    Maximum  Trap     Frequency
------- --------  ---------   ------    ---      -------  --------
```

```
gi1     Enabled   Max-        Discard   3         Enabled 100
                  Addresses
gi2     Disabled  Max-        -         28        -       -
                  Addresses
gi3     Enabled   Lock        Discard,  8         Disabled -
                                Shutdown
```

The following table describes the fields shown above.

Field	Description
Port	The port number.
Status	The port security status. The possible values are: Enabled or Disabled.
Action	The action taken on violation.
Maximum	The maximum number of addresses that can be associated on this port in the Max-Addresses mode.
Trap	The status of SNMP traps. The possible values are: Enable or Disable.
Frequency	The minimum time interval between consecutive traps.

27.31 show ports security addresses

Use the **show ports security addresses** Privileged EXEC mode command to display the current dynamic addresses in locked ports.

Syntax

show ports security addresses [*interface-id*

Parameters

interface-id—Display addresses for the specified interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Display for all interfaces.

Command Mode

Privileged EXEC mode

Example

The following example displays dynamic addresses in all currently locked port:

Port	Status	Learning	Current	Maximum
gi1	Disabled	Lock	0	10
gi2	Disabled	Lock	0	1
gi3	Disabled	Lock	0	1
gi4	Disabled	Lock	0	1
gi5	Disabled	Lock	0	1
gi6	Disabled	Lock	0	1
gi7	Disabled	Lock	0	1

...

27.32 bridge multicast reserved-address

Use the **bridge multicast reserved-address** Global Configuration mode command to define the action on Multicast reserved-address packets. Use the **no** form of this command to revert to default.

Syntax

bridge multicast reserved-address *mac-multicast-address [**ethernet-v2** ethtype | **llc** sap | **llc-snap** pid] {**discard** | **bridge**}*

no bridge multicast reserved-address *mac-multicast-address [**ethernet-v2** ethtype | **llc** sap | **llc-snap** pid]*

Parameters

- **mac-multicast-address**—MAC Multicast address in the reserved MAC addresses range.(Range: 01-80-C2-00-00-00, 01-80-C2-00-00-02–01-80-C2-00-00-2F)

- **ethernet-v2** *ethtype*—Specifies that the packet type is Ethernet v2 and the Ethernet type field (16 bits in hexadecimal format).(Range: 0x0600–0xFFFF)
- **llc** *sap*—Specifies that the packet type is LLC and the DSAP-SSAP field (16 bits in hexadecimal format).(Range: 0xFFFF)
- **llc-snap** *pid*—Specifies that the packet type is LLC-SNAP and the PID field (40 bits in hexadecimal format). (Range: 0x0000000000 - 0xFFFFFFFFFF)
- **discard**—Specifies discarding the packets.
- **bridge**—Specifies bridging (forwarding) the packets

Default Configuration

- If the user-supplied MAC Multicast address, ethertype and encapsulation (LLC) specifies a protocol supported on the device (called Peer), the default action (discard or bridge) is determined by the protocol.
- If not, the default action is as follows:
  - For MAC addresses in the range 01-80-C2-00-00-00, 01-80-C2-00-00-02– 01-80-C2-00-00-0F, the default is **discard**.
  - For MAC addresses in the range 00-80-C2-00-00-10– 01-80-C2-00-00-2F, the default is **bridge**.

Command Mode

Global Configuration mode

User Guidelines

If the packet/service type (ethertype/encapsulation) is not specified, the configuration is relevant to all the packets with the configured MAC address.

Specific configurations (that contain service type) have precedence over less specific configurations (contain only MAC address).

The packets that are bridged are subject to security ACLs.

The actions define by this command has precedence over forwarding rules defined by applications/protocols (STP, LLDP etc.) supported on the device.

Example

```
switchxxxxxx(conf)#bridge multicast reserved-address 00:3f:bd:45:5a:b1
```

27.33 show bridge multicast reserved-addresses

Use the **show bridge multicast reserved-addresses** EXEC mode command to display the Multicast reserved-address rules.

Syntax

show bridge multicast reserved-addresses

Command Mode

EXEC mode

Example

```
switchxxxxxx # show bridge multicast reserved-addresses

MAC Address         Frame Type  Protocol        Action

------------------  ----------- --------------  ------------

01-80-C2-00-00-00   LLC-SNAP    00-00-0C-01-29  Bridge
```

28 Port Monitor Commands

28.1 port monitor

Use the **port monitor** Interface Configuration (Ethernet) mode command to start a port monitoring session (mirroring). Use the **no** form of this command to stop a port monitoring session.

Syntax

port monitor *src-interface-id [**rx** | **tx**]*

no port monitor *src-interface-id*

port monitor ***vlan*** *vlan-id*

no port monitor ***vlan*** *vlan-id*

Parameters

- **rx**—Monitors received packets only. If no option is specified, it monitors both rx and tx.
- **tx**—Monitors transmitted packets only. If no option is specified, it monitors both rx and tx.
- **vlan** *vlan-id*—VLAN number
- **src-interface-id**—Specifies an interface ID. The interface ID must be and Ethernet port.

Default Configuration

Monitors both received and transmitted packets.

Command Mode

Interface Configuration (Ethernet) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

This command enables port copy between Source Port (src-interface) to a Destination Port (The port in context).

The analyzer port for port ingress traffic mirroring should be the same port for all mirrored ports.

The analyzer port for port egress traffic mirroring should be the same port for all mirrored ports.

The analyzer port for VLAN mirroring should be the same for all the mirrored VLANs, and should be the same port as the analyzer port for port ingress mirroring traffic.

The following restriction applies to ports that are configured to be source ports:

- The port cannot be a destination port.

The following restrictions apply to ports that are configured to be monitor ports:

- The port cannot be source port.
- The port is not a member in port-channel.
- IP interface is not configured on the port.
- GVRP is not enabled on the port.
- The port is not a member in any VLAN, except for the default VLAN (will be automatically removed from the default VLAN).
- L2 protocols, such as: LLDP, CDP, LBD, STP, LACP, are not active on the destination port.

Notes:

1. In this mode some traffic duplication on the analyzer port may be observed. For example:
    - Port 2 is being egress monitored by port 4.
    - Port 2 & 4 are members in VLAN 3.
    - Unknown Unicast packet sent to VLAN 3 will egress from port 4 twice, one instance as normal forward and another instance as mirrored from port 2.
    - Moreover, if port 2 is an untagged member in VLAN 3 and port 4 is a tagged member then both instances will look different (one tagged and the other is not).

1. When the port is configured to 802.1X auto mode it will forward any mirrored traffic regardless of the.1X state. However, it will operate as a normal network port (forward traffic) only after authorization is done.

2. Mirrored traffic is exposed to STP state, i.e. if the port is in STP blocking, it will not egress any mirrored traffic.

Example

The following example copies traffic for both directions (Tx and Rx) from the source port gi2 to destination port gi1.

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# port monitor gi2
```

28.2 show ports monitor

Use the **show ports monitor** EXEC mode command to display the port monitoring status.

Syntax

show ports monitor

Command Mode

EXEC mode

Example

The following example displays the port monitoring status.

```
switchxxxxxx# show ports monitor
Source port     Destination Port   Type      Status
-----------   -----------------    --------  --------
gi8            gi1                RX,TX     Active
gi2            gi1                RX,TX     Active
gi18           gi1               Rx        Active
VLAN 9         gi1               N/A       Active
```

29 Spanning-Tree Commands

29.1 spanning-tree

Use the **spanning-tree** Global Configuration mode command to enable spanning-tree functionality. Use the **no** form of this command to disable the spanning-tree functionality.

Syntax

spanning-tree

no spanning-tree

Parameters

N/A

Default Configuration

Spanning-tree is enabled.

Command Mode

Global Configuration mode

Example

The following example enables spanning-tree functionality.

```
switchxxxxxx(config)# spanning-tree
```

29.2 spanning-tree mode

Use the **spanning-tree mode** Global Configuration mode command to select which Spanning Tree Protocol (STP) protocol to run. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree mode *{stp | rstp | mst}*

no spanning-tree mode

Parameters

- **stp**—Specifies that STP is enabled.
- **rstp**—Specifies that the Rapid STP is enabled.
- **mst**—Specifies that the Multiple STP is enabled.

Default Configuration

The default is RSTP.

Command Mode

Global Configuration mode

User Guidelines

In RSTP mode, the device uses STP when the neighbor device uses STP.

In MSTP mode, the device uses RSTP when the neighbor device uses RSTP, and uses STP when the neighbor device uses STP.

Example

The following example enables MSTP.

```
switchxxxxxx(config)# spanning-tree mode mstp
```

29.3 spanning-tree forward-time

Use the **spanning-tree forward-time** Global Configuration mode command to configure the spanning-tree bridge forward time, which is the amount of time a port remains in the listening and learning states before entering the forwarding state. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree forward-time *seconds*

no spanning-tree forward-time

Parameters

seconds—Specifies the spanning-tree forward time in seconds. (Range: 4–30)

Default Configuration

15 seconds.

Command Mode

Global Configuration mode

User Guidelines

When configuring the forwarding time, the following relationship should be maintained:

2*(Forward-Time - 1) >= Max-Age

Example

The following example configures the spanning tree bridge forwarding time to 25 seconds.

```
switchxxxxxx(config)# spanning-tree forward-time 25
```

29.4 spanning-tree hello-time

Use the **spanning-tree hello-time** Global Configuration mode command to configure how often the device broadcasts Hello messages to other devices. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree hello-time *seconds*

no spanning-tree hello-time

Parameters

seconds—Specifies the spanning-tree Hello time in seconds. (Range: 1–10)

Default Configuration

2 seconds.

Command Mode

Global Configuration mode

User Guidelines

When configuring the Hello time, the following relationship should be maintained:

Max-Age >= 2*(Hello-Time + 1)

Example

The following example configures the spanning-tree bridge hello time to 5 seconds.

```
switchxxxxxx(config)# spanning-tree hello-time 5
```

29.5 spanning-tree max-age

Use the **spanning-tree max-age** Global Configuration mode command to configure the STP maximum age. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree max-age *seconds*

no spanning-tree max-age

Parameters

seconds—Specifies the spanning-tree bridge maximum age in seconds. (Range: 6–40)

Default Configuration

The default maximum age is 20 seconds.

Command Mode

Global Configuration mode

User Guidelines

When configuring the maximum age, the following relationships should be maintained:

2*(Forward-Time - 1) >= Max-Age

Max-Age >= 2*(Hello-Time + 1)

Example

The following example configures the spanning-tree bridge maximum age to 10 seconds.

```
switchxxxxxx(config)# spanning-tree max-age 10
```

29.6 spanning-tree priority

Use the **spanning-tree priority** Global Configuration mode command to configure the device STP priority, which is used to determine which bridge is selected as the root bridge. Use the **no** form of this command to restore the default device spanning-tree priority.

Syntax

spanning-tree priority *priority*

no spanning-tree priority

Parameters

priority—Specifies the bridge priority. (Range: 0–61440)

Default Configuration

Default priority = 32768.

Command Mode

Global Configuration mode

User Guidelines

The priority value must be a multiple of 4096.

The switch with the lowest priority is the root of the spanning tree. When more than one switch has the lowest priority, the switch with the lowest MAC address is selected as the root.

Example

The following example configures the spanning-tree priority to 12288.

```
switchxxxxxx(config)# spanning-tree priority 12288
```

29.7 spanning-tree disable

Use the **spanning-tree disable** Interface Configuration (Ethernet, port-channel) mode command to disable the spanning tree on a specific port. Use the **no** form of this command to enable the spanning tree on a port.

Syntax

spanning-tree disable

no spanning-tree disable

Parameters

N/A

Default Configuration

Spanning tree is enabled on all ports.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example disables the spanning tree on `gi5`

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# spanning-tree disable
```

29.8 spanning-tree cost

Use the **spanning-tree cost** Interface Configuration (Ethernet, port-channel) mode command to configure the spanning-tree path cost for a port. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree cost *cost*

no spanning-tree cost

Parameters

cost—Specifies the port path cost. (Range: 1–200000000)

Default Configuration

Default path cost is determined by port speed and path cost method (long or short) as shown below:

Interface	Long	Short
Port-channel	20,000	4
Gigabit Ethernet (1000 Mbps)	20,000	4
Fast Ethernet (100 Mbps)	200,000	19
Ethernet (10 Mbps)	2,000,000	100

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example configures the spanning-tree cost on `gi` 15 to 35000.

```
switchxxxxxx(config)# interface gi15
switchxxxxxx(config-if)# spanning-tree cost 35000
```

29.9 spanning-tree port-priority

Use the **spanning-tree port-priority** Interface Configuration (Ethernet, port-channel) mode command to configure the port priority. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree port-priority *priority*

no spanning-tree port-priority

Parameters

priority—Specifies the port priority. (Range: 0–240)

Default Configuration

The default port priority is 128.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The priority value must be a multiple of 16.

Example

The following example configures the spanning priority on `gi`15 to 96

```
switchxxxxxx(config)# interface gi15

switchxxxxxx(config-if)# spanning-tree port-priority 96
```

29.10 spanning-tree portfast

Use the **spanning-tree portfast** Interface Configuration (Ethernet, port-channel) mode command to enable the PortFast mode. In PortFast mode, the interface is immediately put into the forwarding state upon linkup, without waiting for the standard forward time delay. Use the **no** form of this command to disable the PortFast mode.

Syntax

spanning-tree portfast [auto]

no spanning-tree portfast

Parameters

auto—Specifies that the software waits for 3 seconds (with no Bridge Protocol Data Units (BPDUs) received on the interface) before putting the interface into the PortFast mode.

Default Configuration

PortFast mode is disabled.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example enables the PortFast mode on gi15.

```
switchxxxxxx(config)# interface gi15
switchxxxxxx(config-if)# spanning-tree portfast
```

29.11 spanning-tree link-type

Use the **spanning-tree link-type** Interface Configuration (Ethernet, port-channel) mode command to override the default link-type setting determined by the port duplex mode, and enable RSTP transitions to the Forwarding state. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree link-type *{point-to-point | shared}*

no spanning-tree spanning-tree link-type

Parameters

- **point-to-point**—Specifies that the port link type is point-to-point.
- **shared**—Specifies that the port link type is shared.

Default Configuration

The device derives the port link type from the duplex mode. A full-duplex port is considered a point-to-point link and a half-duplex port is considered a shared link.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example enables shared spanning-tree on gi15.

```
switchxxxxxx(config)# interface gi15
```

```
switchxxxxxx(config-if)# spanning-tree link-type shared
```

29.12 spanning-tree pathcost method

Use the **spanning-tree pathcost method** Global Configuration mode command to set the default path cost method. Use the **no** form of this command to return to the default configuration.

Syntax

spanning-tree pathcost method *{long | short}*

no spanning-tree pathcost method

Parameters

- **long**—Specifies that the default port path costs are within the range: 1–200,000,000.
- **short**—Specifies that the default port path costs are within the range: 1–65,535.

Default Configuration

Long path cost method.

Command Mode

Global Configuration mode

User Guidelines

This command applies to all the spanning tree instances on the switch.

- If the short method is selected, the switch calculates cost in the range 1 through 65,535.
- If the long method is selected, the switch calculates cost in the range 1 through 200,000,000.

Example

The following example sets the default path cost method to Long.

```
switchxxxxxx(config)# spanning-tree pathcost method long
```

29.13 spanning-tree bpdu (Global)

Use the **spanning-tree bpdu** Global Configuration mode command to define Bridge Protocol Data Unit (BPDU) handling when the spanning tree is disabled globally or on a single interface. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree bpdu *{filtering | flooding}*

no spanning-tree bpdu

Parameters

- **filtering**—Specifies that BPDU packets are filtered when the spanning tree is disabled on an interface.
- **flooding**—Specifies that untagged BPDU packets are flooded unconditionally (without applying VLAN rules) to all ports with the spanning tree disabled and BPDU handling mode of flooding. Tagged BPDU packets are filtered.

Default Configuration

The default setting is **flooding**.

Command Mode

Global Configuration mode

User Guidelines

The **filtering** and **flooding** modes are relevant when the spanning tree is disabled globally or on a single interface.

Example

The following example defines the BPDU packet handling mode as **flooding** when the spanning tree is disabled on an interface.

```
switchxxxxxx(config)# spanning-tree bpdu flooding
```

29.14 spanning-tree bpdu (Interface)

Use the **spanning-tree bpdu** Interface Configuration (Ethernet, Port-channel) mode command to define BPDU handling when the spanning tree is disabled on a single interface. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree bpdu *{filtering | flooding}*

no spanning-tree bpdu

Parameters

- **filtering**—Specifies that BPDU packets are filtered when the spanning tree is disabled on an interface.
- **flooding**—Specifies that untagged BPDU packets are flooded unconditionally (without applying VLAN rules) to ports with the spanning tree disabled and BPDU handling mode of flooding. Tagged BPDU packets are filtered.

Default Configuration

The spanning-tree bpdu (Global) command determines the default configuration.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example defines the BPDU packet as **flooding** when the spanning tree is disabled on `gi3`.

```
switchxxxxxx(config)# interface gi3
switchxxxxxx(config-if)# spanning-tree bpdu flooding
```

29.15 spanning-tree bpduguard

Use the **spanning-tree bpduguard** Interface Configuration (Ethernet, port-channel) mode command to shut down an interface when it receives a Bridge Protocol Data Unit (BPDU). Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree bpduguard *{enable | disable}*

no spanning-tree bpduguard

Parameters

bpduguard ***enable***—Enables BPDU Guard.

bpduguard ***disable***—Disables BPDU Guard.

Default Configuration

BPDU Guard is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

The command can be enabled when the spanning tree is enabled (useful when the port is in the PortFast mode) or disabled.

Example

The following example shuts down `gi5` when it receives a BPDU.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# spanning-tree bpduguard enable
```

29.16 clear spanning-tree detected-protocols

Use the **clear spanning-tree detected-protocols** Privileged EXEC command to restart the STP migration process (force renegotiation with neighboring switches) on all interfaces or on the specified interface

Syntax

clear spanning-tree detected-protocols *[interface interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

All interfaces.

Command Mode

Privileged EXEC mode

User Guidelines

This feature can only be used when working in RSTP or MSTP mode.

Example

This restarts the STP migration process on all interfaces.

```
switchxxxxxx# clear spanning-tree detected-protocols
```

29.17 spanning-tree mst priority

Use the **spanning-tree mst priority** Global Configuration mode command to configure the device priority for the specified spanning-tree instance. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree mst *instance-id* ***priority*** *priority*

no spanning-tree mst *instance-id* ***priority***

Parameters

- **instance-id**—Specifies the spanning-tree instance ID. (Range:1–7)
- **priority**—Specifies the device priority for the specified spanning-tree instance. This setting determines the likelihood that the switch is selected as the root switch. A lower value increases the probability that the switch is selected as the root switch. (Range: 0–61440)

Default Configuration

The default priority is 32768.

Command Mode

Global Configuration mode

User Guidelines

The priority value must be a multiple of 4096.

The switch with the lowest priority is the root of the spanning tree.

Example

The following example configures the spanning tree priority of instance 1 to 4096.

```
switchxxxxxx(config)# spanning-tree mst 1 priority 4096
```

29.18 spanning-tree mst max-hops

Use the **spanning-tree mst max-hops** Global Configuration mode command to configure the number of hops in an MST region before the BDPU is discarded and the port information is aged out. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree mst max-hops *hop-count*

no spanning-tree mst max-hops

Parameters

max-hops *hop-count*—Specifies the number of hops in an MST region before the BDPU is discarded. (Range: 1–40)

Default Configuration

The default number of hops is 20.

Command Mode

Global Configuration mode

Example

The following example configures the maximum number of hops that a packet travels in an MST region before it is discarded to 10.

```
switchxxxxxx(config)# spanning-tree mst max-hops 10
```

29.19 spanning-tree mst port-priority

Use the **spanning-tree mst port-priority** Interface Configuration (Ethernet, port-channel) mode command to configure the priority of a port. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree mst *instance-id* **port-priority** *priority*

no spanning-tree mst *instance-id* **port-priority**

Parameters

- **instance-id**—Specifies the spanning tree instance ID. (Range: 1–15)
- **priority**—Specifies the port priority. (Range: 0–240 in multiples of 16)

Default Configuration

The default port priority is 128.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The priority value must be a multiple of 16.

Example

The following example configures the port priority of gi1 to 144.

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# spanning-tree mst 1 port-priority 144
```

29.20 spanning-tree mst cost

Use the **spanning-tree mst cost** Interface Configuration (Ethernet, Port-channel) mode command to configure the path cost for MST calculations. If a loop occurs, the spanning tree considers path cost when selecting an interface to put in the Forwarding state. Use the **no** form of this command to restore the default configuration.

Syntax

spanning-tree mst *instance-id* **cost** *cost*

no spanning-tree mst *instance-id* **cost**

Default Configuration

N/A

Parameters

- **instance-id**—Specifies the spanning-tree instance ID. (Range: 1–15)
- **cost**—Specifies the port path cost. (Range: 1–200000000)

Default Configuration

Default path cost is determined by the port speed and path cost method (long or short) as shown below:

Interface	Long	Short
Port-channel	20,000	4
Gigabit Ethernet (1000 Mbps)	20,000	4
Fast Ethernet (100 Mbps)	200,000	19
Ethernet (10 Mbps)	2,000,000	100

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example configures the MSTP instance 1 path cost for gigabitethernet port 9 to 4.

```
switchxxxxxx(config)# interface gi9

switchxxxxxx(config-if)# spanning-tree mst 1 cost 4
```

29.21 spanning-tree mst configuration

Use the **spanning-tree mst configuration** Global Configuration mode command to enable configuring an MST region by entering the MST mode.

Syntax

spanning-tree mst configuration

Command Mode

Global Configuration mode

User Guidelines

For two or more switches to be in the same MST region, they must contain the same VLAN mapping, the same configuration revision number, and the same name.

Example

The following example configures an MST region.

```
switchxxxxxx(config)# spanning-tree mst configuration

switchxxxxxx(config-mst)# instance 1 vlan 10-20

switchxxxxxx(config-mst)# name region1

switchxxxxxx(config-mst)# revision 1
```

29.22 instance (MST)

Use **instance** MST Configuration mode command to map VLANs to an MST instance. Use the **no** form of this command to restore the default mapping.

Syntax

instance *instance-id* ***vlan*** *vlan-range*

no **instance** *instance-id* ***vlan*** *vlan-range*

Parameters

- **instance-id**—MST instance (Range: 1–7)
- **vlan-range**—The specified range of VLANs is added to the existing ones. To specify a range, use a hyphen. To specify a series, use a comma. (Range: 1–4094)

Default Configuration

All VLANs are mapped to the common and internal spanning tree (CIST) instance (instance 0).

Command Mode

MST Configuration mode

User Guidelines

All VLANs that are not explicitly mapped to an MST instance are mapped to the common and internal spanning tree (CIST) instance (instance 0) and cannot be unmapped from the CIST.

For two or more devices to be in the same MST region, they must have the same VLAN mapping, the same configuration revision number, and the same name.

Example

The following example maps VLANs 10-20 to MST instance 1.

```
switchxxxxxx(config)# spanning-tree mst configuration
switchxxxxxx(config-mst)# instance 1 vlan 10-20
```

29.23 name (MST)

Use the **name** MST Configuration mode command to define the MST instance name. Use the **no** form of this command to restore the default setting.

Syntax

name *string*

no name

Parameters

string—Specifies the MST instance name. (Length: 1–32 characters)

Default Configuration

The default name is the bridge MAC address.

Command Mode

MST Configuration mode

Example

The following example defines the instance name as Region1.

```
switchxxxxxx(config)# spanning-tree mst configuration
switchxxxxxx(config-mst)# name region1
```

29.24 revision (MST)

Use the **revision** MST Configuration mode command to define the MST configuration revision number. Use the **no** form of this command to restore the default configuration.

Syntax

revision *value*

no revision

Parameters

value—Specifies the MST configuration revision number. (Range: 0–65535)

Default Configuration

The default configuration revision number is 0.

Command Mode

MST Configuration mode

Example

The following example sets the configuration revision to 1.

```
switchxxxxxx(config) # spanning-tree mst configuration
switchxxxxxx(config-mst) # revision 1
```

29.25 show (MST)

Use the **show** MST Configuration mode command to display the current or pending MST region configuration.

Syntax

show *{current | pending}*

Parameters

- **current**—Displays the current MST region configuration.
- **pending**—Displays the pending MST region configuration.

Default Configuration

N/A

Command Mode

MST Configuration mode

Example

The following example displays a pending MST region configuration

```
switchxxxxxx(config-mst)# show pending
Gathering information ..........
Current MST configuration
Name: Region1
Revision: 1
Instance  VLANs Mapped               State
--------  -------------------------  -----
```

```
0          1-4094                      Disabled

switchxxxxxx(config-mst)#
```

29.26 exit (MST)

Use the **exit** MST Configuration mode command to exit the MST region Configuration mode and apply all configuration changes.

Syntax

exit

Parameters

N/A

Default Configuration

N/A

Command Mode

MST Configuration mode

Example

The following example exits the MST Configuration mode and saves changes.

```
switchxxxxxx(config)# spanning-tree mst configuration

switchxxxxxx(config-mst)# exit

switchxxxxxx(config)#
```

29.27 abort (MST)

Use the **abort** MST Configuration mode command to exit the MST Configuration mode without applying the configuration changes.

Syntax

abort

Parameters

N/A

Default Configuration

N/A

Command Mode

MST Configuration mode

Example

The following example exits the MST Configuration mode without saving changes.

```
switchxxxxxx(config)# spanning-tree mst configuration
switchxxxxxx(config-mst)# abort
```

29.28 show spanning-tree

Use the **show spanning-tree** Privileged EXEC mode command to display the spanning-tree configuration.

Syntax

show spanning-tree *[interface-id] [**instance** instance-id]*

show spanning-tree *[**detail**] [**active** | **blockedports**] [**instance** instance-id]*

show spanning-tree *mst-configuration*

Parameters

- **instance** *instance-id*—Specifies the spanning tree instance ID. (Range: 1–7)
- **detail**—Displays detailed information.
- **active**—Displays active ports only.
- **blockedports**—Displays blocked ports only.
- **mst-configuration**—Displays the MST configuration identifier.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

If no interface is specified, the default is all interfaces.

Command Mode

Privileged EXEC mode

User Guidelines

This command only works when MST is enabled.

Example

The following examples display spanning-tree information in various configurations:

```
switchxxxxxx# show spanning-tree
Spanning tree enabled mode RSTP
Default port cost method: long
Loopback guard: Disabled
Root ID    Priority            32768
           Address             00:01:42:97:e0:00
           Cost                20000
           Port                gi1
           Hello Time 2 sec           Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority            36864
           Address             00:02:4b:29:7a:00
           Hello Time 2 sec           Max Age 20 sec  Forward Delay 15 sec
```

```
Interfaces
Name       State    Prio. No    Cost    Sts     Role    PortFast Type
------     ------   ------      -----   ---     ----    -------- ----------
gi1        Enabled  128.1       20000   FWD     Root    No       P2p (RSTP)
gi2        Enabled  128.2       20000   FWD     Desg    No       Shared (STP)
gi3        Disabled 128.3       20000   -       -       -        -
gi4        Enabled  128.4       20000   BLK     Altn    No       Shared (STP)
gi5        Enabled  128.5       20000   DIS     -       -        -
```

```
switchxxxxxx# show spanning-tree
Spanning tree enabled mode RSTP
Default port cost method: long
Root ID    Priority            36864
           Address             00:02:4b:29:7a:00
           This switch is the Root.
           Hello Time 2 sec           Max Age 20 sec Forward Delay 15 sec
Interfaces
Name       State    Prio.Nbr    Cost    Sts     Role    PortFast Type
--------   -------- ---------   -----   ---     ----    -------- ----------
gi1        Enabled  128.1       20000   FWD     Desg    -        P2p (RSTP)
gi2        Enabled  128.2       20000   FWD     Desg    No       Shared (STP)
gi3        Disabled 128.3       20000   -       -       No       -
gi4        Enabled  128.4       20000   FWD     Desg    -        Shared (STP)
gi5        Enabled  128.5       20000   DIS     -       No       -
                                                                 -
```

```
switchxxxxxx# show spanning-tree
Spanning tree disabled (BPDU filtering) mode RSTP
Default port cost method: long
Root ID    Priority            N/A
           Address             N/A
           Path Cost           N/A
           Root Port           N/A
           Hello Time          N/A     Max Age N/A     Forward Delay N/A

Bridge ID  Priority            36864
           Address             00:02:4b:29:7a:00
           Hello Time 2 sec           Max Age 20 sec Forward Delay 15 sec
```

```
Interfaces
Name       State    Prio.Nb     Cost    Sts     Role    PortFast Type
---------  -------- -------     -----   ---     ----    -------- ----------
gi1        Enabled  128.1       20000   -       -       -        -
gi2        Enabled  128.2       20000   -       -       -        -
gi3        Disabled 128.3       20000   -       -       -        -
gi4        Enabled  128.4       20000   -       -       -        -
gi5        Enabled  128.5       20000   -       -       -        -
                                                         -
```

```
switchxxxxxx# show spanning-tree active
Spanning tree enabled mode RSTP
Default port cost method: long
Root ID    Priority            32768
           Address             00:01:42:97:e0:00
           Path Cost           20000
           Root Port           gi1
           Hello Time 2 sec          Max Age 20 sec Forward Delay 15 sec

Bridge ID  Priority            36864
           Address             00:02:4b:29:7a:00
           Hello Time 2 sec          Max Age 20 sec Forward Delay 15 sec
Interfaces
Name       State    Prio.Nbr    Cost    Sts     Role    PortFast Type
---------  -------- ------      -----   ---     ----    -------- ----------
gi1        Enabled  128.1       20000   FWD     Root    -        P2p (RSTP)
gi2        Enabled  128.2       20000   FWD     Desg    No       Shared (STP)
gi4        Enabled  128.4       20000   BLK     Altn    No       Shared (STP)
                                                         No
```

```
switchxxxxxx# show spanning-tree blockedports
Spanning tree enabled mode RSTP
Default port cost method: long
Root ID    Priority            32768
           Address             00:01:42:97:e0:00
           Path Cost           20000
           Root Port           gi1
           Hello Time 2 sec          Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID  Priority            36864
           Address             00:02:4b:29:7a:00
           Hello Time 2 sec           Max Age 20 sec Forward Delay 15 sec

Interfaces
Name       State    Prio.Nbr    Cost    Sts     Role    PortFast Type
---------  -------  ------      -----   ---     ----    -------- ----------
gi4        Enabled  128.4       19      BLK     Altn    No       Shared (STP)
```

```
switchxxxxxx# show spanning-tree detail
Spanning tree enabled mode RSTP
Default port cost method: long
Root ID    Priority            32768
           Address             00:01:42:97:e0:00
           Path Cost           20000
           Root Port           gi1
           Hello Time 2 sec           Max Age 20 sec Forward Delay 15 sec

Bridge ID  Priority            36864
           Address             00:02:4b:29:7a:00
           Hello Time 2 sec           Max Age 20 sec Forward Delay 15 sec
Number of topology changes 2 last change occurred 2d18h ago
Times:     hold 1, topology change 35, notification 2
           hello 2, max age 20, forward delay 15

Port 1 (gi1) enabled
State: Forwarding                     Role: Root
Port id: 128.1                        Port cost: 20000
Type: P2p (configured: auto) RSTP     Port Fast: No (configured:no)
Designated bridge Priority: 32768     Address: 00:01:42:97:e0:00
Designated port id: 128.25            Designated path cost: 0
Guard root: Disabled                  BPDU guard: Disabled
Number of transitions to forwarding state: 1
BPDU: sent 2, received 120638
```

```
Port 2 (gi2) enabled
State: Forwarding                      Role: Designated
Port id: 128.2                         Port cost: 20000
Type: Shared (configured: auto) STP    Port Fast: No (configured:no)
Designated bridge Priority: 32768      Address: 00:02:4b:29:7a:00
Designated port id: 128.2              Designated path cost: 20000
Guard root: Disabled                   BPDU guard: Disabled
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638
Port 3 (gi3) disabled
State: N/A                             Role: N/A
Port id: 128.3                         Port cost: 20000
Type: N/A (configured: auto)           Port Fast: N/A (configured:no)
Designated bridge Priority: N/A        Address: N/A
Designated port id: N/A                Designated path cost: N/A
Guard root: Disabled                   BPDU guard: Disabled
Number of transitions to forwarding state: N/A
BPDU: sent N/A, received N/A
Port 4 (gi4) enabled
State: Blocking                        Role: Alternate
Port id: 128.4                         Port cost: 20000
Type: Shared (configured:auto) STP     Port Fast: No (configured:no)
Designated bridge Priority: 28672      Address: 00:30:94:41:62:c8
Designated port id: 128.25             Designated path cost: 20000
Guard root: Disabled                   BPDU guard: Disabled
Number of transitions to forwarding state: 1
BPDU: sent 2, received 120638
Port 5 (gi5) enabled
State: Disabled                        Role: N/A
Port id: 128.5                         Port cost: 20000
Type: N/A (configured: auto)           Port Fast: N/A (configured:no)
Designated bridge Priority: N/A        Address: N/A
Designated port id: N/A                Designated path cost: N/A
Guard root: Disabled                   BPDU guard: Disabled
Number of transitions to forwarding state: N/A
BPDU: sent N/A, received N/A
```

```
switchxxxxxx# show spanning-tree ethernet gi1
Port 1 (gi1) enabled
State: Forwarding                    Role: Root
Port id: 128.1                       Port cost: 20000
Type: P2p (configured: auto) RSTP    Port Fast: No (configured:no)
Designated bridge Priority: 32768    Address: 00:01:42:97:e0:00
Designated port id: 128.25           Designated path cost: 0
Guard root: Disabled                 BPDU guard: Disabled
Number of transitions to forwarding state: 1
BPDU: sent 2, received 120638
```

```
switchxxxxxx# show spanning-tree mst-configuration
Name: Region1
Revision: 1
Instance          Vlans mapped       State
--------          ------------       ---------
0                 1-9, 21-4094       Enabled
1                 10-20              Enabled
```

```
switchxxxxxx# show spanning-tree
Spanning tree enabled mode MSTP
Default port cost method: long
###### MST 0 Vlans Mapped: 1-9
CST Root ID       Priority    32768
                  Address     00:01:42:97:e0:00
                  Path Cost   20000
                  Root Port    gi1
                  Hello Time 2 sec   Max Age 20 sec Forward Delay 15 sec

IST Master ID     Priority    32768
                  Address     00:02:4b:29:7a:00
                  This switch is the IST master.
                  Hello Time 2 sec   Max Age 20 sec Forward Delay 15 sec
                  Max hops 20

Interfaces
```

```
Name       State    Prio.Nbr    Cost    Sts     Role    PortFast Type
----       -------  --------    -----   ---     ----    -------- --------------
gi1        Enabled  128.1       20000   FWD     Root    No       P2p Bound
gi2        Enabled  128.2       20000   FWD     Desg    No       (RSTP)
gi3        Enabled  128.3       20000   FWD     Desg    No       Shared Bound
gi4        Enabled  128.4       20000   FWD     Desg    No       (STP)
                                                                  P2p
                                                                  P2p

###### MST 1 Vlans Mapped: 10-20
Root ID            Priority    24576
                   Address     00:02:4b:29:89:76
                   Path Cost   20000
                   Root Port    gi4
                   Rem hops    19

Bridge ID          Priority    32768
                   Address     00:02:4b:29:7a:00
Interfaces
Name       State    Prio.Nbr    Cost    Sts     Role    PortFast Type
----       -------  --------    -----   ---     ----    -------- --------------
gi1        Enabled  128.1       20000   FWD     Boun    No       P2p Bound
gi2        Enabled  128.2       20000   FWD     Boun    No       (RSTP)
gi3        Enabled  128.3       20000   BLK     Altn    No       Shared Bound
gi4        Enabled  128.4       20000   FWD     Root    No       (STP)
                                                                  P2p
                                                                  P2p
```

```
switchxxxxxx# show spanning-tree detail
Spanning tree enabled mode MSTP
Default port cost method: long
###### MST 0 Vlans Mapped: 1-9
CST Root ID        Priority    32768
                   Address     00:01:42:97:e0:00
                   Path Cost   20000
                   Root Port    gi1
                   Hello Time 2 sec   Max Age 20 sec Forward Delay 15 sec

IST Master ID      Priority    32768
                   Address     00:02:4b:29:7a:00
```

```
                    This switch is the IST master.
                    Hello Time 2 sec   Max Age 20 sec  Forward Delay 15 sec
                    Max hops 20
                    Number of topology changes 2 last change occurred 2d18h
                    ago
                    Times:  hold 1, topology change 35, notification 2
                    hello 2, max age 20, forward delay 15

Port 1 (gi1) enabled
State: Forwarding                               Role: Root
Port id: 128.1                                  Port cost: 20000
Type: P2p (configured: auto) Boundary RSTP      Port Fast: No (configured:no)
Designated bridge Priority: 32768               Address: 00:01:42:97:e0:00
Designated port id: 128.25                      Designated path cost: 0
Number of transitions to forwarding state: 1
BPDU: sent 2, received 120638

Port 2 (gi2) enabled
State: Forwarding                               Role: Designated
Port id: 128.2                                  Port cost: 20000
Type: Shared (configured: auto) Boundary STP    Port Fast: No (configured:no)
Designated bridge Priority: 32768               Address: 00:02:4b:29:7a:00
Designated port id: 128.2                       Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638

Port 3 (gi3) enabled
State: Forwarding                               Role: Designated
Port id: 128.3                                  Port cost: 20000
Type: Shared (configured: auto) Internal        Port Fast: No (configured:no)
Designated bridge Priority: 32768               Address: 00:02:4b:29:7a:00
Designated port id: 128.3                       Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638
```

```
Port 4 (gi4) enabled
State: Forwarding                              Role: Designated
Port id: 128.4                                 Port cost: 20000
Type: Shared (configured: auto) Internal       Port Fast: No (configured:no)
Designated bridge Priority: 32768              Address: 00:02:4b:29:7a:00
Designated port id: 128.2                      Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638

###### MST 1 Vlans Mapped: 10-20
Root ID            Priority    24576
                   Address     00:02:4b:29:89:76
                   Path Cost   20000
                   Root Port    gi4
                   Rem hops 19

Bridge ID          Priority    32768
                   Address     00:02:4b:29:7a:00
                   Number of topology changes 2 last change occurred 1d9h
                   ago
                   Times:  hold 1, topology change 2, notification 2
                   hello 2, max age 20, forward delay 15

Port 1 (gi1) enabled
State: Forwarding                              Role: Boundary
Port id: 128.1                                 Port cost: 20000
Type: P2p (configured: auto) Boundary RSTP     Port Fast: No (configured:no)
Designated bridge Priority: 32768              Address: 00:02:4b:29:7a:00
Designated port id: 128.1                      Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 120638
```

```
Port 2 (gi2) enabled
State: Forwarding                              Role: Designated
Port id: 128.2                                 Port cost: 20000
Type: Shared (configured: auto) Boundary STP   Port Fast: No (configured:no)
Designated bridge Priority: 32768              Address: 00:02:4b:29:7a:00
Designated port id: 128.2                      Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638

Port 3 (gi3) disabled
State: Blocking                                Role: Alternate
Port id: 128.3                                 Port cost: 20000
Type: Shared (configured: auto) Internal       Port Fast: No (configured:no)
Designated bridge Priority: 32768              Address: 00:02:4b:29:1a:19
Designated port id: 128.78                     Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638

Port 4 (gi4) enabled
State: Forwarding                              Role: Designated
Port id: 128.4                                 Port cost: 20000
Type: Shared (configured: auto) Internal       Port Fast: No (configured:no)
Designated bridge Priority: 32768              Address: 00:02:4b:29:7a:00
Designated port id: 128.2                      Designated path cost: 20000
Number of transitions to forwarding state: 1
BPDU: sent 2, received 170638
```

```
switchxxxxxx# show spanning-tree
Spanning tree enabled mode MSTP
Default port cost method: long
###### MST 0 Vlans Mapped: 1-9
CST Root ID        Priority    32768
                   Address     00:01:42:97:e0:00
                   Path Cost   20000
                   Root Port    gi1
                   Hello Time 2 sec   Max Age 20 sec Forward Delay 15 sec
```

```
IST Master ID       Priority    32768
                    Address     00:02:4b:19:7a:00
                    Path Cost   10000
                    Rem hops    19

Bridge ID           Priority    32768
                    Address     00:02:4b:29:7a:00
                    Hello Time 2 sec   Max Age 20 sec Forward Delay 15 sec
                    Max hops 20
```

```
switchxxxxxx# show spanning-tree
Spanning tree enabled mode MSTP
Default port cost method: long

###### MST 0 Vlans Mapped: 1-9
CST Root ID         Priority    32768
                    Address     00:01:42:97:e0:00
                    This switch is root for CST and IST master.
                    Root Port    gi1
                    Hello Time 2 sec   Max Age 20 sec Forward Delay 15 sec
                    Max hops 20
```

29.29 show spanning-tree bpdu

Use the **show spanning-tree bpdu** EXEC mode command to display the BPDU handling when spanning-tree is disabled.

Syntax

show spanning-tree bpdu *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

EXEC mode

Example

The following examples display spanning-tree BPDU information:

```
switchxxxxxx# show spanning-tree bpdu
The following is the output if the global BPDU handling
command is not supported.
Interface       Admin Mode      Oper Mode
---------       ----------      ---------
gi1             Filtering       Filtering
gi2             Filtering       Filtering
gi3             Filtering       Guard
The following is the output if both the global BPDU
handling command and the per-interface BPDU handling
command are supported.
Global: Flooding

Interface       Admin Mode      Oper Mode
---------       ----------      ---------
gi1             Global          Flooding
gi2             Global          STP
gi3             Flooding        STP
```

29.30 spanning-tree loopback-guard

Use the **spanning-tree loopback-guard global configuration** command to shut down an interface if it receives a loopback BPDU. Use the **no** form of this command to return the default setting.

Syntax

spanning-tree loopback-guard

no spanning-tree loopback-guard

Parameters

N/A

Default Configuration

N/A

Command Mode

Global

User Guidelines

This enables shutting down all interfaces if a loopback BPDU is received on it.

Example

```
switchxxxxxx(config)# spanning-tree loopback-guard
```

30 Virtual Local Area Network (VLAN) Commands

30.1 vlan database

Use the **vlan database** Global Configuration mode command to enter the VLAN Configuration mode. This mode is used to create VLAN(s) and define the default VLAN.

Use the **exit** command to return to Global Configuration mode.

Syntax

vlan database

Parameters

N/A

Default Configuration

VLAN 1 exists by default.

Command Mode

Global Configuration mode

Example

The following example enters the VLAN Configuration mode, creates VLAN 1972 and exits VLAN Configuration mode.

```
switchxxxxxx(config)# vlan database
switchxxxxxx(config-vlan)# vlan 1972
switchxxxxxx(config-vlan)# exit
switchxxxxxx(config)#
```

30.2 vlan

Use the **vlan** VLAN Configuration mode command to create a VLAN. Use the **no** form of this command to delete the VLAN(s).

To assign the VLAN a name, use the Interface Configuration (VLAN) mode name command.

Syntax

vlan *vlan-range*

no vlan *vlan-range*

Parameters

- **vlan-range**—Specifies a list of VLAN IDs to add. Separate nonconsecutive VLAN IDs with a comma and no spaces. Use a hyphen to designate a range of IDs (range: 2-4094).

Default Configuration

VLAN 1 exists by default.

Command Mode

VLAN Configuration mode

Example

The following example creates VLANs 100 and 1972.

```
switchxxxxxx(config)# vlan database
switchxxxxxx(config-vlan)#vlan 100,1972
switchxxxxxx(config-vlan)#
```

30.3 show vlan

Use the **show vlan** Privileged EXEC mode command to display the following VLAN information for all VLANs or for a specific VLAN:

- VLAN ID
- VLAN name
- Ports on the VLAN
- Whether the VLAN was is dynamic or permanent
- Whether authorization is required on the VLAN

Syntax

show vlan [***tag*** *vlan-id* | ***name*** *vlan-name*]

Parameters

- **tag** *vlan-id*—Specifies a VLAN ID.
- **name** *vlan-name*—Specifies a VLAN name string (length: 1–32 characters)

Default Configuration

All VLANs are displayed.

Command Mode

Privileged EXEC mode

Examples:

Example 1 - The following example displays information for all VLANs:.

```
switchxxxxxx# show vlan

VLAN   Name         Ports          Type         Authorization
----   ---------    --------       -------      -------------
1      default      gi1-2          Default      Required
10     Marketing    gi3-14         Static       Required
11     VLAN0011     gi5-16         Static       Required
20     VLAN0020     gi7-18         Static       Required
21     VLAN0021                    Static       Required
30     VLAN0030                    Static       Required
31     VLAN0031                    Static       Required
91     VLAN0091     gi2            Dynamic      Not Required
3978   Guest        gi7            Static       Guest
       VLAN
```

Example 2 - The following example displays information for the default VLAN (VLAN 1):

```
switchxxxxxx# show vlan tag default

VLAN   Name        Ports         Type       Authorization
----   ---------   --------      -------    -------------
1      default     gi1-2         Default    Required
```

Example 3 - The following example displays information for the VLAN named Marketing:

```
switchxxxxxx# show vlan name Marketing

VLAN   Name        Ports         Type       Authorization
----   ---------   --------      -------    -------------
1      Marketing   gi3-14        static     Required
```

30.4 default-vlan vlan

Use the **default-vlan vlan** VLAN Configuration mode command to define the default VLAN. Use the **no** form of this command to set VLAN 1 as the default VLAN.

Syntax

default-vlan vlan *vlan-id*

no default-vlan vlan

Parameters

vlan *vlan-id*—Specifies the default VLAN ID.

Default Configuration

The default VLAN is 1 by default.

Command Mode

VLAN Configuration mode

User Guidelines

This command becomes effective after reboot of the device.

Example

The following example defines the default VLAN as 2.

```
switchxxxxxx(config)# vlan database

switchxxxxxx(config-vlan)# default-vlan vlan 2

New Default VLAN ID will be active after save configuration and reboot device.
```

30.5 show default-vlan-membership

Use the **show default-vlan-membership** privileged EXEC command to view the default VLAN membership.

Syntax

show default-vlan-membership [*interface-id*]

Parameters

interface-id—Specify an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel

Default Configuration

Membership in the default VLAN is displayed for all interfaces.

Command Mode

Privileged EXEC

Example

```
switchxxxxxx # show default-vlan-membership


Port    Forbidden     Membership

----    ------        -------

gi1     TRUE          FALSE

gi2     FALSE         TRUE

gi3     FALSE         FALSE
```

30.6 interface vlan

Use the **interface vlan** Global Configuration mode command to enter the Interface Configuration (VLAN) mode for a specific VLAN. After this command is entered, all commands configure this VLAN. To configure a range of VLANs, use **interface range vlan**.

Syntax

interface vlan *vlan-id*

Parameters

vlan *vlan-id*—Specifies the VLAN to be configured.

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

If the VLAN does not exist (ghost VLAN), some commands are not available under the interface VLAN context.

The commands that are supported for VLANs but do not exist for ghost VLANs are:

- IGMP snooping control commands
- Bridge Multicast configuration commands

Example

The following example configures VLAN 1 with IP address 131.108.1.27 and subnet mask 255.255.255.0.

```
switchxxxxxx (config)# interface vlan 1

switchxxxxxx (config-if)# ip address 131.108.1.27 255.255.255.0
```

30.7 interface range vlan

Use the **interface range vlan** Global Configuration mode command to configure multiple VLANs simultaneously.

Syntax

interface range vlan *vlan-range*

Parameters

vlan *vlan-range*—Specifies a list of VLANs. Separate nonconsecutive VLANs with a comma and no spaces. Use a hyphen to designate a range of VLANs.

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

Commands under the interface VLAN range context are executed independently on each VLAN in the range. If the command returns an error on one of the VLANs, an error message is displayed, and the system attempts to configure the remaining VLANs.

If a VLAN does not exist (ghost VLAN), some commands are not available under the interface VLAN context. These are:

- IGMP snooping control commands
- Bridge Multicast configuration commands

Example

The following example groups VLANs 221 through 228 and 889 to receive the same command(s).

```
switchxxxxxx(config)# interface range vlan 221-228, vlan 889
switchxxxxxx(config-if)#
```

30.8 name

Use the **name** Interface Configuration (VLAN) mode command to name a VLAN. Use the **no** form of this command to remove the VLAN name.

Syntax

name *string*

no name

Parameters

string—Specifies a unique name associated with this VLAN. (Length: 1–32 characters)

Default Configuration

No name is defined.

Command Mode

Interface Configuration (VLAN) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

The VLAN name must be unique.

Example

The following example assigns VLAN 19 the name Marketing.

```
switchxxxxxx(config)# interface vlan 19

switchxxxxxx(config-if)# name Marketing
```

30.9 switchport protected-port

Use the **switchport protected-port** Interface Configuration mode command to isolate Unicast, Multicast, and Broadcast traffic at Layer 2 from other protected ports on the same switch. Use the **no** form of this command to disable protection on the port.

Syntax

switchport protected-port

no switchport protected-port

Parameters

N/A

Default Configuration

Unprotected

Command Mode

Interface configuration (Ethernet, port-channel)

User Guidelines

Note that packets are subject to all filtering rules and Filtering Database (FDB) decisions.

Example

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# switchport protected-port
```

30.10 show interfaces protected-ports

Use the **show interfaces protected-ports** EXEC mode command to display protected ports configuration.

Syntax

show interfaces protected-ports [*interface-id*]

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

Show all protected ports.

Command Mode

EXEC mode

Example

```
switchxxxxxx#show interfaces protected-ports


Interface     State

--------- -------------

  gi1       Protected

  gi2       Protected

  gi3       Unprotected

  gi4       Unprotected
```

30.11 switchport mode

Use the **switchport mode** Interface Configuration (Ethernet, port-channel) mode command to configure the VLAN membership mode (access, trunk, general or customer) of a port. Use the **no** form of this command to restore the default configuration.

Syntax

switchport mode *{access | trunk | general | customer}*

no switchport mode

Parameters

- **access**—Specifies an untagged layer 2 VLAN port.
- **trunk**—Specifies a trunking layer 2 VLAN port.
- **general**—Specifies a full 802-1q-supported VLAN port.
- **customer**—Specifies that the port is connected to customer equipment. Used when the switch is in a provider network.

Default Configuration

Trunk mode.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

- When the port's mode is changed, it receives the configuration corresponding to the mode.
- If the port mode is changed to access and the access VLAN does not exist, then the port does not belong to any VLAN.
- Trunk and general mode ports can be changed to access mode only if all VLANs (except for an untagged PVID are first removed.

Example

The following example configures `gi1` as an access port (untagged layer 2) VLAN port.

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# switchport mode access
switchxxxxxx(config-if)# switchport access vlan 2
```

30.12 switchport access vlan

An interface in access mode can belong to only one VLAN. The **switchport access vlan** Interface Configuration command reassigns an interface to a different VLAN than it currently belongs to.

Use the **no** form of this command to restore the default configuration.

Syntax

switchport access vlan *vlan-id*

no switchport access vlan

Parameters

vlan *vlan-id*—Specifies the VLAN ID to which the port is configured.

Default Configuration

The interface belongs to the default VLAN.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The command automatically removes the port from its previous VLAN and adds it to the new VLAN.

Example

The following example sets gi1 as an access port and assigns it to VLAN 2 (and removes it from its previous VLAN).

```
switchxxxxxx(config)# interface gi2
switchxxxxxx(config-if)# switchport mode access
switchxxxxxx(config-if)# switchport access vlan 2
```

30.13 switchport trunk allowed vlan

A trunk interface is an untagged member of a single VLAN, and, in addition, it may be an tagged member of one or more VLANs. The **switchport trunk allowed vlan** Interface Configuration mode command adds/removes VLAN(s) to/from a trunk port.

Syntax

switchport trunk allowed vlan {**add** *vlan-list* | **remove** *vlan-list*}

Parameters

- **add** *vlan-list* — Specifies a list of VLAN IDs to add to a port. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs.
- **remove** *vlan-list* — Specifies a list of VLAN IDs to remove from a port. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs.

Default Configuration

By default, trunk ports belongs to all created VLANs.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

To add VLANs 2,3 and 100 to trunk ports 1 to 13:

```
switchxxxxxx(config)# interface range gi1-13
switchxxxxxx(config-if)# switchport mode trunk
switchxxxxxx(config-if)# switchport trunk allowed vlan add 2-3,100
switchxxxxxx(config-if)#
```

30.14 switchport trunk native vlan

If an untagged packet arrives on a trunk port, it is directed to the port's native VLAN. Use the **switchport trunk native vlan** Interface Configuration (Ethernet, port-channel) mode command to define the native VLAN for a trunk interface. Use the **no** form of this command to restore the default native VLAN.

Syntax

switchport trunk native vlan *vlan-id*

no switchport trunk native vlan

Parameters

- **vlan-id**—Specifies the native VLAN ID.

Default Configuration

The default VLAN is the native VLAN.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The command adds the port as a member of the VLAN. If the port is already a member of the VLAN (not a native), it must first be removed from the VLAN.

Examples:

Example 1 - The following example:

- Defines VLAN 2 as native VLAN for port 1
- Removes VLAN 2 from port 1 and then sets it as the native VLAN

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# switchport trunk native vlan 2
Port 1: Port is Trunk in VLAN 2.
switchxxxxxx(config-if)# switchport trunk allowed vlan remove 2
switchxxxxxx(config-if)# switchport trunk native vlan 2
switchxxxxxx(config-if)#
```

Example 2 - The following example sets packets on port as untagged on ingress and untagged on egress:

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# switchport mode trunk
switchxxxxxx(config-if)# switchport trunk native vlan 2
switchxxxxxx(config-if)#
```

Example 3 - The following example sets packets on port as tagged on ingress and tagged on egress:

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# switchport mode trunk
switchxxxxxx(config-if)# switchport trunk allowed vlan add 2
switchxxxxxx(config-if)#
```

30.15 switchport general allowed vlan

General ports can receive tagged or untagged packets. Use the **switchport general allowed vlan** Interface Configuration mode command to add/remove

VLANs to/from a general port and configure whether packets on the egress are tagged or untagged. Use the **no** form of this command to reset to the default.

Syntax

switchport general allowed vlan {[**add** *vlan-list* [***tagged***| ***untagged***]] | [***remove*** *vlan-list*]}

Parameters

- **add** *vlan-list* — Specifies the list of VLAN IDs to add. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs.
- **tagged** — Specifies that the port transmits tagged packets for the VLANs. This is the default value
- **untagged** — Specifies that the port transmits untagged packets for the VLANs.
- **remove** *vlan-list* — Specifies the list of VLAN IDs to remove. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs.

Default Configuration

The port is not member in any VLAN.

Packets are transmitted untagged.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

You can change the egress rule (for example, from tagged to untagged) without first removing the VLAN from the list.

Example

Sets port 1 to general mode and adds VLAN 2 and 3 to it. Packets are tagged on the egress.

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# switchport mode general
```

```
switchxxxxxx(config-if)# switchport general allowed vlan add 2-3 tagged
```

30.16 switchport general pvid

The port VLAN ID (PVID) is the VLAN to which incoming untagged and priority-tagged frames are classified on a general port. Use the **switchport general pvid** Interface Configuration (Ethernet, Port-channel) mode command to configure the Port VLAN ID (PVID) of an interface when it is in general mode. Use the **no** form of this command to restore the default configuration.

Syntax

switchport general pvid *vlan-id*

no switchport general pvid

Parameters

pvid *vlan-id*—Specifies the Port VLAN ID (PVID).

Default Configuration

The default VLAN is the PVID.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

Example 1 - The following example configures port 2 as a general port and sets its PVID to 234.

```
switchxxxxxx(config)# interface gi2
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general pvid 234
```

Example 2 - Performs the following:

- Adds VLANs 2&3 as tagged, and VLAN 100 as untagged to general mode port 14
- Defines VID 100 as the PVID

- Reverts to the default PVID (VID=1)

```
switchxxxxxx(config)# interface gi14
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)#  switchport general allowed vlan add 2-3 tagged
switchxxxxxx(config-if)# switchport general allowed vlan add 100 untagged
switchxxxxxx(config-if)# switchport general pvid 100
switchxxxxxx(config-if)# no switchport general pvid
switchxxxxxx(config-if)#
```

Example 3 - Configures VLAN on port 14 as untagged on input and untagged on output:

```
switchxxxxxx(config)# interface gi14
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)#  switchport general pvid 2
switchxxxxxx(config-if)# switchport general allowed vlan add 2 untagged
switchxxxxxx(config-if)#
```

Example 4 - Configures VLAN on port 21 as untagged on input and tagged on output:

```
switchxxxxxx(config)# interface gi21
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)#  switchport general pvid 2
switchxxxxxx(config-if)# switchport general allowed vlan add 2 tagged
switchxxxxxx(config-if)#
```

Example 5 - Configures VLAN on port 14 as tagged on input and tagged on output:

```
switchxxxxxx(config)# interface gi14
switchxxxxxx(config-if)# switchport mode general
```

```
switchxxxxxx(config-if)# switchport general allowed vlan add 2 tagged
switchxxxxxx(config-if)#
```

Example 6 - Configures VLAN on port 23 as tagged on input and untagged on output:

```
switchxxxxxx(config)# interface gi23
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general allowed vlan add 2 tagged
switchxxxxxx(config-if)#
```

30.17 switchport general ingress-filtering disable

Use the **switchport general ingress-filtering disable** Interface Configuration (Ethernet, Port-channel) mode command to disable port ingress filtering (no packets are discarded at the ingress) on a general port. Use the no form of this command to restore the default configuration.

Syntax

switchport general ingress-filtering disable

no switchport general ingress-filtering disable

Parameters

N/A

Default Configuration

Ingress filtering is enabled.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example disables port ingress filtering on `gi1`.

```
switchxxxxxx(config)# interface gi1
```

```
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general ingress-filtering disable
```

30.18 switchport general acceptable-frame-type

The **switchport general acceptable-frame-type** Interface Configuration mode command configures the types of packets (tagged/untagged) that are filtered (discarded) on the interface. Use the **no** form of this command to return ingress filtering to the default.

Syntax

switchport general acceptable-frame-type *{tagged-only | untagged-only | all}*

no switchport general acceptable-frame-type

Parameters

- **tagged-only**—Ignore (discard) untagged packets and priority-tagged packets.
- **untagged-only**—Ignore (discard) VLAN-tagged packets (not including priority-tagged packets)
- **all**—Do not discard packets untagged or priority-tagged packets.

Default Configuration

All frame types are accepted at ingress (**all**).

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

The following example configures port `gi3` to be in general mode and to discard untagged frames at ingress.

```
switchxxxxxx(config)# interface gi3
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general acceptable-frame-type tagged-only
```

30.19 switchport customer vlan

When a port is in customer mode it is in QinQ mode. This enables the user to use their own VLAN arrangements (PVID) across a provider network. The switch is in QinQ mode when it has one or more customer ports.

Use the **switchport customer vlan** Interface Configuration mode command to set the port's VLAN when the interface is in customer mode (set by switchport mode). Use the no form of this command to restore the default configuration.

Syntax

switchport customer vlan *vlan-id*

no switchport customer vlan

Parameters

vlan *vlan-id*—Specifies the customer VLAN.

Default Configuration

No VLAN is configured as customer.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example defines `gi5` as a member of customer VLAN 5.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# switchport mode customer
switchxxxxxx(config-if)# switchport customer vlan 5
```

30.20 map mac macs-group

Forwarding of packets based on their MAC address requires setting up groups of MAC addresses and then mapping these groups to VLANs.

Use the **map mac macs-group** VLAN Configuration mode command to map a MAC address or range of MAC addresses to a group of MAC addresses, which is then

used in switchport general map macs-group vlan. Use the **no** form of this command to delete the mapping.

This command can only be used when the device is in Layer 2 mode.

Syntax

map mac *mac-address* {*prefix-mask* | ***host***} ***macs-group*** *group*

no map mac *mac-address* {*prefix-mask* | ***host***}

Parameters

- **mac** *mac-address*—Specifies the MAC address to be mapped to the group of MAC addresses.
- **prefix-mask**—Specifies the number of ones in the mask.
- **host**—Specifies that the mask is comprised of all 1s.
- **macs-group** *group*—Specifies the group number (range: 1–2147483647)

Default Configuration

N/A

Command Mode

VLAN Configuration mode

Example

The following example creates two groups of MAC addresses, sets a port to general mode and maps the groups of MAC addresses to specific VLANs.

```
switchxxxxxx(config)# vlan database
switchxxxxxx(config-vlan)# map mac 0000.1111.0000 32 macs-group 1
switchxxxxxx(config-vlan)# map mac 0000.0000.2222 host macs-group 2
switchxxxxxx(config-vlan)# exit
switchxxxxxx(config)# interface gi11
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general map macs-group 1 vlan 2
switchxxxxxx(config-if)# switchport general map macs-group 2 vlan 3
```

30.21 switchport general map macs-group vlan

After groups of MAC addresses have been created (see map mac macs-group), they can be mapped to specific VLANs.

Use the **switchport general map macs-group vlan** Interface Configuration (Ethernet, Port-channel) mode command to set a MAC-based classification rule. Use the no form of this command to delete a classification rule.

Syntax

switchport general map macs-group *group* **vlan** *vlan-id*

no switchport general map macs-group *group*

Parameters

- **macs-group** *group*—Specifies the group number (range: 1–2147483647)
- **vlan** *vlan-id*—Defines the VLAN ID associated with the rule.

Default Configuration

N/A

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

MAC-based VLAN rules cannot contain overlapping ranges on the same interface.

The VLAN classification rule priorities are:

1. MAC-based VLAN (Best match among the rules).
2. Subnet-based VLAN (Best match among the rules).
3. Protocol-based VLAN.
4. PVID.

Example

The following example creates two groups of MAC addresses, sets a port to general mode and maps the groups of MAC addresses to specific VLANs.

```
switchxxxxxx(config)# vlan database
```

```
switchxxxxxx(config-vlan)# map mac 0000.1111.0000 32 macs-group 1
switchxxxxxx(config-vlan)# map mac 0000.0000.2222 host macs-group 2
switchxxxxxx(config-vlan)# exit
switchxxxxxx(config)# interface gi11
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general map macs-group 1 vlan 2
switchxxxxxx(config-if)# switchport general map macs-group 2 vlan 3
```

30.22 show vlan macs-groups

Use the **show vlan macs-groups** EXEC mode command to display the MAC addresses that belong to the defined MACs-groups.

Syntax

show vlan macs-groups

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays macs-groups information.

```
switchxxxxxx# show vlan macs-groups

     MAC Address              Mask                Group ID
---------------------- ---------------------- ----------------------
  00:12:34:56:78:90            20                    22
  00:60:70:4c:73:ff            40                    1
```

30.23 switchport forbidden default-vlan

Use the **switchport forbidden default-vlan** Interface Configuration command to forbid a port from being added to the default VLAN. Use the no form of this command to revert to default.

Syntax

switchport forbidden default-vlan

no switchport forbidden default-vlan

Parameters

N/A

Default Configuration

Membership in the default VLAN is allowed.

Command Mode

Interface and Interface range configuration (Ethernet, port-channel)

User Guidelines

The command may be used at any time regardless of whether the port belongs to the default VLAN.

The **no** command does not add the port to the default VLAN, it only defines an interface as permitted to be a member of the default VLAN, and the port will be added only when conditions are met.

Example

The following example forbids the port gi1 from being added to the default VLAN.

```
switchxxxxxx(config)#interface gi1

switchxxxxxx(config-if)# switchport forbidden default-vlan
```

30.24 switchport forbidden vlan

The **switchport forbidden vlan** Interface Configuration (Ethernet, Port-channel) mode command forbids adding or removing specific VLANs to or from a port. To restore the default configuration, use the **no** form of this command.

Syntax

switchport forbidden vlan {**add** *vlan-list* | **remove** *vlan-list*}

no switchport forbidden vlan {**add** *vlan-list* | **remove** *vlan-list*}

Parameters

- **add** *vlan-list* — Specifies a list of VLAN IDs to add. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen designate a range of IDs.
- **remove** *vlan-list* — Specifies a list of VLAN IDs to remove. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen designate a range of IDs.

Default Configuration

All VLANs are allowed.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example forbids adding VLAN IDs 234 to 256 to `gi7`.

```
switchxxxxxx(config)# interface gi7
switchxxxxxx(config-if)# switchport mode trunk
switchxxxxxx(config-if)# switchport forbidden vlan add 234-256
```

30.25 switchport default-vlan tagged

Use the **switchport default-vlan tagged** Interface Configuration command to configure the port as a tagged port in the default VLAN. Use the **no** form of the command to return the port to an untagged port.

Syntax

switchport default-vlan tagged

no switchport default-vlan tagged

Parameters

N/A

Default Configuration

If the port is a member in the default VLAN, by default, it is a member as an untagged port.

Command Mode

Interface configuration (Ethernet, port-channel)

User Guidelines

The command adds a port to the default VLAN as a tagged port.

The command is available only if the port mode is trunk or general.

When a trunk port is a member in the default VLAN as a tagged port then:

- The native VLAN cannot be the default VLAN
- The default of the native VLAN is 4095

Note: If the native VLAN of a port is the default VLAN when the port is added to the default VLAN as tagged, the native VLAN is set by the system to 4095.

When a general port is a member in the default VLAN as a tagged port then:

- The PVID can be the default VLAN.
- The default PVID is the default VLAN.

Note: The PVID is not changed when the port is added to the default VLAN as a tagged.

When executing the **switchport default-vlan tagged** command, the port is added (automatically by the system) to the default VLAN when the following conditions no longer exist:

- The port is a member in a LAG.
- The port is 802.1X unauthorized.
- An IP address is defined on the port.
- The port is a destination port of port mirroring.
- An IP address is defined on the default VLAN and the port is a PVE protected port.

The **no switchport default-vlan tagged** command removes the port from the default VLAN, and returns the default VLAN mode to untagged.

Note:

- If the native VLAN of a trunk port is 4095 when the port is removed from the default VLAN (as a tagged), the native VLAN is set by the system to the default VLAN.
- The PVID of a general port is not changed when the port is removed from the default VLAN (as a tagged). If the PVID is the default VLAN, the port is added by the system to the default VLAN as an untagged.

Example

The following example configures the port gi1 as a tagged port in the default VLAN.

```
switchxxxxxx(config)#interface gi1

switchxxxxxx(config-if)# switchport mode trunk

switchxxxxxx(config-if)#switchport default-vlan tagged
```

30.26 show interfaces switchport

Use the **show interfaces switchport** Privileged EXEC command to display the administrative and operational status of all interfaces or a specific interface.

Syntax

show interfaces switchport *[interface-id]*

Parameters

interface-id—Specify an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel

Default Configuration

Displays information for all interfaces.

Command Mode

EXEC mode

Examples:

Example 1 - The following example displays the the command output for a trunk port:

```
switchxxxxxx# show interfaces switchport gi1

Port gi1:

Port Mode: Trunk
Gvrp Status: disabled

Ingress Filtering: true

Acceptable Frame Type: admitAll

Ingress UnTagged VLAN ( NATIVE ): 2

Protected: Enabled, Uplink is gi9.
Port gi1 is member in:

    VLAN   Name          Egress Rule  Type

    ----   ----------    ----------- -----

    1      default       untagged    System

    8       VLAN008       tagged      Dynamic

   11      VLAN0011      tagged      Static

   19       IPv6VLAN      untagged    Static

   72       VLAN0072      untagged    Static

Forbidden VLANS:

    VLAN     Name

    ----     ---------

    73       Out

Classification rules:

Mac based VLANs:

  Group ID   Vlan ID
```

Example 2 - The following example displays the output for a general port:

```
switchxxxxxx# show interfaces switchport gi2

Port gi2:

VLAN Membership mode: General

Operating Parameters:
```

```
PVID: 4095 (discard vlan)

Ingress Filtering: Enabled

Acceptable Frame Type: All

GVRP status: Enabled

Protected: Disabled

Port gi1 is member in:

VLAN   Name         Egress Rule Type

----   ---------    ----------- -----

91     IP Telephony   tagged    Static

Protected: Disabled

Port gi2 is statically configured to:

VLAN   Name            Egress Rule Type

----   ---------       ----------- -----

8       VLAN0072        untagged

91     IP Telephony     tagged

Forbidden VLANS:

VLAN   Name

----   ---------

73      Out
```

Example 3 - The following example displays the command output for an access port:

```
switchxxxxxx# show interfaces switchport gi2

Port gi2:

Port Mode: Access

Gvrp Status: disabled

Ingress Filtering: true

Acceptable Frame Type: admitAll

Ingress UnTagged VLAN ( NATIVE ): 1

Port is member in:

Vlan               Name               Egress Rule Port Membership Type

---- ------------------------------- ----------- --------------------
```

```
 1                  1                  Untagged          System

Forbidden VLANS:

Vlan               Name

---- --------------------------------

Classification rules:

Mac based VLANs:
```

30.27 ip internal-usage-vlan

The system assigns a VLAN to every IP address. In rare cases, this might conflict with a user requirement for that VLAN. In this case, use the **ip internal-usage-vlan** Interface Configuration (Ethernet, Port-channel) mode command to reserve a different VLAN as the internal usage VLAN of an interface. Use the **no** form of this command to restore the default configuration.

Syntax

ip internal-usage-vlan *vlan-id*

no ip internal-usage-vlan

Parameters

vlan-id—Specifies the internal usage VLAN ID.

Default Configuration

No VLAN is reserved as an internal usage VLAN by default (using this command).

Command Mode

Interface Configuration (Ethernet, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

An internal usage VLAN is assigned by the system when an IP interface is defined on an Ethernet port or port-channel.

If an internal usage VLAN is not defined for a port, the software selects one of the unused VLANs.

If a VLAN was chosen by the software for internal usage, but you want to use that VLAN for a static or dynamic VLAN, do one of the following:

- Remove the IP address from the interface (this releases the internal usage VLAN).
- Recreate the VLAN on the required interface (now it will be assigned to the interface and not be used as an internal usage VLAN)
- Recreate the IP interface (another internal usage VLAN is assigned to this IP interface) or use this command to explicitly define the internal usage VLAN.

Example

The following example reserves unused VLAN 200 as the internal usage VLAN of gi3.

```
switchxxxxxx(config)# interface gi3
switchxxxxxx(config-if)# ip internal-usage-vlan 200
```

30.28 show vlan internal usage

Use the **show vlan internal usage** Privileged EXEC mode command to display a list of VLANs used internally by the device (defined by the user).

Syntax

show vlan internal usage

Parameters

N/A

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays VLANs used internally by the device.

```
switchxxxxxx# show vlan internal usage
Usage          VLAN             Reserved       IP address
--------       --------         ----------     ----------
gi21           1007             No             Active
gi22           1008             Yes            Inactive
gi23           1009             Yes            Active
```

31 Internet Group Management Protocol (IGMP) Snooping Commands

31.1 ip igmp snooping (Global)

Use the **ip igmp snooping** Global Configuration mode command to enable Internet Group Management Protocol (IGMP) snooping. Use the **no** form of this command to disable IGMP snooping.

Syntax

ip igmp snooping

no ip igmp snooping

Default Configuration

Disabled.

Command Mode

Global Configuration mode

Example

The following example enables IGMP snooping.

```
switchxxxxxx(config)# ip igmp snooping
```

31.2 ip igmp snooping vlan

Use the **ip igmp snooping vlan** Global Configuration mode command to enable IGMP snooping on a specific VLAN. Use the **no** form of this command to disable IGMP snooping on a VLAN interface.

Syntax

ip igmp snooping vlan *vlan-id*

no ip igmp snooping vlan *vlan-id*

Parameters

vlan *vlan-id*—Specifies the VLAN.

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

IGMP snooping can be enabled only on static VLANs.

IGMPv1, IGMPv2 and IGMPv3 are supported.

To activate IGMP snooping, the bridge multicast filtering should be enabled.

The user guidelines of the bridge multicast mode Interface VLAN Configuration command describes the configuration that is written into the FDB as a function of the FDB mode and the IGMP version that is used in the network.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 2
```

31.3 ip igmp snooping vlan mrouter

Use the **ip igmp snooping mrouter** Global Configuration mode command to enable automatic learning of Multicast router ports on a VLAN. Use the **no** form of this command to remove the configuration.

Syntax

ip igmp snooping vlan *vlan-id* **mrouter learn pim-dvmrp**

no ip igmp snooping vlan *vlan-id* **mrouter learn pim-dvmrp**

Parameters

vlan *vlan-id*—Specifies the VLAN.

Default Configuration

Learning pim-dvmrp is enabled.

Command Mode

Global Configuration mode

User Guidelines

Multicast router ports are learned according to:

- Queries received on the port
- PIM/PIMv2 received on the port
- DVMRP received on the port
- MRDISC received on the port
- MOSPF received on the port

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 mrouter learn pim-dvmrp
```

31.4 ip igmp snooping vlan mrouter interface

Use the **ip igmp snooping mrouter interface** Global Configuration mode command to define a port that is connected to a Multicast router port. Use the **no** form of this command to remove the configuration.

Syntax

ip igmp snooping vlan *vlan-id* **mrouter interface** i*nterface-list*

no ip igmp snooping vlan *vlan-id* **mrouter interface** *interface-list*

Parameters

- **vlan** *vlan-id*—Specifies the VLAN.
- **interface** *interface-list*—Specifies the list of interfaces. The interfaces can be one of the following types: Ethernet port or Port-channel.

Default Configuration

No ports defined

Command Mode

Global Configuration mode

User Guidelines

A port that is defined as a Multicast router port receives all IGMP packets (reports and queries) as well as all Multicast data.

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 mrouter interface gi1
```

31.5 ip igmp snooping vlan forbidden mrouter interface

Use the **ip igmp snooping forbidden mrouter interface** Global Configuration mode command to forbid a port from being defined as a Multicast router port by static configuration or by automatic learning. Use the **no** form of this command to remove the configuration.

Syntax

ip igmp snooping vlan *vlan-id* **forbidden mrouter interface** *interface-list*

no ip igmp snooping **vlan** vlan-id **forbidden** mrouter **interface** interface-list

Parameters

- **vlan** *vlan-id*—Specifies the VLAN.
- **interface** *interface-list*—Specifies a list of interfaces. The interfaces can be from one of the following types: Ethernet port or Port-channel.

Default Configuration

No ports defined.

Command Mode

Global Configuration mode

User Guidelines

A port that is a forbidden mrouter port cannot be a Multicast router port (i.e. cannot be learned dynamically or assigned statically).

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 forbidden mrouter interface gi1
```

31.6 ip igmp snooping vlan static

Use the **ip igmp snooping vlan static** Global Configuration mode command to register an IP-layer Multicast address to the bridge table, and to add static ports to the group defined by this address. Use the **no** form of this command to remove ports specified as members of a static Multicast group.

Syntax

ip igmp snooping vlan *vlan-id* **static** *ip-address [***interface** *interface-list]*

no ip igmp snooping vlan *vlan-id* **static** *ip-address [***interface** *interface-list]*

Parameter

- **vlan** *vlan-id*—Specifies the VLAN.
- **static** *ip-address*—Specifies the IP Multicast address.
- **interface** i*nterface-list*—Specifies a list of interfaces. The interfaces can be from one of the following types: Ethernet port or Port-channel.

Default Configuration

No Multicast addresses are defined.

Command Mode

Global Configuration mode

User Guidelines

Static Multicast addresses can only be defined on static VLANs.

You can execute the command before the VLAN is created.

You can register an entry without specifying an interface.

Using the **no** command without a port-list removes the entry.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 static 239.2.2.2 interface gi1
```

31.7 ip igmp snooping vlan querier

Use the **ip igmp snooping vlan querier** Global Configuration mode command to enable the Internet Group Management Protocol (IGMP) querier on a specific VLAN. Use the **no** form of this command to disable the IGMP querier on a VLAN interface.

Syntax

ip igmp snooping vlan *vlan-id* **querier**

no ip igmp snooping vlan *vlan-id* **querier**

Parameters

vlan *vlan-id*—Specifies the VLAN

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

The IGMP snooping querier can be enabled on a VLAN only if IGMP snooping is enabled for that VLAN.

At most one switch can be configured as an IGMP Querier for a VLAN.

When the IGMP snooping querier is enabled, it starts after a host-time-out/2 with no IGMP traffic being detected from a Multicast router.

The IGMP Snooping Querier disables itself if it detects IGMP traffic from a Multicast router. It restarts automatically after host-time-out/2.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 querier
```

31.8 ip igmp snooping vlan querier address

Use the **ip igmp snooping vlan querier address** Global Configuration mode command to define the source IP address that the IGMP snooping querier uses. Use the **no** form of this command to return to default.

Syntax

ip igmp snooping vlan *vlan-id* **querier address** *ip-address*

no ip igmp snooping vlan *vlan-id* **querier address**

Parameters

- **vlan** *vlan-id*—Specifies the VLAN.
- **querier address** *ip-address*—Source IP address.

Default Configuration

If an IP address is configured for the VLAN, it is used as the source address of the IGMP snooping querier. If there are multiple IP addresses, the minimum IP address defined on the VLAN is used.

Command Mode

Global Configuration mode

User Guidelines

If an IP address is not configured by this command, and no IP address is configured for the querier's VLAN, the querier is disabled.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 querier address 10.5.234.205
```

31.9 ip igmp snooping vlan querier version

Use the **ip igmp snooping vlan querier version** Global Configuration mode command to configure the IGMP version of an IGMP querier on a specific VLAN. Use the **no** form of this command to return to the default version.

Syntax

ip igmp snooping vlan *vlan-id* **querier version** *{2 | 3}*

no ip igmp snooping vlan *vlan-id* **querier version**

Parameters

- **vlan** *vlan-id*—Specifies the VLAN.
- **querier version** *2*—Specifies that the IGMP version would be IGMPv2.
- **querier version** *3*—Specifies that the IGMP version would be IGMPv3.

Default Configuration

IGMPv2.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 querier version 3
```

31.10 ip igmp robustness

Use the **ip igmp robustness** Interface Configuration (VLAN) mode command to set the IGMP robustness variable on a VLAN. Use the **no** format of the command to return to default.

Syntax

ip igmp robustness *count*

no ip igmp robustness

Parameters

count—The number of expected packet loss on a link. Parameter range. (Range: 1–7)

Default Configuration

2

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created, but you must enter the command in Interface VLAN mode.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ip igmp robustness 3
```

31.11 ip igmp query-interval

Use the **ip igmp query-interval** Interface Configuration (VLAN) mode command to configure the Query interval on a VLAN. Use the **no** format of the command to return to default.

Syntax

ip igmp query-interval *seconds*

no ip igmp query-interval

Parameters

seconds—Frequency, in seconds, at which IGMP query messages are sent on the interface. (Range: 30–18000)

Default Configuration

125

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ip igmp query-interval 200
```

31.12 ip igmp query-max-response-time

Use the **ip igmp query-max-response-time** Interface Configuration (VLAN) mode command to configure the Query Maximum Response time on a VLAN. Use the **no** format of the command to return to default.

Syntax

ip igmp query-max-response-time *seconds*

no ip igmp query-max-response-time

Parameters

seconds—Maximum response time, in seconds, advertised in IGMP queries. (Range: 5–20)

Default Configuration

10

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# interface vlan 1
```

```
switchxxxxxx(config-if)# ip igmp query-max-response-time 20
```

31.13 ip igmp last-member-query-count

Use the **ip igmp last-member-query-count** Interface Configuration (VLAN) mode command to configure the Last Member Query Counter on a VLAN. Use the **no** format of the command to return to default.

Syntax

ip igmp last-member-query-count *count*

no ip igmp last-member-query-count

Parameter

count—The number of times that group- or group-source-specific queries are sent upon receipt of a message indicating a leave. (Range: 1–7)

Default Configuration

A value of Robustness variable

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ip igmp last-member-query-count 7
```

31.14 ip igmp last-member-query-interval

Use the **ip igmp last-member-query-interval** Interface Configuration (VLAN) mode command to configure the Last Member Query interval on a VLAN. Use the **no** format of the command to return to default.

Syntax

ip igmp last-member-query-interval *milliseconds*

no ip igmp last-member-query-interval

Parameters

milliseconds—Interval, in milliseconds, at which IGMP group-specific host query messages are sent on the interface. (Range: 100–25500)

Default Configuration

1000

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ip igmp last-member-query-interval 2000
```

31.15 ip igmp snooping vlan immediate-leave

Use the **ip igmp snooping vlan immediate-leave** Global Configuration mode command to enable the IGMP Snooping Immediate-Leave processing on a VLAN. Use the **no** format of the command to disable IGMP Snooping Immediate-Leave processing.

Syntax

ip igmp snooping vlan *vlan-id* **immediate-leave**

no ip igmp snooping vlan *vlan-id* **immediate-leave**

Parameters

vlan *vlan-id*—Specifies the VLAN ID value. (Range: 1–4094)

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

You can execute the command before the VLAN is created.

Example

The following example enables IGMP snooping immediate-leave feature on VLAN 1.

```
switchxxxxxx(config)# ip igmp snooping vlan 1 immediate-leave
```

31.16 show ip igmp snooping mrouter

The **show ip igmp snooping mrouter** EXEC mode command displays information on dynamically learned Multicast router interfaces for all VLANs or for a specific VLAN.

Syntax

show ip igmp snooping mrouter [**interface** *vlan-id*]

Parameters

interface *vlan-id*—Specifies the VLAN ID.

Command Mode

EXEC mode

Example

The following example displays information on dynamically learned Multicast router interfaces for VLAN 1000.

```
switchxxxxxx# show ip igmp snooping mrouter interface 1000


VLAN       Dynamic       Static      Forbidden
----       ------        -------     ---------
1000       gi1           gi2         gi3-23
```

31.17 show ip igmp snooping interface

The **show ip igmp snooping interface** EXEC mode command displays the IGMP snooping configuration for a specific VLAN.

Syntax

show ip igmp snooping interface *vlan-id*

Parameters

interface vlan-id—Specifies the VLAN ID.

Command Mode

EXEC mode

Example

The following example displays the IGMP snooping configuration for VLAN 1000

```
switchxxxxxx# show ip igmp snooping interface 1000
IGMP Snooping is globally enabled
IGMP Snooping admin: Enabled
IGMP Snooping oper: Enabled
Routers IGMP version: 3
Groups that are in IGMP version 2 compatibility mode:
231.2.2.3, 231.2.2.3
```

```
Groups that are in IGMP version 1 compatibility mode:
IGMP snooping querier admin: Enabled
IGMP snooping querier oper: Enabled
IGMP snooping querier address admin:
IGMP snooping querier address oper: 172.16.1.1
IGMP snooping querier version admin: 3
IGMP snooping robustness: admin 2  oper 2
IGMP snooping query interval: admin 125 sec oper 125 sec
IGMP snooping query maximum response: admin 10 sec oper 10 sec
IGMP snooping last member query counter: admin 2 oper 2
IGMP snooping last member query interval: admin 1000 msec oper 500 msec
IGMP snooping last immediate leave: enable
Automatic learning of Multicast router ports is enabled
```

31.18 show ip igmp snooping groups

The **show ip igmp snooping groups** EXEC mode command displays the Multicast groups learned by the IGMP snooping.

Syntax

show ip igmp snooping groups [**vlan** *vlan-id*] [*address ip-multicast-address*] [*source ip-address*]

Parameters

vlan *vlan-id*—Specifies the VLAN ID.

address ip-multicast-address—Specifies the IP multicast address.

source ip-address—Specifies the IP source address.

Command Mode

EXEC mode

User Guidelines

To see all Multicast groups learned by IGMP snooping, use the **show ip igmp snooping groups** command without parameters.

Use the **show ip igmp snooping groups** command with parameters to see a needed subset of all Multicast groups learned by IGMP snooping

To see the full Multicast address table (including static addresses), use the **show bridge multicast address-table** command.

Example

The following example shows sample output for IGMP version 2.

```
switchxxxxxx# show ip igmp snooping groups
Vlan    Group            Source       Include Ports       Exclude Ports      Comp-Mode
        Address          Address
----    ---------        --------     ---------           --------           ---------
1       239.255.255.250  *            gi1                                    v3
```

32 IPv6 MLD Snooping Commands

32.1 ipv6 mld snooping (Global)

The **ipv6 mld snooping** Global Configuration mode command enables IPv6 Multicast Listener Discovery (MLD) snooping. To disable IPv6 MLD snooping, use the **no** form of this command.

Syntax

ipv6 mld snooping

no ipv6 mld snooping

Parameters

N/A

Default Configuration

IPv6 MLD snooping is disabled.

Command Mode

Global Configuration mode

Example

The following example enables IPv6 MLD snooping.

```
switchxxxxxx(config)# ipv6 mld snooping
```

32.2 ipv6 mld snooping vlan

Use the **ipv6 mld snooping vlan** Global Configuration mode command to enable MLD snooping on a specific VLAN. Use the **no** form of this command to disable MLD snooping on a VLAN interface.

Syntax

ipv6 mld snooping vlan *vlan-id*

no ipv6 mld snooping vlan *vlan-id*

Parameters

vlan-id—Specifies the VLAN.

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

MLD snooping can only be enabled on static VLANs.

MLDv1 and MLDv2 are supported.

To activate MLD snooping, the Bridge Multicast Filtering command must be enabled.

The user guidelines of the bridge multicast ipv6 mode Interface VLAN Configuration command describe the configuration that can be written into the FDB as a function of the FDB mode, and the MLD version that is used in the network.

Example

```
switchxxxxxx(config)# ipv6 mld snooping vlan 2
```

32.3 ipv6 mld robustness

Use the **ipv6 mld robustness** interface Configuration mode command to change a value of MLD robustness. Use the **no** format of the command to return to default.

Syntax

ipv6 mld robustness *count*

no ipv6 mld robustness

Parameters

count - The number of expected packet losses on a link. (Range: 1–7)

Default Configuration

2

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ipv6 mld robustness 3
```

32.4 ipv6 mld snooping mrouter

Use the **ipv6 mld snooping mrouter** Global Configuration mode command to enable automatic learning of Multicast router ports. Use the **no** form of this command to remove the configuration.

Syntax

ipv6 mld snooping vlan *vlan-id* **mrouter learn** ***pim-dvmrp***

no ipv6 mld snooping vlan *vlan-id* **mrouter learn** ***pim-dvmrp***

Parameters

- **vlan-id**—Specifies the VLAN.
- **pim-dvmrp**—Learn Multicast router port by PIM, DVMRP and MLD messages.

Default Configuration

Learning **pim-dvmrp** is enabled.

Command Mode

Global Configuration mode

User Guidelines

Multicast router ports can be configured statically with the bridge multicast forward-all command.

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ipv6 mld snooping vlan 1 mrouter learn pim-dvmrp
```

32.5 ipv6 mld snooping mrouter interface

Use the **ipv6 mld snooping mrouter interface** Global Configuration mode command to define a port that is connected to a Multicast router port. Use the **no** form of this command to remove the configuration.

Syntax

ipv6 mld snooping ***vlan*** *vlan-id* **mrouter interface** *interface-list*

no ipv6 mld snooping ***vlan*** *vlan-id* **mrouter interface** *interface-list*

Parameters

- **vlan-id**—Specifies the VLAN.
- **interface-list**—Specifies a list of interfaces. The interfaces can be from one of the following types: port or port-channel.

Default Configuration

No ports defined

Command Mode

Global Configuration mode

User Guidelines

This command may be used in conjunction with the bridge multicast forward-all command, which is used in older versions to statically configure a port as a Multicast router.

A port that is defined as a Multicast router port receives all MLD packets (reports and queries) as well as all Multicast data.

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ipv6 mld snooping vlan 1 mrouter interface gi1
```

32.6 ipv6 mld snooping forbidden mrouter interface

Use the **ipv6 mld snooping forbidden mrouter interface** Global Configuration mode command to forbid a port from being defined as a Multicast router port by static configuration or by automatic learning. Use the **no** form of this command to remove the configuration.

Syntax

ipv6 mld snooping ***vlan*** *vlan-id* **forbidden mrouter** ***interface*** *interface-list*

no ipv6 mld snooping ***vlan*** *vlan-id* **forbidden mrouter** ***interface*** *interface-list*

Parameters

- **vlan-id**—Specifies the VLAN.
- **interface-list**—Specifies list of interfaces. The interfaces can be from one of the following types: Ethernet port or Port-channel.

Default Configuration

No forbidden ports by default

Command Mode

Global Configuration mode

User Guidelines

A port that is forbidden to be defined as a Multicast router port (mrouter port) cannot be learned dynamically or assigned statically.

The bridge multicast forbidden forward-all command was used in older versions to forbid dynamic learning of Multicast router ports.

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ipv6 mld snooping vlan 1 forbidden mrouter interface gi1
```

32.7 ipv6 mld snooping static

Use the **ipv6 mld snooping static** Global Configuration mode command to register a IPv6-layer Multicast address to the bridge table, and to add statically ports to the group. Use the **no** form of this command to remove ports specified as members of a static Multicast group.

Syntax

ipv6 mld snooping ***vlan*** *vlan-id* **static** *ipv6-address* ***interface*** *[interface-list]*

no ipv6 mld snooping ***vlan*** *vlan-id* **static** *ipv6-address* ***interface*** *[interface-list]*

Parameters

- **vlan-id**—Specifies the VLAN.
- **ipv6-address**—Specifies the IP multicast address
- **interface-list**—Specifies list of interfaces. The interfaces can be from one of the following types: Ethernet port or Port-channel.

Default Configuration

No Multicast addresses are defined.

Command Mode

Global configuration mode

User Guidelines

Static multicast addresses can only be defined on static VLANs.

You can execute the command before the VLAN is created.

You can register an entry without specifying an interface.

Using the **no** command without a port-list removes the entry.

Example

```
switchxxxxxx(config)# ipv6 mld snooping vlan 1 static 239.2.2.2 gi1
```

32.8 ipv6 mld query-interval

Use the **ipv6 mld query-interval** Interface Configuration mode command to configure the Query interval. Use the **no** format of the command to return to default.

Syntax

ipv6 mld query-interval *seconds*

ipv6 mld query-interval

Parameters

seconds—Frequency, in seconds, at which MLD query messages are sent on the interface. (Range: 30–18000)

Default Configuration

125

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command provides the frequency value if this value is not received in MLD general query messages. A field for this value is present in MLDv2 general query messages, but this field may be blank. There is no field for this value in MLDv1 general query messages.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ipv6 mld query-interval 3000
```

32.9 ipv6 mld query-max-response-time

Use the **ipv6 mld query-max-response-time** Interface Configuration mode command to configure the Query Maximum Response time. Use the **no** format of the command to return to default.

Syntax

ipv6 mld query-max-response-time *seconds*

no ipv6 mld query-max-response-time

Parameter

seconds—Maximum response time, in seconds, advertised in MLD queries. (Range: 5–20)

Default Configuration

10

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command provides the maximum response time value if this value is not received in MLD general query messages. A field for this value is present in MLDv2 general query messages, but this field may be blank. There is no field for this value in MLDv1 general query messages.

Example

switchxxxxxx(config)# **interface vlan** 1

switchxxxxxx(config-if)# **ipv6 mld query-max-response-time** 5

32.10 ipv6 mld last-member-query-count

Use the **ipv6 mld last-member-query-count** Interface Configuration mode command to configure the Last Member Query Count. This is the number of Multicast address specific queries sent before the router assumes there are no local listeners.The Last Listener Query Count is also the number of Multicast Address and Source Specific Queries sent before the router assumes there are no listeners for a particular source.

Use the **no** format of the command to return to default.

Syntax

ipv6 mld last-member-query-count *count*

no ipv6 mld last-member-query-count

Parameters

count—The number of times that group- or group-source-specific queries are sent upon receipt of a Leave message. (Range: 1–7)

Default Configuration

The value of the Robustness variable.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command provides this value if it is not is not received in MLD general query messages. A field for this value is present in MLDv2 general query messages, but this field may be blank. There is no field for this value in MLDv1 general query messages.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ipv6 mld last-member-query-count 3
```

32.11 ipv6 mld last-member-query-interval

Use the **ipv6 mld last-member-query-interval** interface configuration command to configure the Last Member Query Interval. Use the **no** format of the command to return to default.

Syntax

ipv6 mld last-member-query-interval *milliseconds*

no ipv6 mld last-member-query-interval

Parameter

milliseconds—Interval, in milliseconds, at which MLD group-specific host query messages are sent on the interface. (Range: 100–64512).

Default Configuration

1000

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command provides this value if it is not is not received in MLD general query messages. A field for this value is present in MLDv2 general query messages, but this field may be blank. There is no field for this value in MLDv1 general query messages.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ipv6 mld last-member-query-interval 2000
```

32.12 ipv6 mld snooping vlan immediate-leave

Use the **ipv6 mld snooping vlan immediate-leave** Global Configuration mode command to enable MLD Snooping Immediate-Leave processing on a VLAN. When an MLD Leave Group message is received from a host, the system removes the host port from the table entry. After it relays the MLD queries from the Multicast router, it deletes entries periodically if it does not receive any MLD membership reports from the Multicast clients.

MLD snooping Immediate-Leave processing allows the switch to remove an interface that sends a leave message from the forwarding table without first sending out MAC-based general queries to the interface.

Use the **no** format of the command to return to disable MLD Snooping Immediate-Leave processing.

Syntax

ipv6 mld snooping vlan *vlan-id* **immediate-leave**

no ipv6 mld snooping vlan *vlan-id* **immediate-leave**

Parameters

vlan-id—Specifies the VLAN ID value. (Range: 1–4094)

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

You can execute the command before the VLAN is created.

Example

```
switchxxxxxx(config)# ipv6 mld snooping vlan 1 immediate-leave
```

32.13 show ipv6 mld snooping mrouter

The **show ipv6 mld snooping mrouter** EXEC mode command displays information on dynamically learned Multicast router interfaces for all VLANs or for a specific VLAN.

Syntax

show ipv6 mld snooping mrouter *[**interface** vlan-id*]

Parameters

interface vlan-id—Specifies the VLAN ID.

Default Configuration

Display information for all VLANs.

Command Mode

EXEC mode

Example

The following example displays information on dynamically learned Multicast router interfaces for VLAN 1000

```
switchxxxxxx# show ipv6 mld snooping mrouter interface 1000

VLAN   Static    Dynamic   Forbidden

----   ------    -------   ---------

1000   gi1       gi2       gi3-23
```

32.14 show ipv6 mld snooping interface

The **show ipv6 mld snooping interface** EXEC mode command displays the IPv6 MLD snooping configuration for a specific VLAN.

Syntax

show ipv6 mld snooping interface *vlan-id*

Parameters

vlan-id—Specifies the VLAN ID.

Default Configuration

Display information for all VLANs.

Command Mode

EXEC mode

Example

The following example displays the MLD snooping configuration for VLAN 1000.

```
switchxxxxxx# show ipv6 mld snooping interface 1000

MLD Snooping is globally enabled

MLD Snooping admin: Enabled

MLD snooping oper mode: Enabled

Routers MLD version: 2

Groups that are in MLD version 1 compatibility mode:

FF12::3, FF12::8

MLD snooping robustness:admin 2  oper 2

MLD snooping query interval: admin 125 sec  oper 125 sec
```

```
MLD snooping query maximum response: admin 10 sec  oper 10 sec

MLD snooping last member query counter: admin 2  oper 2

MLD snooping last member query interval: admin 1000 msec  oper 600 msec

MLD snooping last immediate leave: enable

Automatic learning of multicast router ports is enabled
```

32.15 show ipv6 mld snooping groups

The **show ipv6 mld snooping groups** EXEC mode command displays the multicast groups learned by the MLD snooping.

Syntax

show ipv6 mld snooping groups *[**vlan** vlan-id] [**address** ipv6-multicast-address] [**source** ipv6-address]*

Parameters

- **vlan vlan-id**—Specifies the VLAN ID.
- **address ipv6-multicast-address**—Specifies the IPv6 multicast address.
- **source ipv6-address**—Specifies the IPv6 source address.

Command Mode

EXEC mode

Default Configuration

Display information for all VLANs and addresses defined on them.

User Guidelines

To see the full multicast address table (including static addresses), use the **show bridge multicast address-table** command.

The Include list contains the ports which are in a forwarding state for this group according to the snooping database. In general, the Exclude list contains the ports which have issued an explicit Exclude for that specific source in a multicast group.

The Reporters That Are Forbidden Statically list contains the list of ports which have asked to receive a multicast flow but were defined as forbidden for that multicast group in a multicast bridge.

Note: Under certain circumstances, the Exclude list may not contain accurate information; for example, in the case when two Exclude reports were received on the same port for the same group but for different sources, the port will not be in the Exclude list but rather in the Include list

Example

The following example shows the output for IPv6 MLD version 2.

```
switchxxxxxx# show ipv6 mld snooping groups
VLAN    Group           Source Address              Include         Exclude       Compatibility Mode
        Address                                     Ports           Ports
----    --------        ----------------------      ------------    -----------   -----------------
1       FF12::3         FE80::201:C9FF:FE40:8001    gi1                           1
1       FF12::3         FE80::201:C9FF:FE40:8002    gi2                           1
19      FF12::8         FE80::201:C9FF:FE40:8003    gi9                           2
19      FF12::8         FE80::201:C9FF:FE40:8004    gi1             gi2           2
19      FF12::8         FE80::201:C9FF:FE40:8005    gi10-11         gi3           2
MLD Reporters that are forbidden statically:
VLAN    Group           Source Address              Ports
        Address
----    ------------    ----------------------      --------
1       FF12::3         FE80::201:C9FF:FE40:8001    gi8
19      FF12::8         FE80::201:C9FF:FE40:8001    gi9
```

33 Link Aggregation Control Protocol (LACP) Commands

33.1 lacp system-priority

Use the **lacp system-priority** Global Configuration mode command to set the system priority. Use the **no** form of this command to restore the default configuration.

Syntax

lacp system-priority *value*

no lacp system-priority

Parameters

value—Specifies the system priority value. (Range: 1–65535)

Default Configuration

The default system priority is 1.

Command Mode

Global Configuration mode

Example

The following example sets the system priority to 120.

```
switchxxxxxx(config)# lacp system-priority 120
```

33.2 lacp port-priority

Use the **lacp port-priority** Interface Configuration (Ethernet) mode command to set the physical port priority. Use the **no** form of this command to restore the default configuration.

Syntax

lacp port-priority *value*

no lacp port-priority

Parameters

value—Specifies the port priority. (Range: 1use the **no** form of this command65535)

Default Configuration

The default port priority is 1.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example sets the priority of `gi6`.

```
switchxxxxxx(config)# interface gi6

switchxxxxxx(config-if)# lacp port-priority 247
```

33.3 lacp timeout

Use the **lacp timeout** Interface Configuration (Ethernet) mode command to assign an administrative LACP timeout to an interface. Use the **no** form of this command to restore the default configuration.

Syntax

lacp timeout *{long | short}*

no lacp timeout

Parameters

- **long**—Specifies the long timeout value.
- **short**—Specifies the short timeout value.

Default Configuration

The default port timeout value is Long.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example assigns a long administrative LACP timeout to gi6.

```
switchxxxxxx(config)# interface gi6

switchxxxxxx(config-if)# lacp timeout long
```

33.4 show lacp

Use the **show lacp** EXEC mode command to display LACP information for all Ethernet ports or for a specific Ethernet port.

Syntax

show lacp *interface-id [**parameters** | **statistics** | **protocol-state**]*

Parameters

- **interface-id** —Specify an interface ID. The interface ID must be an Ethernet port
- **parameters**—Displays parameters only.
- **statistics**—Displays statistics only.
- **protocol-state**—Displays protocol state only.

Command Mode

EXEC mode

Example

The following example displays LACP information for gi1.

```
switchxxxxxx# show lacp ethernet gi1

Port gi1 LACP parameters:

     Actor
```

```
                system priority:            1
                system mac addr:            00:00:12:34:56:78
                port Admin key:             30
                port Oper key:              30
                port Oper number:           21
                port Admin priority:        1
                port Oper priority:         1
                port Admin timeout:         LONG
                port Oper timeout:          LONG
                LACP Activity:              ACTIVE
                Aggregation:                AGGREGATABLE
                synchronization:            FALSE
                collecting:                 FALSE
                distributing:               FALSE
                expired:                    FALSE
        Partner
                system priority:            0
                system mac addr:            00:00:00:00:00:00
                port Admin key:             0
                port Oper key:              0
                port Oper number:           0
                port Admin priority:        0
                port Oper priority:         0
                port Admin timeout:         LONG
                port Oper timeout:          LONG
                LACP Activity:              PASSIVE
                Aggregation:                AGGREGATABLE
                synchronization:            FALSE
                collecting:                 FALSE
                distributing:               FALSE
                expired:                    FALSE
Port gi1 LACP Statistics:
LACP PDUs sent:                             2
LACP PDUs received:                         2
Port gi1 LACP Protocol State:
      LACP State Machines:
                Receive FSM:                Port Disabled State
                Mux FSM:                    Detached State
```

```
Control Variables:
        BEGIN:                          FALSE
        LACP_Enabled:                   TRUE
        Ready_N:                        FALSE
        Selected:                       UNSELECTED
        Port_moved:                     FALSE
        NNT:                            FALSE
        Port_enabled:                   FALSE
Timer counters:
        periodic tx timer:              0
        current while timer:            0
        wait while timer:               0
```

33.5 show lacp port-channel

Use the **show lacp port-channel** EXEC mode command to display LACP information for a port-channel.

Syntax

show lacp port-channel *[port_channel_number]*

Parameters

port_channel_number—Specifies the port-channel number.

Command Mode

EXEC mode

Example

The following example displays LACP information about port-channel 1.

```
switchxxxxxx# show lacp port-channel 1


Port-Channel 1:Port Type 1000 Ethernet
      Actor
```

```
                System              1
                Priority:           000285:0E1C00
                MAC Address:        29
                Admin Key:          29
                Oper Key:

Partner
                System              0
                Priority:           00:00:00:00:00:00
                MAC Address:        14
                Oper Key:
```

34 GARP VLAN Registration Protocol (GVRP) Commands

34.1 gvrp enable (Global)

Use the **gvrp enable** Global Configuration mode command to enable the Generic Attribute Registration Protocol (GARP) VLAN Registration Protocol (GVRP) globally. Use the **no** form of this command to disable GVRP on the device.

Syntax

gvrp enable

no gvrp enable

Parameters

N/A

Default Configuration

GVRP is globally disabled.

Command Mode

Global Configuration mode

Example

The following example enables GVRP globally on the device.

```
switchxxxxxx(config)# gvrp enable
```

34.2 gvrp enable (Interface)

Use the **gvrp enable** Interface Configuration (Ethernet, Port-channel) mode command to enable GVRP on an interface. Use the **no** form of this command to disable GVRP on an interface.

Syntax

gvrp enable

no gvrp enable

Default Configuration

GVRP is disabled on all interfaces.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

An access port does not dynamically join a VLAN because it is always a member of a single VLAN only. Membership in an untagged VLAN is propagated in the same way as in a tagged VLAN. That is, the PVID must be manually defined as the untagged VLAN ID.

Example

The following example enables GVRP on `gi6`.

```
switchxxxxxx(config)# interface gi6

switchxxxxxx(config-if)# gvrp enable
```

34.3 gvrp vlan-creation-forbid

Use the **gvrp vlan-creation-forbid** Interface Configuration mode command to disable dynamic VLAN creation or modification. Use the **no** form of this command to enable dynamic VLAN creation or modification.

Syntax

gvrp vlan-creation-forbid

no gvrp vlan-creation-forbid

Default Configuration

Enabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example disables dynamic VLAN creation on gi3.

```
switchxxxxxx(config)# interface gi3

switchxxxxxx(config-if)# gvrp vlan-creation-forbid
```

34.4 gvrp registration-forbid

Use the **gvrp registration-forbid** Interface Configuration mode command to deregister all dynamic VLANs on a port and prevent VLAN creation or registration on the port. Use the **no** form of this command to allow dynamic registration of VLANs on a port.

Syntax

gvrp registration-forbid

no gvrp registration-forbid

Default Configuration

Dynamic registration of VLANs on the port is allowed.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example forbids dynamic registration of VLANs on gi2.

```
switchxxxxxx(config)# interface gi2

switchxxxxxx(config-if)# gvrp registration-forbid
```

34.5 clear gvrp statistics

Use the **clear gvrp statistics** Privileged EXEC mode command to clear GVRP statistical information for all interfaces or for a specific interface.

Syntax

clear gvrp statistics *[interface-id]*

Parameters

Interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

All GVRP statistics are cleared.

Command Mode

Privileged EXEC mode

Example

The following example clears all GVRP statistical information on `gi5`.

```
switchxxxxxx# clear gvrp statistics gi5
```

34.6 show gvrp configuration

Use the **show gvrp configuration** EXEC mode command to display GVRP configuration information, including timer values, whether GVRP and dynamic VLAN creation are enabled, and which ports are running GVRP.

Syntax

show gvrp configuration *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

All GVRP statistics are displayed.

Command Mode

EXEC mode

Example

The following example displays GVRP configuration.

```
switchxxxxxx# show gvrp configuration

GVRP Feature is currently Enabled on the device.

Maximum VLANs: 4094
Port GVRP-Status Regist-    Dynamic          Timers(ms)
                 ration     VLAN Creation    Leave   Join   Leave All
---- ----------- --------   -------------    ----    -----  ----
gi1   Enabled     Forbidden Disabled         200     600    10000
gi2   Enabled     Normal    Enabled          400     1200   20000
```

34.7 show gvrp statistics

Use the **show gvrp statistics** EXEC mode command to display GVRP statistics for all interfaces or for a specific interface.

Syntax

show gvrp statistics *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

All GVRP statistics are displayed.

Command Mode

EXEC mode

Example

The following example displays GVRP statistical information.

```
switchxxxxxx# show gvrp statistics

GVRP statistics:

----------------

Legend:
rJE :    Join Empty Received       rJIn: Join In Received
rEmp:    Empty Received            rLIn: Leave In Received
rLE :    Leave Empty Received      rLA : Leave All Received
sJE :    Join Empty Sent           sJIn: Join In Sent
sEmp:    Empty Sent                sLIn: Leave In Sent
sLE :    Leave Empty Sent          sLA : Leave All Sent

Port     rJE   rJIn  rEmp  rLIn  rLE   rLA   sJE   sJIn  sEmp  sLIn  sLE   sLA
-----    ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---
gi1      0     0     0     0     0     0     0     0     0     0     0     0
gi2      0     0     0     0     0     0     0     0     0     0     0     0
gi3      0     0     0     0     0     0     0     0     0     0     0     0
gi4      0     0     0     0     0     0     0     0     0     0     0     0
gi5      0     0     0     0     0     0     0     0     0     0     0     0
gi6      0     0     0     0     0     0     0     0     0     0     0     0
gi7      0     0     0     0     0     0     0     0     0     0     0     0
gi8      0     0     0     0     0     0     0     0     0     0     0     0
```

34.8 show gvrp error-statistics

Use the **show gvrp error-statistics** EXEC mode command to display GVRP error statistics for all interfaces or for a specific interface.

Syntax

show gvrp error-statistics *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

All GVRP error statistics are displayed.

Command Mode

EXEC mode

Example

The following example displays GVRP error statistics.

```
switchxxxxxx# show gvrp error-statistics

GVRP Error Statistics:

----------------------

Legend:

  INVPROT  : Invalid Protocol Id

  INVATYP  : Invalid Attribute Type  INVALEN : Invalid Attribute Length

  INVAVAL  : Invalid Attribute Value INVEVENT: Invalid Event

  Port   INVPROT INVATYP INVAVAL INVALEN INVEVENT

-------- ------- ------- ------- ------- --------

 gi1      0       0       0       0       0

 gi2      0       0       0       0       0

 gi3      0       0       0       0       0

 gi4      0       0       0       0       0

 gi5      0       0       0       0       0

 gi6      0       0       0       0       0

 gi7      0       0       0       0       0

 gi8      0       0       0       0       0
```

35 IP Addressing Commands

35.1 ip address

Use the **ip address** Interface Configuration (Ethernet, VLAN, Port-channel) mode command to define an IP address for an interface. Use the **no** form of this command to remove an IP address definition.

Syntax

If the product is in router mode (Layer 3).

ip address *ip-address* {*mask* | */prefix-length*}

no ip address [*ip-address*]

If the product is in switch mode (Layer 2).

ip address *ip-address* {*mask* | */prefix-length*} [**default-gateway** *ip-address*]

no ip address [*ip-address*]

If the product can only be switch mode (Layer 2) and supports a single IP address:

ip address *ip-address* {*mask* | */prefix-length*} [**default-gateway** *ip-address*]

no ip address

Parameters

- **ip-address**—Specifies the IP address.
- **mask**—Specifies the network mask of the IP address.
- **prefix-length**—Specifies the number of bits that comprise the IP address prefix.The prefix length must be preceded by a forward slash (/). (Range: 8–30)
- **default-gateway** *ip-address*—Specifies the default gateway IP address.

Default Configuration

No IP address is defined for interfaces.

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

Defining a static IP address on an interface implicitly removes the DHCP client configuration on the interface.

If the device is in router mode, it supports multiple IP addresses:

- The product supports up to 32 IP addresses.
- The IP addresses must be from different IP subnets. When adding an IP address from a subnet that already exists in the list, the new IP address replaces the existing IP address from that subnet.

If the IP address is configured in Interface context, the IP address is bound to the interface in that context.

If a static IP address is already defined, the user must do **no IP address** in the relevant interface context before changing the IP address.

If a dynamic IP address is already defined, the user must do **no ip address** in the relevant interface context before configuring another dynamic IP address.

The Interface context may be a port, LAG or VLAN, depending on support that is defined for the product.

Example

The following example configures VLAN 1 with IP address 131.108.1.27 and subnet mask 255.255.255.0.

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ip address 131.108.1.27 255.255.255.0
```

35.2 ip address dhcp

Use the **ip address dhcp** Interface Configuration (Ethernet, VLAN, Port-channel) mode command to acquire an IP address for an Ethernet interface from the Dynamic Host Configuration Protocol (DHCP) server. Use the **no** form of this command to release an acquired IP address.

Syntax

ip address dhcp

no ip address dhcp

Parameters

N/A

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

This command enables any interface to dynamically learn its IP address by using the DHCP protocol.

DHCP client configuration on an interface implicitly removes the static IP address configuration on the interface.

If the device is configured to obtain its IP address from a DHCP server, it sends a DHCPDISCOVER message to provide information about itself to the DHCP server on the network.

The **no ip address dhcp** command releases any IP address that was acquired, and sends a DHCPRELEASE message.

Example

The following example acquires an IP address for `gi16` from DHCP.

```
switchxxxxxx(config)# interface gi16
switchxxxxxx(config-if)# ip address dhcp
```

35.3 renew dhcp

Use the **renew dhcp** Privileged EXEC mode command to renew an IP address that was acquired from a DHCP server for a specific interface.

Syntax

renew dhcp *{interface-id}* [**force-autoconfig**]

Parameters

- **interface-id**—Only required in routing mode (Layer 3). Specifies an interface ID (Ethernet port, Port-channel or VLAN).
- **force-autoconfig** - If the DHCP server holds a DHCP option 67 record for the assigned IP address, the record overwrites the existing device configuration.

Command Mode

Privileged EXEC mode

User Guidelines

Note the following:

- When the device is in Layer 2 (switch mode), interface-id is not required..
- This command does not enable DHCP on an interface. If DHCP is not enabled on the requested interface, the command returns an error message.
- If DHCP is enabled on the interface and an IP address was already acquired, the command tries to renew that IP address.
- If DHCP is enabled on the interface and an IP address has not yet been acquired, the command initiates a DHCP request.

Example

The following example renews an IP address that was acquired from a DHCP server for VLAN 19. This assumes that the device is in Layer 3.

```
switchxxxxxx# renew dhcp vlan 19
```

35.4 ip default-gateway

The **ip default-gateway** Global Configuration mode command defines a default gateway (device). Use the **no** form of this command to restore the default configuration.

Syntax

ip default-gateway *ip-address*

no ip default-gateway

Parameters

ip-address—Specifies the default gateway IP address.

Command Mode

Global Configuration mode

Default Configuration

No default gateway is defined.

Example

The following example defines default gateway 192.168.1.1.

```
switchxxxxxx(config)# ip default-gateway 192.168.1.1
```

35.5 show ip interface

Use the **show ip interface** EXEC mode command to display the usability status of configured IP interfaces.

Syntax

show ip interface *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, Port-channel or VLAN.

Default Configuration

All IP addresses.

Command Mode

EXEC mode

Examples

Example 1 - The following example displays the configured IP interfaces and their types when the device is in Router mode.

```
switchxxxxxx# show ip interface
IP Address       I/F     Type    Directed   Precedence Status
                                 Broadcast
-------------    ------  ------- --------   ---------- -------
10.5.234.232/24  vlan 1  Static  disable    No         Valid
```

Example 2 - The following example displays the configured IP interfaces and their types when the device is in Switch mode.

```
switchxxxxxx# show ip interface
 Gateway IP Address      Activity status     Type
---------------------- ---------------------- --------
10.5.234.254          Active              static
   IP Address       I/F      Type      Status
------------------- --------- ----------- -----------
10.5.234.207/24     vlan 1   Static      Valid
```

35.6 arp

Use the **arp** Global Configuration mode command to add a permanent entry to the Address Resolution Protocol (ARP) cache. Use the **no** form of this command to remove an entry from the ARP cache.

Syntax

arp *ip-address mac-address [interface-id]]*

no arp *ip-address*

Parameters

- **ip-address**—IP address or IP alias to map to the specified MAC address.

- **mac-address**—MAC address to map to the specified IP address or IP alias.
- **interface-id**—Address pair is added for specified interface that can be Ethernet port, Port-channel or VLAN.

Command Mode

Global Configuration mode

Default Configuration

No permanent entry is defined.

If no interface ID is entered, address pair is relevant to all interfaces.

User Guidelines

The software uses ARP cache entries to translate 32-bit IP addresses into 48-bit hardware (MAC) addresses. Because most hosts support dynamic address resolution, static ARP cache entries generally do not need to be specified.

Example

The following example adds IP address 198.133.219.232 and MAC address 00:00:0c:40:0f:bc to the ARP table.

```
switchxxxxxx(config)# arp 198.133.219.232 00:00:0c:40:0f:bc gi6
```

35.7 arp timeout (Global)

Use the **arp timeout** Global Configuration mode command to set the time interval during which an entry remains in the ARP cache. Use the **no** form of this command to restore the default configuration.

Syntax

arp timeout *seconds*

no arp timeout

Parameters

seconds—Specifies the time interval (in seconds) during which an entry remains in the ARP cache.
(Range: 1–40000000)

Default Configuration

The default ARP timeout is 60000 seconds in Router mode, and 300 seconds in Switch mode.

Command Mode

Global Configuration mode

Example

The following example configures the ARP timeout to 12000 seconds.

```
switchxxxxxx(config)# arp timeout 12000
```

35.8 ip arp proxy disable

Use the **ip arp proxy disable** Global Configuration mode command to globally disable proxy Address Resolution Protocol (ARP). Use the **no** form of this command reenable proxy ARP.

This command can only be used when the device is in Router mode.

Syntax

ip arp proxy disable

no ip arp proxy disable

Parameters

N/A

Default

Enabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command overrides any proxy ARP interface configuration. To use this command, you must put the switch into routing mode using set system mode.

Example

The following example globally disables ARP proxy when the switch is in router mode.

```
switchxxxxxx(config)# ip arp proxy disable
```

35.9 ip proxy-arp

Use the **ip proxy-arp** Interface Configuration mode command to enable an ARP proxy on specific interfaces. Use the **no** form of this command disable it.

This command can only be used when the device is in Router mode.

Syntax

ip proxy-arp

no ip proxy-arp

Default Configuration

ARP Proxy is disabled.

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

This configuration can be applied only if at least one IP address is defined on a specific interface.To use this command, you must put the switch into routing mode using set system mode.

Example

The following example enables ARP proxy when the switch is in router mode.

```
switchxxxxxx(config-if)# ip proxy-arp
```

35.10 clear arp-cache

Use the **clear arp-cache** Privileged EXEC mode command to delete all dynamic entries from the ARP cache.

Syntax

clear arp-cache

Command Mode

Privileged EXEC mode

Example

The following example deletes all dynamic entries from the ARP cache.

```
switchxxxxxx# clear arp-cache
```

35.11 show arp

Use the **show arp** Privileged EXEC mode command to display entries in the ARP table.

Syntax

show arp *[**ip-address** ip-address] [**mac-address** mac-address] [interface-id]*

Parameters

- **ip-address** *ip-address*—Specifies the IP address.
- **mac-address** *mac-address*—Specifies the MAC address.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

Privileged EXEC mode

User Guidelines

Since the associated interface of a MAC address can be aged out from the FDB table, the Interface field can be empty.

If an ARP entry is associated with an IP interface that is defined on a port or port-channel, the VLAN field is empty.

Example

The following example displays entries in the ARP table.

```
switchxxxxxx# show arp

ARP timeout: 80000 Seconds

VLAN      Interface   IP Address   HW Address          Status

-------   ---------   ----------   -------------       -------

VLAN 1    gi1         10.7.1.102   00:10:B5:04:DB:4B   Dynamic

VLAN 1    gi2         10.7.1.135   00:50:22:00:2A:A4   Static
```

35.12 show arp configuration

Use the **show arp configuration** privileged EXEC command to display the global and interface configuration of the ARP protocol.

Syntax

show arp configuration

Parameters

This command has no arguments or key words.

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx# show arp configuration

Global configuration:

    ARP Proxy: enabled

    ARP timeout:    80000 Seconds

Interface configuration:

g2:

    ARP Proxy: disabled
```

```
    ARP timeout:60000 Seconds
VLAN 1:
    ARP Proxy: enabled
    ARP timeout:70000 Seconds
VLAN 2:
    ARP Proxy: enabled
    ARP timeout:80000 Second (Global)
```

35.13 interface ip

Use the **interface ip** Global Configuration mode command to enter the IP Interface Configuration mode.

This command can only be used when the device is in Router mode.

Syntax

interface ip *-address*

Parameters

ip-address—Specifies one of the IP addresses of the device.

Command Mode

Global Configuration mode

User Guidelines

To use this command, you must put the switch into routing mode using set system mode.

Example

The following example enters the IP interface configuration mode.

```
switchxxxxxx(config)# interface ip 192.168.1.1
switchxxxxxx(config-ip)#
```

35.14 ip helper-address

Use the **ip helper-address** Global Configuration mode command to enable the forwarding of UDP Broadcast packets received on an interface to a specific (helper) address. Use the **no** form of this command to disable the forwarding of broadcast packets to a specific (helper) address.

This can be used in Router mode only.

Syntax

ip helper-address {*ip-interface* | ***all***} *address* [*udp-port-list*]

no ip helper-address {*ip-interface* | ***all***} *address*

Parameters

- **ip-interface**—Specifies the IP interface.
- **all**—Specifies all IP interfaces.
- **address**—Specifies the destination broadcast or host address to which to forward UDP broadcast packets. A value of 0.0.0.0 specifies that UDP broadcast packets are not forwarded to any host.
- **udp-port-list**—Specifies the destination UDP port number to which to forward Broadcast packets. (Range: 1–65535). This can be a list of port numbers separated by spaces.

Default Configuration

Forwarding of UDP Broadcast packets received on an interface to a specific (helper) address is disabled.

If **udp-port-list** is not specified, packets for the default services are forwarded to the helper address.

Command Mode

Global Configuration mode

User Guidelines

To use this command, you must put the switch into routing mode using the set system mode command.

This command forwards specific UDP Broadcast packets from one interface to another, by specifying a UDP port number to which UDP broadcast packets with

that destination port number are forwarded. By default, if no UDP port number is specified, the device forwards UDP broadcast packets for the following six services:

- IEN-116 Name Service (port 42)
- DNS (port 53)
- NetBIOS Name Server (port 137)
- NetBIOS Datagram Server (port 138)
- TACACS Server (port 49)
- Time Service (port 37)

Many helper addresses may be defined. However, the total number of address-port pairs is limited to 128 for the device.

The setting of a helper address for a specific interface has precedence over the setting of a helper address for all the interfaces.

Forwarding of BOOTP/DHCP (ports 67, 68) cannot be enabled with this command. Use the DHCP relay commands to relay BOOTP/DHCP packets.

Example

The following example enables the forwarding of UDP Broadcast packets received on all interfaces to the UDP ports of a destination IP address and UDP port 1 and 2.

```
switchxxxxxx(config)# ip helper-address all 172.16.9.9 49 53 1 2
```

35.15 show ip helper-address

Use the **show ip helper-address** Privileged EXEC mode command to display the IP helper addresses configuration on the system.

This can be used in Router mode only.

Syntax

show ip helper-address

Parameters

This command has no arguments or key words.

Command Mode

Privileged EXEC mode

User Guidelines

To use this command, you must put the switch into routing mode using the set system mode command.

Example

The following example displays the IP helper addresses configuration on the system.

```
switchxxxxxx# show ip helper-address
Interface           Helper Address        UDP Ports
------------        --------------        ------------------------
192.168.1.1         172.16.8.8            37, 42, 49, 53, 137, 138
192.168.2.1         172.16.9.9            37, 49
```

35.16 ip domain lookup

Use the **ip domain lookup** Global Configuration mode command to enable the IP Domain Name System (DNS)-based host name-to-address translation. Use the **no** form of this command to disable DNS-based host name-to-address translation.

Syntax

ip domain lookup

no ip domain lookup

Default Configuration

Enabled.

Command Mode

Global Configuration mode

Example

The following example enables DNS-based host name-to-address translation.

```
switchxxxxxx(config)# ip domain lookup
```

35.17 ip domain name

Use the **ip domain name** Global Configuration mode command to define a default domain name used by the software to complete unqualified host names (names without a dotted-decimal domain name). Use the **no** form of this command to remove the default domain name.

Syntax

ip domain name *name*

no ip domain name

Parameters

name—Specifies the default domain name used to complete unqualified host names. Do not include the initial period that separates an unqualified name from the domain name. (Length: 1–158 characters. Maximum label length of each domain level is 63 characters)

Default Configuration

A default domain name is not defined.

Command Mode

Global Configuration mode

User Guidelines

Domain names and host names are restricted to the ASCII letters A through Z (case-insensitive), the digits 0 through 9, the underscore and the hyphen. A period (.) is used to separate labels.

The maximum size of each domain level is 63 characters. The maximum name size is 158 bytes.

Example

The following example defines the default domain name as ‘www.website.com’.

```
switchxxxxxx(config)# ip domain name www.website.com
```

35.18 ip name-server

Use the **ip name-server** Global Configuration mode command to define the available name servers. Use the **no** form of this command to remove a name server.

Syntax

ip name-server *{server1-ip-address} [server-address2 ... server-address8]*

no ip name-server [*server-address ... server-address8*]

Parameters

server-address—IP addresses of the name server. Up to 8 servers can be defined in one command or by using multiple commands. The IP address can be an IPv4 address, IPv6 or IPv6z address. See IPv6z Address Conventions.

Default Configuration

No name server IP addresses are defined.

Command Mode

Global Configuration mode

User Guidelines

The preference of the servers is determined by the order in which they were entered.

Up to 8 servers can be defined using one command or using multiple commands.

Example

The following example defines the available name server.

```
switchxxxxxx(config)# ip name-server 176.16.1.18
```

35.19 ip host

Use the **ip host** Global Configuration mode command to define the static host name-to-address mapping in the host cache. Use the **no** form of this command to remove the static host name-to-address mapping.

Syntax

ip host *name address* [*address2 address3 address4*]

no ip host *name*

Parameters

- **name**—Specifies the host name. (Length: 1–158 characters. Maximum label length of each domain level is 63 characters)
- **address**—Specifies the associated IP address. Up to 4 addresses can be defined separated by blanks.

Default Configuration

No host is defined.

Command Mode

Global Configuration mode

User Guidelines

Host names are restricted to the ASCII letters A through Z (case-insensitive), the digits 0 through 9, the underscore and the hyphen. A period (.) is used to separate labels.

Example

The following example defines a static host name-to-address mapping in the host cache.

```
switchxxxxxx(config)# ip host accounting.website.com 176.10.23.1
```

35.20 clear host

Use the **clear host** Privileged EXEC mode command to delete entries from the host name-to-address cache.

Syntax

clear host *{name | *}*

Parameters

- **name**—Specifies the host entry to remove. (Length: 1–158 characters. Maximum label length: of each domain level is 63 characters)
- * —Removes all entries.

Command Mode

Privileged EXEC mode

Example

The following example deletes all entries from the host name-to-address cache.

```
switchxxxxxx# clear host *
```

35.21 clear host dhcp

Use the **clear host dhcp** Privileged EXEC mode command to delete entries from the host name-to-address mapping received from the Dynamic Host Configuration Protocol (DHCP) server.

Syntax

clear host dhcp *{name | *}*

Parameters

- **name** —Specifies the host entry to remove. (Length: 1–158 characters. Maximum label length of each domain level is 63 characters)
- *—Removes all entries.

Command Mode

Privileged EXEC mode

User Guidelines

This command deletes the host name-to-address mapping temporarily until the next refresh of the IP addresses.

Example

The following example deletes all entries from the host name-to-address mapping received from DHCP.

```
switchxxxxxx# clear host dhcp *
```

35.22 show hosts

Use the **show hosts** EXEC mode command to display the default domain name, the list of name server hosts, the static and the cached list of host names and addresses.

Syntax

show hosts *[name]*

Parameters

name—Specifies the host name. (Length: 1–158 characters. Maximum label length of each domain level is 63 characters).

Command Mode

EXEC mode

Example

The following example displays host information.

```
switchxxxxxx#  show hosts
System name: Device
Default domain is gm.com, sales.gm.com, usa.sales.gm.com(DHCP)
Name/address lookup is enabled
Name servers (Preference order): 176.16.1.18 176.16.1.19
Configured host name-to-address mapping:
Host                                IP Addresses
-----------------                   --------------------------
accounting.gm.com                   176.16.8.8 176.16.8.9(DHCP)
                                    2002:0:130F::0A0:1504:0BB4
```

Cache: TTL (Hours)

```
Host              Total   Elapsed   Type     IP Addresses
--------------    -----   -------   ----     -------------
www.stanford.edu  72      3         IP       171.64.14.203
```

36 IPv6 Addressing Commands

36.1 ipv6 enable

Use the **ipv6 enable** Interface Configuration (Ethernet, VLAN, Port-channel) mode command to enable the IPv6 addressing mode on an interface. Use the **no** form of this command to disable the IPv6 addressing mode on an interface.

Syntax

ipv6 enable *[no-autoconfig]*

no ipv6 enable

Parameters

no-autoconfig—Enables processing of IPv6 on an interface without the stateless address autoconfiguration procedure. This procedure assigns link-local addresses.

Default Configuration

IPv6 addressing is disabled.

Unless you are using the no-autoconfig parameter, when the interface is enabled, stateless address autoconfiguration procedure is enabled.

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

This command automatically configures an IPv6 link-local Unicast address on the interface, while also enabling the interface for IPv6 processing. The **no ipv6 enable** command removes the entire IPv6 interface configuration.

To enable stateless address autoconfiguration on an enabled IPv6 interface, use the ipv6 address autoconfig command.

Example

The following example enables VLAN 1 for the IPv6 addressing.

```
switchxxxxxx(config)# interface vlan 1
switchxxxxxx(config-if)# ipv6 enable
```

36.2 ipv6 address autoconfig

Use the **ipv6 address autoconfig** Interface Configuration mode command to enable automatic configuration of IPv6 addresses, using stateless autoconfiguration on an interface. Addresses are configured depending on the prefixes received in Router Advertisement messages. Use the **no** form of this command to disable address autoconfiguration on the interface.

Syntax

ipv6 address ***autoconfig***

no ipv6 address ***autoconfig***

Parameters

N/A

Default Configuration

Address autoconfiguration is enabled on the interface, no addresses are assigned by default.

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode.

User Guidelines

When **address autoconfig** is enabled, the router solicitation ND procedure is initiated to discover a router and assign IP addresses to the interface, based on the advertised on-link prefixes.

When disabling address autoconfig, automatically generated addresses that were assigned to the interface are removed.

The default state of the address autoconfig is **enabled**. Use the **ipv6 enable no-autoconfig** command to enable an IPv6 interface without address autoconfig.

Example

```
switchxxxxxx(config)# interface vlan 1
```

```
switchxxxxxx(config-if)# ipv6 address autoconfig
```

36.3 ipv6 icmp error-interval

Use the **ipv6 icmp error-interval** Global Configuration mode command to configure the rate limit interval and bucket size parameters for IPv6 Internet Control Message Protocol (ICMP) error messages. Use the **no** form of this command to return the interval to its default setting.

Syntax

ipv6 icmp error-interval *milliseconds [bucketsize]*

no ipv6 icmp error-interval

Parameters

- **milliseconds**—The time interval between tokens being placed in the bucket. Each token represents a single ICMP error message. The acceptable range is from 0–2147483647 with a default of 100 milliseconds. Setting milliseconds to 0 disables rate limiting. (Range: 0– 2147483647)
- **bucketsize**—(Optional) The maximum number of tokens stored in the bucket. The acceptable range is from 1–200 with a default of 10 tokens.

Default Configuration

The default interval is 100ms and the default bucketsize is 10 i.e. 100 ICMP error messages per second.

Command Mode

Global Configuration mode

User Guidelines

To set the average ICMP error rate limit, calculate the interval with the following formula:

Average Packets Per Second = (1/ interval) * bucket size

Example

```
switchxxxxxx(config)# ipv6 icmp error-interval 123 45
```

36.4 show ipv6 icmp error-interval

Use the **show ipv6 error-interval** command in the EXEC mode to display the IPv6 ICMP error interval.

Syntax

show ipv6 icmp error-interval

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

```
switchxxxxxx#  show ipv6 icmp error-interval

Rate limit interval: 100 ms

Bucket size: 10 tokens
```

36.5 ipv6 address

Use the **ipv6 address** Interface Configuration mode command to configure an IPv6 address for an interface. Use the **no** form of this command to remove the address from the interface.

Syntax

ipv6 address *ipv6-address/prefix-length* ***[eui-64] [Unicast]***

no ipv6 address *[ipv6-address/prefix-length]* ***[link-local] [eui-64]***

Parameters

- **ipv6-address**—Specifies the IPv6 network assigned to the interface. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

- **prefix-length**—Specifies the length of the IPv6 prefix. 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.
- **eui-64**—(Optional) Builds an interface ID in the low order 64 bits of the IPv6 address based on the interface MAC address.
- **anycast**—(Optional) Indicates that this address is an anycast address.
- **prefix-length**—3–128(64 when the **eui-64** parameter is used).
- **link-local**—Use the link-local address.

Default Configuration

No IP address is defined for the interface.

Command Mode

Interface configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

If the value specified for the /prefix-length argument is greater than 64 bits, the prefix bits have precedence over the interface ID.

Using the **no IPv6 address** command without arguments removes all manually configured IPv6 addresses from an interface, including link-local manually-configured addresses.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ipv6 address 3000::123/64 eui-64 anycast
```

36.6 ipv6 address link-local

Use the **ipv6 address link-local** command to configure an IPv6 link-local address for an interface. Use the **no** form of this command to return to the default link-local address on the interface.

Syntax

ipv6 address *ipv6-address /prefix-length* **link-local**

no ipv6 address [i*pv6-address /prefix-length* **link-local]**

Parameters

- **ipv6-address**—Specifies the IPv6 network assigned to the interface.This argument must be in the format documented in RFC 2373, where the address is specified in hexadecimals using 16-bit values between colons.
- **prefix-length**—Specifies the length of the IPv6 prefix. A decimal value 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. Only 64-bit length is supported, according to IPv6 over Ethernet's well-known practice

Default Configuration

IPv6 is enabled on the interface, the link-local address of the interface is FE80::EUI64 (interface MAC address).

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

Using the **no ipv6 link-local address** command removes the manually configured link-local IPv6 address from an interface. Multiple IPv6 addresses can be configured per interface, but only one link-local address. When the **no ipv6 link-local address** command is used, the interface is reconfigured with the standard link-local address (the same IPv6 link-local address that is set automatically when the **enable ipv6** command is used). The system automatically generates a link-local address for an interface when IPv6 processing is enabled on the interface. To manually specify a link-local address to be used by an interface, use the **ipv**6 link-local address command. The system supports only 64 bits prefix length for link-local addresses.

Example

```
switchxxxxxx(config)# interface vlan 1

switchxxxxxx(config-if)# ipv6 address fe80::123/64 link-local
```

36.7 ipv6 unreachables

Use the **ipv6 unreachables** Interface Configuration mode command to enable the generation of Internet Control Message Protocol for IPv6 (ICMPv6) unreachable messages for any packets arriving on a specified interface. Use the **no** form of this command To prevent the generation of unreachable messages.

Syntax

ipv6 unreachables

no ipv6 unreachables

Parameters

N/A

Default Configuration

ICMP unreachable messages are sent by default.

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode.

User Guidelines

When ICMP unreachable messages are enabled, when receiving a packet addressed to one of the interface's IP address with TCP/UDP port not assigned, the device sends ICMP unreachable messages.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# ipv6 unreachables
```

36.8 ipv6 default-gateway

Use the **ipv6 default-gateway** Global Configuration mode command to define an IPv6 default gateway. Use the **no** form of this command To remove the default gateway.

Syntax

ipv6 default-gateway *ipv6-address*

no ipv6 default-gateway

Parameters

ipv6-address—Specifies the IPv6 address of the next hop that can be used to reach the required network. When the IPv6 address is a link-local address (IPv6Z address), see IPv6z Address Conventions.

Default Configuration

No default gateway is defined.

Command Mode

Global Configuration mode

User Guidelines

Configuring a new default GW without deleting the previous configured information overwrites the previous configuration.

A configured default GW has a higher precedence over an automatically advertised (via router advertisement message).

Precedence takes effect after the configured default GW is reachable.

Reachability state is not verified automatically by the neighbor discovery protocol. Router reachability can be confirmed by either receiving a Router Advertisement message containing the router's MAC address or by manually configuring this using the ipv6 neighbor command. Another option to force reachability confirmation is to ping the router link-local address (this will initiate the neighbor discovery process).

If the egress interface is not specified, the default interface is selected. Specifying interface zone=0 is equal to not defining an egress interface.

Example

```
switchxxxxxx(config)# ipv6 default-gateway fe80::abcd
```

36.9 show ipv6 interface

Use the **show ipv6 interface** EXEC command mode to display the usability status of interfaces configured for IPv6.

Syntax

show ipv6 interface *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, Port-channel or VLAN.

Default Configuration

Displays all IPv6 interfaces.

Command Mode

EXEC mode

User Guidelines

Use the **show ipv6 neighbors** command in the privileged EXEC mode to display an IPv6 neighbor's discovery cache information.

Examples

Example 1- Show all IPv6 interfaces.

```
switchxxxxxx# show ipv6 interface

Interface    IP addresses                              Type

-----------  ----------------------------------------  ------------

VLAN 1       4004::55/64 [ANY]                         manual

VLAN 1       fe80::200:b0ff:fe00:0                     linklayer

VLAN 1       ff02::1                                   linklayer

VLAN 1       ff02::77                                  manual

VLAN 1       ff02::1:ff00:0                            manual

VLAN 1       ff02::1:ff00:1                            manual

VLAN 1       ff02::1:ff00:55                           manual
```

```
Default Gateway IP address     Type     Interface   State
----------------------------   -------- ---------   -----
fe80::77                       Static   VLAN 1      unreachable
fe80::200:cff:fe4a:dfa8        Dynamic  VLAN 1      stale
```

Example 2 - Show IPv6 interfaces on VLAN 15 where IPv6 is not enabled.

```
switchxxxxxx# show ipv6 interface Vlan 15
IPv6 is disabled
```

Example 3 - Show IPv6 interfaces on VLAN 15 where it is enabled.

```
switchxxxxxx# show ipv6 interface Vlan 1
Number of ND DAD attempts: 1
MTU size: 1500
Stateless Address Autoconfiguration state: enabled
ICMP unreachable message state: enabled
MLD version: 2
IP addresses                          Type        DAD State
------------------------------------  ---------   -----------
4004::55/64 [ANY]                     manual      Active
fe80::200:b0ff:fe00:0                 linklayer   Active
ff02::1                               linklayer   ------
ff02::77                              manual      ------
ff02::1:ff00:0                        manual      ------
ff02::1:ff00:1                        manual      ------
ff02::1:ff00:55                       manual      ------
```

36.10 show IPv6 route

Use the **show ipv6 route** Exec mode command to display the current state of the IPv6 routing table.

Syntax

show ipv6 route

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

```
switchxxxxxx#  show ipv6 route

Codes: L - Local, S - Static, I - ICMP, ND - Router Advertisment

The number in the brackets is the metric.

S  ::/0 via fe80::77 [0] VLAN 1 Lifetime Infinite

ND ::/0 via fe80::200:cff:fe4a:dfa8 [0] VLAN 1 Lifetime 1784 sec

L  2001::/64 is directly connected, g2 Lifetime Infinite

L  2002:1:1:1::/64 is directly connected, VLAN 1 Lifetime 2147467 sec

L  3001::/64 is directly connected, VLAN 1 Lifetime Infinite

L  4004::/64 is directly connected, VLAN 1 Lifetime Infinite

L  6001::/64 is directly connected, g2 Lifetime Infinite
```

36.11 ipv6 nd dad attempts

Use the **ipv6 nd dad attempts** Interface Configuration (Ethernet, VLAN, Port-channel) mode command to configure the number of consecutive neighbor solicitation messages that are sent on an interface while Duplicate Address Detection (DAD) is performed on the unicast IPv6 addresses of the interface. Use the **no** form of this command to restore the number of messages to the default value.

This command can only be used when the device is in Router mode.

Syntax

ipv6 nd dad attempts *attempts*

Parameters

attempts—Specifies the number of neighbor solicitation messages. A value of 0 disables DAD processing on the specified interface. A value of 1 configures a single transmission without follow-up transmissions. (Range: 0–600)

Default Configuration

DAD on Unicast IPv6 addresses with the sending of one neighbor solicitation message is enabled.

Command Mode

Interface Configuration (Ethernet, VLAN, Port-channel) mode. It cannot be configured for a range of interfaces (range context).

User Guidelines

DAD verifies the uniqueness of new Unicast IPv6 addresses before the addresses are assigned to interfaces (the new addresses remain in a tentative state while DAD is performed). DAD uses neighbor solicitation messages to verify the uniqueness of unicast IPv6 addresses.

An interface returning to the administrative Up state restarts DAD for all Unicast IPv6 addresses on the interface. While DAD is performed on the link-local address of an interface, the state of the other IPv6 addresses is still set to TENTATIVE. When DAD is completed on the link-local address, DAD is performed on the remaining IPv6 addresses.

When DAD identifies a duplicate address, the address state is set to DUPLICATE and the address is not used. If the duplicate address is the link-local address of the interface, the processing of IPv6 packets is disabled on the interface and an error message is displayed.

All configuration commands associated with the duplicate address remain as configured, while the address state is set to DUPLICATE.

If the link-local address for an interface changes, DAD is performed on the new link-local address and all of the other IPv6 address associated with the interface are regenerated (DAD is performed only on the new link-local address).

Configuring a value of 0 with this command disables duplicate address detection processing on the specified interface. A value of 1 configures a single transmission without follow-up transmissions. The default is 1 message.

Until the DAD process is completed, an IPv6 address is in the tentative state and cannot be used for data transfer. It is recommended to limit the configured value.

Example

The following example configures the number of consecutive neighbor solicitation messages sent during DAD processing to 2 on gi9.

```
switchxxxxxx (config)# interface gi9
switchxxxxxx (config-if)# ipv6 nd dad attempts 2
```

36.12 ipv6 host

Use the **ipv6 host** Global Configuration mode command to define a static host name-to-address mapping in the host name cache. Use the **no** form of this command to remove the host name-to-address mapping.

Syntax

ipv6 host *name ipv6-address1 [ipv6-address2...ipv6-address4]*

no ipv6 host name

Parameters

host name - Name of the host. (Range: 1–158 characters)

- **ipv6-address1**—Associated IPv6 address. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons. When the IPv6 address is a link-local address (IPv6Z address), the outgoing interface name must be specified. See IPv6z Address Conventions.
- **ipv6-address2-4**—(Optional) Additional IPv6 addresses that may be associated with the host's name

Default Configuration

No host is defined.

Command Mode

Global Configuration mode

Example

switchxxxxxx(config)# **ipv6 host** server 3000::a31b

36.13 ipv6 neighbor

Use the **ipv6 neighbor** command to configure a static entry in the IPv6 neighbor discovery cache. Use the **no** form of this command to remove a static IPv6 entry from the IPv6 neighbor discovery cache.

Syntax

ipv6 neighbor *ipv6_addr interface-id hw_addr*

no ipv6 neighbor *ipv6_addr interface-id*

Parameters

- **Ipv6_addr**—Specifies the Pv6 address to map to the specified MAC address.
- **interface-id**—Specifies the interface that is associated with the IPv6 address
- **hw_addr**—Specifies the MAC address to map to the specified IPv6 address.

Command Mode

Global Configuration mode

User Guidelines

The **IPv6 neighbor** command is similar to the arp command.

If an entry for the specified IPv6 address already exists in the neighbor discovery cache—learned through the IPv6 neighbor discovery process—the entry is automatically converted to a static entry.

A new static neighbor entry with a global address can be configured only if a manually configured subnet already exists in the device.

Use the show ipv6 neighbors command to view static entries in the IPv6 neighbor discovery cache.

Example

```
switchxxxxxx(config)# ipv6 neighbor 3000::a31b vlan 1 001b.3f9c.84ea
```

36.14 ipv6 set mtu

Use the **ipv6 mtu** Privileged EXEC mode command to set the maximum transmission unit (MTU) size of IPv6 packets sent on an interface. Use the default parameter to restore the default MTU size.

Syntax

ipv6 set mtu *{interface-id} {bytes | **default**}*

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.
- **bytes**—Specifies the MTU in bytes. Range is 1280-65535.
- **default**—Sets the default MTU size 1500 bytes. Minimum is 1280 bytes

Default Configuration

1500 bytes

Command Mode

Privileged EXEC mode

User Guidelines

This command is intended for debugging and testing purposes and should be used only by technical support personnel.

Example

```
switchxxxxxx# ipv6 set mtu gi1 default
```

36.15 show ipv6 neighbors

Use the **show ipv6 neighbors** Privileged EXEC mode command to display IPv6 neighbor discovery cache information.

Syntax

show ipv6 neighbors *{**static** | **dynamic**}[**ipv6-address** ipv6-address] [**mac-address** mac-address] [interface-id]*

Parameters

- **static**—Shows static neighbor discovery cash entries.
- **dynamic**—Shows dynamic neighbor discovery cash entries.
- **ipv6-address**—Shows the neighbor discovery cache information entry of a specific IPv6 address.
- **mac-address**—Shows the neighbor discovery cache information entry of a specific MAC address.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, Port-channel or VLAN.

Command Mode

Privileged EXEC mode

User Guidelines

Since the associated interface of a MAC address can be aged out from the FDB table, the Interface field can be empty.

When an ARP entry is associated with an IP interface that is defined on a port or port-channel, the VLAN field is empty.

The possible neighbor cash states are:

- **INCMP (Incomplete)**—Address resolution is being performed on the entry. Specifically, a Neighbor Solicitation has been sent to the solicited-node multicast address of the target, but the corresponding Neighbor Advertisement has not yet been received.
- **REACH (Reachable)**—Positive confirmation was received within the last ReachableTime milliseconds that the forward path to the neighbor was functioning properly. While REACHABLE, no special action takes place as packets are sent.
- **STALE**—More than ReachableTime milliseconds have elapsed since the last positive confirmation was received that the forward path was functioning properly. While stale, no action takes place until a packet is sent.

- **DELAY**—More than ReachableTime milliseconds have elapsed since the last positive confirmation was received that the forward path was functioning properly, and a packet was sent within the last DELAY_FIRST_PROBE_TIME seconds. If no reachability confirmation is received within DELAY_FIRST_PROBE_TIME seconds of entering the DELAY state, send a Neighbor Solicitation and change the state to PROBE.
- **PROBE**—A reachability confirmation is actively sought by retransmitting Neighbor Solicitations every RetransTimer milliseconds until a reachability confirmation is received.

Example

```
switchxxxxxx# show ipv6 neighbors dynamic

Interface     IPv6 Address              HW Address         State*  Router

----------    ------------------------  -----------------  ------ ------

  VLAN 1      fe80::200:cff:fe4a:dfa8   00:00:0c:4a:df:a8  stale  yes

  VLAN 1      fe80::2d0:b7ff:fea1:264d  00:d0:b7:a1:26:4d  stale  no

*See State values above.
```

36.16 clear ipv6 neighbors

Use the **clear ipv6 neighbors** Privileged EXEC mode command to delete all entries in the IPv6 neighbor discovery cache, except for static entries.

Syntax

clear ipv6 neighbors

Parameters

This command has no keywords or arguments.

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx# clear ipv6 neighbors
```

37 Tunnel Commands

37.1 interface tunnel

Use the **interface tunnel** Global Configuration mode command to enter the Interface Configuration (Tunnel) mode.

Syntax

interface tunnel *number*

Parameters

number—Specifies the tunnel index.

Default Configuration

N/A

Command Mode

Global Configuration mode

Example

The following example enters the Interface Configuration (Tunnel) mode.

```
switchxxxxxx(config)# interface tunnel 1

switchxxxxxx(config-tunnel)#
```

37.2 tunnel mode ipv6ip

Use the **tunnel mode ipv6ip** Interface Configuration (Tunnel) mode command to configure an IPv6 transition-mechanism global support mode. Use the **no** form of this command to remove an IPv6 transition mechanism.

Syntax

tunnel mode ipv6ip *{isatap}*

no tunnel mode ipv6ip

Parameters

isatap—Enables an automatic IPv6 over IPv4 ISATAP tunnel.

Default Configuration

Disabled.

Command Mode

Interface Configuration (Tunnel) mode

User Guidelines

The system can be enabled to support ISATAP tunnels. When enabled, an automatic tunnel interface is created on each interface that is assigned an IPv4 address.

Note that on a specific interface (for example, port or VLAN), both native IPv6 and transition-mechanisms can coexist. The host implementation chooses the egress interface according to the scope of the destination IP address (such as ISATAP or native IPv6).

Example

The following example configures an ISATAP tunnel mechanism.

```
switchxxxxxx(config)# interface tunnel 1

switchxxxxxx(config-tunnel)# tunnel mode ipv6ip isatap
```

37.3 tunnel isatap router

Use the **tunnel isatap router** Interface Configuration (Tunnel) mode command to configure a global string that represents a specific automatic tunnel router domain name. Use the **no** form of this command to remove this router name and restore the default configuration.

Syntax

tunnel isatap router *router-name*

no tunnel isatap router

Parameters

router-name—Specifies the router's domain name.

Default Configuration

The automatic tunnel router's default domain name is ISATAP.

Command Mode

Interface Configuration (Tunnel) mode

User Guidelines

This command determines the string that the host uses for automatic tunnel router lookup in the IPv4 DNS procedure. By default, the string ISATAP is used for the corresponding automatic tunnel types.

Only one string can represent the automatic tunnel router name per tunnel. Using this command, therefore, overwrites the existing entry.

Example

The following example configures the global string ISATAP2 as the automatic tunnel router domain name.

```
switchxxxxxx(config)# tunnel 1
switchxxxxxx(config-tunnel)# tunnel isatap router ISATAP2
```

37.4 tunnel source

Use the **tunnel source** Interface Configuration (Tunnel) mode command to set the local (source) IPv4 address of a tunnel interface. The **no** form deletes the tunnel local address.

Syntax

tunnel source *{auto* /**ipv4-address** *ipv4-address}*

no tunnel source

Parameters

- **auto**—The system minimum IPv4 address is used as the source address for packets sent on the tunnel interface. If the IPv4 address is changed, then the local address of the tunnel interface is changed too.
- **ip4-address**—Specifies the IPv4 address to use as the source address for packets sent on the tunnel interface. The local address of the tunnel interface is not changed when the IPv4 address is moved to another interface.

Default

No source address is defined.

Command Mode

Interface Configuration (Tunnel) mode

User Guidelines

The configured source IPv4 address is used for forming the tunnel interface identifier. The interface identifier is set to the 8 least significant bytes of the SIP field of the encapsulated IPv6 tunneled packets.

Example

```
switchxxxxxx(config)# interface tunnel 1

switchxxxxxx(config-tunnel)# tunnel source auto
```

37.5 tunnel isatap query-interval

Use the **tunnel isatap query-interval** Global Configuration mode command to set the time interval between DNS queries (before the ISATAP router IP address is known) for the automatic tunnel router domain name. Use the **no** form of this command to restore the default configuration.

Syntax

tunnel isatap query-interval *seconds*

no tunnel isatap query-interval

Parameters

seconds—Specifies the time interval in seconds between DNS queries. (Range: 10–3600)

Default Configuration

The default time interval between DNS queries is 10 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command determines the time interval between DNS queries before the ISATAP router IP address is known. If the IP address is known, the robustness level that is set by the tunnel isatap robustness Global Configuration mode command determines the refresh rate.

Example

The following example sets the time interval between DNS queries to 30 seconds.

```
switchxxxxxx(config)# tunnel isatap query-interval 30
```

37.6 tunnel isatap solicitation-interval

Use the **tunnel isatap solicitation-interval** Global Configuration mode command to set the time interval between ISATAP router solicitation messages. Use the **no** form of this command to restore the default configuration.

Syntax

tunnel isatap solicitation-interval *seconds*

no tunnel isatap solicitation-interval

Parameters

seconds—Specifies the time interval in seconds between ISATAP router solicitation messages. (Range: 10–3600)

Default Configuration

The default time interval between ISATAP router solicitation messages is 10 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command determines the interval between router solicitation messages when there is no active ISATAP router. If there is an active ISATAP router, the robustness level set by the **tunnel isatap robustness** Global Configuration mode command determines the refresh rate.

Example

The following example sets the time interval between ISATAP router solicitation messages to 30 seconds.

```
switchxxxxxx(config)# tunnel isatap solicitation-interval 30
```

37.7 tunnel isatap robustness

Use the **tunnel isatap robustness** Global Configuration mode command to configure the number of DNS query/router solicitation refresh messages that the device sends. Use the **no** form of this command to restore the default configuration.

Syntax

tunnel isatap robustness *number*

no tunnel isatap robustness

Parameters

number—Specifies the number of DNS query/router solicitation refresh messages that the device sends. (Range: 1–20)

Default Configuration

The default number of DNS query/router solicitation refresh messages that the device sends is 3.

Command Mode

Global Configuration mode

User Guidelines

The DNS query interval (after the ISATAP router IP address is known) is the Time-To-Live (TTL) that is received from the DNS, divided by (Robustness + 1).

The router solicitation interval (when there is an active ISATAP router) is the minimum-router-lifetime that is received from the ISATAP router, divided by (Robustness + 1).

Example

The following example sets the number of DNS query/router solicitation refresh messages that the device sends to 5.

```
switchxxxxxx(config)# tunnel isatap robustness 5
```

37.8 show ipv6 tunnel

Use the **show ïpv6 tunnel** EXEC mode command to display information on the ISATAP tunnel.

Syntax

show ïpv6 tunnel

Command Mode

EXEC mode

Example

The following example displays information on the ISATAP tunnel.

```
switchxxxxxx#  show ipv6 tunnel

Tunnel 1

--------

Tunnel status                    : DOWN

Tunnel protocol                  : NONE
```

```
Tunnel Local address type        : auto
Tunnel Local Ipv4 address        : 0.0.0.0
Router DNS name                  : ISATAP
Router IPv4 address              : 0.0.0.0
DNS Query interval               : 300 seconds
Min DNS Query interval           : 0 seconds
Router Solicitation interval     : 10 seconds
Min Router Solicitation interval : 0 seconds
Robustness                       : 2
```

38 DHCP Relay Commands

38.1 ip dhcp relay enable (Global)

Use the **ip dhcp relay enable** Global Configuration mode command to enable the DHCP relay feature on the device. Use the **no** form of this command to disable the DHCP relay feature.

Syntax

ip dhcp relay enable

no ip dhcp relay enable

Parameters

N/A

Default Configuration

DHCP relay feature is disabled.

Command Mode

Global Configuration mode

Example

The following example enables the DHCP relay feature on the device.

```
switchxxxxxx(config)# ip dhcp relay enable
```

38.2 ip dhcp relay enable (Interface)

Use the **ip dhcp relay enable** Interface Configuration (VLAN, Ethernet, Port-channel) mode command to enable the DHCP relay feature on an interface. Use the **no** form of this command to disable the DHCP relay agent feature on an interface.

Syntax

ip dhcp relay enable

no ip dhcp relay enable

Parameters

N/A

Default Configuration

Disabled

Command Mode

Interface Configuration (VLAN, Ethernet, Port-channel) mode

User Guidelines

The operational status of DHCP Relay on an interface is active if one of the following conditions exist:

- DHCP Relay is globally enabled, and there is an IP address defined on the interface.

Or

- DHCP Relay is globally enabled, there is no IP address defined on the interface, the interface is a VLAN, and option 82 is enabled.

Example

The following example enables DHCP Relay on VLAN 21.

```
switchxxxxxx(config)# interface vlan 21
switchxxxxxx(config-if)# ip dhcp relay enable
```

38.3 ip dhcp relay address

Use the **ip dhcp relay address** Global Configuration mode command to define the DHCP servers available for the DHCP relay. Use the **no** form of this command to remove servers from the list.

Syntax

ip dhcp relay address *ip-address*

no ip dhcp relay address [*ip-address*]

Parameters

ip-address—Specifies the DHCP server IP address. Up to 8 servers can be defined.

Default Configuration

No server is defined.

Command Mode

Global Configuration mode

Example

The following example defines the DHCP server on the device.

```
switchxxxxxx(config)# ip dhcp relay address 176.16.1.1
```

38.4 show ip dhcp relay

Use the **show ip dhcp relay** EXEC mode command to display the DHCP relay information.

Syntax

show ip dhcp relay

Command Mode

EXEC mode

Example

Example 1. Option 82 is not supported:

```
switchxxxxxx# show ip dhcp relay

DHCP relay is globally enabled

Option 82 is Disabled

Maximum number of supported VLANs without IP Address is 256

Number of DHCP Relays enabled on VLANs without IP Address is 0

DHCP relay is not configured on any port.
```

```
DHCP relay is not configured on any vlan.
No servers configured
```

Example 2. Option 82 is supported (disabled):

```
switchxxxxxx# show ip dhcp relay
DHCP relay is globally disabled
Option 82 is disabled
Maximum number of supported VLANs without IP Address: 0
Number of DHCP Relays enabled on VLANs without IP Address: 4
DHCP relay is enabled on Ports: gi5,po3-4
 Active:
 Inactive: gi5, po3-4
DHCP relay is enabled on VLANs: 1, 2, 4, 5
 Active:
 Inactive: 1, 2, 4, 5
Servers: 1.1.1.1 , 2.2.2.2
```

Example 3. Option 82 is supported (enabled):

```
switchxxxxxx# show ip dhcp relay
DHCP relay is globally enabled
Option 82 is enabled
Maximum number of supported VLANs without IP Address is 4
Number of DHCP Relays enabled on VLANs without IP Address: 2
DHCP relay is enabled on Ports: gi5,po3-4
 Active: gi5
 Inactive: po3-4
DHCP relay is enabled on VLANs: 1, 2, 4, 5
 Active: 1, 2, 4, 5
 Inactive:
```

```
Servers: 1.1.1.1 , 2.2.2.2
```

38.5 ip dhcp information option

Use the **ip dhcp information option** Global Configuration command to enable DHCP option-82 data insertion. Use the **no** form of this command to disable DHCP option-82 data insertion.

Syntax

ip dhcp information option

no ip dhcp information option

Parameters

N/A

Default Configuration

DHCP option-82 data insertion is disabled.

Command Mode

Global Configuration mode

User Guidelines

DHCP option 82 would be enabled only if DHCP snooping or DHCP relay are enabled.

Example

```
switchxxxxxx(config)# ip dhcp information option
```

38.6 show ip dhcp information option

The **show ip dhcp information option** EXEC mode command displays the DHCP Option 82 configuration.

Syntax

show ip dhcp information option

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays the DHCP Option 82 configuration.

```
switchxxxxxx# show ip dhcp information option
Relay agent Information option is Enabled
```

39 IP Routing Protocol-Independent Commands

39.1 ip route

Use the **ip route** Global Configuration mode command to configure static routes. Use the **no** form of this command to remove static routes.

Syntax

ip route *prefix* {*mask* | *prefix-length*} {{*ip-address* [**metric** *distance*]} | **reject-route**}

no ip route *prefix* {*mask* | *prefix-length*} [*ip-address*]

Parameters

- **prefix**—Specifies the IP address that is the IP route prefix for the destination IP.
- **mask**—Specifies the network subnet mask of the IP address prefix.
- **prefix-length**—Specifies the number of bits that comprise the IP address prefix. The prefix length must be preceded by a forward slash (/). (Range: 0–32)
- **ip-address**—Specifies the IP address or IP alias of the next hop that can be used to reach the network.
- **metric** *distance*—Specifies an administrative distance. (Range: 1–255).
- **reject-route**—Stops routing to the destination network via all gateways.

Default Configuration

The default administrative distance is 1.

Command Mode

Global Configuration mode

User Guidelines

To use this command, set the device in router mode with the command set system mode.

Use the **no ip route** command with the *ip-address* parameter to remove a single static route to the given subnet via the given next hop.

Use the **no ip route** command without the i*p-address* parameter to remove all static routes to the given subnet.

Examples

Example 1 - The following example shows how to route packets for network 172.31.0.0 to a router at 172.31.6.6 using mask:

```
switchxxxxxx(conf)#ip route 172.31.0.0 255.255.0.0 172.31.6.6 metric 2
```

Example 2 - The following example shows how to route packets for network 172.31.0.0 to a router at 172.31.6.6 using prefix length:

```
switchxxxxxx(conf)#ip route 172.31.0.0 /16 172.31.6.6 metric 2
```

Example 3 - The following example shows how to reject packets for network 194.1.1.0:

```
switchxxxxxx(conf)#ip route 194.1.1.0 255.255.255.0 reject-route
```

Example 4 - The following example shows how to remove all static routes to network 194.1.1.0/24:

```
switchxxxxxx(conf)#no ip route 194.1.1.0 /24
```

Example 5 - The following example shows how to remove one static route to network 194.1.1.0/24 via 1.1.1.1:

```
switchxxxxxx(conf)#no ip route 194.1.1.0 /24 1.1.1.1
```

39.2 show ip route

Use the **show ip route** EXEC mode command to display the current routing table state.

Syntax

show ip route *[connected | static | {**address** address [mask | prefix-length] [**longer-prefixes**]}]*

Parameters

- **connected**—Displays connected routing entries only.
- **static**—Displays static routing entries only.
- **address address**—Specifies the address for which routing information is displayed.
- **mask**—Specifies the network subnet mask of the IP address.
- **prefix-length**—Specifies the number of bits that comprise the IP address prefix. The prefix length must be preceded by a forward slash (/). (Range: 1–32)
- **longer-prefixes**—Specifies that the **address** and **mask** pair becomes a prefix and any routes that match that prefix are displayed.

Command Mode

EXEC mode

User Guidelines

To use this command set the device in router mode with the command set system mode.

Example

The following example displays the current routing table state.

```
switchxxxxxx#  show ip route
switchxxxxxx# show ip route
Maximum Parallel Paths: 1 (1 after reset)
IP Forwarding:          enabled
Codes: C - connected, S - static, D - DHCP
S  0.0.0.0/0          [gi1] via  10.5.234.254  119:9:27   vlan 1
C  10.5.234.0/24      is directly connected               vlan 1
```

```
switchxxxxxx#  show ip route address 172.1.1.0 255.255.255.0
Codes: C - connected, S - static, E - OSPF external, * - candidate default
S 172.1.1.0/24 [gi3] via 10.0.2.1, 17:12:19, gi1
```

```
switchxxxxxx#  show ip route address 172.1.1.0 255.255.255.0 longer-prefixes
Codes: C - connected, S - static, E - OSPF external
S 172.1.1.0/24 [gi3] via 10.0.2.1, 17:12:19, gi1
S 172.1.1.1/32 [gi3] via 10.0.3.1, 19:51:18, gi1
```

The following table describes the significant fields shown in the display:

Field	Description
O	The protocol that derived the route.
10.8.1.0/24	The remote network address.
[30/2000]	The first number in the brackets is the administrative distance of the information source; the second number is the metric for the route.
via 10.0.1.2	The address of the next router to the remote network.
00:39:08	The last time the route was updated in hours:minutes:seconds.
gi1	The interface through which the specified network can be reached.

40 ACL Commands

40.1 ip access-list (IP extended)(ISCLI)

Use the **ip access-list extended** Global Configuration mode command to name an IPv4 access list (ACL) and to place the device in IPv4 Access List Configuration mode. All commands after this command refer to this ACL. The rules (ACEs) for this ACL are defined in the permit (IP) and deny (IP) commands. The absolute command is used to attach this ACL to an interface.

Use the **no** form of this command to remove the access list.

Syntax

ip access-list extended *acl-name*

no ip access-list extended *acl-name*

Parameters

- **acl-name**—Name of the IPv4 access list. (Range 1-32 characters)

Default Configuration

No IPv4 access list is defined.

Command Mode

Global Configuration mode

User Guidelines

An IPv4 ACL is defined by a unique name. IPv4 ACL, IPv6 ACL, MAC ACL or policy maps cannot have the same name.

Example

```
switchxxxxxx(config)# ip access-list extended server

switchxxxxxx(config-ip-al)#
```

40.2 permit (IP)

Use the **permit** IP Access-list Configuration mode command to set permit conditions for an IPv4 access list (ACL). Permit conditions are also known as access control entries (ACEs).

Syntax

permit *protocol {**any** | source source-wildcard} {**any** | destination destination-wildcard} [**dscp** number | **precedence** number]*

permit *icmp {**any** | source source-wildcard} {**any** | destination destination-wildcard} [**any** | icmp-type] [**any** | icmp-code]] [**dscp** number | **precedence** number]*

permit *igmp {**any** | source source-wildcard} {**any** | destination destination-wildcard}[igmp-type] [**dscp** number | **precedence** number]*

permit tcp *{**any** | source source-wildcard} {**any**|source-port/port-range}{**any** | destination destination-wildcard} {**any**|destination-port/port-range} [**dscp** number | **precedence** number] [**match-all** list-of-flags]*

permit udp *{**any** | source source-wildcard} {**any**|source-port/port-range} {**any** | destination destination-wildcard} {**any**|destination-port/port-range} [**dscp** number | **precedence** number]*

Parameters

- **permit** *protocol*—The name or the number of an IP protocol. Available protocol names are: icmp, igmp, ip, tcp, egp, igp, udp, hmp, rdp, idpr, ipv6, ipv6:rout, ipv6:frag, idrp, rsvp, gre, esp, ah, ipv6:icmp, eigrp, ospf, ipinip, pim, l2tp, isis. To match any protocol, use the **ip** keyword.(Range: 0–255)
- **source**—Source IP address of the packet.
- **source-wildcard**—Wildcard bits to be applied to the source IP address. Use ones in the bit position that you want to be ignored.
- **destination**—Destination IP address of the packet.
- **destination-wildcard**—Wildcard bits to be applied to the destination IP address. Use ones in the bit position that you want to be ignored.
- **dscp** *number*—Specifies the DSCP value.
- **precedence** *number*—Specifies the IP precedence value.
- **icmp-type**—Specifies an ICMP message type for filtering ICMP packets. Enter a number or one of the following values: echo-reply, destination-unreachable, source-quench, redirect, alternate-host-address,

echo-request, router-advertisement, router-solicitation, time-exceeded, parameter-problem, timestamp, timestamp-reply, information-request, information-reply, address-mask-request, address-mask-reply, traceroute, datagram-conversion-error, mobile-host-redirect, mobile-registration-request, mobile-registration-reply, domain-name-request, domain-name-reply, skip, photuris. (Range: 0–255)

- **icmp-code**—Specifies an ICMP message code for filtering ICMP packets. (Range: 0–255)
- **igmp-type**—IGMP packets can be filtered by IGMP message type. Enter a number or one of the following values: host-query, host-report, dvmrp, pim, cisco-trace, host-report-v2, host-leave-v2, host-report-v3. (Range: 0–255)
- **destination-port**—Specifies the UDP/TCP destination port. You can enter range of ports by using hyphen. E.g. 20 - 21. For TCP enter a number or one of the following values: bgp (179), chargen (19), daytime (13), discard (9), domain (53), drip (3949), echo (7), finger (79), ftp (21), ftp-data (20), gopher (70), hostname (42), irc (194), klogin (543), kshell (544), lpd (515), nntp (119), pop2 (109), pop3 (110), smtp (25), sunrpc (1110, syslog (514), tacacs-ds (49), talk (517), telnet (23), time (37), uucp (117), whois (43), www (80). For UDP enter a number or one of the following values: biff (512), bootpc (68), bootps (67), discard (9), dnsix (90), domain (53), echo (7), mobile-ip (434), nameserver (42), netbios-dgm (138), netbios-ns (137), on500-isakmp (4500), ntp (123), rip (520), snmp (161), snmptrap (162), sunrpc (111), syslog (514), tacacs-ds (49), talk (517), tftp (69), time (37), who (513), xdmcp (177).(Range: 0–65535).
- **source-port**—Specifies the UDP/TCP source port. Predefined port names are defined in the destination-port parameter. (Range: 0–65535)
- **match-all** *list-of-flags*—List of TCP flags that should occur. If a flag should be set, it is prefixed by “+”. If a flag should be unset, it is prefixed by “-”. Available options are +urg, +ack, +psh, +rst, +syn, +fin, -urg, -ack, -psh, -rst, -syn and -fin. The flags are concatenated to a one string. For example: +fin-ack.

Default Configuration

No IPv4 access list is defined.

Command Mode

IP Access-list Configuration mode

User Guidelines

After an ACE is added to an access control list, an implicit **deny any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets up to #ASIC-specific ranges for TCP and up to #ASIC-specific ranges for UDP. If a range of ports is used for source port in an ACE, it is not counted again, if it is also used for a source port in another ACE. If a range of ports is used for the destination port in an ACE, it is not counted again if it is also used for destination port in another ACE.

If a range of ports is used for source port it is counted again if it is also used for destination port.

Example

```
switchxxxxxx(config)# ip access-list extended server

switchxxxxxx(config-ip-al)# permit ip 176.212.0.0 00.255.255
```

40.3 deny (IP)

Use the **deny** IP Access-list Configuration mode command to set deny conditions for IPv4 access list. Deny conditions are also known as access control entries (ACEs).

Syntax

deny *protocol {**any** | source source-wildcard} {**any** | destination destination-wildcard} [**dscp** number | **precedence** number]*

deny *icmp {**any** | source source-wildcard} {**any** | destination destination-wildcard} [**any** | icmp-type] [**any** | icmp-code]] [**dscp** number | **precedence** number]*

deny *igmp {**any** | source source-wildcard} {**any** | destination destination-wildcard}[igmp-type] [**dscp** number | **precedence** number]*

deny tcp *{**any** | source source-wildcard} {**any**|source-port/port-range}{**any** | destination destination-wildcard} {**any**|destination-port/port-range} [**dscp** number | **precedence** number] [**match-all** list-of-flags]*

deny udp *{**any** | source source-wildcard} {**any**|source-port/port-range} {**any** | destination destination-wildcard} {**any**|destination-port/port-range} [**dscp** number | **precedence** number]*

Parameters

- **protocol**—The name or the number of an IP protocol. Available protocol names: icmp, igmp, ip, tcp, egp, igp, udp, hmp, rdp, idpr, ipv6, ipv6:rout, ipv6:frag, idrp, rsvp, gre, esp, ah, ipv6:icmp, eigrp, ospf, ipinip, pim, l2tp, isis. To match any protocol, use the Ip keyword. (Range: 0–255)
- **source**—Source IP address of the packet.
- **source-wildcard**—Wildcard bits to be applied to the source IP address. Use 1s in the bit position that you want to be ignored.
- **destination**—Destination IP address of the packet.
- **destination-wildcard**—Wildcard bits to be applied to the destination IP address. Use 1s in the bit position that you want to be ignored.
- **dscp** *number*—Specifies the DSCP value.
- **precedence** *number*—Specifies the IP precedence value.
- **icmp-type**—Specifies an ICMP message type for filtering ICMP packets. Enter a number or one of the following values: echo-reply, destination-unreachable, source-quench, redirect, alternate-host-address, echo-request, router-advertisement, router-solicitation, time-exceeded, parameter-problem, timestamp, timestamp-reply, information-request, information-reply, address-mask-request, address-mask-reply, traceroute, datagram-conversion-error, mobile-host-redirect, mobile-registration-request, mobile-registration-reply, domain-name-request, domain-name-reply, skip, photuris. (Range: 0–255)
- **icmp-code**—Specifies an ICMP message code for filtering ICMP packets. (Range: 0–255)
- **igmp-type**—IGMP packets can be filtered by IGMP message type. Enter a number or one of the following values: host-query, host-report, dvmrp, pim, cisco-trace, host-report-v2, host-leave-v2, host-report-v3. (Range: 0–255)
- **destination-port**—Specifies the UDP/TCP destination port. You can enter range of ports by using hyphen. E.g. 20 - 21. For TCP enter a number or one of the following values: bgp (179), chargen (19), daytime (13), discard (9), domain (53), drip (3949), echo (7), finger (79), ftp (21), ftp-data (20), gopher (70), hostname (42), irc (194), klogin (543), kshell (544), lpd (515), nntp (119), pop2 (109), pop3 (110), smtp (25), sunrpc (1110, syslog (514), tacacs-ds (49), talk (517), telnet (23), time (37), uucp (117), whois (43), www (80). For UDP enter a number or one of the following values: biff (512), bootpc (68), bootps (67), discard (9), dnsix (90), domain (53), echo (7), mobile-ip (434),

nameserver (42), netbios-dgm (138), netbios-ns (137), non500-isakmp (4500), ntp (123), rip (520), snmp 161), snmptrap (162), sunrpc (111), syslog (514), tacacs-ds (49), talk (517), tftp (69), time (37), who (513), xdmcp (177). (Range: 0–65535)

- **source-port**—Specifies the UDP/TCP source port. Predefined port names are defined in the destination-port parameter. (Range: 0–65535)
- **match-all** *list-of-flags*—List of TCP flags that should occur. If a flag should be set it is prefixed by "+".If a flag should be unset it is prefixed by "-". Available options are +urg, +ack, +psh, +rst, +syn, +fin, -urg, -ack, -psh, -rst, -syn and -fin. The flags are concatenated to a one string. For example: +fin-ack.
- **disable-port**—The Ethernet interface is disabled if the condition is matched.
- **log-input**—Specifies sending an informational syslog message about the packet that matches the entry. Because forwarding is done in hardware and logging is done in software, if a large number of packets match a deny ACE containing a log-input keyword, the software might not be able to match the hardware processing rate, and not all packets will be logged.

Default Configuration

No IPv4 access list is defined.

Command Mode

IP Access-list Configuration mode

User Guidelines

After an ACE is added to an access control list, an implicit **deny any any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

The number of TCP/UDP ranges that can be defined in ACLs is limited. You can define up to #ASIC-specific ranges for TCP and up to #ASIC-specific ranges for UDP. If a range of ports is used for a source port in ACE it is not counted again if it is also used for source port in another ACE. If a range of ports is used for destination port in ACE it is not counted again if it is also used for destination port in another ACE.

If a range of ports is used for source port, it is counted again if it is also used for destination port.

Example

```
switchxxxxxx(config)# ip access-list extended server

switchxxxxxx(config-ip-al)# deny ip 176.212.0.0 00.255.255
```

40.4 ipv6 access-list (IPv6 extended)

Use the **ipv6 access-list** Global Configuration mode command to define an IPv6 access list (ACL) and to place the device in IPv6 Access List Configuration mode. All commands after this command refer to this ACL. The rules (ACEs) for this ACL are defined in the permit (IPv6) and deny (IPv6) commands. The absolute command is used to attach this ACL to an interface.

Use the **no** form of this command to remove the access list.

Syntax

ipv6 access-list [*acl-name]*

no ipv6 access-list *[acl-name]*

Parameters

- **acl-name**—Name of the IPv6 access list. Range 1-32 characters.

Default Configuration

No IPv6 access list is defined.

Command Mode

Global Configuration mode

User Guidelines

IPv6 ACL is defined by a unique name. IPv4 ACL, IPv6 ACL, MAC ACL or policy maps cannot have the same name.

Every IPv6 ACL has an implicit **permit icmp any any nd-ns any**, **permit icmp any any nd-na any**, and **deny ipv6 any any** statements as its last match conditions. (The former two match conditions allow for ICMPv6 neighbor discovery.)

The IPv6 neighbor discovery process uses the IPv6 network layer service, therefore, by default, IPv6 ACLs implicitly allow IPv6 neighbor discovery packets to be sent and received on an interface. In IPv4, the Address Resolution Protocol (ARP), which is equivalent to the IPv6 neighbor discovery process, uses a separate data link layer protocol; therefore, by default, IPv4 ACLs implicitly allow ARP packets to be sent and received on an interface.

Example

```
Switch (config)# ipv6 access-list acl1

Switch(config-ipv6-acl)# permit tcp 2001:0DB8:0300:0201::/64 any any 80
```

40.5 permit (IPv6)

Use the **permit** command in IPv6 Access-list Configuration mode to set permit conditions (ACEs) for IPv6 ACLs.

Syntax

permit *protocol {**any** |{source-prefix/length}{**any** | destination- prefix/length} [**dscp** number | **precedence** number]*

permit icmp *{**any** | {source-prefix/length}{**any** | destination- prefix/length} {**any**|icmp-type} {**any**|icmp-code} [**dscp** number | **precedence** number]*

permit tcp *{**any** | {source-prefix/length} {**any** | source-port/port-range}}{**any** | destination- prefix/length} {**any**| destination-port/port-range} [**dscp** number | **precedence** number] [**match-all** list-of-flags]*

permit *udp {**any** | {source-prefix/length}} {**any** | source-port/port-range}}{**any** | destination- prefix/length} {**any**| destination-port/port-range} [**dscp** number | **precedence** number]*

Parameters

- **protocol**—The name or the number of an IP protocol. Available protocol names are: icmp (58), tcp (6) and udp (17). To match any protocol, use the ipv6 keyword. (Range: 0–255)
- **source-prefix/length**—The source IPv6 network or class of networks about which to set permit conditions. This argument must be in the form documented in RFC 3513 where the address is specified in hexadecimal using 16-bit values between colons.
- **destination-prefix/length**—The destination IPv6 network or class of networks about which to set permit conditions. This argument must be in the form documented in RFC 3513 where the address is specified in hexadecimal using 16-bit values between colons.
- **dscp** *number*—Specifies the DSCP value. (Range: 0–63)
- **precedence** *number*—Specifies the IP precedence value.

- **icmp-type**—Specifies an ICMP message type for filtering ICMP packets. Enter a number or one of the following values: destination-unreachable (1), packet-too-big (2), time-exceeded (3), parameter-problem (4), echo-request (128), echo-reply (129), mld-query (130), mld-report (131), mldv2-report (143), mld-done (132), router-solicitation (133), router-advertisement (134), nd-ns (135), nd-na (136). (Range: 0–255)
- **icmp-code**—Specifies an ICMP message code for filtering ICMP packets. (Range: 0–255)
- **destination-port**—Specifies the UDP/TCP destination port. You can enter a range of ports by using a hyphen. E.g. 20 - 21. For TCP enter a number or one of the following values: bgp (179), chargen (19), daytime (13), discard (9), domain (53), drip (3949), echo (7), finger (79), ftp (21), ftp-data (20), gopher (70), hostname (42), irc (194), klogin (543), kshell (544), lpd (515), nntp (119), pop2 (109), pop3 (110), smtp (25), sunrpc (1110, syslog (514), tacacs-ds (49), talk (517), telnet (23), time (37), uucp (117), whois (43), www (80). For UDP enter a number or one of the following values: biff (512), bootpc (68), bootps (67), discard (9), dnsix (90), domain (53), echo (7), mobile-ip (434), nameserver (42), netbios-dgm (138), netbios-ns (137), non500-isakmp (4500), ntp (123), rip (520), snmp (161), snmptrap (162), sunrpc (111), syslog (514), tacacs (49), talk (517), tftp (69), time (37), who (513), xdmcp (177). (Range: 0–65535)
- **source-port**—Specifies the UDP/TCP source port. Predefined port names are defined in the destination-port parameter. (Range: 0–65535)
- **match-all** *list-of-flag*—List of TCP flags that should occur. If a flag should be set it is prefixed by “+”.If a flag should be unset it is prefixed by “-”. Available options are +urg, +ack, +psh, +rst, +syn, +fin, -urg, -ack, -psh, -rst, -syn and -fin. The flags are concatenated to a one string. For example: +fin-ack.

Default Configuration

No IPv6 access list is defined.

Command Mode

Ipv6 Access-list Configuration mode

User Guidelines

The number of TCP/UDP ranges that can be defined in ACLs is limited. You can define up to #ASIC-specific ranges for TCP and up to #ASIC-specific ranges for UDP. If a range of ports is used for a source port in ACE, it is not counted again if it is also used for a source port in another ACE. If a range of ports is used for

destination port in ACE it is not counted again if it is also used for destination port in another ACE.

If a range of ports is used for source port it is counted again if it is also used for destination port.

Example

This example defines an ACL by the name of server and enters a rule (ACE) for tcp packets.

```
switchxxxxxx(config)# ipv6 access-list server

switchxxxxxx(config-ipv6-al)# permit tcp 3001::2/64 any any 80
```

40.6 deny (IPv6)

Use the **deny** command in IPv6 Access List Configuration mode to set permit conditions (ACEs) for IPv6 ACLs.

Syntax

deny ***protocol*** *{**any** | {source-prefix/length}{**any** | destination- prefix/length} [**dscp** number | **precedence** number][**disable-port** | **log-input**]*

deny ***icmp*** *{**any** | {source-prefix/length}{any | destination- prefix/length} {**any**|icmp-type} {**any**|icmp-code} [**dscp** number | **precedence** number][**disable-port** | **log-input**]*

deny ***tcp*** *{**any** | {source-prefix/length} {**any** | source-port/port-range}}{**any** | destination- prefix/length} {**any**| destination-port/port-range} [**dscp** number | **precedence** number] [**match-all** list-of-flags][**disable-port** | **log-input**]*

deny ***udp*** *{**any** | {source-prefix/length}} {**any** | source-port/port-range}}{**any** | destination- prefix/length} {**any**| destination-port/port-range} [**dscp** number | **precedence** number] [**disable-port** | **log-input**]*

Parameters

- **protocol**—The name or the number of an IP protocol. Available protocol names are: icmp (58), tcp (6) and udp (17). To match any protocol, use the ipv6 keyword. (Range: 0–255)
- **source-prefix/length**—The source IPv6 network or class of networks about which to set permit conditions. This argument must be in the format

documented in RFC 3513 where the address is specified in hexadecimal using 16-bit values between colons.

- **destination-prefix/length**—The destination IPv6 network or class of networks about which to set permit conditions. This argument must be in the format documented in RFC 3513 where the address is specified in hexadecimal using 16-bit values between colons.
- **dscp** *number*—Specifies the DSCP value. (Range: 0–63)
- **precedence** *number*—Specifies the IP precedence value.
- **icmp-type**—Specifies an ICMP message type for filtering ICMP packets. Enter a number or one of the following values: destination-unreachable (1), packet-too-big (2), time-exceeded (3), parameter-problem (4), echo-request (128), echo-reply (129), mld-query (130), mld-report (131), mldv2-report (143), mld-done (132), router-solicitation (133), router-advertisement (134), nd-ns (135), nd-na (136). (Range: 0–255)
- **icmp-code**—Specifies an ICMP message code for filtering ICMP packets. (Range: 0–255)
- **destination-port**—Specifies the UDP/TCP destination port. You can enter a range of ports by using a hyphen. E.g. 20 - 21. For TCP enter a number or one of the following values: bgp (179), chargen (19), daytime (13), discard (9), domain (53), drip (3949), echo (7), finger (79), ftp (21), ftp-data 20), gopher (70), hostname (42), irc (194), klogin (543), kshell (544), lpd (515), nntp (119), pop2 (109), pop3 (110), smtp (25), sunrpc (1110, syslog (514), tacacs-ds (49), talk (517), telnet (23), time (37), uucp (117), whois (43), www (80). For UDP enter a number or one of the following values: biff (512), bootpc (68), bootps (67), discard (9), dnsix (90), domain (53), echo (7), mobile-ip (434), nameserver (42), netbios-dgm (138), netbios-ns (137), non500-isakmp (4500), ntp (123), rip (520), snmp (161), snmptrap (162), sunrpc (111), syslog (514), tacacs (49), talk (517), tftp (69), time (37), who (513), xdmcp (177). (Range: 0–65535)
- **source-port**—Specifies the UDP/TCP source port. Predefined port names are defined in the destination-port parameter. (Range: 0–65535)
- **match-all** *list-of-flags*—List of TCP flags that should occur. If a flag should be set it is prefixed by “+”.If a flag should be unset it is prefixed by “-”. Available options are +urg, +ack, +psh, +rst, +syn, +fin, -urg, -ack, -psh, -rst, -syn and -fin. The flags are concatenated to a one string. For example: +fin-ack.
- **disable-port**—The Ethernet interface is disabled if the condition is matched.

- **log-input**—Specifies to send an informational syslog message about the packet that matches the entry. Because forwarding is done in hardware and logging is done in software, if a large number of packets match a deny ACE containing a log-input keyword, the software might not be able to match the hardware processing rate, and not all packets will be logged.

Default Configuration

No IPv6 access list is defined.

Command Mode

IPv6 Access-list Configuration mode

User Guidelines

The number of TCP/UDP ranges that can be defined in ACLs is limited. You can define up to #ASIC-specific ranges for TCP and up to #ASIC-specific ranges for UDP. If a range of ports is used for source port in ACE it is not counted again if it is also used for source port in another ACE. If a range of ports is used for a destination port in ACE it is not counted again if it is also used for a destination port in another ACE.

If a range of ports is used for source port it is counted again if it is also used for destination port.

Example

```
switchxxxxxx(config)# ipv6 access-list server

switchxxxxxx(config-ipv6-al)# deny tcp 3001::2/64 any any 80
```

40.7 mac access-list

Use the **mac access-list** Global Configuration mode command to define a Layer 2 access list (ACL) based on source MAC address filtering and to place the device in MAC Access List Configuration mode. All commands after this command refer to this ACL. The rules (ACEs) for this ACL are defined in the permit (MAC) and deny (MAC) commands. The absolute command is used to attach this ACL to an interface.

Use the **no** form of this command to remove the access list.

Syntax

mac access-list extended *acl-name*

no mac access-list extended *acl-name*

Parameters

acl-name—Specifies the name of the MAC ACL (Range: 1–32 characters).

Default Configuration

No MAC access list is defined.

Command Mode

Global Configuration mode

User Guidelines

A MAC ACL is defined by a unique name. IPv4 ACL, IPv6 ACL, MAC ACL or policy maps cannot have the same name.

Example

```
switchxxxxxx(config)# mac access-list extended server1

switchxxxxxx(config-mac-al)# permit 00:00:00:00:00:01 00:00:00:00:00:ff any
```

40.8 permit (MAC)

Use the **permit** command in MAC Access List Configuration mode to set permit conditions (ACEs) for a MAC ACL.

Syntax

permit *{**any** | source source-wildcard} {**any** | destination destination-wildcard} [eth-type 0 | **aarp** | **amber** | **dec-spanning** | **decnet-iv** | **diagnostic** | **dsm** | **etype-6000**] [**vlan** vlan-id] [**cos** cos cos-wildcard]*

Parameters

- **source**—Source MAC address of the packet.
- **source-wildcard**—Wildcard bits to be applied to the source MAC address. Use 1s in the bit position that you want to be ignored.
- **destination**—Destination MAC address of the packet.
- **destination-wildcard**—Wildcard bits to be applied to the destination MAC address. Use 1s in the bit position that you want to be ignored.

- **eth-type**—The Ethernet type in hexadecimal format of the packet.
- **vlan-id**—The VLAN ID of the packet. (Range: 1–4094)
- **cos**—The Class of Service of the packet. (Range: 0–7)
- **cos-wildcard**—Wildcard bits to be applied to the CoS.

Default Configuration

No MAC access list is defined.

Command Mode

MAC Access-list Configuration mode

User Guidelines

After an access control entry (ACE) is added to an access control list, an implicit **deny any any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

Example

```
switchxxxxxx(config)# mac access-list extended server1

switchxxxxxx(config-mac-al)# permit 00:00:00:00:00:01 00:00:00:00:00:ff any
```

40.9 deny (MAC)

Use the **deny** command in MAC Access List Configuration mode to set deny conditions (ACEs) for a MAC ACL.

Syntax

deny *{**any** | source source-wildcard} {**any** | destination destination-wildcard} [{eth-type 0}| **aarp** | **amber** | **dec-spanning** | **decnet-iv** | **diagnostic** | **dsm** | **etype-6000**] [**vlan** vlan-id] [**cos** cos cos-wildcard] [**disable-port** | **log-input**]*

Parameters

- **source**—Source MAC address of the packet.
- **source-wildcard**—Wildcard bits to be applied to the source MAC address. Use ones in the bit position that you want to be ignored.

- **destination**—Destination MAC address of the packet.
- **destination-wildcard**—Wildcard bits to be applied to the destination MAC address. Use 1s in the bit position that you want to be ignored.
- **eth-type**—The Ethernet type in hexadecimal format of the packet.
- **vlan-id**—The VLAN ID of the packet. (Range: 1–4094)
- **cos**—The Class of Service of the packet.(Range: 0–7)
- **cos-wildcard**—Wildcard bits to be applied to the CoS.
- **disable-port**—The Ethernet interface is disabled if the condition is matched.
- **log-input**—Sends an informational syslog message about the packet that matches the entry. Because forwarding is done in hardware and logging is done in software, if a large number of packets match a deny ACE containing a log-input keyword, the software might not be able to match the hardware processing rate, and not all packets will be logged.

Default Configuration

No MAC access list is defined.

Command Mode

MAC Access-list Configuration mode

User Guidelines

After an access control entry (ACE) is added to an access control list, an implicit **deny any any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

Example

```
switchxxxxxx(config)# mac access-list extended server1

switchxxxxxx(config-mac-al)# deny 00:00:00:00:00:01 00:00:00:00:00:ff any
```

40.10 absolute

Use the **absolute** Time-range Configuration mode command to specify an absolute time when a time range is in effect. Use the **no** form of this command to remove the time limitation.

Syntax

absolute ***start*** *hh:mm day month year*

no absolute *start*

absolute ***end*** *hh:mm day month year*

no absolute *end*

Parameters

- **start**—Absolute time and date that the permit or deny statement of the associated function going into effect. If no start time and date are specified, the function is in effect immediately.
- **end**—Absolute time and date that the permit or deny statement of the associated function is no longer in effect. If no end time and date are specified, the function is in effect indefinitely.
- **hh:mm**—Time in hours (military format) and minutes (Range: 0–23, mm: 0–5)
- **day**—Day (by date) in the month. (Range: 1–31)
- **month**—Month (first three letters by name). (Range: Jan...Dec)
- **year**—Year (no abbreviation) (Range: 2000–2097)

Default Configuration

There is no absolute time when the time range is in effect.

Command Mode

Time-range Configuration mode

Example

```
switchxxxxxx(config)# time-range
switchxxxxxx(config-time-range)# absolute start 12:00 1 jan 2005
switchxxxxxx(config-time-range)# absolute end 12:00 31 dec 2005
```

40.11 periodic

Use the **periodic** Time-range Configuration mode command to specify a recurring (weekly) time range for functions that support the time-range feature. Use the **no** form of this command to remove the time limitation.

Syntax

periodic *day-of-the-week hh:mm* ***to*** *day-of-the-week hh:mm*

no periodic *day-of-the-week hh:mm* ***to*** *day-of-the-week hh:mm*

periodic list *hh:mm* ***to*** *hh:mm day-of-the-week1 [day-of-the-week2... day-of-the-week7]*

no periodic list *hh:mm* ***to*** *hh:mm day-of-the-week1 [day-of-the-week2... day-of-the-week7]*

periodic list *hh:mm* ***to*** *hh:mm all*

no periodic list *all hh:mm* ***to*** *hh:mm all*

Parameters

- **day-of-the-week**—The starting day that the associated time range is in effect. The second occurrence is the ending day the associated statement is in effect. The second occurrence can be the following week (see description in the User Guidelines). Possible values are: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday.
- **hh:mm**—The first occurrence of this argument is the starting hours:minutes (military format) that the associated time range is in effect. The second occurrence is the ending hours:minutes (military format) the associated statement is in effect. The second occurrence can be at the following day (see description in the User Guidelines). (Range: 0–23, mm: 0–59)
- **list day-of-the-week1**—Specifies a list of days that the time range is in effect.

Default Configuration

There is no periodic time when the time range is in effect.

Command Mode

Time-range Configuration mode

User Guidelines

The second occurrence of the day can be at the following week, e.g. Thursday–Monday means that the time range is effective on Thursday, Friday, Saturday, Sunday, and Monday.

The second occurrence of the time can be on the following day, e.g. “22:00–2:00”.

Example

```
switchxxxxxx(config)# time-range

switchxxxxxx(config-time-range)# periodic Monday 12:00 to Wednesday 12:00
```

40.12 show access-lists

Use the **show access-lists** Privileged EXEC mode command to display access control lists (ACLs) configured on the switch.

Syntax

show access-lists [*name*]

show access-lists

Parameters

name—Specifies the name of the ACL.

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx#show access-lists
Standard IP access list 1
deny   any any
Standard IP access list 2
deny   192.168.0.0/24
permit any any
Standard IP access list 3
```

```
deny   192.168.0.1 10.0.0.0/8

permit any any

Standard IP access list ACL1

permit 192.168.0.0/16 10.1.1.1

Extended IP access list ACL2

permit 234 172.30.19.1 0.0.0.255 any

permit 234 172.30.23.8 0.0.0.255 any
```

40.13 show interfaces access-lists

Use the **show interfaces access-lists** Privileged EXEC mode command to display access lists (ACLs) applied on interfaces.

Syntax

show interfaces access-lists *[interface-id]*

Parameters

interface-id—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, port-channel or VLAN.

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx# show interfaces access-lists
Interface      Input ACL

----------     ---------

gi1            ACL1

gi2            ACL3
```

41 Quality of Service (QoS) Commands

41.1 qos

Use the **qos** Global Configuration mode command to enable QoS on the device and set its mode. Use the **no** form of this command to disable QoS on the device.

Syntax

qos [*basic* | *advanced* [*ports-not-trusted* | *ports-trusted*]]

no qos

Parameters

- **basic**—QoS basic mode. If no option is specified, the QoS mode defaults to the basic mode.
- **advanced**—Specifies the QoS advanced mode, which enables the full range of QoS configuration.
- **ports-not-trusted**—Relevant for advanced mode only. Indicates that packets, which are not classified by policy map rules to a QoS action, are mapped to egress queue 0. This is the default setting in advanced mode.
- **ports-trusted**—Relevant for advanced mode only. Indicates that packets, which are not classified by policy map rules to a QoS action, are mapped to an egress queue based on the packet's fields. Use the qos advanced-mode trust command to specify the trust mode.

Default Configuration

If **qos** is entered without any keywords, the QoS **basic** mode is **enabled**.

If **qos advanced** is entered without a keyword, the default is **ports-not-trusted**.

Command Mode

Global Configuration mode

Examples

Example 1- The following example enables QoS basic mode on the device.

```
switchxxxxxx(config)# qos
```

Example 2 - The following example enables QoS advanced mode on the device with the **ports-not-trusted** option.

```
switchxxxxxx(config)# qos advanced
```

41.2 qos advanced-mode trust

Use the **qos advanced-mode trust** Global Configuration command to configure the trust mode in advanced mode. Use the **no** form of this command to return to default.

Syntax

qos advanced-mode trust {*cos* | *dscp* | *cos-dscp*}

no qos advanced-mode trust

Parameters

- **cos**—Classifies ingress packets with the packet CoS values. For untagged packets, the port default CoS is used.
- **dscp**—Classifies ingress packets with the packet DSCP values.
- **cos-dscp**—Classifies ingress packets with the packet DSCP values for IP packets. For other packet types, use the packet CoS values.

Default Configuration

cos-dscp

Command Mode

Global Configuration

User Guidelines

The configuration is relevant for advanced mode in the following cases:

- **ports-not-trusted mode:** For packets that are classified to the QoS action trust.

- **ports-trusted mode:** For packets that are not classified by to any QoS action or classified to the QoS action trust.

Example

The following example sets **cos** as the trust mode for QoS on the device.

```
switchxxxxxx(config)# qos advanced-mode trust cos
```

41.3 show qos

Use the **show qos** EXEC mode command to display the QoS information for the device. The trust mode is displayed for the QoS basic mode.

Syntax

show qos

Parameters

N/A

Default Configuration

Disabled Command Mode

Command Mode

EXEC mode

User Guidelines

Trust mode is displayed if QoS is enabled in basic mode.

Examples

Example 1 - The following example displays QoS attributes when QoS is enabled in basic mode and the advanced mode is supported.

```
switchxxxxxx#  show qos

Qos: basic
```

```
Basic trust: dscp
```

Example 2 - The following example displays QoS attributes when QoS is enabled in basic mode on the device and the advanced mode is not supported.

```
switchxxxxxx#  show qos

Qos: disable

Trust: dscp
```

41.4 class-map

The **class-map** command and its subcommands are used to define packet classification, marking, and aggregate policing as part of a globally-named service policy applied on a per-interface basis.

A class map consists of one or more ACLs (see ACL Commands). It defines a traffic flow by determining which packets match some or all of the criteria specified in the ACLs.

Use the **class-map** Global Configuration mode command to create or modify a class map and enter the Class-map Configuration mode (only possible when QoS is in the advanced mode).

Use the **no** form of this command to delete a class map.

All class map commands are only available when QoS is in advanced mode.

Syntax

class-map *class-map-name* ***[match-all | match-any]***

no class-map *class-map-name*

Parameters

- ***c*lass-map-name**—Specifies the class map name.
- **match-all**—Performs a logical AND of all the criteria of the ACLs belonging to this class map. All match criteria in this class map must be matched.
- **match-any**—Performs a logical OR of the criteria of the ACLs belonging to this class map. Only a single match criteria in this class map must be matched.

Default Configuration

If neither **match-all** nor **match-any** is specified, the **match-all** parameter is selected by default.

Command Mode

Global Configuration mode

User Guidelines

The **class-map** enters Class-map Configuration mode. In this mode, up to two **match** commands can be entered to configure the criteria for this class. Each **match** specifies an ACL.

When using two **match** commands, each must point to a different type of ACL, such as: one IP ACL and one MAC ACL. The classification is by first match, therefore, the order of the ACLs is important.

Error messages are generated in the following cases:

- There is more than one **match** command in a **match-all** class map
- There is a repetitive classification field in the participating ACLs.

After entering the Class-map Configuration mode, the following configuration commands are available:

- **exit**: Exits the Class-map Configuration mode.
- **match**: Configures classification criteria.
- **no**: Removes a match statement from a class map.

Example

The following example creates a class map called Class1 and configures it to check that packets match all classification criteria in the ACL specified.

```
switchxxxxxx(config)# class-map class1 match-all

switchxxxxxx(config-cmap)#match access-group acl-name
```

41.5 show class-map

The **show class-map** EXEC mode command displays all class maps when QoS is in advanced mode.

Syntax

show class-map [*class-map-name*]

Parameters

class-map-name—Specifies the name of the class map to be displayed.

Command Mode

EXEC mode

Example

The following example displays the class map for Class1.

```
switchxxxxxx#  show class-map class1

Class Map match-any class1 (id4)

Match IP dscp 11 21
```

41.6 match

Use the **match** Class-map Configuration mode command to bind the ACLs that belong to the class-map being configured. Use the **no** form of this command to delete the ACLs.

This command is available only when the device is in QoS advanced mode.

Syntax

match access-group *acl-name*

no match access-group *acl-name*

Parameters

acl-name—Specifies the MAC or IP ACL name.

Default Configuration

No match criterion is supported.

Command Mode

Class-map Configuration mode.

Example

The following example defines a class map called Class1. Class1 contains an ACL called **enterprise**. Only traffic matching all criteria in **enterprise** belong to the class map.

```
switchxxxxxx(config)# class-map class1

switchxxxxxx(config-cmap)# match access-group enterprise
```

41.7 policy-map

A policy map contains one or more class maps and an action that is taken if the packet matches the class map. Policy maps may be bound to ports/port-channels.

Use the **policy-map** Global Configuration mode command to creates a policy map and enter the Policy-map Configuration mode. Use the **no** form of this command to delete a policy map.

This command is only available when QoS is in advanced mode.

Syntax

policy-map *policy-map-name*

no policy-map *policy-map-name*

Parameters

policy-map-name—Specifies the policy map name.

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

Use the **policy-map** Global Configuration mode command to specify the name of the policy map to be created, added to, or modified before configuring policies for classes whose match criteria are defined in a class map.

Entering the policy-map Global Configuration mode command also enables configuring or modifying the class policies for that policy map. Class policies in a

policy map can be configured only if the classes have match criteria defined for them.

Policy map is applied on the ingress path.

The match criteria is for a class map. Only one policy map per interface is supported. The same policy map can be applied to multiple interfaces and directions.

The service-policy command binds a policy map to a port/port-channel.

Example

The following example creates a policy map called Policy1 and enters the Policy-map Configuration mode.

```
switchxxxxxx(config)# policy-map policy1

switchxxxxxx(config-pmap)#
```

41.8 class

Use the **class** Policy-map Configuration mode command after the policy-map command to attach ACLs to a policy-map.

Use the **no** form of this command to detach a class map from a policy map.

This command is only available when QoS is in advanced mode.

Syntax

class *class-map-name [***access-group** *acl-name*]

no class *class-map-name*

Parameters

- **class-map-name**—Specifies the name of an existing class map. If the class map does not exist, a new class map is created under the specified name.
- **access-group** *acl-name*—Specifies the name of an IP or MAC Access Control List (ACL).

Default Configuration

No class map is defined for the policy map.

Command Mode

Policy-map Configuration mode

User Guidelines

This is the same as creating a class map and then binding it to the policy map.

You can specify an existing class map in this command, or you can use the **access-group** parameter to create a new class map.

After the policy-map is defined, use the service-policy command to attach it to a port/port-channel.

Example

The following example defines a traffic classification (class map) called **class1** containing an ACL called **enterprise**. The class is in a policy map called **policy1**. The policy-map **policy1** now contains the ACL **enterprise**.

```
switchxxxxxx(config)# policy-map policy1
switchxxxxxx(config-pmap)# class class1 access-group enterprise
```

41.9 show policy-map

Use the **show policy-map** EXEC mode command to display all policy maps or a specific policy map.

This command is only available when QoS is in advanced mode.

Syntax

show policy-map [*policy-map-name*]

Parameters

policy-map-name—Specifies the policy map name.

Default Configuration

All policy-maps are displayed.

Command Mode

EXEC mode

Example

The following example displays all policy maps.

```
switchxxxxxx#  show policy-map
Policy Map policy1
class class1
set IP dscp 7
Policy Map policy2
class class 2
police 96000 4800 exceed-action drop
class class3
police 124000 96000 exceed-action policed-dscp-transmit
```

41.10 trust

Use the **trust** Policy-map Class Configuration mode command to configure the trust state. This command is relevant only when QoS is in advanced, ports-not-trusted mode. Trust indicates that traffic is sent to the queue according to the packet's QoS parameters (UP or DSCP).

Use the **no** form of this command to return to the default trust state.

This command is only available when QoS is in advanced mode.

Syntax

trust

no trust

Parameters

N/A

Default Configuration

The default state is according to the mode selected in the qos command (advanced mode). The type of trust is determined in qos advanced-mode trust.

Command Mode

Policy-map Class Configuration mode

User Guidelines

Use this command to distinguish the QoS trust behavior for certain traffic from others. For example, incoming traffic with certain DSCP values can be trusted. A class map can be configured to match and trust the DSCP values in the incoming traffic.

The type of trust is determined in qos advanced-mode trust.

Trust values set with this command supersede trust values set on specific interfaces with the qos trust (Interface) Interface Configuration mode command.

The trust and set commands are mutually exclusive within the same policy map.

Policy maps, which contain **set** or **trust** commands or that have ACL classification to an egress interface, cannot be attached by using the service-policy Interface Configuration mode command.

If specifying **trust cos**, QoS maps a packet to a queue, the received or default port CoS value, and the CoS-to-queue map.

Example

The following example creates an ACL, places it into a class map, places the class map into a policy map and configures the trust state using the DSCP value in the ingress packet.

```
switchxxxxxx(config)# ip access-list extended ip1
switchxxxxxx(config-mac-al)# permit ip any any
switchxxxxxx(config-mac-al)# exit
switchxxxxxx(config)# class-map c1
switchxxxxxx(config-cmap)# match access-group ip1
switchxxxxxx(config-cmap)# exit
switchxxxxxx(config)# policy-map p1
switchxxxxxx(config-pmap)# class c1
switchxxxxxx(config-pmap-c)# trust
```

41.11 set

Use the **set** Policy-map Class Configuration mode command to select the value that QoS uses as the DSCP value, the egress queue or to set user priority values.

This command is only available when QoS is in advanced mode.

Syntax

set *{**dscp** new-dscp | **queue** queue-id | **cos** new-cos}*

no set

Parameters

- **dscp** *new-dscp*—Specifies the new DSCP value for the classified traffic. (Range: 0–63)
- **queue** *queue-id*—Specifies the egress queue. (Range: 1-4)
- **cos** *new-cos*—Specifies the new user priority to be marked in the packet. (Range: 0–7)

Command Mode

Policy-map Class Configuration mode

User Guidelines

The set and trust commands are mutually exclusive within the same policy map.

To return to the Configuration mode, use the **exit** command. To return to the Privileged EXEC mode, use the **end** command.

Example

The following example creates an ACL, places it into a class map, places the class map into a policy map and sets the DSCP value in the packet to 56 for classes in the policy map called p1.

```
switchxxxxxx(config)# ip access-list extended ip1

switchxxxxxx(config-mac-al)# permit ip any any

switchxxxxxx(config-mac-al)# exit

switchxxxxxx(config)# class-map c1

switchxxxxxx(config-cmap)# match access-group ip1
```

```
switchxxxxxx(config-cmap)# exit

switchxxxxxx(config)# policy-map p1

switchxxxxxx(config-pmap)# class c1

switchxxxxxx(config-pmap-c)# set dscp 56
```

41.12 police

Use the **police** Policy-map Class Configuration mode command to define the policer for classified traffic. This defines another group of actions for the policy map (per class map).

This command is used after the policy-map and class commands.

Use the **no** form of this command to remove a policer.

This command is only available when QoS is in advanced mode.

Syntax

police *committed-rate-kbps committed-burst-byte [**exceed-action** {**drop** | **policed-dscp-transmit**}]*

no police

Parameters

- **committed-rate-kbps**—Specifies the average traffic rate (CIR) in kbits per second (bps). (Range: 100–10000000)
- **committed-burst-byte**—Specifies the normal burst size (CBS) in bytes. (Range: 3000–19173960)
- **exceed-action** {**drop** | **policed-dscp-transmit**}—Specifies the action taken when the rate is exceeded. The possible values are:
  - **drop**—Drops the packet.
  - **policed-dscp-transmit**—Remarks the packet DSCP, according to the policed-DSCP map as configured by the **qos map policed-dscp** Global Configuration mode command.

Default Usage

N/A

Command Mode

Policy-map Class Configuration mode

User Guidelines

This command only exists in when the device is in Layer 2 mode.

Policing uses a token bucket algorithm. CIR represents the speed with which the token is added to the bucket. CBS represents the depth of the bucket.

Example

The following example defines a policer for classified traffic. When the traffic rate exceeds 124,000 kbps and the normal burst size exceeds 9600 bytes, the packet is dropped. The class is called class1 and is in a policy map called policy1.

```
switchxxxxxx(config)# policy-map policy1
switchxxxxxx(config-pmap)# class class1
switchxxxxxx(config-pmap-c)# police 124000 9600 exceed-action drop
```

41.13 service-policy

Use the **service-policy** Interface Configuration (Ethernet, Port-channel) mode command to bind a policy map to a port/port-channel. Use the **no** form of this command to detach a policy map from an interface.

This command is only available in QoS advanced mode.

Syntax

service-policy input *policy-map-name*

no service-policy input

Parameters

policy-map-name—Specifies the policy map name to apply to the input interface. (Length: 1–32 characters)

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

Only one policy map per interface per direction is supported.

Example

The following example attaches a policy map called Policy1 to the input interface.

```
switchxxxxxx(config-if)# service-policy input policy1
```

41.14 qos aggregate-policer

Use the **qos aggregate-policer** Global Configuration mode command to define the policer parameters that can be applied to multiple traffic classes. Use the **no** form of this command to remove an existing aggregate policer.

This command is only available when QoS is in advanced mode.

Syntax

qos aggregate-policer *aggregate-policer-name committed-rate-kbps excess-burst-byte* [***exceed-action*** *{**drop** | **policed-dscp-transmit**}]*

no qos aggregate-policer *aggregate-policer-name*

Parameters

- **aggregate-policer-name**—Specifies the aggregate policer name.
- **committed-rate-kbps**—Specifies the average traffic rate (CIR) in kbits per second (kbps). (Range: 3–57982058)
- **excess-burst-byte**—Specifies the normal burst size (CBS) in bytes. (Range: 3000–19173960)
- **exceed-action** {***drop*** | ***policed-dscp-transmit***}—Specifies the action taken when the rate is exceeded. The possible values are:
  - **drop**—Drops the packet.
  - **policed-dscp-transmit**—Remarks the packet DSCP.

Default Configuration

No aggregate policer is defined.

Command Mode

Global Configuration mode

User Guidelines

This command only exists when the device is in Layer 2.

Define an aggregate policer if the policer aggregates traffic from multiple class maps.

Aggregate policers cannot aggregate traffic from multiple devices. If the aggregate policer is applied to more than one device, the traffic on each device is counted separately and is limited per device.

Traffic from two different ports on the same device can be aggregated for policing purposes.

An aggregate policer can be applied to multiple classes in the same policy map.

An aggregate policer cannot be deleted if it is being used in a policy map. The **no police aggregate** Policy-map Class Configuration mode command must first be used to delete the aggregate policer from all policy maps before using the **no mls qos aggregate-policer** command.

Policing uses a token bucket algorithm. CIR represents the speed with which the token is added to the bucket. CBS represents the depth of the bucket.

Example

The following example defines the parameters of a policer called Policer1 that can be applied to multiple classes in the same policy map. When the average traffic rate exceeds 124,000 kbps or the normal burst size exceeds 9600 bytes, the packet is dropped.

```
switchxxxxxx(config)# qos aggregate-policer policer1 124000 9600
exceed-action drop
```

41.15 show qos aggregate-policer

Use the **show qos aggregate-policer** EXEC mode command to display aggregate policers

This command is only available in QoS advanced mode.

Syntax

show qos aggregate-policer [*aggregate-policer-name*]

Parameters

aggregate-policer-name—Specifies the aggregate policer name.

Default Configuration

All policers are displayed.

Command Mode

EXEC mode

Example

The following example displays the parameters of the aggregate policer called Policer1.

```
switchxxxxxx#  show qos aggregate-policer policer1

aggregate-policer policer1 96000 4800 exceed-action drop

not used by any policy map
```

41.16 police aggregate

Use the **police aggregate** Policy-map Class Configuration mode command to apply an aggregate policer to multiple class maps within the same policy map. Use the **no** form of this command to remove an existing aggregate policer from a policy map.

This command is only available in QoS advanced mode.

Syntax

police aggregate *aggregate-policer-name*

no police aggregate *aggregate-policer-name*

Parameters

aggregate-policer-name—Specifies the aggregate policer name.

Command Mode

Policy-map Class Configuration mode

User Guidelines

An aggregate policer can be applied to multiple classes in the same policy map. An aggregate policer cannot be applied across multiple policy maps or interfaces.

Use the **exit** command to return to the Configuration mode. Use the **end** command to return to the Privileged EXEC mode.

Example

The following example applies the aggregate policer called Policer1 to a class called class1 in a policy map called policy1 and class2 in policy map policy2.

```
switchxxxxxx(config)# qos aggregate-policer policer1 124000 9600
exceed-action drop
switchxxxxxx(config)# policy-map policy1
switchxxxxxx(config-pmap)# class class1
switchxxxxxx(config-pmap-c)# police aggregate policer1
switchxxxxxx(config-pmap-c)# exit
switchxxxxxx(config-pmap)# exit
switchxxxxxx(config)# policy-map policy2
switchxxxxxx(config-pmap)# class class2
switchxxxxxx(config-pmap-c)# police aggregate policer1
```

41.17 wrr-queue cos-map

Use the **wrr-queue cos-map** Global Configuration mode command to map Class of Service (CoS) values to a specific egress queue. Use the **no** form of this command to restore the default configuration.

Syntax

wrr-queue cos-map *queue-id cos0... cos7*

no wrr-queue cos-map [*queue-id*]

Parameters

- **queue-id**—Specifies the queue number to which the CoS values are mapped.
- **cos0... cos7**—Specifies up to 8 CoS values to map to the specified queue number. (Range: 0–7)

Default Configuration

The default CoS value mapping to 4 queues is as follows:

CoS value 0 is mapped to queue 1.

CoS value 1 is mapped to queue 1.

CoS value 2 is mapped to queue 2.

CoS value 3 is mapped to queue 3.

CoS value 4 is mapped to queue 3.

CoS value 5 is mapped to queue 4.

CoS value 6 is mapped to queue 4.

CoS value 7 is mapped to queue 4.

Command Mode

Global Configuration mode

User Guidelines

Use this command to distribute traffic to different queues.

Example

The following example maps CoS value 4 and 6 to queue 2.

```
switchxxxxxx(config)# wrr-queue cos-map 2 4 6
```

41.18 wrr-queue bandwidth

Use the **wrr-queue bandwidth** global Configuration command to assign Weighted Round Robin (WRR) weights to egress queues. The weight ratio determines the

frequency at which the packet scheduler removes packets from each queue. Use the **no** form of this command to restore the default configuration.

Syntax

wrr-queue bandwidth *weight1 weight2... weighting*

no wrr-queue bandwidth

Parameters

weight1 weight1... weighting the ratio of bandwidth assigned by the WRR packet scheduler to the packet queues. See explanation in the User Guidelines. Separate each value by a space. (Range for each weight: 0–255)

Default Configuration

wrr is disabled by default. The default wrr weight is '1' for all queues.

Command Mode

Global Configuration mode

User Guidelines

The ratio for each queue is defined as the queue weight divided by the sum of all queue weights (the normalized weight). This sets the bandwidth allocation of each queue.

A weight of 0 indicates that no bandwidth is allocated for the same queue, and the shared bandwidth is divided among the remaining queues. It is not recommended to set the weight of a queue to a 0 as it might stop transmission of control-protocols packets generated by the device.

All 3 queues participate in the WRR, excluding the expedite queues, whose corresponding weight is not used in the ratio calculation.

An expedite queue is a priority queue, which is serviced until empty before the other queues are serviced. The expedite queues are designated by the priority-queue out num-of-queues command.

Example

The following assigns WRR values to the queues.

```
switchxxxxxx(config)# wrr-queue bandwidth 6 6 6 6
```

41.19 priority-queue out num-of-queues

An expedite queue is a strict priority queue, which is serviced until empty before the other lower priority queues are serviced.

Use the **priority-queue out num-of-queues** Global Configuration mode command to configure the number of expedite queues. Use the **no** form of this command to restore the default configuration.

Syntax

priority-queue out num-of-queues *number-of-queues*

no priority-queue out num-of-queues

Parameters

- **number-of-queues**—Specifies the number of expedite (strict priority) queues. Expedite queues are assigned to the queues with the higher indexes. (Range: 0–4).

  There must be either 0 wrr queues or more than one.

- If **number-of-queues** = 0, all queues are assured forwarding (according to wrr weights) If the **number-of-queues** = 4, all queues are expedited (strict priority queues).

Default Configuration

All queues are expedite queues.

Command Mode

Global Configuration mode

User Guidelines

the weighted round robin (WRR) weight ratios are affected by the number of expedited queues, because there are fewer queues participating in WRR. This indicates that the corresponding weight in the **wrr-queue bandwidth** Interface Configuration mode command is ignored (not used in the ratio calculation).

Example

The following example configures the number of expedite queues as 2.

```
switchxxxxxx(config)# priority-queue out num-of-queues 2
```

41.20 traffic-shape

The egress port shaper controls the traffic transmit rate (Tx rate) on a port.

Use the **traffic-shape** Interface Configuration mode command to configure the egress port shaper. Use the **no** form of this command to disable the shaper.

Syntax

traffic-shape *committed-rate* [*committed-burst*]

no traffic-shape

Parameters

- **committed-rate**—Specifies the maximum average traffic rate (CIR) in kbits per second (kbps). (Range: GE: 64kbps–maximum port speed; 10GE: 64Kbps–maximum port speed)
- **committed-burst**—Specifies the maximum permitted excess burst size (CBS) in bytes. (Range: 4096 - 16762902 bytes)

Default Configuration

The shaper is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example sets a traffic shaper on `gi5` on queue 1 when the average traffic rate exceeds 124000 kbps or the normal burst size exceeds 9600 bytes.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# traffic-shape 1 124000 9600
```

41.21 traffic-shape queue

The egress port shaper controls the traffic transmit rate (Tx rate) on a queue on a port.

Use the **traffic-shape queue** Interface Configuration mode command to configure the egress queue shaper. Use the **no** form of this command to disable the shaper.

Syntax

traffic-shape queue *queue-id committed-rate* [*committed-burst*]

no traffic-shape queue *queue-id*

Parameters

- **queue-id**—Specifies the queue number to which the shaper is assigned. (Range: 1-4)
- **committed-rate**—Specifies the average traffic rate (CIR) in kbits per second (kbps). (Range: 64 kbps–maximum port speed)
- **committed-burst**—Specifies the excess burst size (CBS) in bytes. (Range: 4096 - 16762902 bytes)

Default Configuration

The shaper is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example sets a shaper on queue 1 on `gi5` when the average traffic rate exceeds 124000 kbps or the normal burst size exceeds 9600 bytes.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# traffic-shape 1 124000 9600
```

41.22 rate-limit (Ethernet)

Use the **rate-limit** Interface Configuration mode command to limit the incoming traffic rate on a port. Use the **no** form of this command to disable the rate limit.

Syntax

rate-limit *committed-rate-kbps [**burst** committed-burst-bytes]*

no rate-limit

Parameters

- **committed-rate-kbps**—Specifies the maximum number of kilobits per second of ingress traffic on a port. The range is 100 – max port speed.
- ***burst** committed-burst-bytes*—The burst size in bytes (3000–19173960). If unspecified, defaults to 128K.

Default Configuration

Rate limiting is disabled.

Committed-burst-bytes is 128K.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Storm control and rate-limit (of Unicast packets) cannot be enabled simultaneously on the same port.

Example

The following example limits the incoming traffic rate on `gi5` to 150,000 kbps.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# rate-limit 150000
```

41.23 rate-limit (VLAN)

Use the Layer 2 **rate-limit** (VLAN) Global Configuration mode command to limit the incoming traffic rate for a VLAN. Use the **no** form of this command to disable the rate limit.

Syntax

rate-limit *vlan-id committed-rate committed-burst*

no rate-limit vlan

Parameters

- **vlan-id**—Specifies the VLAN ID.
- **committed-rate**—Specifies the average traffic rate (CIR) in kbits per second (kbps). (Range: 3-57982058)
- **committed-burst**—Specifies the maximum burst size (CBS) in bytes. (Range: 3000-19173960)

Default Configuration

Rate limiting is disabled.

Committed-burst-bytes is 128K.

Command Mode

Global Configuration mode

User Guidelines

Traffic policing in a policy map takes precedence over VLAN rate limiting. If a packet is subject to traffic policing in a policy map and is associated with a VLAN that is rate limited, the packet is counted only in the traffic policing of the policy map.

This command does not work in Layer 3 mode.

Example

The following example limits the rate on VLAN 11 to 150000 kbps or the normal burst size to 9600 bytes.

```
switchxxxxxx(config)# rate-limit 11 150000 9600
```

41.24 qos wrr-queue wrtd

Use the **qos wrr-queue wrtd** Global Configuration mode command to enable Weighted Random Tail Drop (WRTD). Use the **no** form of this command to disable WRTD.

Syntax

qos wrr-queue wrtd

no qos wrr-queue wrtd

Parameters

N/A

Default

Disabled

Command Mode

Global Configuration mode

User Guidelines

The command is effective after reset.

Example

```
switchxxxxxx(conf)#>qos wrr-queue wrtd
This setting will take effect only after copying running configuration to startu
p configuration and resetting the device
switchxxxxxx(config)#
```

41.25 show qos wrr-queue wrtd

Use the **show qos wrr-queue wrtd** Exec mode command to display the Weighted Random Tail Drop (WRTD) configuration.

Syntax

show qos wrr-queue wrtd

Parameters

N/A

Default Configuration

N/A

Command Mode

Exec mode

Example

```
switchxxxxxx#  show qos wrr-queue wrtd
 Weighted Random Tail Drop is disabled
 Weighted Random Tail Drop will be enabled after reset
```

41.26 show qos interface

Use the **show qos interface** EXEC mode command to display Quality of Service (QoS) information on the interface.

Syntax

show qos interface [***buffers*** | ***queueing*** | ***policers*** | ***shapers*** | ***rate-limit***] *[interface-id]*

Parameters

- **buffers**—Displays the buffer settings for the interface's queues. For GE ports, displays the queue depth for each of the 4 queues.
- **queueing**—Displays the queue's strategy (WRR or EF), the weight for WRR queues, the CoS to queue map and the EF priority.
- **policers**—Displays all the policers configured for this interface, their settings, and the number of policers currently unused (on a VLAN).
- **shapers**—Displays the shaper of the specified interface and the shaper for the queue on the specified interface.
- **rate-limit**—Displays the rate-limit configuration.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port, or Port-channel.

Default Configuration

N/A

Command Mode

EXEC mode

User Guidelines

If no parameter is specified with the **show qos interface** command, the port QoS mode (DSCP trusted, CoS trusted, untrusted, and so on), default CoS value, DSCP-to-DSCP- map (if any) attached to the port, and policy map (if any) attached to the interface are displayed. If a specific interface is not specified, the information for all interfaces is displayed.

Examples

Example 1 - This is an example of the output from the **show qos interface queueing** command for 4 queues.

```
switchxxxxxx#  show qos interface queueing gi1
gi1

wrr bandwidth weights and EF priority:
qid   weights    Ef          Priority
1     125        Disable     N/A
2     125        Disable     N/A
3     125        Disable     N/A
4     125        Disable     N/A
Cos-queue map:
CoS   QID
0     2
1     1
2     1
3     2
4     3
5     3
6     4
7     4
```

Example 2 - This is an example of the output from the **show qos interface shapers** command.

```
switchxxxxxx#show qos interface shapers gi1
gi1
Port shaper: enable
Committed rate: 192000 bps
Committed burst: 9600 bytes
                Target                Target
QID   Status    Committed             Committed
                Rate [bps]            Burst [bytes]
1     Enable    100000                17000
2     Disable   N/A                   N/A
3     Enable    200000                19000
4     Disable   N/A                   N/A
```

Example - 3 This is an example of the output from the **show qos interface policer** command.

```
switchxxxxxx#  show qos interface policer gi1
Ethernet gi1
Class map: A
Policer type: aggregate
Commited rate: 192000 bps
Commited burst: 9600 bytes
Exceed-action: policed-dscp-transmit
Class map: B
Policer type: single
Commited rate: 192000 bps
Commited burst: 9600 bytes
Exceed-action: drop
Class map: C
Policer type: none
Commited rate: N/A
Commited burst: N/A
Exceed-action: N/A
```

Example 4 - This is an example of the output from the **show qos interface rate-limit** command.

```
switchxxxxxx#  show qos interface rate-limit gi1

Port          rate-limit [kbps]         Burst [KBytes]

-----         -----------------         --------------

gi1           1000                      512K
```

41.27 wrr-queue

Use the **wrr-queue** Global Configuration mode command to enable the tail-drop mechanism on an egress queue. Use the **no** form of this command to disable the tail-drop mechanism on an egress queue.

Syntax

wrr-queue *tail-drop*

no wrr-queue

Parameters

tail-drop— Specifies the tail-drop mechanism.

Default Configuration

The tail-drop mechanism on an egress queue i

s disabled.

Command Mode

Global Configuration mode

User Guidelines

This command can only be used if Advanced mode is enabled.

Example

The following example enables the tail-drop mechanism on an egress queue.

```
switchxxxxxx(config)# wrr-queue tail-drop
```

41.28 qos wrr-queue threshold

Use the **qos wrr-queue threshold** Global Configuration mode command to assign queue thresholds globally. Use the **no** form of this command to restore the default configuration.

This command is only available in QoS advanced mode.

Syntax

qos wrr-queue threshold gigabitethernet *queue-id threshold-percentage*

no qos wrr-queue threshold gigabitethernet *queue-id*

Parameters

- **gigabitethernet**—Specifies that the thresholds are to be applied to Gigabit Ethernet ports.
- **queue-id**—Specifies the queue number to which the tail-drop threshold is assigned.
- **threshold-percentage**—Specifies the queue threshold percentage value.

Default Configuration

The default threshold is 80 percent.

Command Mode

Global Configuration mode

User Guidelines

If the threshold is exceeded, packets with the corresponding Drop Precedence (DP) are dropped until the threshold is no longer exceeded.

Example

The following example assigns a threshold of 80 percent to WRR queue 1.

```
switchxxxxxx(config)# qos wrr-queue threshold gigabitethernet 1 80
```

41.29 qos map policed-dscp

Use the **qos map policed-dscp** Global Configuration mode command to configure the policed-DSCP map for remarking purposes. Use the **no** form of this command to restore the default configuration.

This command is only available in QoS advanced mode.

Syntax

qos map policed-dscp *dscp-list* ***to*** *dscp-mark-down*

no qos map policed-dscp [*dscp-list*]

Parameters

- **dscp- list**—Specifies up to 8 DSCP values, separated by spaces. (Range: 0–63)
- **dscp-mark-down**—Specifies the DSCP value to mark down. (Range: 0–63)

Default Configuration

The default map is the Null map, which means that each incoming DSCP value is mapped to the same DSCP value.

Command Mode

Global Configuration mode.

User Guidelines

The original DSCP value and policed-DSCP value must be mapped to the same queue in order to prevent reordering.

Example

The following example marks incoming DSCP value 3 as DSCP value 5 on the policed-DSCP map.

```
switchxxxxxx(config)# qos map policed-dscp 3 to 5
```

41.30 qos map dscp-queue

Use the **qos map dscp-queue** Global Configuration mode command to configure the DSCP to CoS map. Use the **no** form of this command to restore the default configuration.

Syntax

qos map dscp-queue *dscp-list* to *queue-id*

no qos map dscp-queue [*dscp-list*]

Parameters

- **dscp-list**—Specifies up to 8 DSCP values, separated by spaces. (Range: 0–63)
- **queue-id**—Specifies the queue number to which the DSCP values are mapped.

.Default Configuration

The default map for 4 queues is as follows.

DSCP value	0-16	17-23	24-30,49-63	40-48
Queue-ID	1	2	3	4

Command Mode

Global Configuration mode

Example

The following example maps DSCP values 33, 40 and 41 to queue 1.

```
switchxxxxxx(config)# qos map dscp-queue 33 40 41 to 1
```

41.31 qos map dscp-dp

Use the **qos map dscp-dp** Global Configuration mode command to map the DSCP values to Drop Precedence. Use the **no** form of this command to restore the default configuration.

This command is only available in QoS advanced mode.

Syntax

qos map dscp-dp *dscp-list* to *dp*

no qos map dscp-dp [*dscp-list*]

Parameters

- **dscp-list**—Specifies up to 8 DSCP values, with values separated by a space. (Range: 0–63)
- **dp**—Specifies the Drop Precedence value to which the DSCP values are mapped. (values: 0,2) where 2 is the highest Drop Precedence).

Default Configuration

All the DSCPs are mapped to Drop Precedence 0.

Command Mode

Global Configuration mode.

Example

The following example maps DSCP values 25, 27 and 29 to Drop Precedence 2.

```
switchxxxxxx(config)# qos map dscp-dp 25 27 29 to 2
```

41.32 qos trust (Global)

Use the **qos trust** Global Configuration mode command to configure the system to the basic mode and trust state. Use the **no** form of this command to return to the default configuration.

Syntax

qos trust *{cos | dscp}*

no qos trust

Parameters

- **cos**— Specifies that ingress packets are classified with packet CoS values. Untagged packets are classified with the default port CoS value.
- **dscp**—Specifies that ingress packets are classified with packet DSCP values.

Default Configuration

DSCP is the default trust mode.

Command Mode

Global Configuration mode

User Guidelines

This command can be used only in QoS basic mode.

Packets entering a QoS domain are classified at its edge. When the packets are classified at the edge, the switch port within the QoS domain can be configured to one of the trusted states because there is no need to classify the packets at every switch within the domain.

Use this command to specify whether the port is trusted and which fields of the packet to use to classify traffic.

When the system is configured with trust DSCP, the traffic is mapped to the queue by the DSCP-queue map.

When the system is configured with trust CoS, the traffic is mapped to the queue by the CoS-queue map.

For an inter-QoS domain boundary, configure the port to the DSCP-trusted state and apply the DSCP-to-DSCP-mutation map if the DSCP values are different in the QoS domains.

Example

The following example configures the system to the DSCP trust state.

```
switchxxxxxx(config)# qos trust dscp
```

41.33 qos trust (Interface)

Use the **qos trust** Interface Configuration (Ethernet, Port-channel) mode command to enable port trust state while the system is in the basic QoS mode. Use the **no** form of this command to disable the trust state on each port.

Syntax

qos trust

no qos trust

Parameters

N/A

Default Configuration

Each port is enabled while the system is in basic mode.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example configures `gi15` to the default trust state.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# qos trust
```

41.34 qos cos

Use the **qos cos** Interface Configuration (Ethernet, Port-channel) mode command to define the default CoS value of a port. Use the **no** form of this command to restore the default configuration.

Syntax

qos cos *default-cos*

no qos cos

Parameters

default-cos—Specifies the default CoS value (VPT value) of the port. If the port is trusted and the packet is untagged, then the default CoS value become the CoS value. (Range: 0–7)

Default Configuration

The default CoS value of a port is 0.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

Use the default CoS value to assign a CoS value to all untagged packets entering the interface.

Example

The following example defines the port `gi5` default CoS value as 3.

```
switchxxxxxx(config)# interface gi5

switchxxxxxx(config-if)# qos cos 3
```

41.35 qos dscp-mutation

Use the **qos dscp-mutation** Global Configuration mode command to apply the DSCP Mutation map to system DSCP trusted ports. Use the **no** form of this command to restore the trusted port with no DSCP mutation.

Syntax

qos dscp-mutation

no qos dscp-mutation

Parameters

N/A

Default Configuration

N/A

Command Mode

Global Configuration mode.

User Guidelines

Apply the DSCP-to-DSCP-mutation map to a port at the boundary of a Quality of Service (QoS) administrative domain. If two QoS domains have different DSCP definitions, use the DSCP-to-DSCP-mutation map to translate a set of DSCP values to match the definition of another domain. Apply the map to ingress and to DSCP-trusted ports only. Applying this map to a port causes IP packets to be rewritten with newly mapped DSCP values at the ingress ports. If applying the DSCP mutation map to an untrusted port, to class of service (CoS), or to an IP-precedence trusted port.

Global trust mode must be DSCP or CoS-DSCP. In advanced CoS mode, ports must be trusted.

Example

The following example applies the DSCP Mutation map to system DSCP trusted ports.

```
switchxxxxxx(config)# qos dscp-mutation
```

41.36 qos map dscp-mutation

Use the **qos map dscp-mutation** Global Configuration mode command to configure the DSCP to DSCP Mutation table. Use the **no** form of this command to restore the default configuration.

Syntax

qos map dscp-mutation *in-dscp* to *out-dscp*

no qos map dscp-mutation [*in-dscp*]

Parameters

- **in-dscp**—Specifies up to 8 DSCP values to map, separated by spaces. (Range: 0–63)
- **out-dscp**—Specifies up to 8 DSCP mapped values, separated by spaces. (Range: 0–63)

Default Configuration

The default map is the Null map, which means that each incoming DSCP value is mapped to the same DSCP value.

Command Mode

Global Configuration mode.

User Guidelines

This is the only map that is not globally configured. It is possible to have several maps and assign each one to a different port.

Example

The following example changes DSCP values 1, 2, 4, 5 and 6 to DSCP Mutation Map value 63.

```
switchxxxxxx(config)# qos map dscp-mutation 1 2 4 5 6 to 63
```

41.37 show qos map

Use the **show qos map** EXEC mode command to display the various types of QoS mapping.

Syntax

show qos map [**dscp-queue** | **dscp-dp** | **policed-dscp** | **dscp-mutation**]

Parameters

- **dscp-queue**—Displays the DSCP to queue map.
- **dscp-dp**—Displays the DSCP to Drop Precedence map.
- **policed-dscp**—Displays the DSCP to DSCP remark table.
- **dscp-mutation**—Displays the DSCP-DSCP mutation table.

Default Configuration

Display all maps.

Command Mode

EXEC mode

Example

The following example displays the QoS mapping information.

```
switchxxxxxx#  show qos map dscp-queue
Dscp-queue map:
d1   :    d2   0    1    2    3    4    5    6    7    8    9
--   --   --   --   --   --   --   --   --   --   --   --   --
0    :         01   01   01   01   01   01   01   01   01   01
1    :         01   01   01   01   01   01   01   02   02   02
2    :         02   02   02   02   03   03   03   03   03   03
3    :         04   04   05   05   05   05   05   05   05   05
4    :         06   06   06   06   06   06   06   06   07   07
5    :         07   07   07   07   07   07   08   08   08   08
6    :         08   08   08   08
```

41.38 clear qos statistics

Use the **clear qos statistics** EXEC mode command to clear the QoS statistics counters.

Syntax

clear qos statistics

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example clears the QoS statistics counters.

```
switchxxxxxx# clear qos statistics
```

41.39 qos statistics policer

Use the **qos statistics policer** Interface Configuration (Ethernet, Port-channel) mode command to enable counting in-profile and out-of-profile. Use the **no** form of this command to disable counting.

This command is relevant only when policers are defined.

Syntax

qos statistics policer *policy-map-name class-map-name*

no qos statistics policer *policy-map-name class-map-name*

Parameters

- **policy-map-name**—Specifies the policy map name.
- **class-map-name**—Specifies the class map name.

Default Configuration

Counting in-profile and out-of-profile is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

Example

The following example enables counting in-profile and out-of-profile on the interface.

```
switchxxxxxx(config-if)# qos statistics policer policy1 class1
```

41.40 qos statistics aggregate-policer

Use the **qos statistics aggregate-policer** Global Configuration mode command to enable counting in-profile and out-of-profile. Use the **no** form of this command to disable counting.

Syntax

qos statistics aggregate-policer *aggregate-policer-name*

no qos statistics aggregate-policer *aggregate-policer-name*

Parameters

aggregate-policer-name—Specifies the aggregate policer name.

Default Configuration

Counting in-profile and out-of-profile is disabled.

Command Mode

Global Configuration mode

Example

The following example enables counting in-profile and out-of-profile on the interface.

```
switchxxxxxx(config)# qos statistics aggregate-policer policer1
```

41.41 qos statistics queues

Use the **qos statistics queues** Global Configuration mode command to enable QoS statistics for output queues. Use the **no** form of this command to disable QoS statistics for output queues.

Syntax

qos statistics queues *set {queue | **all**} {**dp** | **all**} {interface | **all**}*

no qos statistics queues *set*

Parameters

- **set**—Specifies the counter set number.
- **interface**—Specifies the Ethernet port.
- **queue**—Specifies the output queue number.
- **dp**—Specifies the drop precedence. The available values are: **high**, **low**.

Default Configuration

Set 1: All interfaces, all queues, high DP.

Set 2: All interfaces, all queues, low DP.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

If the queue parameter is all, traffic in cascading ports is also counted.

Example

The following example enables QoS statistics for output queues for counter set 1.

```
switchxxxxxx(config)# qos statistics queues 1 all all all
```

41.42 show qos statistics

Use the **show qos statistics** EXEC mode command to display Quality of Service statistical information.

Syntax

show qos statistics

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

User Guidelines

Up to 16 sets of counters can be enabled for policers. The counters can be enabled in the creation of the policers.

Use the **qos statistics queues** Global Configuration mode command to enable QoS statistics for output queues.

Example

The following example displays Quality of Service statistical information.

```
switchxxxxxx# show qos statistics
Policers
---------
Interface   Policy map   Class      In-profile       Out-of-profile bytes
                         Map        bytes            --------------------
--------    ----------   -------    -------------    5433
gi1         Policy1      Class1     7564575          52
gi1         Policy1      Class2     8759             3214
gi2         Policy1      Class1     746587458        23
gi2         Policy1      Class2     5326
Aggregate Policers
------------------
Name        In-profile bytes        Out-of-profile bytes
--------    ----------------        --------------------
Policer1    7985687                 121322
Output Queues
-------------
Interface   Queue        DP         Total packets    %TD packets
---------   -----        --         -------------    -----------
gi1         2            High       799921           1.2%
gi2         All          High       5387326          0.2%
```

41.43 security-suite enable

Use the **security-suite enable** Global Configuration mode command to enable the security suite feature. This feature supports protection against various types of attacks.

When this command is used, hardware resources are reserved. These hardware resources are released when the **no security-suite enable** command is entered.

The security-suite feature can be enabled in one of the following ways:

- **Global-rules-only** - This enables the feature globally but per-interface features are not enabled.
- **All** (no keyword) - The feature is enabled globally and per-interface.

Use the **no** form of this command to disable the security suite feature.

When security-suite is enabled, you can specify the types of protection required. The following commands can be used:

- security-suite dos protect
- security-suite dos syn-attack
- security-suite deny martian-addresses
- security-suite deny syn
- security-suite deny icmp
- security-suite deny fragmented
- show security-suite configuration
- security-suite dos protect

Syntax

security-suite enable *[global-rules-only]*

no security-suite enable

Parameters

global-rules-only—Specifies that all the security suite commands are global commands only (they cannot be applied per-interface). This setting saves space in the Ternary Content Addressable Memory (TCAM). If this keyword is not used, security-suite commands can be used both globally on per-interface.

Default Configuration

The security suite feature is disabled.

If **global-rules-only** is not specified, the default is to enable security-suite globally and per interfaces.

Command Mode

Global Configuration mode

User Guidelines

MAC ACLs must be removed before the security-suite is enabled. The rules can be re-entered after the security-suite is enabled.

If ACLs or policy maps are assigned on interfaces, per interface security-suite rules cannot be enabled.

Examples

Example 1 - The following example enables the security suite feature and specifies that security suite commands are global commands only. When an attempt is made to configure security-suite on a port, it fails.

```
switchxxxxxx(config)# security-suite enable global-rules-only

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# security-suite dos syn-attack 199 any /10

To perform this command, DoS Prevention must be enabled in the per-interface mode.
```

Example 2 - The following example enables the security suite feature globally and on interfaces. The security-suite command succeeds on the port.

```
switchxxxxxx(config)# security-suite enable

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# security-suite dos syn-attack 199 any /10

switchxxxxxx(config-if)#
```

41.44 security-suite dos protect

Use the **security-suite dos protect** Global Configuration mode command to protect the system from specific well-known Denial of Service (DoS) attacks.

There are three types of attacks against which protection can be supplied (see parameters below).

Use the **no** form of this command to disable DoS protection.

Syntax

security-suite dos protect *{**add** attack | **remove** attack}*

no security-suite dos protect

Parameters

add/remove *attack*—Specifies the attack type to add/remove. To add an attack is to provide protection against it; to remove the attack is to remove protection.

The possible attack types are:

- **stacheldraht**—Discards TCP packets with source TCP port 16660.
- **invasor-trojan**—Discards TCP packets with destination TCP port 2140 and source TCP port 1024.
- **back-orifice-trojan**—Discards UDP packets with destination UDP port 31337 and source UDP port 1024.

Default Configuration

No protection is configured.

Command Mode

Global Configuration mode

User Guidelines

For this command to work, security-suite enable must be enabled globally.

Example

The following example protects the system from the Invasor Trojan DOS attack.

```
switchxxxxxx(config)# security-suite dos protect add invasor-trojan
```

41.45 security-suite dos syn-attack

Use the **security-suite dos syn-attack** Interface Configuration mode command to rate limit Denial of Service (DoS) SYN attacks. This provides partial blocking of SNY packets (up to the rate that the user specifies).

Use the **no** form of this command to disable rate limiting.

Syntax

security-suite dos syn-attack *syn-rate* {***any*** | *ip-address*} {*mask* | **/***prefix-length*}

no security-suite dos syn-attack {***any*** | *ip-address*} {*mask* | **/***prefix-length*}

Parameters

- **syn-rate**—Specifies the maximum number of connections per second. (Range: 199–1000)
- **any | ip-address**—Specifies the destination IP address. Use **any** to specify all IP addresses.
- **mask**—Specifies the network mask of the destination IP address.
- **prefix-length**—Specifies the number of bits that comprise the destination IP address prefix. The prefix length must be preceded by a forward slash (/).

Default Configuration

No rate limit is configured.

If **ip-address** is unspecified, the default is 255.255.255.255

If **prefix-length** is unspecified, the default is 32.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

For this command to work, security-suite enable must be enabled both globally and for interfaces.

This command rate limits ingress TCP packets with "SYN=1", "ACK=0" and "FIN=0" for the specified destination IP addresses.

SYN attack rate limiting is implemented after the security suite rules are applied to the packets. The ACL and QoS rules are not applied to those packets.

Since the hardware rate limiting counts bytes, it is assumed that the size of “SYN” packets is short.

Example

The following example attempts to rate limit DoS SYN attacks on a port. It fails because security suite is enabled globally and not per interface.

```
switchxxxxxx(config)# security-suite enable global-rules-only

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# security-suite dos syn-attack 199 any /10

To perform this command, DoS Prevention must be enabled in the per-interface mode.
```

41.46 security-suite deny martian-addresses

Use the **security-suite deny martian-addresses** Global Configuration mode command to deny packets containing system-reserved IP addresses or user-defined IP addresses.

Syntax

security-suite deny martian-addresses ***{add*** *{ip-address {mask | /prefix-length}} |* ***remove*** *{ip-address {mask | /prefix-length}}* (Add/remove user-specified IP addresses)

security-suite deny martian-addresses ***reserved*** *{***add** | ***remove***} (*Add/remove system-reserved IP addresses, see tables below)

no security-suite deny martian-addresses (This command removes addresses reserved by **security-suite deny martian-addresses** ***{add*** *{ip-address {mask | /prefix-length}} |* ***remove*** *{ip-address {mask | /prefix-length}},* and removes all entries added by the user. The user can remove a specific entry by using **remove** *ip-address {mask | /prefix-length}* parameter.

There is no **no** form of the **security-suite deny martian-addresses** ***reserved*** *{***add** | ***remove***}* command. Use instead the **security-suite deny martian-addresses reserved** ***remove*** command to remove protection (and free up hardware resources).

Parameters

- **reserved add/remove**—Add or remove the table of reserved addresses below.

- **ip-address**—Adds/discards packets with the specified IP source or destination address.
- **mask**—Specifies the network mask of the IP address.
- **prefix-length**—Specifies the number of bits that comprise the IP address prefix. The prefix length must be preceded by a forward slash (/).
- **reserved**—Discards packets with the source or destination IP address in the block of the reserved (Martian) IP addresses. See the User Guidelines for a list of reserved addresses.

Default Configuration

Martian addresses are allowed.

Command Mode

Global Configuration mode

User Guidelines

For this command to work, security-suite enable must be enabled globally.

security-suite deny martian-addresses ***reserved*** adds or removes the addresses in the following table:

Address block	Present Use
0.0.0.0/8 (except when 0.0.0.0/32 is the source address)	Addresses in this block refer to source hosts on "this" network.
127.0.0.0/8	This block is assigned for use as the Internet host loopback address.
192.0.2.0/24	This block is assigned as "TEST-NET" for use in documentation and example code.
224.0.0.0/4 as source	This block, formerly known as the Class D address space, is allocated for use in IPv4 multicast address assignments.
240.0.0.0/4 (except when 255.255.255.255/32 is the destination address)	This block, formerly known as the Class E address space, is reserved.

Note that if the reserved addresses are included, individual reserved addresses cannot be removed.

Example

The following example discards all packets with a source or destination address in the block of the reserved IP addresses.

```
switchxxxxxx(config)# security-suite deny martian-addresses reserved add
```

41.47 security-suite deny syn

Use the **security-suite deny syn** Interface Configuration (Ethernet, Port-channel) mode command to block the creation of TCP connections from a specific interface. This a complete block of these connections.

Use the **no** form of this command to permit creation of TCP connections.

Syntax

security-suite deny syn {*[**add** {tcp-port | **any**} {ip-address | **any**} {mask | /prefix-length}] |*
*[**remove** {tcp-port | **any**} {ip-address | **any**} {mask | /prefix-length}]]*

no security-suite deny syn

Parameters

- **ip-address** | **any**—Specifies the destination IP address. Use **any** to specify all IP addresses.
- **mask**— Specifies the network mask of the destination IP address.
- **prefix-length**—Specifies the number of bits that comprise the destination IP address prefix. The prefix length must be preceded by a forward slash (/).
- **tcp-port** | **any**—Specifies the destination TCP port. The possible values are: **http**, **ftp-control**, **ftp-data**, **ssh**, **telnet**, **smtp**, **dns**, **tftp**, **ntp**, **snmp** or **port number**. Use **any** to specify all ports.

Default Configuration

Creation of TCP connections is allowed from all interfaces.

If the **mask** is not specified, it defaults to 255.255.255.255.

If the *prefix-length* is not specified, it defaults to 32.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

For this command to work, security-suite enable must be enabled both globally and for interfaces.

The blocking of TCP connection creation from an interface is done by discarding ingress TCP packets with "SYN=1", "ACK=0" and "FIN=0" for the specified destination IP addresses and destination TCP ports.

Example

The following example attempts to block the creation of TCP connections from an interface. It fails because security suite is enabled globally and not per interface.

```
switchxxxxxx(config)# security-suite enable global-rules-only

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# security-suite deny syn add any /32 any

To perform this command, DoS Prevention must be enabled in the per-interface mode.
```

41.48 security-suite deny icmp

Use the **security-suite deny icmp** Interface Configuration (Ethernet, Port-channel) mode command to discard ICMP echo requests from a specific interface (to prevent attackers from knowing that the device is on the network).

Use the **no** form of this command to permit echo requests.

Syntax

security-suite deny icmp *{[**add** {ip-address | **any**} {mask | /prefix-length}] | [**remove** {ip-address | **any**} {mask | /prefix-length}]}*

no security-suite deny icmp

Parameters

- **ip-address | any**—Specifies the destination IP address. Use **any** to specify all IP addresses.

- **mask**—Specifies the network mask of the IP address.
- **prefix-length**—Specifies the number of bits that comprise the IP address prefix. The prefix length must be preceded by a forward slash (/).

Default Configuration

Echo requests are allowed from all interfaces.

If **mask** is not specified, it defaults to 255.255.255.255.

If **prefix-length** is not specified, it defaults to 32.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

For this command to work, security-suite enable must be enabled both globally and for interfaces.

This command discards ICMP packets with "ICMP type= Echo request" that ingress the specified interface.

Example

The following example attempts to discard echo requests from an interface.

```
switchxxxxxx(config)# security-suite enable global-rules-only

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# security-suite deny icmp add any /32

To perform this command, DoS Prevention must be enabled in the per-interface mode.
```

41.49 security-suite deny fragmented

Use the **security-suite deny fragmented** Interface Configuration (Ethernet, Port-channel) mode command to discard IP fragmented packets from a specific interface.

Use the **no** form of this command to permit IP fragmented packets.

Syntax

security-suite deny fragmented *{[**add** {ip-address | **any**} {mask | /prefix-length}] | [**remove** {ip-address | **any**} {mask | /prefix-length}]}*

no security-suite deny fragmented

Parameters

- **ip-address | any**—Specifies the destination IP address. Use **any** to specify all IP addresses.
- **mask**—Specifies the network mask of the IP address.
- **prefix-length**—Specifies the number of bits that comprise the IP address prefix. The prefix length must be preceded by a forward slash (/).

Default Configuration

Fragmented packets are allowed from all interfaces.

If **mask** is unspecified, the default is 255.255.255.255.

If **prefix-length** is unspecified, the default is 32.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

For this command to work, security-suite enable must be enabled both globally and for interfaces.

Example

The following example attempts to discard IP fragmented packets from an interface.

```
switchxxxxxx(config)# security-suite enable global-rules-only

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# security-suite deny fragmented add any /32

To perform this command, DoS Prevention must be enabled in the per-interface mode.
```

41.50 show security-suite configuration

Use the **show security-suite configuration** EXEC mode command to display the security-suite configuration.

Syntax

show security-suite configuration

Command Mode

EXEC mode

Example

The following example displays the security-suite configuration.

```
switchxxxxxx# show security-suite configuration
Security suite is enabled (Per interface rules are enabled).
Denial Of Service Protect: stacheldraht, invasor-trojan,
back-office-trojan.
Denial Of Service SYN Attack
Interface                IP Address               SYN Rate (pps)
------------------       --------------           --------------
gi1                      176.16.23.0\24           100
Martian addresses filtering
Reserved addresses: enabled.
Configured addresses: 10.0.0.0/8, 192.168.0.0/16
SYN filtering
Interface                IP Address               TCP port
-----------------        --------------           --------------
gi2                      176.16.23.0\24           FTP
ICMP filtering
Interface                IP Address
---------------          --------------
gi2                      176.16.23.0\24
Fragmented packets filtering
Interface                IP Address
--------------           --------------
gi2s                     176.16.23.0\24
```

42 Voice VLAN Commands

42.1 voice vlan state

The **voice vlan state** Global Configuration mode command sets the type of voice VLAN that is functional on the device or disables voice VLAN entirely. The **no** format of the command returns to the default.

Syntax

voice vlan state {*oui-enabled*| *auto-enabled*| *auto-triggered*| *disabled*}

no voice vlan state

Parameters

- **oui-enabled**—Voice VLAN is of type OUI.
- **auto-enabled**—Auto VLAN is enabled.
- **auto-triggered**—Auto Voice VLAN on the switch is in standby and is put into operation when the switch detects a CDP device advertising a voice VLAN or if a voice VLAN ID is configured manually on the switch.
- **disabled**—Voice VLAN is disabled.

Default Configuration

auto-triggered

Command Mode

Global Configuration mode

User Guidelines

By factory default, CDP, LLDP, and LLDP-MED are enabled on the switch. In addition, manual Smartport mode and Basic QoS with trusted DSCP is enabled.

All ports are members of default VLAN 1, which is also the default Voice VLAN.

In addition, dynamic voice VLAN (**auto-triggered**) mode is the default mode of auto voice VLAN. In this mode, voice VLAN is enabled by a trigger (advertisement received by voice device attached to port).

If the administrative state is:

- **disabled** — The operational state is **disabled**.
- **oui-enabled** —The operational state is **oui-enabled**.
- **auto-enabled** — The operational state is **auto-enabled**.
- **auto-triggered** — The operational state is **auto-enabled** only if one of the following occurs:
  - A static local configured voice VLAN ID, CoS/802.1p, and/or DSCP that is not factory default is configured.
  - A CDP voice VLAN advertisement is received from a neighboring CDP device.
  - A Voice Service Discovery Protocol (VSDP) message was received from a neighbor switch. VSDP is a Cisco Small Business proprietary protocol for SF and SG series managed switches.

  In all other cases the operational state is **disabled**.

Notes:

- To change the administrative state from **oui-enabled** to **auto-enabled** (or **auto-triggered)**, or vice versa, you must first set the administrative state to **disabled**.
- The administrative state cannot be set to **oui-enabled** if the Auto SmartPort administrative state is **enabled**.

Examples:

Example 1 — The following example enables the OUI mode of Voice VLAN. The first try did not work - it was necessary to first disable voice VLAN.

```
switchxxxxxx(config)# voice vlan state oui-enabled

Disable the voice VLAN before changing the voice VLAN trigger.

switchxxxxxx(config)#voice vlan state disabled

switchxxxxxx(config)#voice vlan state oui-enabled

<CR>
```

Example 2 — The following example disables the Voice VLAN state. All auto Smartport configuration on ports are removed.

```
switchxxxxxx(config)#voice vlan state disabled

All interfaces with Auto Smartport dynamic type will be set to default.

Are you sure you want to continue? (Y/N)[Y] Y

switchxxxxxx(config)#30-Apr-2011 00:04:41 %LINK-W-Down:  Vlan 5

30-Apr-2011 00:04:41 %LINK-W-Down:  Vlan 8

30-Apr-2011 00:04:41 %LINK-W-Down:  Vlan 9

30-Apr-2011 00:04:41 %LINK-W-Down:  Vlan 100
```

Example 3 —The following example sets the Voice VLAN state to auto-triggered. The VLANs are re-activated after auto SmartPort state is applied.

```
switchxxxxxx(config)#voice vlan state auto-triggered

switchxxxxxx(config)#30-Apr-2011 00:13:52 %LINK-I-Up:  Vlan 5

30-Apr-2011 00:13:52 %LINK-I-Up:  Vlan 8

30-Apr-2011 00:13:52 %LINK-I-Up:  Vlan 9

30-Apr-2011 00:13:52 %LINK-I-Up:  Vlan 100
```

42.2 voice vlan refresh

The **voice vlan refresh** Global Configuration mode command restarts the Voice VLAN discovery process on all the Auto Voice VLAN-enabled switches in the VLAN by removing all externally learned voice VLAN attributes and resetting the voice VLAN to the default voice VLAN.

Syntax

voice vlan refresh

Parameters

N/A

Default Configuration

N/A

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# voice vlan refresh

switchxxxxxx(config)#

30-Apr-2011 02:01:02 %VLAN-I-ReceivedFromVSDP: Voice VLAN updated by VSDP. Voice
VLAN-ID 100, VPT 5, DSCP 46 (Notification that Agreed Voice VLAN is updated)

(Auto Smartport configuration is changed)

30-Apr-2011 02:01:05 %LINK-W-Down:  Vlan 50

30-Apr-2011 02:01:05 %LINK-W-Down:  Vlan 100

30-Apr-2011 02:01:06 %LINK-I-Up:  Vlan 50

30-Apr-2011 02:01:06 %LINK-I-Up:  Vlan 100

switchxxxxxx#show voice vlan

Administrate Voice VLAN state is auto-triggered

Operational Voice VLAN state is auto-enabled

Best Local Voice VLAN-ID is 100

Best Local VPT is 5 (default)

Best Local DSCP is 46 (default)

(Following is the new active source)

Agreed Voice VLAN is received from switch b0:c6:9a:c1:da:00

Agreed Voice VLAN priority is  2 (active CDP device)

Agreed Voice VLAN-ID is 100

Agreed VPT is 5

Agreed DSCP is 46

Agreed Voice VLAN Last Change is 11-Apr-30 02:01:02
```

42.3 voice vlan id

Use the **voice vlan id** Global Configuration mode command to statically configure the VLAN identifier of the voice VLAN. The **no** format of the command returns the voice VLAN to the default VLAN (1).

Syntax

voice vlan id *vlan-id*

no voice vlan id

Parameters

vlan id *vlan-id*—Specifies the voice VLAN (range 1-4094).

Default Configuration

VLAN ID 1.

Command Mode

Global Configuration mode

User Guidelines

If the Voice VLAN does not exist, it is created automatically. It will not be removed automatically by the **no** version of this command.

Example

The following example enables VLAN 104 as the voice VLAN on the device.

```
switchxxxxxx(config)# voice vlan id 35

For Auto Voice VLAN, changes in the voice VLAN ID, CoS/802.1p, and/or DSCP will
cause the switch to advertise the administrative voice VLAN as static voice VLAN
which has higher priority than voice VLAN learnt from external sources.

Are you sure you want to continue? (Y/N)[Y] Y

30-Apr-2011 00:19:36 %VLAN-I-VoiceVlanCreated: Voice Vlan ID 104 was created.

switchxxxxxx(config)#30-Apr-2011 00:19:51 %VLAN-I-ReceivedFromVSDP: Voice VLAN
updated by VSDP. Voice VLAN-ID 104, VPT 5, DSCP 46
```

42.4 voice vlan vpt

Use the **voice vlan vpt** Global Configuration mode command to specify a value of VPT (802.1p VLAN priority tag) that will be advertised by LLDP in the Network Policy TLV. The **no** format of the command returns the value to the default.

Syntax

voice vlan vpt *vpt-value*

no voice vlan vpt

Parameters

vpt *vpt-value*—The VPT value to be advertised (range 0-7).

Default Configuration

5

Command Mode

Global Configuration mode

Example

The following example sets 7 as the voice VLAN VPT. A notification that the new settings are different than the old ones is displayed.

```
switchxxxxxx(config)# voice vlan vpt 7

For Auto Voice VLAN, changes in the voice VLAN ID, CoS/802.1p, and/or DSCPwill
cause the switch to advertise the administrative voice VLAN as static voice
VLANwhich has higher priority than voice VLAN learnt from external sources.

Are you sure you want to continue? (Y/N)[Y] Y

30-Apr-2011 00:24:52 %VLAN-W-BestLocal!=Oper: inconsistency detected, VSDP voice
VLAN configuration differs from best local. Best local is Voice VLAN-ID 104, VPT
5, DSCP 46

switchxxxxxx(config)#30-Apr-2011 00:25:07 %VLAN-I-ReceivedFromVSDP: Voice VLAN
updated by VSDP. Voice VLAN-ID 104, VPT 7, DSCP 46
```

42.5 voice vlan dscp

Use the **voice vlan dscp** Global Configuration mode command to specify a value of DSCP that will be advertised by LLDP in the Network Policy TLV. The **no** format of the command returns the value to the default.

Syntax

voice vlan dscp *dscp-value*

no voice vlan dscp

Parameters

dscp *dscp-value*—The DSCP value (range 0-63).

Default Configuration

46

Command Mode

Global Configuration mode

Example

The following example sets 63 as the voice VLAN DSCP.

```
switchxxxxxx(config)# voice vlan dscp 63

For Auto Voice VLAN, changes in the voice VLAN ID, CoS/802.1p, and/or DSCPwill
cause the switch to advertise the administrative voice VLAN as static voice
VLANwhich has higher priority than voice VLAN learnt from external sources.

Are you sure you want to continue? (Y/N)[Y] Y

30-Apr-2011 00:31:07 %VLAN-W-BestLocal!=Oper: inconsistency detected, VSDP voice
VLAN configuration differs from best local. Best local is Voice VLAN-ID 104, VPT
7, DSCP 46

switchxxxxxx(config)#30-Apr-2011 00:31:22 %VLAN-I-ReceivedFromVSDP: Voice VLAN
updated by VSDP. Voice VLAN-ID 104, VPT 7, DSCP 63
```

42.6 voice vlan oui-table

Use the **voice vlan oui-table** Global Configuration mode command to configure the voice OUI table. Use the **no** form of this command to restore the default configuration.

Syntax

voice vlan oui-table *{**add** mac-address-prefix | **remove** mac-address-prefix}* [*text*]

no voice vlan oui-table

Parameters

- **add** *mac-address-prefix*—Adds the specified MAC address prefix to the voice VLAN OUI table (length: 3 bytes).
- **remove** *mac-address-prefix*—Removes the specified MAC prefix address from the voice VLAN OUI table (length: 3 bytes).
- **text**—Adds the specified text as a description of the specified MAC address to the voice VLAN OUI table (length: 1–32 characters).

Default Configuration

The default voice VLAN OUI table is:

OUI	Description
00:e0:bb	3COM Phone
00:03:6b	Cisco Phone
00:e0:75	Veritel Polycom Phone
00:d0:1e	Pingtel Phone
00:01:e3	Siemens AG Phone
00:60:b9	NEC/Philips Phone
00:0f:e2	Huawei-3COM Phone
00:09:6e	Avaya Phone

Command Mode

Global Configuration mode

User Guidelines

The classification of a packet from VoIP equipment/phones is based on the packet's OUI in the source MAC address. OUIs are globally assigned (administered) by the IEEE.

In MAC addresses, the first three bytes contain a manufacturer ID (Organizationally Unique Identifiers (OUI)) and the last three bytes contain a unique station ID.

Since the number of IP phone manufacturers that dominates the market is limited and well known, the known OUI values are configured by default and OUIs can be added/removed by the user when required.

Example

The following example adds an entry to the voice VLAN OUI table.

```
switchxxxxxx(config)# voice vlan oui-table add 00:AA:BB description
experimental
```

42.7 voice vlan cos mode

Use the **voice vlan cos mode** Interface Configuration mode command to select the OUI voice VLAN Class of Service (CoS) mode. Use the **no** form of this command to return to the default.

Syntax

voice vlan cos mode *{src | all}*

no voice vlan cos mode

Parameters

- **src**—QoS attributes are applied to packets with OUIs in the source MAC address. See the User Guidelines of voice vlan oui-table.
- **all**—QoS attributes are applied to packets that are classified to the Voice VLAN.

Default Configuration

The default mode is **src**.

Command Mode

Global Configuration mode

Example

The following example applies QoS attributes to voice packets.

```
switchxxxxxx(config)# voice vlan cos mode all
```

42.8 voice vlan cos

Use the **voice vlan cos** Global Configuration mode command to set the OUI Voice VLAN Class of Service (CoS). Use the **no** form of this command to restore the default configuration.

Syntax

voice vlan ***cos*** *cos* ***[remark]***

no voice vlan cos

Parameters

- **cos** *cos*—Specifies the voice VLAN Class of Service value. (Range: 0–7)
- **remark**—Specifies that the L2 user priority is remarked with the CoS value.

Default Configuration

The default CoS value is 5.

The L2 user priority is not remarked by default.

Command Mode

Global Configuration mode

Example

The following example sets the OUI voice VLAN CoS to 7 and does not do remarking.

```
switchxxxxxx(config)# voice vlan cos 7
```

42.9 voice vlan aging-timeout

Use the **voice vlan aging-timeout** Global Configuration mode command to set the OUI Voice VLAN aging timeout interval. Use the **no** form of this command to restore the default configuration.

Syntax

voice vlan aging-timeout *minutes*

no voice vlan aging-timeout

Parameters

aging-timeout *minutes*—Specifies the voice VLAN aging timeout interval in minutes. (Range: 1–43200).

Default Configuration

1440 minutes

Command Mode

Global Configuration mode

Example

The following example sets the OUI Voice VLAN aging timeout interval to 12 hours.

```
switchxxxxxx(config)# voice vlan aging-timeout 720
```

42.10 voice vlan enable

Use the **voice vlan enable** Interface Configuration (Ethernet, Port-channel) mode command to enable OUI voice VLAN configuration on an interface. Use the **no** form of this command to disable OUI voice VLAN configuration on an interface.

Syntax

voice vlan enable

no voice vlan enable

Default Configuration

Disabled

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

This command is applicable only if the voice VLAN state is globally configured as OUI voice VLAN (using voice vlan state).

The port is added to the voice VLAN if a packet with a source MAC address OUI address (defined by voice vlan oui-table) is trapped on the port. Note: The packet VLAN ID does not have to be the voice VLAN, it can be any VLAN.

The port joins the voice VLAN as a tagged port.

If the time since the last MAC address with a source MAC address OUI address was received on the interface exceeds the timeout limit (configured by voice vlan aging-timeout), the interface is removed from the voice VLAN.

Example

The following example enables OUI voice VLAN configuration on `gi2`.

```
switchxxxxxx(config)# interface gi2
switchxxxxxx(config-if)# voice vlan enable
```

42.11 show voice vlan

Use the **show voice vlan** EXEC mode command to display the voice VLAN status for all interfaces or for a specific interface if the voice VLAN type is OUI.

Syntax

show voice vlan [type {*oui*| *auto*}] [*interface-id*]

Parameters

- **type oui**—Common and OUI-voice-VLAN specific parameters are displayed.
- **type auto**—Common and Auto Voice VLAN-specific parameters are displayed.
- **interface-id**—Specifies an Ethernet port ID. Relevant only for the OUI type.

Default Configuration

If the **type** parameter is omitted the current Voice VLAN type is used.

If interface-id parameter is omitted then information about all interfaces is displayed.

Command Mode

EXEC mode

User Guidelines

Using this command without parameters displays the current voice VLAN type parameters and local and agreed voice VLAN settings.

Using this command with the **type** parameter displays the voice VLAN parameters relevant to the type selected. The the local and agreed voice VLAN settings are displayed only if this is the current voice VLAN state.

The interface-id parameter is relevant only for the OUI VLAN type.

Examples:

The following examples display the output of this command in various configurations.

Example 1—Displays the **auto** voice VLAN parameters (this is independent of the voice VLAN state actually enabled).

```
switch>show voice vlan type auto

switchxxxxxx#show voice vlan type auto

Best Local Voice VLAN-ID is 5

Best Local VPT is 5 (default)

Best Local DSCP is 46 (default)

Agreed Voice VLAN is received from switch 00:24:01:30:10:00

Agreed Voice VLAN priority is  0 (active static source)

Agreed Voice VLAN-ID is 5

Agreed VPT is 5

Agreed DSCP is 46

Agreed Voice VLAN Last Change is 11-Jul-11 15:52:51

switchxxxxxx#
```

Example 2—Displays the current voice VLAN parameters when the voice VLAN state is auto-enabled.

```
switch>show voice vlan

Administrate Voice VLAN state is auto-enabled
```

```
Operational Voice VLAN state is auto-enabled

Best Local Voice VLAN-ID is 5

Best Local VPT is 5 (default)

Best Local DSCP is 46 (default)

Agreed Voice VLAN is received from switch 00:24:01:30:10:00

Agreed Voice VLAN priority is  0 (active static source)

Agreed Voice VLAN-ID is 5

Agreed VPT is 5

Agreed DSCP is 46

Agreed Voice VLAN Last Change is 11-Jul-11 16:48:13

switchxxxxxx#
```

Example 3—Displays the current voice VLAN parameters when the administrative voice VLAN state is auto-triggered but voice VLAN has not been triggered.

```
switch>show voice vlan

Administrate Voice VLAN state is auto-triggered

Operational Voice VLAN state is disabled

VSDP Authentication is disabled
```

Example 4—Displays the current voice VLAN parameters when the administrative voice VLAN state is auto-triggered and it has been triggered.

```
switchxxxxxx(config)#voice vlan state auto-triggered

switchxxxxxx(config)#voice vlan state auto-triggered

operational voice vlan state is auto

admin state is auto triggered

switchxxxxxx#show voice vlan

Administrate Voice VLAN state is auto-triggered

Operational Voice VLAN state is auto-enabled

Best Local Voice VLAN-ID is 5

Best Local VPT is 5 (default)

Best Local DSCP is 46 (default)
```

```
Agreed Voice VLAN is received from switch 00:24:01:30:10:00

Agreed Voice VLAN priority is  0 (active static source)

Agreed Voice VLAN-ID is 5

Agreed VPT is 5

Agreed DSCP is 46

Agreed Voice VLAN Last Change is 11-Jul-11 15:52:51
```

Example 5—Displays the current voice VLAN parameters when both auto voice VLAN and OUI are disabled.

```
switch>show voice vlan

switchxxxxxx#show voice vlan

Administrate Voice VLAN state is disabled

Operational Voice VLAN state is disabled

Best Local Voice VLAN-ID is 5

Best Local VPT is 5 (default)

Best Local DSCP is 46 (default)

Aging timeout: 1440 minutes
```

Example 5—Displays the voice VLAN parameters when the voice VLAN operational state is OUI.

```
switch>show voice vlan

Administrate Voice VLAN state is oui-enabled

Operational Voice VLAN state is oui-enabled

Best Local Voice VLAN-ID is 1 (default)

Best Local VPT is 4

Best Local DSCP is 1

Aging timeout: 1440 minutes

CoS: 6

Remark: Yes

OUI table
```

```
MAC Address - Prefix   Description
--------------------   ------------------
00:E0:BB               3COM
00:03:6B               Cisco
00:E0:75               Veritel
00:D0:1E               Pingtel
00:01:E3               Simens
00:60:B9               NEC/Philips
00:0F:E2               Huawei-3COM
00:09:6E               Avaya
Interface        Enabled    Secure    Activated  CoS Mode
-------------    -------    -------   ---------  --------
gi1              Yes        Yes         Yes      all
gi2              Yes        Yes         No       src
gi3              No         No
...
```

42.12 show voice vlan local

The **show voice vlan local** EXEC mode command displays information about the auto voice VLAN local configuration, including the best local voice VLAN.

Syntax

show voice vlan local

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Examples:

Example 1—A CDP device is connected to an interface and a conflict is detected:

```
30-Apr-2011 00:39:24 %VLAN-W-ConflictingCDPDetected: conflict detected between
operational VLAN and new CDP device 00:1e:13:73:3d:62 on interface gi7. Platform
TLV is -4FXO-K9, Voice VLAN-ID is 100...

switchxxxxxx#show voice vlan local

Administrate Voice VLAN state is auto-triggered

Operational Voice VLAN state is auto-enabled

VSDP Authentication is enabled, key string name is alpha

The character '*; marks the best local Voice VLAN

VLAN-ID  VPT    DSCP   Source        MAC Address          Interface

-------- -----  -----  ---------     -----------          ------------

   1       5     46    default       ---                  ---

  *104     7     63    static        ---                  ---

   100                 CDP           00:1e:13:73:3d:62    gi7
```

Example 2—Displays the local voice VLAN configuration when the voice VLAN state is auto-triggered.

```
switchxxxxxx#show voice vlan local

Administrate Voice VLAN state is auto-triggered

Operational Voice VLAN state is auto-enabled

 VLAN-ID   VPT   DSCP    Source        MAC Address        Interface

--------- ----- ------ ---------- -------------------- -----------

    1       5     46    default            ---              ---

  *100                    CDP       00:23:56:1a:dc:68     gi11

   100                    CDP       00:44:55:44:55:4d     gi11

The character "*" marks the best local voice VLAN.
```

Example 3—Displays the local voice VLAN configuration when the voice VLAN state is OUI.

```
switchxxxxxx#show voice vlan local

Administrate Voice VLAN state is auto-OUI
```

```
Operational Voice VLAN state is OUI

The character '*; marks the best local Voice VLAN

VLAN-ID    VPT   DSCP   Source      MAC Address      Interface

---------  ----  -----  ---------   ------------     --------------------

       1    0     0     default        ---               ---

     *10    1     27    static         ---               ---

      10                CDP          00:00:12:ea:87:dc    gi1

      10                CDP          00:00:aa:aa:89:dc    po1
```

43 Smartport Commands

43.1 macro auto (Global)

The **macro auto** Global Configuration mode command sets the Auto Smartports administrative global state. The **no** format of the command returns to the default.

Syntax

macro auto {*enabled*| *disabled*| *controlled*}

no macro auto

Parameters

- **enabled**—Auto Smartport administrative global and operational states are enabled.
- **disabled**—Auto Smartport administrative global and operational states are disabled.
- **controlled**—Auto Smartport administrative global and operational states are enabled when Auto Voice VLAN is in operation.

Default Configuration

Administrative state is **controlled**.

Command Mode

Global Configuration mode

User Guidelines

Regardless of the status of Auto Smartport, you can always manually apply a Smartport macro to its associated Smartport type. A Smartport macro is either a built-in macro or a user-defined macro. You can define and apply a macro using the CLI commands presented in the Macro Commands section.

If the Auto Smartport Administrative state is controlled, the Auto Smartport Operational state is managed by the Voice VLAN manager and is set as follows:

- Auto Smartport Operational state is disabled when the OUI Voice VLAN is enabled.

- Auto Smartport Operational state is enabled when the Auto Voice VLAN is enabled.

A user cannot enable Auto Smartport globally if the OUI Voice VLAN is enabled.

Example

This example shows an attempt to enable the Auto Smartport feature globally in the controlled mode. This is not possible because the OUI voice feature is enabled. The voice VLAN state is then disabled, after which Auto Smartports can be enabled. The appropriate VLANs are automatically enabled because the ports are configured for Auto Smartports on these VLANs.

```
switchxxxxxx(config)# macro auto controlled

switchxxxxxx(config)#macro auto enabled

Auto smartports cannot be enabled because OUI voice is enabled.

switchxxxxxx(config)#voice vlan state disabled

switchxxxxxx(config)#macro auto enabled

switchxxxxxx(config)#10-Apr-2011 16:11:31 %LINK-I-Up:  Vlan 20

10-Apr-2011 16:11:33 %LINK-I-Up:  Vlan 5

10-Apr-2011 16:11:33 %LINK-I-Up:  Vlan 6

10-Apr-2011 16:11:33 %LINK-I-Up:  Vlan 7

10-Apr-2011 16:11:33 %LINK-I-Up:  Vlan 8

10-Apr-2011 16:11:33 %LINK-I-Up:  Vlan 9

10-Apr-2011 16:11:33 %LINK-I-Up:  Vlan 10
```

43.2 macro auto smartport (Interface)

The **macro auto smartport** Interface Configuration mode command enables the Auto Smartport feature on a given interface. The **no** format of the command disables the feature on the interface.

Syntax

macro auto smartport

no macro auto smartport

Parameters

N/A

Default Configuration

Enabled.

Command Mode

Interface Configuration mode (Ethernet Interface, Port Channel)

User Guidelines

This command is effective only when Auto Smartport is globally enabled.

Example

Enables the Auto Smartport feature on port 1:

```
switchxxxxxx(conf)#interface gi1

switchxxxxxx(conf-if)# macro auto smartport
```

43.3 macro auto trunk refresh

The **macro auto trunk refresh** Global Configuration command reapplies the Smartport macro on a specific interface, or to all the interfaces with the specified Smartport type.

Syntax

macro auto trunk refresh [*smartport-type*] [*interface-id*]

Parameters

- **smartport-type**—Smartport type (switch, router, wireless access point (ap))
- **interface-id**—Interface Identifier (port or port channel).

Default Configuration

See User Guidelines.

Command Mode

Global Configuration mode

User Guidelines

The **macro auto smartport** command becomes effective only when the Auto Smartport is globally enabled.

If both *smartport-type* and *interface-id* are defined, the attached Smartport macro is executed on the interface if it has the given Smartport type.

If only *smartport-type* is defined, the attached Smartport macro is executed on all interfaces having the given Smartport type.

If only *interface-id* is defined then the corresponding attached Smartport macro is executed if the interface has one of the following Smartport types: **switch**, **router** or wireless access point (**ap**).

If a Smartport macro contains configuration commands that are no longer current on one or more interfaces, you can update their configuration by reapplying the Smartport macro on the interfaces.

Example

Adds the ports of Smartport type **switch** to all existing VLANs by running the associated Smartport macros.

```
switchxxxxxx(conf)#macro auto trunk refresh switch
```

43.4 macro auto resume

The **macro auto resume** Interface Configuration mode command changes the Smartport type from **unknown** to **default** and resumes the Smartport feature on a given interface (but does not reapply the Smartport macro; this is done by macro auto trunk refresh).

Syntax

macro auto resume

Parameters

N/A

Default Configuration

N/A

Command Mode

Interface Configuration mode (Ethernet Interface, Port Channel)

User Guidelines

When a Smartport macro fails at an interface, the Smartport type of the interface becomes **Unknown**. You must diagnose the reason for the failure on the interface and/or Smartport macro, and correct the error. Before you or Auto Smartport are allowed to reapply the desired Smartport macro, you must reset the interface using the **macro auto resume** command, which changes the Smartport type of the interface to **Default**. Then you can run macro auto trunk refresh.

Example

Changes the Smartport type from **unknown** to **default** and resumes the Smartport feature on port 1.

```
switchxxxxxx(conf)interface gi1

switchxxxxxx(conf-if)#macro auto resume
```

43.5 macro auto persistent

The **macro auto persistent** Interface Configuration mode command sets the interface as a Smartport persistent interface. The **no** format of the command returns it to default.

Syntax

macro auto persistent

no macro auto persistent

Parameters

N/A

Default Configuration

Not persistent.

Command Mode

Interface Configuration mode (Ethernet Interface, Port Channel)

User Guidelines

A Smartport's persistent interface retains its dynamic configuration in the following cases: link down/up, the attaching device ages out, and reboot. Note that for persistence and the Smartport configuration to be effective across reboot, the Running Configuration file must be saved to the Startup Configuration file.

Example

The example establishes two port ranges and makes one persistent and the other not.

```
switchxxxxxx(config)#interface range gi1-2
switchxxxxxx(config-if-range)#macro auto persistent
switchxxxxxx(config-if-range)#exit
switchxxxxxx(config)#interface range gi3-4
switchxxxxxx(config-if-range)#no macro auto persistent
```

43.6 macro auto smartport type

The **macro auto smartport type** Interface Configuration mode command manually (statically) assigns a Smartport type to an interface. The **no** format of the command removes the manually-configured type and returns it to **default**.

Syntax

macro auto smartport type *smartport-type* [*parameter-name value* [*parameter-name value* [*parameter-name value*]]]

no macro auto smartport type

Parameters

- **smartport type** *smartport-type*—Smartport type.
- ***parameter-name*** *value*—Specifies the parameter name and its value (Range: printer, desktop, guest, server, host, ip_camera, ip_phone, ip_phone_desktop, switch, router or wireless access point (ap)).

Default Configuration

parameter-name *value*—Parameter default value. For instance, if the parameter is the voice VLAN, the default value is the default voice VLAN.

Command Mode

Interface Configuration mode (Ethernet Interface, Port Channel)

User Guidelines

A static type set by the command cannot be changed by a dynamic type.

Example

This example shows an attempt to set the Smartport type of port 1 to printer (statically). The macro fails at line 10. The **show parser macro name** command is run to display the contents of the macro printer in order to see which line failed.

```
switchxxxxxx(conf)interface gi1
switchxxxxxx(conf-if)#macro auto smartport type printer
30-May-2011 15:02:45 %AUTOSMARTPORT-E-FAILEDMACRO: Macro printer for auto smar
port type Printer on interface gi1 failed at command number 10
switchxxxxxx(conf-if)#exit
switchxxxxxx(conf-if)#do show parser macro name printer
Macro name : printer
Macro type : default interface
  1. #macro description printer
  2. #macro keywords $native_vlan
  3. #
  4. #macro key description:  $native_vlan: The untag VLAN which will be configu
red on the port
  5. #Default Values are
  6. #$native_vlan = Default VLAN
  7. #
  8. #the port type cannot be detected automatically
  9. #
```

```
 10. switchport mode access
 11. switchport access vlan $native_vlan
 12. #
 13. #single host
 14. port security max 1
 15. port security mode max-addresses
 16. port security discard trap 60
 17. #
 18. smartport storm-control broadcast level 10
 19. smartport storm-control include-multicast
 20. smartport storm-control broadcast enable
switch030008(config)#
```

43.7 macro auto processing cdp

The **macro auto processing cdp** Global Configuration mode command enables using CDP capability information to identify the type of an attached device.

When Auto Smartport is enabled on an interface and this command is run, the switch automatically applies the corresponding Smartport type to the interface based on the CDP capabilities advertised by the attaching device(s).

The **no** format of the command disables the feature.

Syntax

macro auto processing cdp

no macro auto processing cdp

Parameters

N/A

Default Configuration

Enabled

Command Mode

Global Configuration

Example

To enable CDP globally:

```
switchxxxxxx(conf)#macro auto processing cdp
```

43.8 macro auto processing lldp

The **macro auto processing lldp** Global Configuration mode command enables using the LLDP capability information to identify the type of an attached device.

When Auto Smartport is enabled on an interface and this command is run, the switch automatically applies the corresponding Smartport type to the interface based on the LLDP capabilities advertised by the attaching device(s).

The **no** format of the command disables the feature.

Syntax

macro auto processing lldp

no macro auto processing lldp

Parameters

N/A

Default Configuration

Enabled

Command Mode

Global Configuration

Example

To enable LLDP globally:

```
switchxxxxxx(conf)#macro auto processing lldp
```

43.9 macro auto processing type

The **macro auto processing type** Global Configuration mode command enables or disables automatic detection of devices of given type. The no format of the command returns to the default.

Syntax

macro auto processing type *smartport-type* {***enabled*** | ***disabled***}

no macro auto processing type *smartport-type*

Parameters

smartport-type—Smartport type (range: host, ip_phone, ip_phone_desktop, switch, router or wireless access point (ap)).

Default Configuration

By default, auto detection of ip_phone, ip_phone_desktop, switch, and wireless access point (ap) is enabled.

Command Mode

Global Configuration

Example

In this example, automatic detection of wireless access points (ap) is enabled.

```
switchxxxxxx(config)#macro auto processing type ?

  host                  set type to host

  ip_phone              set type to ip_phone

  ip_phone_desktop      set type to ip_phone_desktop

  switch                set type to switch

  router                set type to router

  ap                    set type to access point

switchxxxxxx(config)#macro auto processing type ap enabled
```

43.10 macro auto user smartport macro

The **macro auto user smartport macro** Global Configuration mode command links user-defined Smartport macros to a Smartport type. This is done by replacing the link to the built-in macro with the link to the user-defined macro. The **no** format of the command returns the link to the default built-in Smartport macro.

Syntax

macro auto user smartport macro *smartport-type user-defined-macro-name* [*parameter-name value* [*parameter-name value* [*parameter-name value*]]]

no macro auto user smartport macro *smartport-type*

Parameters

- **smartport macro** *smartport-type*—Smartport type (range: printer, desktop, guest, server, host, ip_camera, ip_phone, ip_phone_desktop, switch, router or wireless access point (ap)).
- **smartport macro** *user-defined-macro-name*—Specifies the user-defined macro name that replaces the built-in Smartport macro.
- ***parameter-name*** *value*—Specifies the parameter name and its value in the user-defined macro.

Default Configuration

parameter-name *value*—Parameter's default value. For instance, if the parameter is the native VLAN, the default value is the default native VLAN.

Command Mode

Global Configuration

User Guidelines

The scope of each parameter is the macro in which it is defined, with the exception of the parameter **$voice_vlan**, which is a global parameter and its value is specified by the switch and cannot be defined in a macro.

The macros must be defined before linking them in this command.

Smartport macros must be disconnected from the Smartport type before removing them (using the **no** version of this command).

To associate a Smartport type with a user-defined macros, you must have defined a pair of macros: one to apply the configuration, and the other (anti macro) to

remove the configuration. The macros are paired by their name. The name of the anti macro is the concatenation of **no_** with the name of the corresponding macro. Please refer to the Macro Command section for details about defining macro.

Example

To link the user-defined macro: my_ip_phone_desktop to the Smartport type: ip_phone_desktop and provide values for its two parameters:

```
switchxxxxxx(conf)#macro auto user smartport macro ip_phone_desktop
my_ip_phone_desktop $p1 1 $p2 2
```

43.11 macro auto built-in parameters

The **macro auto built-in parameters** Global Configuration mode command replaces the default Auto Smartport values of built-in Smartport macros. The **no** format of the command returns to the default values.

Syntax

macro auto built-in parameters *smartport-type* [*parameter-name value* [*parameter-name value* [*parameter-name value*]]]

no macro auto built-in parameters *smartport-type*

Parameters

- **smartport-type**—Smartport type (range: printer, desktop, guest, server, host, ip_camera, ip_phone, ip_phone_desktop, switch, router or wireless access point (ap)).
- **parameter-name value**—Specifies the parameter name and its value. These are the parameters of the built-in or user-defined macro defined in macro auto user smartport macro.

Default Configuration

The default value of parameter **$native_vlan** of the built-in Smartport macros is 1.

For other parameters, the default value is the parameter's default value. For instance, if the parameter is the native VLAN, the default value is the default native VLAN.

Command Mode

Global Configuration

User Guidelines

By default, each Smartport type is associated with a pair of built-in macros: a macro that applies the configuration and the anti macro (no macro) to remove the configuration. The Smartport types are the same as the name of the corresponding built-in Smartport macros, with the anti macro prefixed with **no_**.

The value of the parameter **$voice_vlan** cannot be changed by this command.

Example

To change the parameters of a built-in macro:

```
switchxxxxxx(conf)#macro auto built-in parameters switch $native_vlan 2
```

43.12 show macro auto processing

The **show macro auto processing** EXEC mode command displays information about which protocols (CDP/LLDP) are enabled and which device types can be detected automatically.

Syntax

show macro auto processing

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC

Example

```
switchxxxxxx#show macro auto processing
```

```
CDB: enabled

LLDP: enabled

host            :disabled

ip_phone        :enabled

ip_phone_desktop:enabled

switch          :enabled

router          :disabled

ap              :enabled
```

43.13 show macro auto smart-macros

The **show macro auto smart-macros** EXEC mode command displays the name of Smartport macros, their type (built-in or user-defined) and their parameters. This information is displayed for all Smartport types or for the specified one.

Syntax

show macro auto smart-macros [*smartport-type*]

Parameters

smartport-type—Smartport type (range: printer, desktop, guest, server, host, ip_camera, ip_phone, ip_phone_desktop, switch, router or wireless access point (ap)).

Default Configuration

N/A

Command Mode

EXEC

Example

```
switchxxxxxx#show macro auto smart-macros

SG300-52-R#show macro auto smart-macros

SmartPort type : printer

Parameters     : $native_vlan=1

SmartPort Macro: printer (Built-In)
```

```
SmartPort type : desktop
Parameters     : $max_hosts=10 $native_vlan=1
SmartPort Macro: desktop (Built-In)
SmartPort type : guest
Parameters     : $native_vlan=1
SmartPort Macro: guest (Built-In)
SmartPort type : server
Parameters     : $max_hosts=10 $native_vlan=1
SmartPort Macro: server (Built-In)
SmartPort type : host
Parameters     : $max_hosts=10 $native_vlan=1
SmartPort Macro: host (Built-In)
SmartPort type : ip-camera
Parameters     : $native_vlan=1
SmartPort Macro: ip_camera (Built-In)
SmartPort type : ip-phone
Parameters     : $max_hosts=10 $native_vlan=1 $voice_vlan=1
SmartPort Macro: ip_phone (Built-In)
SmartPort type : ip-phone-desktop
Parameters     : $max_hosts=10 $native_vlan=1 $voice_vlan=1
SmartPort Macro: ip_phone_desktop (Built-In)
SmartPort type : switch
Parameters     : $native_vlan=1 $voice_vlan=1
SmartPort Macro: switch (Built-In)
SmartPort type : router
Parameters     : $native_vlan=1 $voice_vlan=1
SmartPort Macro: router (Built-In)
SmartPort type : ap
Parameters     : $native_vlan=1 $voice_vlan=1
SmartPort Macro: ap (Built-In)
SG300-52-R#
```

43.14 show macro auto ports

The **show macro auto ports** EXEC mode command displays information about all Smartport ports or a specific one. If a macro was run on the port and it failed, the type of the port is displayed as Unknown.

Syntax

show macro auto ports [*interface-id*]

Parameters

interface-id—Interface Identifier (Ethernet interface, port channel)

Default Configuration

Information about all ports is displayed.

Command Mode

EXEC

Examples

Example 1—Note that Smartport on switch and phone types was configured automatically. Smartport on routers was configured statically.

```
switchxxxxxx# show macro auto ports


Smartport is enabled

Administrative Globally Auto Smartport is enabled

Operational Globally Auto Smartport is enabled


Interface    Auto Smartport  Persistent  Smartport Type
             Admin State     State
-----------  --------------  ----------- ---------------
gi1          disabled        enabled     switch
gi2          enabled         enabled     default
gi3          enabled         disabled    phone
gi4          enabled         enabled     router (static)
```

```
gi5          enabled         enabled     switch
gi6          enabled         enabled     unknown
```

Example 2—Disabling auto SmartPort on gi2:

```
switchxxxxxx(config-if)#interface gi2
switchxxxxxx(config-if)#no macro auto smartport
switchxxxxxx(config-if)#end
switchxxxxxx#show macro auto ports gi2
SmartPort is Enabled
Administrative Globally Auto SmartPort is controlled
Operational Globally Auto SmartPort is enabled
Auto SmartPort is disabled on gi2
Persistent state is not-persistent
Interface type is default
No macro has been activated
```

Example 3—Enabling auto Smartport on gi1:

```
switchxxxxxx(config-if)#interface gi1
switchxxxxxx(config-if)#macro auto smartport
switchxxxxxx(config-if)#end
switchxxxxxx#show macro auto ports gi1
SmartPort is Enabled
Administrative Globally Auto SmartPort is enabled
Operational Globally Auto SmartPort is enabled
Auto SmartPort is enabled on gi1
Persistent state is persistent
Interface type is switch
Last activated macro is switch
```

43.15 smartport switchport trunk allowed vlan

The **smartport switchport trunk allowed vlan** Interface Configuration (Ethernet, port-channel) mode command adds/removes VLANs to/from a trunk port.

Syntax

smartport switchport trunk allowed vlan {**add** [*vlan-list* / ***all***] | **remove** [*vlan-list* / ***all***]}

Parameters

- **add** *vlan-list*—Specifies a list of VLAN IDs to add to interface. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs.
- **add** ***all***—Add all VLANs to interface.
- **remove** *vlan-list*—Specifies a list of VLAN IDs to remove. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs.
- **remove** ***all***—Remove all VLANs from interface.

Default Configuration

N/A

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

This command is an extension of the **switchport trunk allowed vlan** command. Unlike the **switchport trunk allowed vlan** command, the *vlan-list* parameter of this command may include the voice VLAN (when it is the default VLAN). If the default VLAN is the voice VLAN, the following occurs:

- **add** ***all*** — Adds the interface to the default VLAN as an egress tagged port.
- **remove** ***all*** — Removes the interface from the default VLAN.

Example

To add port 1 to VLANs 1-5:

```
switchxxxxxx(conf)#interface gi1
```

```
switchxxxxxx(conf-if)#smartport switchport trunk allowed vlan add 1-5
```

43.16 smartport switchport trunk native vlan

Use the **smartport switchport trunk native vlan** Interface Configuration (Ethernet, port-channel) mode command to define the native VLAN when the interface is in trunk mode. Use the **no** form of this command to restore the default configuration.

Syntax

smartport switchport trunk native vlan *native-vlan-id*

Parameters

native-vlan-id—Specifies the native VLAN ID.

Default Configuration

VLAN 1

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

This command is an extension of the **switchport trunk native vlan** CLI command. Unlike the **switchport trunk native vlan** CLI command, this command may also be applied to the default VLAN when the interface belongs to the default VLAN as egress tagged port.

Example

Define the native VLAN when port 1 is in trunk mode:

```
switchxxxxxx(conf)interface gi1

switchxxxxxx(conf-if)#smartport switchport trunk native vlan 1
```

43.17 smartport storm-control broadcast enable

Use the **smartport storm-control broadcast enable** Interface Configuration (Ethernet, port-channel) mode command to enable storm control on a Smartport port. Use the **no** form of this command to disable storm control.

Syntax

smartport storm-control broadcast enable

Parameters

N/A

Default Configuration

N/A

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Example

```
switchxxxxxx(conf)interface gi1

switchxxxxxx(conf-if)#smartport storm-control broadcast enable
```

43.18 smartport storm-control broadcast level

Use the **smartport storm-control broadcast level** Interface Configuration (Ethernet, port-channel) mode command to control the amount of Broadcast traffic allowed on an interface.

Syntax

smartport storm-control broadcast level [***kbps*** *max-kilobits*] | [*max-percentage*]

Parameters

- **kbps** *max-kilobits*—Maximum of kilobits per second of broadcast traffic on a port. Range is 3500-10000000.
- **max-percentage**—Suppression level in percentage. Block the flooding of storm packets when the percentage of traffic equals or exceeds the value specified. Range: 1-100.

Default Configuration

max-kilobits - 1000

Command Mode

Interface Configuration (Ethernet, port-channel) mode

Examples

Example 1 - Set the maximum number of kilobits per second of Broadcast traffic on port 1 to 10000.

```
switchxxxxxx(conf)interface gi1

switchxxxxxx(conf-if)#smartport storm-control broadcast level kpbs 10000
```

Example 2 - Set the maximum percentage of kilobits per second of Broadcast traffic on port 1 to 30%.

```
switchxxxxxx(conf)interface gi1

switchxxxxxx(conf-if)#smartport storm-control broadcast level 30
```

43.19 smartport storm-control include-multicast

Use the **smartport storm-control include-multicast** Interface Configuration mode command to count Multicast packets in a Broadcast storm control. Use the **no** form of this command to disable counting of Multicast packets in the Broadcast storm control.

Syntax

storm-control include-multicast ***[unknown-unicast]***

no storm-control include-multicast

Parameters

unknown-unicast—Specifies also the count of unknown Unicast packets.

Default Configuration

Disabled

Command Mode

Interface Configuration mode (Ethernet)

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# storm-control include-multicast
```

44 Link Layer Discovery Protocol (LLDP) Commands

44.1 lldp run

Use the **lldp run** Global Configuration mode command to enable LLDP. To disable LLDP, use the **no** form of this command.

Syntax

lldp run

no lldp run

Parameters

N/A.

Default Configuration

Enabled

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# lldp run
```

44.2 lldp transmit

Use the **lldp transmit** Interface Configuration mode command to enable transmitting LLDP on an interface. Use the **no** form of this command to stop transmitting LLDP on an interface.

Syntax

lldp transmit

no lldp transmit

Parameters

N/A

Default Configuration

Enabled

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

LLDP manages LAG ports individually. LLDP sends separate advertisements on each port in a LAG.

LLDP operation on a port is not dependent on the STP state of a port. I.e. LLDP frames are sent on blocked ports.

If a port is controlled by 802.1x, LLDP operates only if the port is authorized.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# lldp transmit
```

44.3 lldp receive

Use the **lldp receive** Interface Configuration mode command to enable receiving LLDP on an interface. Use the **no** form of this command to stop receiving LLDP on an interface.

Syntax

lldp receive

no lldp receive

Parameters

N/A

Default Configuration

Enabled

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

LLDP manages LAG ports individually. LLDP data received through LAG ports is stored individually per port.

LLDP operation on a port is not dependent on the STP state of a port. I.e. LLDP frames are received on blocked ports.

If a port is controlled by 802.1x, LLDP operates only if the port is authorized.

Example

```
switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# lldp receive
```

44.4 lldp timer

Use the **lldp timer** Global Configuration mode command to specify how often the software sends LLDP updates. Use the **no** form of this command to restore the default configuration.

Syntax

lldp timer *seconds*

no lldp timer

Parameters

timer *seconds*—Specifies, in seconds, how often the software sends LLDP updates (range: 5-32768 seconds).

Default Configuration

30 seconds.

Command Mode

Global Configuration mode

Example

The following example sets the interval for sending LLDP updates to 60 seconds.

```
switchxxxxxx(config)# lldp timer 60
```

44.5 lldp hold-multiplier

Use the **lldp hold-multiplier** Global Configuration mode command to specify how long the receiving device holds a LLDP packet before discarding it. Use the **no** form of this command to restore the default configuration.

Syntax

lldp hold-multiplier *number*

no lldp hold-multiplier

Parameters

hold-multiplier *number*—Specifies the LLDP packet hold time interval as a multiple of the LLDP timer value (range: 2-10).

Default Configuration

The default LLDP hold multiplier is 4.

Command Mode

Global Configuration mode

User Guidelines

The actual Time-To-Live (TTL) value of LLDP frames is calculated by the following formula:

TTL = min(65535, LLDP-Timer * LLDP-hold-multiplier)

For example, if the value of the LLDP timer is 30 seconds, and the value of the LLDP hold multiplier is 4, then the value 120 is encoded in the TTL field of the LLDP header.

Example

The following example sets the LLDP packet hold time interval to 90 seconds.

```
switchxxxxxx(config)# lldp timer 30

switchxxxxxx(config)# lldp hold-multiplier 3
```

44.6 lldp reinit

Use the **lldp reinit** Global Configuration mode command to specify the minimum time an LLDP port waits before reinitializing LLDP transmission. Use the **no** form of this command to revert to the default setting.

Syntax

lldp reinit *seconds*

no lldp reinit

Parameters

reinit *seconds*—Specifies the minimum time in seconds an LLDP port waits before reinitializing LLDP transmission.(Range: 1–10)

Default Configuration

2 seconds

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# lldp reinit 4
```

44.7 lldp tx-delay

Use the **lldp tx-delay** Global Configuration mode command to set the delay between successive LLDP frame transmissions initiated by value/status changes in the LLDP local systems MIB. Use the **no** form of this command to restore the default configuration.

Syntax

lldp tx-delay *seconds*

no lldp tx-delay

Parameters

tx-delay *seconds*—Specifies the delay in seconds between successive LLDP frame transmissions initiated by value/status changes in the LLDP local systems MIB (range: 1-8192 seconds).

Default Configuration

The default LLDP frame transmission delay is 2 seconds.

Command Mode

Global Configuration mode

User Guidelines

It is recommended that the tx-delay be less than 0.25 of the LLDP timer interval.

Example

The following example sets the LLDP transmission delay to 10 seconds.

```
switchxxxxxx(config)# lldp tx-delay 10
```

44.8 lldp optional-tlv

Use the **lldp optional-tlv** Interface Configuration (Ethernet) mode command to specify which optional TLVs are transmitted. Use the **no** form of this command to restore the default configuration.

Syntax

lldp optional-tlv {*tlv* [*tlv2* ... *tlv5*] | **none**}

no lldp optional-tlv

Parameters

tlv—Specifies TLV to be included. Available optional TLVs are: port-desc, sys-name, sys-desc, sys-cap, 802.3-mac-phy, 802.3-lag, 802.3-max-frame-size.

none - No optional TLV is transmitted

Default Configuration

The syscap is transmitted

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example specifies that the port description TLV is transmitted on gigabitethernet port 2.

```
switchxxxxxx(config)# interface gi2

switchxxxxxx(config-if)# lldp optional-tlv port-desc
```

44.9 lldp management-address

Use the **lldp management-address** Interface Configuration (Ethernet) mode command to specify the management address advertised by an interface. Use the **no** form of this command to stop advertising management address information.

Syntax

lldp management-address *{ip-address | **none** | **automatic** [interface-id]}*

no lldp management-address

Parameters

- **ip-address**—Specifies the static management address to advertise.
- **none**—Specifies that no address is advertised.
- **automatic**—Specifies that the software automatically selects a management address to advertise from all the IP addresses of the product. In case of multiple IP addresses, the software selects the lowest IP address among the dynamic IP addresses. If there are no dynamic addresses, the software selects the lowest IP address among the static IP addresses.
- **automatic** *interface-id*—(Available only when the device is in Layer 3 (router mode)). Specifies that the software automatically selects a management address to advertise from the IP addresses that are configured on the interface ID. In case of multiple IP addresses, the software selects the lowest IP address among the dynamic IP addresses of the interface. If there are no dynamic addresses, the software selects the lowest IP address among the static IP addresses of the interface. The interface ID can be one of the following types: Ethernet port, port-channel or VLAN. Note that if the

port or port- channel are members in a VLAN that has an IP address, that address is not included because the address is associated with the VLAN.

Default Configuration

No IP address is advertised.

The default advertisement is **automatic**.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Each port can advertise one IP address.

Example

The following example sets the LLDP management address advertisement mode to **automatic** on `gi2`.

```
switchxxxxxx(config)# interface gi2
switchxxxxxx(config-if)# lldp management-address automatic
```

44.10 lldp notifications

Use the **lldp notifications** Interface Configuration (Ethernet) mode command to enable/disable sending LLDP notifications on an interface. Use the **no** form of this command to restore the default configuration.

Syntax

lldp notifications *{enable | disable}*

no lldp notifications

Parameters

- **enable**—Enables sending LLDP notifications.
- **disable**—Disables sending LLDP notifications.

Default Configuration

Disabled.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example enables sending LLDP notifications on gi5.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# lldp notifications enable
```

44.11 lldp notifications interval

Use the **lldp notifications interval** Global Configuration mode command to configure the maximum transmission rate of LLDP notifications. Use the **no** form of this command to return to the default.

Syntax

lldp notifications interval *seconds*

no lldp notifications interval

Parameters

interval *seconds*—The device does not send more than a single notification in the indicated period (range: 5–3600).

Default Configuration

5 seconds

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# lldp notifications interval 10
```

44.12 lldp lldpdu

The **lldp lldpdu** Global Configuration mode command defines LLDP packet handling when LLDP is globally disabled. To restore the default configuration, use the **no** form of this command.

Syntax

lldp lldpdu {*filtering* | *flooding*}

no lldp lldpdu

Parameters

- **filtering** — Specifies that when LLDP is globally disabled, LLDP packets are filtered (deleted).
- **flooding** — Specifies that when LLDP is globally disabled, LLDP packets are flooded (forwarded to all interfaces).

Default Configuration

LLDP packets are filtered when LLDP is globally disabled.

Command Mode

Global Configuration mode

User Guidelines

If the STP mode is MSTP, the LLDP packet handling mode cannot be set to **flooding**.

The STP mode cannot be set to MSTP if the LLDP packet handling mode is **flooding**.

If LLDP is globally disabled, and the LLDP packet handling mode is **flooding**, LLDP packets are treated as data packets with the following exceptions:

- VLAN ingress rules are not applied to LLDP packets. The LLDP packets are trapped on all ports for which the STP state is Forwarding.
- Default "deny-all" rules are not applied to LLDP packets.
- VLAN egress rules are not applied to LLDP packets. The LLDP packets are flooded to all ports for which the STP state is Forwarding.
- LLDP packets are sent as untagged.

Example

The following example sets the LLDP packet handling mode to Flooding when LLDP is globally disabled.

```
switchxxxxxx(config)# lldp lldpdu flooding
```

44.13 lldp med

Use the **lldp med** Interface Configuration (Ethernet) mode command to enable or disable LLDP Media Endpoint Discovery (MED) on a port. Use the **no** form of this command to return to the default state.

Syntax

lldp med {***enable*** [*tlv* ... *tlv4*] | ***disable***}

no lldp med

Parameters

enable - Enable LLDP MED

tlv—Specifies the TLV that should be included. Available TLVs are: network-policy, location, and poe-pse, inventory. The capabilities TLV is always included if LLDP-MED is enabled.

disable - disable LLDP MED on the port

Default Configuration

Enabled with network-policy TLV

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example enables LLDP MED with the **location** TLV on `gi3`.

```
switchxxxxxx(config)# interface gi3

switchxxxxxx(config-if)# lldp med enable location
```

44.14 lldp med notifications topology-change

Use the **lldp med notifications topology-change** Interface Configuration (Ethernet) mode command to enable sending LLDP MED topology change notifications on a port. Use the **no** form of this command to restore the default configuration.

Syntax

lldp med notifications topology-change *{enable | disable}*

no lldp med notifications topology-change

Parameters

- **enable**—Enables sending LLDP MED topology change notifications.
- **disable**—Disables sending LLDP MED topology change notifications.

Default Configuration

Disable is the default.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example enables sending LLDP MED topology change notifications on gi2.

```
switchxxxxxx(config)# interface gi2
switchxxxxxx(config-if)# lldp med notifications topology-change enable
```

44.15 lldp med fast-start repeat-count

When a port comes up, LLDP can send packets more quickly than usual using its fast-start mechanism.

Use the **lldp med fast-start repeat-count** Global Configuration mode command to configure the number of packets that is sent during the activation of the fast start mechanism. Use the **no** form of this command return to default.

Syntax

lldp med fast-start repeat-count *number*

no lldp med fast-start repeat-count

Parameters

repeat-count *number*—Specifies the number of times the fast start LLDPDU is being sent during the activation of the fast start mechanism. The range is 1-10.

Default Configuration

3

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# lldp med fast-start repeat-count 4
```

44.16 lldp med network-policy (global)

Use the **lldp med network-policy** Global Configuration mode command to define a LLDP MED network policy. For voice applications, it is simpler to use lldp med network-policy voice auto.

The **lldp med network-policy** command creates the network policy, which is attached to a port by lldp med network-policy (interface).

The network policy defines how LLDP packets are constructed.

Use the **no** form of this command to remove LLDP MED network policy.

Syntax

lldp med network-policy *number application [**vlan** vlan-id] [**vlan-type** {**tagged** | **untagged**}] [**up** priority] [**dscp** value]*

no lldp med network-policy *number*

Parameters

- **number**—Network policy sequential number. The range is 1-32.

- **application**—The name or the number of the primary function of the application defined for this network policy. Available application names are:
  - voice
  - voice-signaling
  - guest-voice
  - guest-voice-signaling
  - softphone-voice
  - video-conferencing
  - streaming-video
  - video-signaling.
- **vlan** *vlan-id*—VLAN identifier for the application.
- **vlan-type**—Specifies if the application is using a tagged or an untagged VLAN.
- **up** *priority*—User Priority (Layer 2 priority) to be used for the specified application.
- **dscp** *value*—DSCP value to be used for the specified application.

Default Configuration

No network policy is defined.

Command Mode

Global Configuration mode

User Guidelines

Use the **lldp med network-policy** Interface Configuration command to attach a network policy to a port.

Up to 32 network policies can be defined.

Example

This example creates a network policy for the voice-signally application and attaches it to port 1. LLDP packets sent on port 1 will contain the information defined in the network policy.

```
switchxxxxxx(config)# lldp med network-policy 1 voice-signaling vlan 1
vlan-type untagged up 1 dscp 2

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# lldp med network-policy add 1
```

44.17 lldp med network-policy (interface)

Use the **lldp med network-policy** Interface Configuration (Ethernet) mode command to attach or remove an LLDP MED network policy on a port. Network policies are created in lldp med network-policy (global).

Use the **no** form of this command to remove all the LLDP MED network policies from the port.

Syntax

lldp med network-policy *{**add** | **remove**} number*

no lldp med network-policy *number*

Parameters

- **number**—Specifies the network policy sequential number. The range is 1-32
- **add/remove** *number*—Attaches/removes the specified network policy to the interface.

Default Configuration

No network policy is attached to the interface.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

For each port, only one network policy per application (voice, voice-signaling, etc.) can be defined.

Example

This example creates a network policy for the voice-signally application and attaches it to port 1. LLDP packets sent on port 1 will contain the information defined in the network policy.

```
switchxxxxxx(config)# lldp med network-policy 1 voice-signaling vlan 1
vlan-type untagged up 1 dscp 2

switchxxxxxx(config)# interface gi1

switchxxxxxx(config-if)# lldp med network-policy add 1
```

44.18 lldp med network-policy voice auto

A network policy for voice LLDP packets can be created by using the lldp med network-policy (global). The **lldp med network-policy voice auto** Global Configuration mode is simpler in that it uses the configuration of the Voice application to create the network policy instead of the user having to manually configure it.

This command generates an LLDP MED network policy for voice, if the voice VLAN operation mode is **auto voice VLAN**. The voice VLAN, 802.1p priority, and the DSCP of the voice VLAN are used in the policy. Use the **no** form of this command to disable this mode. The network policy is attached automatically to the voice VLAN.

Syntax

lldp med network-policy voice auto

no lldp med network-policy voice auto

Parameters

N/A

Default Configuration

N/A

Command Mode

Global Configuration mode

User Guidelines

In Auto mode, the Voice VLAN feature determines on which interfaces to advertise the network policy TLV with application type **voice**, and controls the parameters of that TLV.

To enable the auto generation of a network policy based on the auto voice VLAN, there must be no manual pre-configured network policies for the voice application

In Auto mode, you cannot manually define a network policy for the voice application using the lldp med network-policy (global) command.

Example

```
switchxxxxxx(config)# lldp med network-policy voice auto
```

44.19 clear lldp table

Use the **clear lldp table** command in Privileged EXEC mode to clear the neighbors table for all ports or for a specific port.

Syntax

clear lldp table *[interface-id]*

Parameters

interface-id—Specifies a port ID.

Default Configuration

If no interface is specified, the default is to clear the LLDP table for all ports.

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx# clear lldp table gi1
```

44.20 lldp med location

Use the **lldp med location** Interface Configuration (Ethernet) mode command to configure the location information for the LLDP Media Endpoint Discovery (MED) for a port. Use the **no** form of this command to delete location information for a port.

Syntax

lldp med location *{{**coordinate** data}|{**civic-address** data}|{**ecs-elin** data}}*

no lldp med location *{**coordinate**|**civic-address**|**ecs-elin**}*

Parameters

- **coordinate** *data*—Specifies the location data as coordinates in hexadecimal format.
- **civic-address** *data*—Specifies the location data as a civic address in hexadecimal format.
- **ecs-elin** *data*—Specifies the location data as an Emergency Call Service Emergency Location Identification Number (ECS ELIN) in hexadecimal format.
- **data**—Specifies the location data in the format defined in ANSI/TIA 1057: dotted hexadecimal data: Each byte in a hexadecimal character string is two hexadecimal digits. Bytes are separated by a period or colon. (Length: coordinate: 16 bytes. Civic-address: 6-160 bytes. Ecs-elin: 10-25 bytes)

Default Configuration

The location is not configured.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example configures the LLDP MED location information on `gi2` as a civic address.

```
switchxxxxxx(config)# interface gi2

switchxxxxxx(config-if)# lldp med location civic-address 616263646566
```

44.21 show lldp configuration

Use the **show lldp configuration** Privileged EXEC mode command to display the LLDP configuration for all ports or for a specific port.

Syntax

show lldp configuration *[interface-id]*

Parameters

interface-id—Specifies the port ID.

Default Configuration

N/A

Command Mode

Privileged EXEC mode

Examples

Example 1 - Display LLDP configuration for all ports.

```
Switch# show lldp configuration

State: Enabled

Timer: 30 Seconds

Hold multiplier: 4

Reinit delay: 2 Seconds

Tx delay: 2 Seconds

Notifications interval: 5 seconds

LLDP packets handling: Filtering

Port      State  Optional TLVs      Address       Notifications

--------  -----  --------------      -------       ------------

gi1       RX,TX  PD, SN, SD, SC      172.16.1.1    Disabled

gi2       TX     PD, SN              172.16.1.1    Disabled

gi3       RX,TX  PD, SN, SD, SC      None          Disabled

gi5       RX,TX  D,  SN, SD, SC      automatic     Disabled
```

```
gi6       RX,TX  PD, SN, SD, SC      auto vlan 1   Disabled
gi7       RX,TX  PD, SN, SD, SC      auto g1       Disabled
gi8       RX,TX  PD, SN, SD, SC      auto ch1      Disabled
```

Example 2 - Display LLDP configuration for port 1.

```
Switch# show lldp configuration gi1
 State: Enabled
Timer: 30 Seconds
Hold multiplier: 4
Reinit delay: 2 Seconds
Tx delay: 2 Seconds
Notifications interval: 5 seconds
LLDP packets handling: Filtering
Port State    Optional TLVs     Address      Notifications
------------- -------------- ------------------------
gi1  RX, TX   PD, SN, SD, SC    72.16.1.1    Disabled
802.3 optional TLVs: 802.3-mac-phy, 802.3-lag, 802.3-max-frame-size
802.1 optional TLVs
PVID: Enabled
PPVIDs: 0, 1, 92
VLANs: 1, 92
Protocols: 802.1x
```

The following table describes the significant fields shown in the display:

Field	Description
Timer	The time interval between LLDP updates.
Hold multiplier	The amount of time (as a multiple of the timer interval) that the receiving device holds a LLDP packet before discarding it.
Reinit timer	The minimum time interval an LLDP port waits before re-initializing an LLDP transmission.

Field	Description
Tx delay	The delay between successive LLDP frame transmissions initiated by value/status changes in the LLDP local systems MIB.
Port	The port number.
State	The port's LLDP state.
Optional TLVs	Optional TLVs that are advertised. Possible values are: PD - Port description SN - System name SD - System description SC - System capabilities
Address	The management address that is advertised.
Notifications	Indicates whether LLDP notifications are enabled or disabled.
PVID	Port VLAN ID advertised.
PPVID	Protocol Port VLAN ID advertised.
Protocols	Protocols advertised.

44.22 show lldp med configuration

Use the **show lldp med configuration** Privileged EXEC mode command to display the LLDP Media Endpoint Discovery (MED) configuration for all ports or for a specific port.

Syntax

show lldp med configuration *[interface-id]*

Parameters

interface-id—Specifies a port ID.

Default Configuration

If no port ID is entered, the command displays information for all ports.

Command Mode

Privileged EXEC mode

Examples

Example 1 - The following example displays the LLDP MED configuration for all interfaces.

```
switchxxxxxx# show lldp med configuration

Fast Start Repeat Count: 4.

lldp med network-policy voice: manual

Network policy 1

--------------------

Application type: voiceSignaling

VLAN ID: 1  untagged

Layer 2 priority: 0

DSCP: 0

Port    Capabilities   Network Policy Location  Notifications  Inventory

------ -------------- -------------- ---------- -------------   --------

gi1    Yes             Yes            Yes         Enabled        Yes

gi2    Yes             Yes            No          Enabled        No

gi3    No              No             No          Enabled        No
```

Example 2 - The following example displays the LLDP MED configuration for `gi1`.

```
switchxxxxxx# show lldp med configuration gi1


Port    Capabilities   Network Policy   Location  Notifications Inventory

------- -------------- ---------------- --------- ----------    --------

gi1     Yes             Yes             Yes       Enabled        Yes

Network policies:

Location:

Civic-address: 61:62:63:64:65:66
```

44.23 show lldp local tlvs-overloading

When an LLDP packet contains too much information for one packet, this is called overloading. Use the **show lldp local tlvs-overloading** EXEC mode command to display the status of TLVs overloading of the LLDP on all ports or on a specific port.

Syntax

show lldp local tlvs-overloading *[interface-id]*

Parameters

interface-id—Specifies a port ID.

Default Configuration

If no port ID is entered, the command displays information for all ports.

Command Mode

EXEC mode

User Guidelines

The command calculates the overloading status of the current LLDP configuration, and not for the last LLDP packet that was sent.

Example

```
Switch# show lldp local tlvs-overloading gi1

TLVs Group             Bytes       Status

------------           ------      --------------

Mandatory               31         Transmitted

LLDP-MED Capabilities   9          Transmitted

LLDP-MED Location       200        Transmitted

802.1                   1360       Overloading

Total: 1600 bytes

Left: 100 bytes
```

44.24 show lldp local

Use the **show lldp local** Privileged EXEC mode command to display the LLDP information that is advertised from a specific port.

Syntax

show lldp local *interface-id*

Parameters

Interface-id—Specifies a port ID.

Default Configuration

If no port ID is entered, the command displays information for all ports.

Command Mode

Privileged EXEC mode

Example

The following examples display LLDP information that is advertised from `gi1` and 2.

```
Switch# show lldp local gi1

Device ID: 0060.704C.73FF

Port ID: gi1

Capabilities: Bridge

System Name: ts-7800-1

System description:

Port description:

Management address: 172.16.1.8

802.3 MAC/PHY Configuration/Status

Auto-negotiation support: Supported

Auto-negotiation status: Enabled

Auto-negotiation Advertised Capabilities: 100BASE-TX full duplex, 1000BASE-T full
duplex
```

```
Operational MAU type: 1000BaseTFD
802.3 Link Aggregation
Aggregation capability: Capable of being aggregated
Aggregation status: Not currently in aggregation
Aggregation port ID: 1
802.3 Maximum Frame Size: 1522
802.3 EEE
Local Tx: 30 usec
Local Rx: 25 usec
Remote Tx Echo: 30 usec
Remote Rx Echo: 25 usec
802.1 PVID: 1
802.1 PPVID: 2 supported, enabled
802.1 VLAN: 2 (VLAN2)
802.1 Protocol: 88 8E 01
LLDP-MED capabilities: Network Policy, Location Identification
LLDP-MED Device type: Network Connectivity
LLDP-MED Network policy
Application type: Voice
Flags: Tagged VLAN
VLAN ID: 2
Layer 2 priority: 0
DSCP: 0
LLDP-MED Power over Ethernet
Device Type: Power Sourcing Entity
Power source: Primary Power Source
Power priority: High
Power value: 9.6 Watts
LLDP-MED Location
Coordinates: 54:53:c1:f7:51:57:50:ba:5b:97:27:80:00:00:67:01
Hardware Revision: B1
```

```
Firmware Revision: A1

Software Revision: 3.8

Serial number: 7978399

Manufacturer name: Manufacturer

Model name: Model 1

Asset ID: Asset 123

Switch# show lldp local gi2

LLDP is disabled.
```

44.25 show lldp statistics

Use the show **lldp statistics** EXEC mode command to display LLDP statistics on all ports or a specific port.

Syntax

show lldp statistics *[interface-id]*

Parameters

interface-id—Specifies a port ID.

Default Configuration

If no port ID is entered, the command displays information for all ports.

Command Mode

EXEC mode

Example

switchxxxxxx(config-if)# **do show lldp statistics**

Tables Last Change Time: 14-Oct-2010 32:08:18

Tables Inserts: 26

Tables Deletes: 2

Tables Dropped: 0

Tables Ageouts: 1

```
     TX Frames    RX Frame                RX  TLVs            RX Ageouts

Port  Total Total Discarded Errors   Discarded   Unrecognized  Total

----- ---- ----- --------- --------- ---------   ---------    ------------

gi1   730   850    0       0         0             0          0
gi2   0       0     0       0           0             0          0
gi3   730     0     0       0           0             0          0
gi4   0       0     0       0           0             0          0
gi5   0       0     0       0           0             0          0
gi6   8       7     0       0           0             0          1
gi7   0       0     0       0           0             0          0
gi8   0       0     0       0           0             0          0
gi9   730     0     0       0           0             0          0
gi10  0       0     0       0           0             0          0
```

44.26 show lldp neighbors

Use the **show lldp neighbors** Privileged EXEC mode command to display information about neighboring devices discovered using LLDP. The information can be displayed for all ports or for a specific port.

Syntax

show lldp neighbors *[interface-id]* [**detail** | **secondary**]

Parameters

interface-id—Specifies a port ID.

detail—Displays detailed information about a neighbor (or neighbors) from the main cache.

secondary—Displays information about neighbors from the secondary cache.

Default Configuration

If no port ID is entered, the command displays information for all ports.

Detail is the default parameter.

Command Mode

Privileged EXEC mode

User Guidelines

A TLV value that cannot be displayed as an ASCII string is displayed as an hexadecimal string.

Examples

Example 1 - The following example displays information about neighboring devices discovered using LLDP on all ports.

Location information, if it exists, is also displayed.

```
Switch# show lldp neighbors

Port    Device ID          Port ID  System Name  Capabilities TTL

--- ------------------   --------  ----------   ------------ ----

gi1 00:00:00:11:11:11      gi1      ts-7800-2     B           90

gi1 00:00:00:11:11:11 D    gi1      ts-7800-2     B           90

gi2 00:00:26:08:13:24      gi3      ts-7900-1     B, R        90

gi3 00:00:26:08:13:24      gi2      ts-7900-2     W           90
```

Example 2 - The following example displays information about neighboring devices discovered using LLDP port 1.

```
Switch# show lldp neighbors gi1

Device ID: 00:00:00:11:11:11

Port ID: gi

System Name: ts-7800-2

Capabilities: B

System description:

Port description:

Management address: 172.16.1.1

Time To Live: 90 seconds

802.3 MAC/PHY Configuration/Status

Auto-negotiation support: Supported.

Auto-negotiation status: Enabled.
```

```
Auto-negotiation Advertised Capabilities: 100BASE-TX full duplex, 1000BASE-T full
duplex.
Operational MAU type: 1000BaseTFD
802.3 Power via MDI
MDI Power support Port Class: PD
PSE MDI Power Support: Not Supported
PSE MDI Power State: Not Enabled
PSE power pair control ability: Not supported.
PSE Power Pair: Signal
PSE Power class: 1
802.3 Link Aggregation
Aggregation capability: Capable of being aggregated
Aggregation status: Not currently in aggregation
Aggregation port ID: 1
802.3 Maximum Frame Size: 1522
802.3 EEE
Remote Tx: 25 usec
Remote Rx: 30 usec
Local Tx Echo: 30 usec
Local Rx Echo: 25 usec
802.1 PVID: 1
802.1 PPVID: 2 supported, enabled
802.1 VLAN: 2(VLAN2)
802.1 Protocol: 88 8E 01
LLDP-MED capabilities: Network Policy.
LLDP-MED Device type: Endpoint class 2.
LLDP-MED Network policy
Application type: Voice
Flags: Unknown policy
VLAN ID: 0
Layer 2 priority: 0
```

```
DSCP: 0

LLDP-MED Power over Ethernet

Device Type: Power Device

Power source: Primary power

Power priority: High

Power value: 9.6 Watts

Hardware revision: 2.1

Firmware revision: 2.3

Software revision: 2.7.1

Serial number: LM759846587

Manufacturer name: VP

Model name: TR12

Asset ID: 9

LLDP-MED Location

Coordinates: 54:53:c1:f7:51:57:50:ba:5b:97:27:80:00:00:67:01
```

The following table describes significant LLDP fields shown in the display:

Field	Description
Port	The port number.
Device ID	The neighbor device's configured ID (name) or MAC address.
Port ID	The neighbor device's port ID.
System name	The neighbor device's administratively assigned name.

Field	Description
Capabilities	The capabilities discovered on the neighbor device. Possible values are: B - Bridge R - Router W - WLAN Access Point T - Telephone D - DOCSIS cable device H - Host r - Repeater O - Other
System description	The neighbor device's system description.
Port description	The neighbor device's port description.
Management address	The neighbor device's management address.
Auto-negotiation support	The auto-negotiation support status on the port. (Supported or Not Supported)
Auto-negotiation status	The active status of auto-negotiation on the port. (Enabled or Disabled)
Auto-negotiation Advertised Capabilities	The port speed/duplex/flow-control capabilities advertised by the auto-negotiation.
Operational MAU type	The port MAU type.
LLDP MED	
Capabilities	The sender's LLDP-MED capabilities.
Device type	The device type. Indicates whether the sender is a Network Connectivity Device or Endpoint Device, and if an Endpoint, to which Endpoint Class it belongs.
LLDP MED - Network Policy	
Application type	The primary function of the application defined for this network policy.

Field	Description
Flags	Flags. The possible values are: Unknown policy: Policy is required by the device, but is currently unknown. Tagged VLAN: The specified application type is using a Tagged VLAN. Untagged VLAN: The specified application type is using an Untagged VLAN.
VLAN ID	The VLAN identifier for the application.
Layer 2 priority	The Layer 2 priority used for the specified application.
DSCP	The DSCP value used for the specified application.
LLDP MED - Power Over Ethernet	
Power type	The device power type. The possible values are: Power Sourcing Entity (PSE) or Power Device (PD).
Power Source	The power source utilized by a PSE or PD device. A PSE device advertises its power capability. The possible values are: Primary power source and Backup power source. A PD device advertises its power source. The possible values are: Primary power, Local power, Primary and Local power.
Power priority	The PD device priority. A PSE device advertises the power priority configured for the port. A PD device advertises the power priority configured for the device. The possible values are: Critical, High and Low.
Power value	The total power in watts required by a PD device from a PSE device, or the total power a PSE device is capable of sourcing over a maximum length cable based on its current configuration.
LLDP MED - Location	
Coordinates, Civic address, ECS ELIN.	The location information raw data.

45 CDP Commands

45.1 cdp run

The **cdp run** Global Configuration mode command enables CDP globally. The **no** format of this command disabled CDP globally.

Syntax

cdp run

no cdp run

Parameters

N/A

Default Configuration

Enabled.

Command Mode

Global Configuration mode

User Guidelines

CDP is a link layer protocols for directly-connected CDP/LLDP-capable devices to advertise themselves and their capabilities. In deployments where the CDP/LLDP capable devices are not directly connected and are separated with CDP/LLDP incapable devices, the CDP/LLDP capable devices may be able to receive the advertisement from other device(s) only if the CDP/LLDP incapable devices flood the CDP/LLDP packets they receives. If the CDP/LLDP incapable devices perform VLAN-aware flooding, then CDP/LLDP capable devices can hear each other only if they are in the same VLAN. It should be noted that a CDP/LLDP capable device may receive advertisement from more than one device if the CDP/LLDP incapable devices flood the CDP/LLDP packets.

To learn and advertise CDP information, it must be globally enabled (it is so by default) and also enabled on interfaces (also by default).

Example

```
switchxxxxxx(conf) cdp run
```

45.2 cdp enable

The **cdp enable** Interface Configuration mode command enables CDP on interface. The **no** format of the CLI command disables CDP on an interface.

Syntax

cdp enable

Parameters

N/A

Default Configuration

Enabled

Command Mode

Ethernet Interface

User Guidelines

For CDP to be enabled on an interface, it must first be enabled globally using cdp run.

Example

```
switchxxxxxx(conf) cdp run
switchxxxxxx(conf) interface gi1
switchxxxxxx(conf-if)cdp enable
```

45.3 cdp pdu

Use the **cdp pdu** Global Configuration mode command when CDP is not enabled globally. It specifies CDP packets handling when CDP is globally disabled. The **no** format of this command returns to default.

Syntax

cdp pdu [filtering | bridging | flooding]

no cdp pdu

Parameters

filtering—Specify that when CDP is globally disabled, CDP packets are filtered (deleted).

bridging—Specify that when CDP is globally disabled, CDP packets are bridged as regular data packets (forwarded based on VLAN).

flooding—Specify that when CDP is globally disabled, CDP packets are flooded to all the ports in the product that are in STP forwarding state, ignoring the VLAN filtering rules.

Default Configuration

bridging

Command Mode

Global Configuration mode

User Guidelines

When CDP is globally enabled, CDP packets are filtered (discarded) on CDP-disabled ports.

In the flooding mode, VLAN filtering rules are not applied, but STP rules are applied. In case of MSTP, the CDP packets are classified to instance 0.

Example

```
switchxxxxxx(conf) cdp run

switchxxxxxx(conf) cdp pdu flooding
```

45.4 cdp advertise-v2

The **cdp advertise-v2** Global Configuration mode command specifies version 2 of transmitted CDP packets. The **no** format of this command specifies version 1.

Syntax

cdp advertise-v2

no cdp advertise-v2

Parameters

N/A

Default Configuration

Version 2.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(conf) cdp run

switchxxxxxx(conf)cdp advertise-v2
```

45.5 cdp appliance-tlv enable

The **cdp appliance-tlv enable** Global Configuration mode command enables sending of the Appliance TLV. The **no** format of this command disables the sending of the Appliance TLV.

Syntax

cdp appliance-tlv enable

no cdp appliance-tlv enable

Parameters

N/A

Default Configuration

Enabled

Command Mode

Global Configuration mode

User Guidelines

This MIB specifies the Voice Vlan ID (VVID) to which this port belongs:

- **0** - The CDP packets transmitting through this port would contain Appliance VLAN-ID TLV with value of 0. VoIP and related packets are expected to be sent and received with VLAN-id=0 and an 802.1p priority.
- **1-4094** - The CDP packets transmitting through this port would contain Appliance VLAN-ID TLV with N. VoIP and related packets are expected to be sent and received with VLAN-ID=N and an 802.1p priority.
- **4095** - The CDP packets transmitting through this port would contain Appliance VLAN-ID TLV with value of 4095. VoIP and related packets are expected to be sent and received untagged without an 802.1p priority.
- **4096** - The CDP packets transmitting through this port would not include Appliance VLAN-ID TLV; or, if the VVID is not supported on the port, this MIB object will not be configurable and will return 4096.

Example

```
switchxxxxxx(conf) cdp appliance-tlv enable
```

45.6 cdp mandatory-tlvs validation

Use the **cdp mandatory-tlvs validation** Global Configuration mode command to validate that all mandatory (according to CDP protocol) TLVs are present in received CDP frames. The **no** format of this command disables the validation.

If the mandatory TLVs are not included in the packet, it is deleted.

Syntax

cdp mandatory-tlvs validation

no cdp mandatory-tlvs validation

Parameters

N/A

Default Configuration

Enabled.

Command Mode

Global Configuration mode

Example

Turns off mandatory TLV validation:

```
switchxxxxxx(conf) no cdp mandatory-tlvs validation
```

45.7 cdp source-interface

The **cdp source-interface** Global Configuration mode command specifies the CDP source port used for source IP address selection. The **no** format of this command deletes the source interface.

Syntax

cdp source-interface *interface-id*

no cdp source-interface

Parameters

interface-id—Source port used for Source IP address selection.

Default Configuration

No CDP source interface is specified.

Command Mode

Global Configuration mode

User Guidelines

Use the **cdp source-interface** command to specify an interface whose minimal IP address will be advertised in the TVL instead of the minimal IP address of the outgoing interface.

Example

```
switchxxxxxx(conf) cdp source-interface gi1
```

45.8 cdp log mismatch duplex

Use the **cdp log mismatch duplex** Global and Interface Configuration mode command to enable validating that the duplex status of a port received in a CDP packet matches the ports actual configuration. If not, a SYSLOG duplex mismatch message is generated. The **no** format of the CLI command disables the generation of the SYSLOG messages.

Syntax

cdp log mismatch duplex

no cdp log mismatch duplex

Parameters

N/A

Default Configuration

The switch reports duplex mismatches from all ports.

Command Mode

Global Configuration mode

Ethernet Interface

Example

```
switchxxxxxx(conf) interface gi1

switchxxxxxx(conf-if) cdp log mismatch duplex
```

45.9 cdp log mismatch voip

Use the **cdp log mismatch voip** Global and Interface Configuration mode command to enable validating that the VoIP status of the port received in a CDP packet matches its actual configuration. If not, a SYSLOG message is generated by CDP. The **no** format of the CLI command disables the generation of the SYSLOG messages.

Syntax

cdp log mismatch voip

no cdp log mismatch voip

Parameters

N/A

Default Configuration

The switch reports voip mismatches from all ports.

Command Mode

Global Configuration mode

Ethernet Interface

Example

```
switchxxxxxx(conf) interface gi1

switchxxxxxx(conf-if) cdp log mismatch voip
```

45.10 cdp log mismatch native

Use the **cdp log mismatch native** Global and Interface Configuration mode command to enable validating that the native VLAN received in a CDP packet matches the actual native VLAN of the port. If not, a SYSLOG native mismatch message is generated. The **no** format of the CLI command disables the generation of the SYSLOG messages.

Syntax

cdp log mismatch native

no cdp log mismatch native

Parameters

N/A

Default Configuration

The switch reports Native VLAN mismatches from all ports.

Command Mode

Global Configuration mode

Ethernet Interface

Example

```
switchxxxxxx(conf) interface gi1

switchxxxxxx(conf-if) cdp log mismatch native
```

45.11 cdp device-id format

The **cdp device-id format** Global Configuration mode command specifies the format of the Device-ID TLV. The **no** format of this command returns to default.

Syntax

cdp device-id format {mac | serial-number}

no cdp device-id format

Parameters

mac—Specifies that the Device-ID TLV contains the device's MAC address.

serial-number—Specifies that Device-ID TLV contains the device's hardware serial number.

Default Configuration

MAC address is selected by default.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(conf) cdp device-id format serial-number
```

45.12 cdp timer

The **cdp timer** Global Configuration mode command specifies how often CDP packets are transmitted. The **no** format of this command returns to default.

Syntax

cdp timer *seconds*

no cdp timer

Parameters

seconds—Value of the Transmission Timer in seconds. Range: 5-254 seconds.

Default Configuration

60 seconds.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(conf) cdp timer 100
```

45.13 cdp holdtime

The **cdp holdtime** Global Configuration mode command specified a value of the Time-to-Live field into sent CDP messages. The **no** format of this command returns to default.

Syntax

cdp holdtime *seconds*

no cdp timer

Parameters

seconds—Value of the Time-to-Live field in seconds. The value should be bigger than the value of Transmission Timer.

Parameters range

seconds— 10 - 255.

Default Configuration

180 seconds.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(conf) cdp holdtime 100
```

45.14 clear cdp counters

The **clear cdp counters** Global Configuration mode command resets the CDP traffic counters to 0.

Syntax

clear cdp counters

Parameters

N/A

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(conf) clear cdp couters
```

45.15 clear cdp table

The **clear cdp table** Global Configuration mode command deletes the CDP Cache tables.

Syntax

clear cdp table

Parameters

N/A

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(conf) clear cdp table
```

45.16 show cdp

The **show cdp** Privileged EXEC mode command displays the interval between advertisements, the number of seconds the advertisements are valid and version of the advertisements.

Syntax

show cdp

Parameters

N/A

Command Mode

Privileged EXEC mode

Example

```
switch>show cdp
Global CDP information:
   cdp is globally enabled
   cdp log duplex mismatch is globally enabled
   cdp log voice VLAN mismatch is globally enabled
   cdp log native VLAN mismatch is globally disabled
   Mandatory TLVs are
     Device-ID TLV (0x0001
```

```
    Address TLV (0x0002)
    Port-ID TLV (0x0003)
    Capabilities TLV (0x0004)
    Version TLV (0x0005)
    Platform TLV (0x0006)
  Sending CDPv2 advertisements is enabled
  Sending Appliance TLV is enabled
  Device ID format is Serial Number
  Sending CDP packets every 60 seconds
  Sending a holdtime value of 180 seconds
```

45.17 show cdp entry

The **show cdp entry** Privileged EXEC mode command displays information about specific neighbor. Display can be limited to protocol or version information

Syntax

show cdp entry {***** | *device-name}* [**protocol** | **version**]

Parameters

*****—Specifies all neighbors

device-name—Specifies the name of the neighbor.

protocol—Limits the display to information about the protocols enabled on neighbors.

version—Limits the display to information about the version of software running on the neighbors.

Default Configuration

Version

Command Mode

Privileged EXEC mode

Example

```
switch#show cdp entry device.cisco.com
Device ID: device.cisco.com
```

```
Advertisement version: 2
Entry address(es):
   IP address: 192.168.68.18
   CLNS address: 490001.1111.1111.1111.00
   DECnet address: 10.1
Platform: cisco 4500,  Capabilities: Router
Interface: gi1,  Port ID (outgoing port): Ethernet0
Holdtime: 125 sec
Version:
Cisco Internetwork Operating System Software
IOS (tm) 4500 Software (C4500-J-M), Version 11.1(10.4), MAINTENANCE INTERIM
SOFTWARE
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Mon 07-Apr-97 19:51 by dschwart
```

```
switch#show cdp entry device.cisco.com protocol
Protocol information for device.cisco.com:
  IP address: 192.168.68.18
  CLNS address: 490001.1111.1111.1111.00
  DECnet address: 10.1
```

```
switch#show cdp entry device.cisco.com version
Version information for device.cisco.com:
  Cisco Internetwork Operating System Software
IOS (tm) 4500 Software (C4500-J-M), Version 11.1(10.4), MAINTENANCE INTERIM
SOFTWARE
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Mon 07-Apr-97 19:51 by dschwart
```

45.18 show cdp interface

The **show cdp interface** Privileged EXEC mode command displays information about ports on which CDP is enabled.

Syntax

show cdp interface *interface-id*

Parameters

interface-id—Port ID.

Command Mode

Privileged EXEC mode

Example

```
switch#show cdp interface gi1
CDP is globally enabled
CDP log duplex mismatch
  Globally is enabled
  Per interface is enabled
CDP log voice VLAN mismatch
  Globally is enabled
  Per interface is enabled
CDP log native VLAN mismatch
  Globally is disabled
  Per interface is enabled
gi1 is Down, CDP is enabled
Sending CDP packets every 60 seconds
Holdtime is 180 seconds
```

45.19 show cdp neighbors

The **show cdp neighbors** Privileged EXEC mode command displays information about neighbors kept in the main or secondary cache.

Syntax

show cdp neighbors [*interface-id*] [**detail** | **secondary**]

Parameters

- **interface-id**—Displays the neighbors attached to this port.
- **detail**—Displays detailed information about a neighbor (or neighbors) from the main cache including network address, enabled protocols, hold time, and software version.

- **secondary**—Displays information about neighbors from the secondary cache.

Default Configuration

If interface-id is not specified, the command displays information for neighbors of all ports.

If detail or secondary are not specified, the default is secondary.

Command Mode

Privileged EXEC mode

Example

switch#**show cdp neighbors**

```
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

S - Switch, H - Host, I - IGMP, r - Repeater,P - VoIP Phone,

M - Remotely-Managed Device, C - CAST Phone Port, W - Two-Port MAC Relay
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - VoIP Phone
                  M - Remotely-Managed Device, C - CAST Phone Port,
                  W - Two-Port MAC Relay

    Device ID       Local      Adv  Time To Capability   Platform     Port ID
                    Interface  Ver. Live
------------------ ----------- ---- ------- ---------- ------------ -----------
PTK-SW-A-86.marvel    gi48      2     147      S I     cisco        GigabitEthe
l.com                                                  WS-C4510R-E  rnet3/39
    ESW-520-8P        gi48      2     153     S I M     ESW-520-8P      g1
    ESW-540-8P        gi48      2     146     S I M     ESW-540-8P      g9
   003106131611       gi48      2     143      S I     Cisco           fa2/2/1
                                                       SG500-28P
                                                       (PID:SG500-2
                                                       8P-K9)-VSD
   001828100211       gi48      2     173      S I     Cisco SF        fa20
                                                       200-48P
                                                       (PID:SLM248P
                                                       T)-VSD
   c47d4fed9302       gi48      2     137      S I     Cisco SF        fa12
                                                       200-48
```

switch#**show cdp neighbors detail**

```
-------------------------
Device ID: lab-7206
Advertisement version: 2
Entry address(es):
   IP address: 172.19.169.83
Platform: cisco 7206VXR,  Capabilities: Router
Interface: Ethernet0,  Port ID (outgoing port): fa 0
Time To Live : 123 sec
Version :
Cisco Internetwork Operating System Software
IOS (tm) 5800 Software (C5800-P4-M), Version 12.1(2)
Copyright (c) 1986-2002 by Cisco Systems, Inc.
Duplex: half
-------------------------
Device ID: lab-as5300-1
Entry address(es):
   IP address: 172.19.169.87
Platform: cisco AS5300,  Capabilities: Router
--More--
```

Gateway#show **cdp neighbors fa 1 detail**

```
Device ID: SEP000427D400ED
Advertisement version: 2
Entry address(es):
  IP address: 1.6.1.81
Platform: Cisco IP Phone 7940,   Capabilities: Host
Interface: fa 1,   Port ID (outgoing port): Port 1
Time To Live: 150 sec
Version :
P00303020204
```

```
Duplex: full

Power drawn: 6.300 Watts
```

```
switch#show cdp neighbors secondary

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

S - Switch, H - Host, I - IGMP, r - Repeater,

P - VoIP Phone,M - Remotely-Managed Device,

C - CAST Phone Port, W - Two-Port MAC Relay
Local Interface  Mac Address        TimeToLive   Capability  VLAN-ID   Platform
fa 1             00:00:01:23a:86:9c    157          R,S        10      206VXRYC
fa 1             00:00:05:53a:86:9c    163          R,S        10      ABCD-VSD
fa 3             00:00:01:23b:86:9c    140          R                    QACSZ
fa 3             00:00:ab:c2a:86:9c    132          T                   CAT3000
```

Field Definitions:

- **Advertisement version**—The version of CDP being used for CDP advertisements.
- **Capabilities**—The device type of the neighbor. This device can be a router, a bridge, a transparent bridge, a source-routing bridge, a switch, a host, an IGMP device, or a repeater.
- **COS for Untrusted Ports**—The COS value with which all packets received on an untrusted port should be marked by a simple switching device which cannot itself classify individual packets.
- **Device ID**—The name of the neighbor device and either the MAC address or the serial number of this device.
- **Duplex**—The duplex state of connection between the current device and the neighbor device.
- **Entry address(es)**—A list of network addresses of neighbor devices.
- **Extended Trust**—The Extended Trust.
- **External Port-ID**—Identifies the physical connector port on which the CDP packet is transmitted. It is used in devices, such as those with optical ports, in which signals from multiple hardware interfaces are multiplexed through a single physical port. It contains the name of the external physical port through which the multiplexed signal is transmitted.

- **Interface**—The protocol and port number of the port on the current device.
- IP Network Prefix—It is used by On Demand Routing (ODR). When transmitted by a hub router, it is a default route (an IP address). When transmitted by a stub router, it is a list of network prefixes of stub networks to which the sending stub router can forward IP packets.
- **Management Address**—When present, it contains a list of all the addresses at which the device will accept SNMP messages, including those it will only accept when received on interface(s) other than the one over which the CDP packet is being sent.
- **MTU**—The MTU of the interface via which the CDP packet is sent.
- **Native VLAN**—The ID number of the VLAN on the neighbor device.
- **Physical Location**—A character string indicating the physical location of a connector which is on, or physically connected to, the interface over which the CDP packet containing this TLV is sent.
- **Platform**—The product name and number of the neighbor device. In the case of the Secondary Cache only the 8 last characters of the value are printed.
- **Power Available**—Every switch interface transmits information in the Power Available TLV, which permits a device which needs power to negotiate and select an appropriate power setting. The Power Available TLV includes four fields.
- **Power Consumption**—The maximum amount of power, in milliwatts, expected to be obtained and consumed from the interface over which the CDP packet is sent.
- **Power Drawn**—The maximum requested power.

  Note: For IP Phones the value shown is the maximum requested power (6.3 Watts). This value can be different than the actual power supplied by the routing device (generally 5 watts; shown using the show power command).
- **Protocol-Hello**—Specifies that a particular protocol has asked CDP to piggyback its "hello" messages within transmitted CDP packets.
- **Remote Port_ID**—Identifies the port the CDP packet is sent on
- sysName—An ASCII string containing the same value as the sending device's sysName MIB object.

- sysObjectID—The OBJECT-IDENTIFIER value of the sending device's sysObjectID MIB object.
- **Time To Live**—The remaining amount of time, in seconds, the current device will hold the CDP advertisement from a transmitting router before discarding it.
- **Version**—The software version running on the neighbor device.
- **Voice VLAN-ID**—The Voice VLAN-ID.
- **VTP Management Domain**—A string that is the name of the collective group of VLANs associated with the neighbor device.

45.20 show cdp tlv

The **show cdp tlv** Privileged EXEC mode command displays information about TLVs sent by CDP on all ports or on a specific port.

Syntax

show cdp tlv [*interface-id*]

Parameters

interface-id— Port ID.

Default Configuration

TLVs for all ports.

Command Mode

Privileged EXEC mode

User Guidelines

You can use the **show cdp tlv** command to verify the TLVs configured to be sent in CDP packets. The **show cdp tlv** command displays information for a single port if specified or for all ports if not specified. Information for a port is displayed if only CDP is really running on the port, i.e. CDP is enabled globally and on the port, which is UP.

Examples:

Example 1 - In this example, CDP is disabled and no information is displayed.

```
switch#show cdp tlv
cdp globally is disabled
```

Example 2 - In this example, CDP is globally enabled but disabled on the port and no information is displayed.

```
switch#show cdp tlv gi2
cdp globally is enabled
Capability Codes: R - Router,T - Trans Bridge, B - Source Route Bridge
S - Switch, H - Host, I - IGMP, r - Repeater,
P - VoIP Phone,M - Remotely-Managed Device,
C - CAST Phone Port, W - Two-Port MAC Relay
Interface TLV: gi2
CDP is disabled on gi2
```

Example 3 - In this example, CDP is globally enabled and enabled on the port, but the port is down and no information is displayed.

```
switch#show cdp tlv interface gi2
cdp globally is enabled
Capability Codes: R - Router,T - Trans Bridge, B - Source Route Bridge
S - Switch, H - Host, I - IGMP, r - Repeater,
P - VoIP Phone,M - Remotely-Managed Device,
C - CAST Phone Port, W - Two-Port MAC Relay
Interface TLV: gi3
CDP is enabled on gi3
Ethernet gi3 is down
```

Example 4 - In this example, CDP is globally enabled and enabled on the port, which is up and information is displayed.

```
switch#show cdp tlv interface gi1

cdp globally is enabled

Capability Codes: R - Router,T - Trans Bridge, B - Source Route Bridge

S - Switch, H - Host, I - IGMP, r - Repeater,

P - VoIP Phone,M - Remotely-Managed Device,

C - CAST Phone Port, W - Two-Port MAC Relay

Interface TLV: gi1

CDP is enabled

Ethernet gi1 is up,

Device ID TLV: type is MAC address; Value is 00:11:22:22:33:33:44:44

Address TLV: IPv4:  1.2.2.2 IPv6:

Port_ID TLV: gi1

Capabilities: S, I

Version TLV: 1 and 2

Platform TLV: VSD Ardd

Native VLAN TLV: 1

Full/Half Duplex TLV: full-duplex

Appliance VLAN_ID TLV: Appliance-ID is 1; VLAN-ID is 100

COS for Untrusted Ports TLV: 1

Power Available TLV: Request-ID is 1 Power management-ID is 1;

                                     Available-Power is 10;

                                     Management-Power-Level is 0xFFFFFFFF
```

Example 5 - In this example, CDP is globally enabled, and no ports are specified, so information is displayed for all ports on which CDP is enabled who are up.

```
switch#show cdp tlv interface

cdp globally is enabled

Capability Codes: R - Router,T - Trans Bridge, B - Source Route Bridge
```

```
S - Switch, H - Host, I - IGMP, r - Repeater,

P - VoIP Phone,M - Remotely-Managed Device,

C - CAST Phone Port, W - Two-Port MAC Relay

Interface TLV: gi1

CDP is enabled

Ethernet gi1 is up,

Device ID TLV: type is MAC address; Value is 00:11:22:22:33:33:44:44

Address TLV: IPv4:  1.2.2.2 IPv6:

Port_ID TLV: gis1

Capabilities: S, I

Version TLV: 1 and 2

Platform TLV: VSD Ardd

Native VLAN TLV: 1

Full/Half Duplex TLV: full-duplex

Appliance VLAN_ID TLV: Appliance-ID is 1; VLAN-ID is 100

COS for Untrusted Ports TLV: 1

Power Available TLV: Request-ID is 1 Power management-ID is 1;
                                     Available-Power is 10;
                                     Management-Power-Level is 0xFFFFFFFF

Interface TLV: gi2

CDP is disabled on gi2

Interface TLV: gi3

CDP is enabled on gi3

Ethernet gi3 is down
```

45.21 show cdp traffic

The **show cdp traffic** Privileged EXEC mode command displays the CDP counters, including the number of packets sent and received and checksum errors.

Syntax

show cdp traffic

Parameters

N/A

Command Mode

Privileged EXEC mode

Example

```
switch#show cdp traffic

CDP counters:

     Total packets output: 81684,  Input: 81790

     Hdr syntax:  0, Chksum error: 0, Encaps: 0

     No memory:  0, Invalid packet: 0

     CDP version 1 advertisements output:  100,    Input  0

     CDP version 2 advertisements output:  81784,  Input  0
```

Field Definitions:

- **Total packets output**—The number of CDP advertisements sent by the local device. Note that this value is the sum of the CDP Version 1 advertisements output and CDP Version 2 advertisements output fields.
- **Input**—The number of CDP advertisements received by the local device. Note that this value is the sum of the CDP Version 1 advertisements input and CDP Version 2 advertisements input fields.
- **Hdr syntax**—The number of CDP advertisements with bad headers, received by the local device.
- **Chksum error**—The number of times the checksum (verifying) operation failed on incoming CDP advertisements.
- **No memory**—The number of times the local device did not have enough memory to store the CDP advertisements in the advertisement cache table when the device was attempting to assemble advertisement packets for transmission and parse them when receiving them.
- **Invalid**—The number of invalid CDP advertisements received.
- CDP version 1 advertisements output The number of CDP Version 1 advertisements sent by the local device.

- **CDP version 1 advertisements Input**—The number of CDP Version 1 advertisements received by the local device.
- **CDP version 2 advertisements output**—The number of CDP Version 2 advertisements sent by the local device.
- **CDP version 2 advertisements Input**—The number of CDP Version 2 advertisements received by the local device.