



CLI GUIDE

Cisco Small Business 300 Series Managed Switches
Command Line Interface Guide Release 1.3

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Introduction

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

- **User (Privilege) Levels**
- **CLI Command Modes**
- **Accessing the CLI**
- **CLI Command Conventions**
- **Editing Features**
- **Interface Naming Conventions**
- **System Modes**

Overview

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

Users are assigned privilege levels. Each user privilege level can access specific CLI modes. User levels are described in the section below.

User (Privilege) Levels

Users can 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 or commands in the Privileged EXEC mode.
- **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}
```

Using these passwords, you can raise your user level by entering the command: **enable** and the password for level 7 or 15. You 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.

1. Example 1—Create passwords for level 7 and 15 (by the administrator):

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

Example 2—Create a user with user level 1:

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

Example 3— Switch between Level 1 to Level 15. The user must know the password:

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

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 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 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.

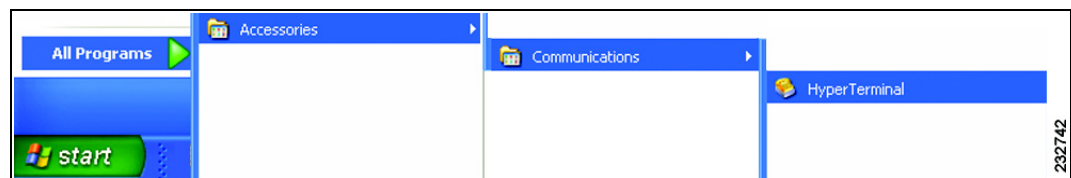
The switch's RS-232 serial console port provides a direct connection to a computer's serial port using a standard DB-9 null-modem or crossover cable. Once the computer and switch are connected, run a terminal application to access the CLI.

To access the CLI 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 *CL/* appears, enter **cisco** at the *User Name* prompt and press **Enter**.

The **switchxxxxx#** 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 CLI over an IP network.

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

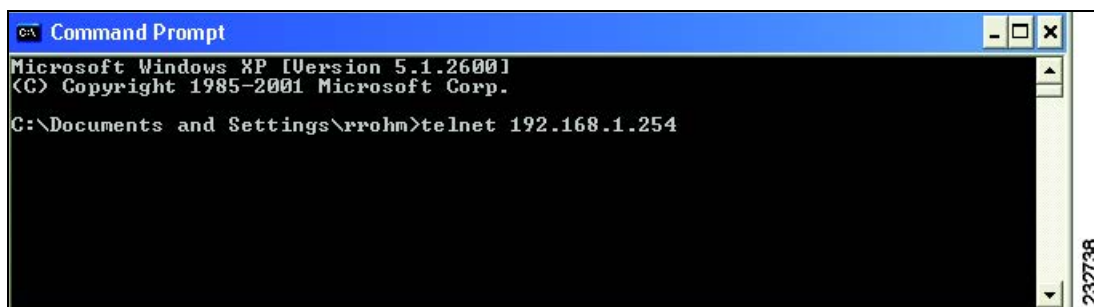
- STEP 1** Click **Start**, then select **All Programs > Accessories > Command Prompt** to open a command prompt.

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 CLI prompt is 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 {autol on off} means that for the flowcontrol command, either auto, on, or off must be selected.
<i>parameter</i>	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 Display	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.
<i>text</i>	When free text can be entered as a parameter for a command (for example in command: snmp-server contact) if the text consists of multiple words separated by blanks, the entire string must appear in double quotes. For example: snmp-server contact "QA on floor 8"

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 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 attempts to identify and complete the command. If the characters already entered are not sufficient 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, ensure 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:
 - **GigabitEthernet ports (10/100/1000 bits)** — This can be written as either **GigabitEthernet** 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**

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

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>]}
```

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

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

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

```
console#configure
console(config-if)#interface range gi1-5, vlan 1-2
```

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 (also known as zone) = vlan<vlan-id> | po<number> | tunnel<number> | port<number> | 0

If the egress interface 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.

System Modes

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

This command performs a system reboot.

In Switch system mode, the switch forwards packets as a VLAN-aware bridge. In Router system mode, the switch performs both IPv4 routing and VLAN-aware bridging.

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

If Router system 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 Router system mode, the switch routes traffic between IP VLANs, and bridges traffic with VLANs.

When the switch operates in Router system mode, the following features are not supported:

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

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'.

```
switchxxxxx# login
User Name:bob
Password:*****
switchxxxxx#
```

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.

```
switchxxxxx# configure
switchxxxxx(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.

```
switchxxxxx# 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.

```
switchxxxxx(config)# end  
switchxxxxx#
```

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# he!p
```

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

terminal no 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 terminal width

Use the **terminal width** EXEC mode command to determine the width of the display for the echo input to CLI sessions and configuration files. Use **terminal no width** to return to the default.

The command is per session and will not be saved in the configuration database.

Syntax

terminal width *number-of-characters*

terminal no width

Parameters

number-of-characters - Specifies the number of characters to be displayed for the echo output of the CLI commands and the configuration file,'0' means endless number of characters on a screen line. (Range: 0, 70-512)

Default Configuration

The default number of characters is 77.

Command Mode

Privileged EXEC mode

Example

The following example sets the terminal width to 100 characters

```
switchxxxxx# terminal width 100
```

2.15 terminal prompt

Use the **terminal prompt** EXEC mode command to enable the terminal prompts. Use **terminal no prompt** command to disable the terminal prompts.

The command is per session and will not be saved in the configuration database.

Syntax

terminal prompt

terminal no prompt

Parameters

N/A

Default Configuration

The default configuration is prompts enabled.

Command Mode

Privileged EXEC mode

Example

The following example disables the terminal prompts

```
switchxxxxxx# terminal no prompt
```

2.16 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)
```

2.17 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
```

2.18 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)#
```

2.19 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.

Token	Information displayed in the banner
\$(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.

```
switchxxxxx(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
```

2.20 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
```

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 (**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](#).
- 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](#) 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 *\$keywordn* 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.

```
switchxxxxx(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

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(config)# 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* / *detailed*] / *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.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display description of all macros on present ports. If detailed is not used, only present ports are displayed.

Command Mode

User EXEC mode

Examples

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

```
switchxxxxx# 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.

```
switchxxxxx# 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.

```
switchxxxxx# 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
-----
```

RSA and Certificate Commands

Keys and Certificates

The device automatically generates default RSA/DSA keys and certificates at following times:

- When the device is booted following a software upgrade.
- When the device is booted with an empty configuration.
- When user-defined keys/certificates are deleted.

Some commands in this section are used to generate user-defined RSA/DSA keys and certificates that replace the default keys and are used by SSL and SSH server commands. Other commands can be used to import these keys from an external source.

These keys and certificates are stored in the configuration files.

Table 1 describes when these keys/certificates are displayed..

Table 1: Keys Displayed with Show Commands

File Type Being Displayed	What is Displayed in a Show Command Without Detailed	What is Displayed in a Show Command With Detailed
Startup Config	Only user-defined keys/certificates.	Option is not supported.
Running Config	Keys are not displayed.	All keys (default and user-defined)
Text-based CLI (local backup config. file, mirror config. file or remote backup config. file)	Keys are displayed as they were copied. There is no distinction here between default and user-defined keys.	Option is not supported.

Table 2 describes how keys/certificates can be copied from one type of configuration file to another (using the **copy** command)..

Table 2: Copying Keys/Certificates

Destination File Type	Copy from Running Config.	Copy from Startup Config.	Copy from Remote/Local Backup Config. File or Mirror Config. File
Startup Config.	All keys/certificates are copied (but only user-defined ones can be displayed	Option is not supported.	All keys/certificates present in this file are copied. ^{1,2}
Running Config	N/A	Only user defined.	All keys/certificates present in this file are copied. ²
Text-based CLI (local backup config. file, mirror config. file or remote backup config. file)	All keys (default and user)	Only user defined.	All keys/certificates present in this file are copied. ²

1. If the Running Configuration file on the device contains default keys (not user-defined ones), the same default keys remain after reboot.
2. In a text-based configuration file, there is no distinction between automatically-defined, default keys and user-defined keys.

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

The application creates a default key automatically.

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 default or user defined, a warning is displayed with a prompt to replace the existing keys with new keys.

Erasing of the startup configuration or returning to factory defaults automatically deletes the default keys and they are recreated during device initialization.

See [Keys and Certificates](#) for information on how to display and copy this key pair.

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

The application creates a default key automatically.

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.

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.

See [Keys and Certificates](#) for information on how to display and copy this key pair.

Example

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

```
switchxxxxx(config)# crypto key generate rsa
Replace Existing RSA Key [y/n]? N
switchxxxxx(config)#
```

4.3 **crypto key import**

The **crypto key import** Global Configuration mode command imports the DSA/RSA key pair.

Use the no form of the command to remove the user key and generate a new default in its place.

Syntax

```
crypto key import {dsa | rsa}
encrypted key import {dsa | rsa}
no crypto key {dsa | rsa}
```

Parameters

N/A

Default Configuration

DSA and RSA key pairs do not exist.

Command Mode

Global Configuration mode

User Guidelines

DSA/RSA keys are imported in pairs - one public DSA/RSA key and one private DSA/RSA key.

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

This command is saved in the Running Configuration file.

When using the **encrypted** key-word, the private key is imported in its encrypted form.

Example

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

Example 1 - Import plaintext key

```

switchxxxxx(config)# crypto key import rsa
Replace Existing RSA Key [y/n]? Y
-----BEGIN RSA PRIVATE KEY-----
MIICWQIBAAKBgQDM3fV+7nopIQ5l2sZU8gkekCzwbw0MiQF2pnarRA+IoKcs/DReyT21NU
podlDmMltefzVBmmiVo8skggfcHVxz3oPsgV9WRs9sxFvPbh2m5aY9VUtSVDLmcIp0MK6L
kopUPrOPeCm6EuEwmivscMAC7l4GsiLYi7AxUm5qTkzT3wIBIwKBgAu06XT3rzWM3EBVp0
7pQlmeLnqKAL7jQemF2uU3FtSbd0RmLuDYTKtE364ypYL/OGvMwTby4Wei9apQkrwe71b5
08eYGCr80QrPWWUE/6FeMDqnJQeZJ8lWHSw5qwAut+wOJ9yHyAQTG2pPas6lM2VYP19Hmb
YwBmB3H47zjjfrAkeA8CYFRVHNLWpZ9wEXSGTJe4QIdk8w2SUBNTxrsqrzylo89yuyV/K8
qzvPuX00rondozPEXd8iBqDir+qLI6Nv9wJBANpjwLZmmNEa1aC+UE4/VXnWMnH0HILVod
hPgozTFJaddE/OSdgKthlFnHLrFw8yt8LVPvZdwjyftn3bmYRwkVkQHskwLte/UHx0+0A
h6bR3jSt2Dl269cv0xnbhMR+63DqAFrMFmuhyVp8IxvDp3rMSNiSW9sYPvnvo/1lAn+7T
0CQBj1dUuz9DUno2LT6+uvd3ujc3q80A7z1/t2zRdolKN/tYV2qVqE4Zx8++/gwmgjDa/d
209bLCQvgpIKd/Hg+qsCQC3KSMwNTQ11SlSf/iA0QkMrunMsBha59wo+tMfdk3/kZkTdQT
knkRQxydFB7pQBojzbqfYL5Zl/R5HR+2r38Tc=
-----END RSA PRIVATE KEY-----

```

```

-----BEGIN RSA PUBLIC KEY-----
MIGHAoGBAMzd9X7ueikhDmXaxlTyCR6QLPBvDQyJAXamdqtED4igpyz8NF7JPbU1Smh2U0
YyW15/NUGaaJWjyySCB9wdXHPeg+yBX1ZGz2zEW89uHablPJ1VS1JUMuZwinQwrouSilQ+
s494KboS4TCaK+wIwALuXgayItiLSDFSbmp0TNPfAgEj
-----END RSA PUBLIC KEY-----

```

.

Example 2 - Import encrypted key

```

encrypted crypto key import rsa
---- BEGIN SSH2 ENCRYPTED PRIVATE KEY ----
Comment: RSA Private Key
84et9C2XUfcRlpemuGINAygnLwfkKJcDM6m20ReALHScqqLhi0wMSSYNLT1IWFZP1kEVHH
Fpt1aECZi7HfGLcp1pMZwn1+HaXBtQjPDiEtbpScXqrg6ml1/0EnwpFK2TrmUy0Iifwk8
E/mMfX3i/2rRZLkEBea5jrA6Q62gl5naRw1Zk0ges+GNeibtvZYSk1jzr56Lur6fT7Xu5i
KMcU2b2NsuSD5yW8R/x0CW2elqDDz/biA2gSgd6FfnW2HV48bTC55eCKrsId2MmjbExUdz
+RQRhzjcGMBYp6HzkD66z8HmSh0U+hKd7M1K9U4Sr+Pr1vyWUJLEk0gz906aZoIGp4tgm4
VDy/K/G/sI5nVL0+bR8LFUXU0/U5hohBcyRUF02fHYKZrhTiPT5Rw+Pht6/+EXKG9E+TRS
lUADmltCRvs+lsB33IBdvoRDdl98YaA2htZay1TkbMqCUBdfL0+74U0qa/b+bp67wCYKe9
yen418MaYKtcHJBQmF7sUQZQGP34VPm0MyZzon68S/ZoT77cy0ihRZx9wcI1yYhJnDiYxP
dgXHYHw6kCTcTj6LrUSQuXCJ9su89ZIWNn50wdgonLSpvfnavb2GHmmeLaveL7JJ/7Ucf0
61q5D4PJ67Vk2xL7PqyHXN931rseTzPuJplkSLCFZ5uqTMbWwyQEKmHDl0x35vlgou5tky
9LgIwG4d+9edctZZaggeq5cgjnsZWJgUoB4Bn4hIreyOdHDiFUPPRxkoyhG0GnJuvx9T9
K6BF1wBTdDQS+Gu47/0/gRoD/50q4sGkzqHsRJJ53W0T0Q1bHMTMLPpwn2NxzvfgxWL/bu
QhZZSqRonG6MX1cP7KT7i4TPq2w2k3TGtNBnVYHx60oNcaTHmg1N2s50gRsyXD9tF++6nY
RfMN8CsV+9jQKQP7ZaGc8Ju+d72jvSwppSr032HY+IpzZ4ujkK+/X5oawZL5NnkaEQTKX
RSL55S405NP0jS/pc9hg7GaVjoY2mQ7HDpSUBeTIDTlv0wC2kskA9C6aF/Axj2dXLweQd5
lxk7m0/mMNaiJsNk6y33LcuKjIxpNNjK9n9KzRPkGNMF0bprfenWkteDftjq==
---- END SSH2 PRIVATE KEY ----
---- BEGIN SSH2 PUBLIC KEY ----
Comment: RSA Public Key
AAAB3NzaC1yc2EAAAABIwAAAIEAvRHsKry6NKMkymb+yWEp9042vupLvYVq3ngt1sB9JH

```



```
OcdK/2nw7lCQguy1mLsX8/bKMXYSk/3aBEvaoJQ82+r/nRf0y3HTy4Wp9zV0SiVC8jLD+7
7t0aHejzfUhr0FRhWwCLnvYwr+nmrYDpS6FADMC2hVA85KZRye9ifxT7otE=
---- END SSH2 PUBLIC KEY ----
```

4.4 show crypto key

The **show crypto key** Privileged EXEC mode command displays the device's SSH private and public keys for both default and user-defined keys.

Syntax

show crypto key [*mypubkey*] [*rsa* | *dsa*]

Parameters

- **mypubkey**—Displays only the public key.
- **rsa**—Displays the RSA key.
- **dsa**—Displays the DSA key.

Default Configuration

N/A

Command Mode

Privileged EXEC mode

User Guidelines

See [Keys and Certificates](#) for information on how to display and copy these keys.

Example

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

```
switchxxxxxx# show crypto key mypubkey dsa
---- BEGIN SSH2 PUBLIC KEY ----
Comment: RSA Public Key
AAAAB3NzaC1yc2EAAAABIwAAAIEAzN31fu56KSE0ZdrGVPIJHAs8G8NDIkB
dqZ2q0QPikCnLPw0Xsk9tTVKaHZQ5jJbXn81QZp0laPLJIIH3B1cc96D7IFf
```

```
VkbPbMRbz24dpuWmPVVLULQy5nCKdDCui5KKVD6zj3gpuhLhMJor7AjAAu5e
BrIi2IuwMVJuak5M098=
---- END SSH2 PUBLIC KEY ----
Public Key Fingerprint: 6f:93:ca:01:89:6a:de:6e:ee:c5:18:82:b2:10:bc:1e
```

4.5 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*]] [**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)

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 **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

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 activate one of them.

See [Keys and Certificates](#) for information on how to display and copy these certificates.

Erasing the startup configuration or returning to factory defaults automatically deletes the default keys and they are recreated during device initialization.

Example

The following example generates a self-signed certificate for HTTPS whose length is 2048 bytes.

```
switchxxxxxx(config)# crypto certificate 1 generate key-generate 2048
```

4.6 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 generate](#) Global 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.

See **Keys and Certificates** for information on how to display and copy these certificates.

Example

The following example displays the certificate request for HTTPS.

```
switchxxxxx# crypto certificate 1 request
-----BEGIN CERTIFICATE REQUEST-----
MIWtCCASoCAQAwYjELMAkGA1UEBhMCUFAXCzAJBgNVBAGTAkNDMQswCQYDVQQH
EWRDEMMAoGA1UEChMDZGxkMQwwCgYDVQQLEWNBbGQxGzAJBgNVBAMTAmxkMRAW
DgKoZiIhvcNAQkBFgFsMIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQC8ecwQ
HdML0831i0fh/F0MV/Kib6Sz5p+3nUUenbfHp/igVPmFM+1nbqTDekb2ymCu6K
aKvEbVLF9F2LmM7VPjDBb9bb4jnxkvwW/wzDLvW2rsy5NPmH1QVl+8Ubx3GyCm
/oW93BS0FwxwEsP58kf+sPYPy+/8wwmoNtDwIDAQABoB8wHQYJKoZIhvcNAQkH
MRDjEyMwgICCAgICAICAQIMA0GCSqGSIb3DQEBAQUAA4GBAGb8UgIx7rB05m+2
m5ZZPhIwL8ARSPXwhVdJexFjbnmvcacqjPG8pIiRV6LkxryGF2bVU3jKEipcZa
g+uNpyTkDt3ZVU72pjz/fa8TF0n3
-----END CERTIFICATE REQUEST-----
```

4.7 crypto certificate import

The **crypto certificate import** Global Configuration mode command imports a certificate signed by a Certification Authority for HTTPS. In addition, the RSA key-pair can also be imported.

Use the no form of the command to delete the user-defined keys and certificate.

Syntax

crypto certificate *number* **import**

encrypted crypto certificate *number* **import**

no crypto certificate *number*

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 only the certificate is imported, and the public key found in the certificate does not match the device's SSL RSA key, the command fails. If both the public key and the certificate are imported, and the public key found in the certificate does not match the imported RSA key, the command fails.

This command is saved in the Running configuration file.

When using the encrypted form of the command, only the private key must be in encrypted format.

See [Keys and Certificates](#) for information on how to display and copy these certificates.

Examples

Example 1 - The following example imports a certificate signed by the Certification Authority for HTTPS.

```
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
```

```

00g9XM1Axf0iqLlQJHd4xP+BHGZWwfKjKjUDBpZn52LxdDu1KrpB/h0+TZP0Fv38
7mIDqtnoF1NLsWxkVKRM5LPka0L/ha1pYxp7EWAt5iDBzSw5s04lv0bSN7oaGjFA
6t4SW2rrnDy8JbwjWQIDAQABoAAwDQYJKoZIhvcNAQEEBQADgYEAuqYQINJst6hI
XFDxe7I80d3Uyt3Dmf7KE/AmUV0Pif2yUluy/RuxRwKhDp/lGrK12tzLQz+s50x7
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
```

Example 2: The following example imports a certificate signed by the Certification Authority for HTTPS, and the RSA key-pair.

```
switchxxxxx(config)# crypto certificate 1 import
```

Please paste the input now, add a period (.) on a separate line after the input, and press Enter.

```
-----BEGIN RSA PRIVATE KEY-----
```

```

ACnrqImEGLXkwxBuZuLA09nHq9IGJsnkf7/MauGPVqxt5vfDf77uQ5CPf49JWQhu07cVXh
20wrBhJgB69vLULJuJm9p1IXFpMk8qR3NS7JzlInYAWjHKKbEZBmsKSA6+t/UzVxevKK6H
TGB7vMxi+hv1bL9zygvmQ6+/6Qfqa51c4nP/8a6Nj0/ZOAgvNAMKNr2Wa+tGU0oAgL0b/C
11EoqzpCq5mT7+V0FhPS04dUU+NwLv1YCb1Fb7MFoAa0N+y+2NwoGp0px0vDA9ENYl7qsZ
MwMcF Xu52/IxC7fD8FwxEBtks4V81Xqa7K6ET657xs7m8yTJFLZJyVawGXKnIU6uTzhhw
dKwWc0e/vwMgPtLlWyxWynnaP0fAJ+Paw0AdsK75bo79NBim3HcNVXhWNzqfg2s3AYCRBx
WuGoazpxHZ0s4+7swmNZtS0xI4ek43d7RaoedGKljhPqLHuzXHUon7Zx15CUtP3sbHl+XI
B3u4EEcEngYMewy5obn1vnFSot+d5JHuRwzEaRAIKfbHa34a1VJaN+2AMCb0hpI3IkreYo
A8Lk6UM0uIQaMnhYf+RyPXhP0Qs01PpIPhKBGTi6pj39XMviyRXvSpn5+eIYPhve5jYaEn
UeOnVZRhNcVnruJAYXSLhjApf5iIQr1JiJb/mVt8+zpqcCU9HCWQqsMrNF0FrSpcbHu5V4

```

```

ZX4jmd9tTJ2mhekoQf1dwUZbfYkRYSK70ps8u7BtgpRfSRUr7g0LfzhzMuswoDSnB65pkC
ql7yZnBeRS0zrUDgHLLRfzwjwmXjmwObxYfRGMLp4=
-----END RSA PRIVATE KEY-----
-----BEGIN RSA PUBLIC KEY-----
MIGHAoGBAMVuFgfJYLBuzmbm6UoLD3ewHYd1ZMXy4A3KLF2SXUd1TIXq84aME8DIitSfB2
Cqy4QB5InhgAobBKC96VRsUe2rzoNG4QDkj2L9ukQ0voFbYNmbzHc7a+7043wfVmH+QOXf
TbnRDhIMVrZJGbz1c9IzGky1l21Xmicy0/nwsXDAgEj
-----END RSA PUBLIC KEY-----
-----BEGIN CERTIFICATE-----
MIIBkzCB/QIBADBUMQswCQYDVQQGEwIgd1EKMAGGA1UECBMBIDEKMBIDEKMBIDEKMBIDEKMB
IDEVMBMGA1UEAxMMMTAuNS4yMzQuMjA5MQowCAYDVQQKEwEgMQowCAYDVQQLEwEg
MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQDK+beogIcke73sBSL7tC2DMZrY
00g9XM1Axf0iqlLQJHd4xP+BHGZWwfKjKjUDBpZn52LxdDu1KrpB/h0+TZP0Fv38
7mIDqtnoF1NLswxkVKRM5LPka0L/ha1pYxp7EWAt5iDBzSw5s04lv0bSN7oaGjFA
6t4SW2rrnDy8JbwjWQIDAQABAAwDQYJKoZIhvcNAQEEBQADgYEAuYQIqNjst6hI
XFDxe7I80d3Uyt3Dmf7KE/AmUV0Pif2yUluY/RuxRwKhDp/lGrK12tzLQz+s50x7
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

Example 3 - Import certificate with encrypted key

encrypted crypto certificate 1 import

```
-----BEGIN RSA ENCRYPTED PRIVATE KEY-----
```

```

wJIjj/tFEI/Z3GFkTL5C+SF0eSyTxnSsfssNo9CoHJ6X9Jg1SukjtXU49kaUbTjoQVQatZ
AdQwgWM5mnjUhUaJ1MM3WfrApY7HaBL3iSXS9jDVrf++Q/KKhVH6Pxlv6cKvYYzHg43Unm

```



```

CNI2n5zf9oisMH0U6gsIDs4yswVD1zNgoVQwD7RqKpL9wo3+YVFVS6XCB7pDb7iPePefa6
GD/crN28vTLGf/NpyKo0hdAMRuEQoapMo0Py2Cvy+sqLiv4ZKck1FPlsVFV7X7sh+zVa3
We84pmzyjGiY9S0tPdBSGhJ2xDNcqTyvUpffFEJJYrdGKGybqD0o3tD/ioUQ3UJgxDbGYw
aLlLoavSjMYiWkdPjfcbn5MVRdU5iApCQJXWv3MYC8GQ4Hda6UDN6aoUBalUhqjT+REwW0
DXpJmvmX4T/u5W4DPvELqThyETxgQKNEr l07gRi2yyLcybUokh+SP+XuRkG4IKnn8KyHtz
XeoDojSe60Y0Qww2R0nAqnZsZPgrDzj0zTDL8qvykurfw4jWa4cv1Sc1hDEFtHH7NdDLjQ
FkPFNAKvFMcYimidapG+Rwc0m3lKBLcEpNXpFEE3v1mCeyN1pPe6eSqMcBXa2VmbInutuP
CZM927oxkb41g+U5oYQxGhMK70EzTmfS1FdL0mfqv0DHZNR4lt4KggcSjSWPQeYSzB+4PW
Qmy4fTF4wQdvCLy+WlVep1jWPbrdCNxIS13RWucNekrm9uf5Zuhd1FA9wf8XWSRJWuAq8q
zZFRmDMHPtey9AL02alpwpjPH0PbJKiCMDjHT94ugkF30eyeni9sGN6Y063IvuKBy0nbwsA
J0srxvt3q6cbKJYozMQE5LsgxLNvQIH4BhPtUz+LNgYwb3V5SI8D8kRejqBM9eaCyJsvLF
+yAI5xABZdTPqz0l7FNMzhIrXvCqcCCCx+JbgP1PwYTDyD+m2H5v8Yv6sT3y7fZC9+5/Sn
Vf8jpTLMWfGvVF9U1Qw9bA8HA7K42XE3R5Zr1do0eUrXQkuRxLAHkifD7ZhrE7ud0mTiP9
W3PqtJzbtjjvMjm5/C+hoC6oLNP6qp0TE78EdfaHPMMutMF0leKuzizenZQ==
-----END RSA PRIVATE KEY-----

-----BEGIN RSA PUBLIC KEY-----

MIGJAoGBAMoCaK+b9hTgrzEewjdz55FoWwV8s54k5VpuRtv1e5r1zp7kzIL6mvCCXk6J9c
kkr+TMfX63b9t5RgwGPgWeDhw3q5QkaqInzz1h7j2+A++mwCsHui1BhpFNfY/gmENiGq9f
puukcnoTvBNvz7z3V0xv6hw1UHMT0e0+Qsbe7WwVAgMBAAE=
-----END RSA PUBLIC KEY-----

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

MIICHDCcAYUcEFCcI4/dhLsUhtWx0wbzngMwDQYJKoZIhvcNAQEEBQAwtzELMAKGA
A1UEBhMCICAxJAIgBgNVBAgTASAxJAIgBgNVBACtASAxEDA0BgNVBAMTBzAuMC4w
LjAxJAIgBgNVBAoTASAxJAIgBgNVBAsTASAwHhcNMTEwNTI1NzE2WhcNMTEw
NTI1MTI1NzE2WjBPMQswCQYDVQQGEWlgIDEKMAgGA1UECBMBIDEKMAgGA1UEBxMB
IDEQMA4GA1UEAxMHMC4wLjAuMDEKMAgGA1UEChMBIDEKMAgGA1UECxBMBIDCBnzAN
BgkqhkiG9w0BAQEFAA0BjQAwwGykCgYEAygJor5v2F0CvMR5aN3PnkWhbBXyzniTl
Wm5G2/V7mvX0nuTMgvqa8IJeTon1ySSv5Mx9frdv23lGDAY+BZ4MfDerlCRqoifP
PWHuPb4D76bAKwe6LUGGku0Vj+CYQ2Iar1+m66Ryeh08E2/PvPdU7G/qHDVQcxM5
475BJt7tbBUCAWEAATANBgkqhkiG9w0BAQQFAA0BgQB0knTzas7HniIHMPeC5yC0
2rd7c+zqQ0e1e4CpEvV10C0QGvPa72pz+m/zvoFmAC5WjQngQMMwH8rNdvrfaSyE

```

```
dkB/761PpeKkUtgyPHfTzfSMcJdB0PPnpQcqbxCfH9QSN4ENSXqC5pND02RHXFx
wS1XJGrhMUoNGz1BY5DJWw==
-----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
```

4.8 show crypto certificate

The **show crypto certificate** Privileged EXEC mode command displays the device SSL certificates and key-pair for both default and user defined keys.

Syntax

show crypto certificate [**mycertificate**] [*number*]

Parameters

- **number**—Specifies the certificate number. (Range: 1,3)
- **mycertificate**—Specifies that only the certificate will be displayed

Default Configuration

Certificate number 1.

Command Mode

Privileged EXEC mode

Examples

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

```
switchxxxxxx# show crypto certificate mycertificate
```

Certificate 1:

Certificate Source: Default

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

dHmUgUm9vdCBDZXJ0awZpZXIwXDANBgkqhkiG9w0BAQEFAANLADBIAEAp4HS
 nnH/xQSGA2ffkRBwU2IXb7n8VPsTm1xyJ1t11a1GaqchfMqqe0kmfhcoHswr
 yf1FpD0MWOTgDAwIDAQABo4IBojCCA4wEwYJKwYBBAGCNxQCBAYeBABDAEEw
 CwR0PBAQDAgFGMA8GA1UdEwEB/wQFMAMBAf8wHQYDVR00BBYEFAf4MT9BRD47
 ZvKBAEL9Ggp+6MIIBNgYDVR0fBIIBLTCCASKwgdKggc+ggcyGgcIsZGFw0i8v
 L0VByb3h5JTJwU29mdHdhcmUlmjBSb290JTJwQ2VydGlmawVyLENOPXNlcnZl

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

Issued by: www.verisign.com

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

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

Fingerprint: DC789788 DC88A988 127897BC BB789788

Certificate 2:

Certificate Source: User-Defined

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

dHmUgUm9vdCBDZXJ0awZpZXIwXDANBgkqhkiG9w0BAQEFAANLADBIAEAp4HS
 nnH/xQSGA2ffkRBwU2IXb7n8VPsTm1xyJ1t11a1GaqchfMqqe0kmfhcoHswr
 yf1FpD0MWOTgDAwIDAQABo4IBojCCA4wEwYJKwYBBAGCNxQCBAYeBABDAEEw
 CwR0PBAQDAgFGMA8GA1UdEwEB/wQFMAMBAf8wHQYDVR00BBYEFAf4MT9BRD47
 ZvKBAEL9Ggp+6MIIBNgYDVR0fBIIBLTCCASKwgdKggc+ggcyGgcIsZGFw0i8v
 L0VByb3h5JTJwU29mdHdhcmUlmjBSb290JTJwQ2VydGlmawVyLENOPXNlcnZl

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

Issued by: www.verisign.com

Valid from: 8/9/2004 to 8/9/2005

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

Fingerprint: DC789788 DC88A988 127897BC BB789788

Example 2:

The following example displays SSL certificate # 1 present on the device and the key-pair.

```
switchxxxxx# show crypto certificate 1

Certificate 1:
Certificate Source: Default
-----BEGIN CERTIFICATE-----
dHmUgUm9vdCBDZXJ0aWZpZXIwXDANBgkqhkiG9w0BAQEFAANLADBIACEAp4HS
nnH/xQSGA2ffkRBwU2XIxb7n8VPsTm1xyJ1t11a1GaqchfMqqe0kmfhcoHSWr
yf1FpD0MW0TgDAwIDAQABo4IBojCCA4wEwYJKwYBBAGCNxQCBAYeBABDAEEw
CwR0PBAQDAgFGMA8GA1UdEwEB/wQFMAMBAf8wHQYDVR00BBYEFAf4MT9BRD47
ZvKBAEL9Ggp+6MIIBNgYDVR0fBIIBLTCCASKwgdKggc+ggcyGgcIsZGFw0i8v
L0VByb3h5JTlWU29mdHdhcmUlmjBSb290JTlWQ2VydgLmawVyLEN0PXNlcnZl
-----END CERTIFICATE-----
-----BEGIN RSA PRIVATE KEY-----
ACnrqImEGLXkwxBuZULa09nHq9IGJsnkf7/MauGPVqxt5vfDf77uQ5CPf49JWQhu07cVXh
20wrBhJgB69vLULJuJm9p1IXFpMk8qR3NS7JzLIInYAWjHKkbEZBMSKSA6+t/UzVxevKK6H
TGB7vMxi+hv1bL9zygvmQ6+/6QfqA51c4nP/8a6Nj0/ZOAgvNAMKNr2Wa+tGU0oAgL0b/C
11EoqzpCq5mT7+V0FhPS04dUU+NwLv1YCb1Fb7MFoAa0N+y+2NwoGp0px0vDA9ENYl7qsZ
MwmCfXu52/IxC7fD8FwXEBtks4V81Xqa7K6ET657xS7m8yTJFLZJyVawGXKnIUS6uTzhhw
dKwWc0e/vwMgPtLlWyxWynnaP0fAJ+Paw0AdsK75bo79NBim3HcNVXhWNzqfg2s3AYCRBx
WuGoazpxHZ0s4+7swmNZtS0xI4ek43d7RaoedGKljhPqLHuzXHUon7Zx15CUtP3sbHl+XI
B3u4EEcEngYMewy5obn1vnFSot+d5JHuRwzEaRAIKfbHa34aLVJaN+2AMCb0hpI3IkreYo
A8Lk6UM0uIQaMnhYf+RyPXhp0Qs01PpIPhKBGTi6pj39XMviyRXvSpn5+eIYPhve5jYaEn
UeOnVZRhNcVnruJAYXSLhjApf5iIqr1JiJb/mVt8+zpqcCU9HCWQqsMrNF0FrSpcbHu5V4
ZX4jmd9tTJ2mhekoQf1dwUZbfYkRYSK70ps8u7BtgpRfSRUr7g0LfzhzMuswoDSnB65pkC
q17yZnBeRS0zrUDgHLLRfzwjwmXjmwObxYfRGMLp4=
-----END RSA PRIVATE KEY-----
-----BEGIN RSA PUBLIC KEY-----
MIGHAoGBAMVuFgfJYLbUzmbm6UoLD3ewHYd1ZMXY4A3KLF2SXUd1TIXq84aME8DIitSfB2
Cqy4QB5InhgAobBK96VRsUe2rzoNG4QDkj2L9ukQ0voFBYNmbzHc7a+7043wfVmH+Q0Xf
TbnRDhIMVrZJGbz1lc9IzGky1l21Xmicy0/nwsXDAgEj
```

-----END RSA PUBLIC KEY-----

Issued by: www.verisign.com

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

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

Finger print: DC789788 DC88A988 127897BC BB78978

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 ping. 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.

```
switchxxxxx# 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

```
switchxxxxx# 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 kscopyng-snvang.abilene.ucaid.edu (198.32.8.103) 33 msec 35 msec 35 msec
6 iplsnk-kscopyng.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

Field	Description
S	Source route failed.
U	Port unreachable.

5.3 telnet

The **telnet** EXEC mode command logs 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.

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)
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.
/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
nnntp	Network News Transport Protocol	119
pim-auto-rp	PIM Auto-RP	496

Keyword	Description	Port Number
pop2	Post Office Protocol v2	109
pop3	Post Office Protocol v3	110
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 at a user-specified time.

Syntax

reload [[in [hhh:mm | mmm] | **at** *hh:mm* [*day month*]] | **cancel**]

Parameters

- **in** hhh:mm | mmm—Schedules a reload of the software to take effect in the specified minutes or hours and minutes. The reload must take place within approximately 24 days.
- **at** hh:mm—Schedules a reload of the software to take place at the specified time (using a 24-hour clock). If you specify the month and day, the reload is scheduled to take place at the specified time and date. If you do not specify the month and day, the reload takes place at the specified time on the current day (if the specified time is later than the current time) or on the next day (if the specified time is earlier than the current time). Specifying 00:00 schedules the reload for midnight. The reload must take place within 24 days.
- **day**—Number of the day in the range from 1 to 31.
- **month**—Month of the year.
- **cancel**—Cancels a scheduled reload.

Default Usage

N/A

Command Mode

Privileged EXEC mode

User Guidelines

The **at** keyword can be used only if the system clock has been set on the device. To schedule reloads across several devices to occur simultaneously, synchronize the time on each device with SNTP.

When you specify the reload time using the **at** keyword, if you specify the month and day, the reload takes place at the specified time and date. If you do not specify the month and day, the reload takes place at the specified time on the

current day (if the specified time is later than the current time), or on the next day (if the specified time is earlier than the current time). Specifying 00:00 schedules the reload for midnight. The reload must take place within 24 days.

To display information about a scheduled reload, use the [show reload](#) command.

Examples

Example 1—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]

Example 2—The following example reloads the operating system in 10 minutes.

```
switchxxxxxx# reload in 10
```

This command will reset the whole system and disconnect your current session.
Reload is scheduled for 11:57:08 UTC Fri Apr 21 2012 (in 10 minutes). Do you want to continue? (y/n) [Y]

Example 3—The following example reloads the operating system at 13:00.

```
switchxxxxxx# reload at 13:00
```

This command will reset the whole system and disconnect your current session.
Reload is scheduled for 13:00:00 UTC Fri Apr 21 2012 (in 1 hour and 3 minutes). Do you want to continue? (y/n) [Y]

Example 4—The following example shows various usages of this command. Note that **reload in 10** can work without the system clock being set, but **reload at 17:12 Jun 6** requires that the system clock be set.

```
switchxxxxxx# show clock
```

```
*16:12:16 UTC Jun 4 2012//please note the '*' on the left side of the time
```

```
No time source
```

```
switchxxxxxx#reload in 10
```

```
This command will reset the whole system and disconnect your current session.
Reload is scheduled to occur in 10 minutes. Do you want to continue ?
(Y/N)[N] Y

switchxxxxxx#reload at 17:12 Jun 6

Schedule-Reload is already set to occur in 9 minutes. Do you wish to
override? (Y/N)[N] Y

To use the 'reload at' command please set the system clock time first.

switchxxxxxx#clock set 16:37:00 Jun 6 2012

switchxxxxxx#reload at 17:12 Jun 6

Schedule-Reload is already set for 16:45:17 UTC Wed Jun 6 2012 (in 8
minutes).          Do you wish to override? (Y/N)[N] Y

This command will reset the whole system and disconnect your current session.
Reload is scheduled for 17:12:00 UTC Wed Jun 6 2012 (in 34 minutes). Do you
want to continue ? (Y/N)[N] Y

06-Jun-2012 16:37:18 %RNDMISC-N-SRACTIVE: system is scheduled to perform a
restart at 17:12:00 Wed Jun 6 2012 (in 34 minutes).
```

Example 4—The following example cancels a reload.

```
switchxxxxxx# reload cancel

Reload cancelled.
```

5.7 show reload

The **show reload** Privileged EXEC mode command displays whether there is a pending reload for the device.

Syntax

show reload

Parameters

N/A

Default Usage

N/A

Command Mode

Privileged EXEC mode

User Guidelines

You can use this command to display a pending software reload. To cancel a pending reload, use the privileged EXEC command with the **cancel** parameter.

Example

The following example displays that a reboot is scheduled for 00:00 on Saturday, April-20.

```
switchxxxxx# show reload
```

```
Reload scheduled for 00:00:00 UTC Sat April 20 (in 3 hours and 12 minutes)
```

```
or
```

```
Scheduled reload is not configured.
```

5.8 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
```

5.9 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%
```

5.10 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

5.11 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.

Field	Description
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.

show system The **show system** EXEC mode command displays various items of information about the device.

Syntax

show system

Parameters

N/A.

Command Mode

EXEC mode

Example

```
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
Main Power Supply Status:	OK
Fans Status:	OK

5.12 show version

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

Syntax

show version

Parameters**Default Usage**

N/A

Command Mode

EXEC mode

Example

The following example displays system version information.

```
switchxxxxx# 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 environment

**Note**

This command is only relevant for devices that have temperature sensors.

The show environment EXEC mode command displays environment information.

Syntax

show environment {all | fan | temperature {status} |

Parameters

- **all** —Displays the fan and temperature general status
- **fan** —Displays the fan status
- **temperature status** —Displays the temperature status

Command Mode

EXEC mode

User Guidelines

The **fan** and **temperature status** parameters are available only on devices on which FAN and/or temperature sensor are installed.

Examples

Example 1 - The following example displays the general environment status of a device

The temperature status is OK if the temperature sensors status in the device is OK, and if the temperature of all the device is below the threshold.

```
switchxxxxxx # show environment all  
  
FAN is OK  
  
TEMPERATURE is OK
```

Example 2 - The following example displays the general FAN status of a device .

```
switchxxxxxx # show environment fan  
  
FAN is OK
```

Example 3 - The following example displays the detailed temperature status of a device

```
switchxxxxxx # show environment temperature status  
  
TEMPERATURE is OK
```

5.14 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

5.15 set system

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

The System mode appears in the configuration file header to specify the system mode. It appears even if it specifies the default system mode.

If this command is entered manually and the configured system mode does not match the current system mode, 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; otherwise the device is configured in the new system mode with an empty configuration

If the system mode is contained in a configuration file that is downloaded to the device, but the file's system mode matches the current system mode, this information is ignored. Otherwise the following cases occurs:

- If this file is copied manually onto the device (using copy tftp, for example), the operation is aborted, and a message is displayed indicating that the system mode must be changed manually.
- If this file is downloaded during the automatic configuration process, the Startup Configuration file is deleted and the device reboots automatically in the new system mode and the device is configured with an empty configuration.

Example

The following example configures the device to function as a switch-router (Layer 3).

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

5.16 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
```

5.17 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.

```
switchxxxxx# show system languages
```

Language Name	Unicode Name	Code	Num of Sections
English	English	en-US	2
Japanese	日本語	ja-JP	2

5.18 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.

```
switchxxxxx# show system tcam utilization
```

TCAM utilization: 58%

5.19 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

```
switchxxxxx# 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	

5.20 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 the output of the following commands (depending on the commands supported on the device).

- show clock
- show system
- show version
- show system mode
- show ip interface
- show ipv6 interface
- show running-config
- show interfaces configuration
- show interfaces status
- show interfaces port-channel
- show vlan
- show interfaces switchport
- show bridge multicast address-table
- show spanning tree
- show ip igmp snooping groups
- show ipv6 mld snooping groups
- show dot1x
- show dot1x users
- show lldp configuration
- show lldp neighbors
- show errdisable interface
- show interfaces counters
- show power inline
- show cdp
- show cdp traffic global

- `show cdp traffic`
- `show cdp neighbors`
- `show voice vlan`
- `show users`
- `show sessions`
- `show logging file`
- `show logging`

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`

5.21 `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
```

5.22 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.
```

5.23 menu

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

Syntax

menu

Command Mode

EXEC mode

Example

```
switchxxxxxx# menu
```

5.24 disable ports leds

Use the **disable ports leds** Global Configuration mode command to turn off the LEDs of all the ports on a device (depending on the actual port status, e.g. link up, port speed etc).

Use no disable ports leds command to set the LEDs of all the ports on the device to their current operational status.

Syntax

disable ports leds

no disable ports leds

Parameters

N/A

Default Configuration

The default is no disable port leds; that is the LEDs of all the ports reflect their current status

Command Mode

Global Configuration mode

User Guidelines

N/A

Examples

The following example turns off the port LEDs.

```
switchxxxxxx# disable ports leds
```

5.25 show ports leds configuration

Use the **show ports leds configuration** EXEC mode command to display whether the LEDs of all the ports are enabled or disabled.

Syntax

show ports leds configuration

Command Mode

EXEC mode

Examples

Example 1 - The following example displays the status of the ports LEDs when the port LEDs are turned on.

show ports leds configuration

Port leds are not disabled

Example 2: The following example displays the status of the ports LEDs when the port LEDs are turned off.

show ports leds configuration

Port leds are disabled

5.26 show system fans

Use the **show system fans** EXEC mode command to view the status of the fans on the device.

Syntax

show system fans

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Example

If the device does not support controlled fan direction, the column Fan Direction is not displayed.

```
switchxxxxxx# show system fans
```

Unit	Speed (RPM)	Admin State	Oper State	Fan Direction
1	0	auto	OK	back to front

5.27 show system sensors

Use the **show system sensors** EXEC mode command to view the temperature sensor status of the device.

Syntax

show system sensors

Parameters

N/A

Default Usage

N/A

Command Mode

EXEC mode

Examples

```
switchxxxxxx# show system sensors
```

```
Sensor Status:      OK
```

```
Temperature(C):     37
```

5.28 system recovery



Note

This command is only relevant for devices that have temperature sensors.

Use the **system recovery** Global Configuration command to set the system to automatically recover from temperature that reached the critical threshold.

Use the **no** form of the command to return to disable automatic recovery.

Syntax

system recovery

no system recovery

Parameters

N/A

Default Configuration

System recovery is enabled by default.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# no system recovery
```

SSH Client Commands

6.1 ip ssh-client authentication

Use the **ip ssh-client authentication** command in Global Configuration mode to define the SSH client authentication method used by the local SSH clients to be authenticated by remote SSH servers.

To return to default, use the **no** format of the command.

Syntax

ip ssh-client authentication {password | public-key {rsa | dsa}}

no ip ssh-client authentication

Parameters

- **password**— Username and password are used for authentication.
- **public-key rsa**— Username and RSA public key are used for authentication.
- **public-key dsa**— Username and DSA public key are used for authentication.

Default Configuration

Username and password are used for authentication by the local SSH clients.

Command Mode

Global Configuration

User Guidelines

A user can use the **ip ssh-client key** command to generate/configure RSA/DSA keys if SSH authentication is by public key. Otherwise, the default keys generated by the switch are used.

Example

The following example specifies that, username and public key are used for authentication:

```
switchxxxxxx(config)# ip ssh-client authentication public-key rsa
```

6.2 ip ssh-client change server password

Use the **ip ssh-client change server password** command in Global Configuration mode to change a password of an SSH client on a remote SSH server.

Syntax

ip ssh-client change server password server *{host| ip-address| ipv6-address}*
username *username* **old-password** *old-password* **new-password** *new-password*

Parameters

- **host**—DNS name of a remote SSH server.
- **ip-address**—Specifies the IP address of a remote SSH server. The IP address can be an IPv4, IPv6 or IPv6z address. See IPv6z Address Conventions.
- **username** — Username of the local SSH clients (1 - 70 characters).
- **old-password** — Old password of the local SSH client (1 - 70 characters).
- **new-password**— New password for the local SSH client (1 - 70 characters) The password cannot include the characters "@" and ":".

Default Configuration

N/A

Command Mode

Global configuration

User Guidelines

Use the command to change a password on a remote SSH server. Use [ip ssh-client password](#) to change the SSH client password of the switch's SSH client so that it matches the new password set on the remote SSH server.

Example

The following example changes a password of the local SSH clients:

```
switchxxxxxx(config)# ip ssh-client change server password server 10.7.50.155  
username john old-password &&&@@@aaff new-password &&&@@@aaee
```

6.3 ip ssh-client key

Use the **ip ssh-client key** command in Global Configuration mode to create a key pair for SSH client authentication by public key (either by generating a key or by importing a key). To enter the private key as encrypted, use the **encrypted ip ssh-client key** command.

To remove a key, use the **no** form of the command.

Syntax

ip ssh-client key {*dsa* | *rsa*} {*generate* | *key-pair* *privkey pubkey*}

encrypted ip ssh-client key {*dsa* | *rsa*} *key-pair* *encrypted-privkey pubkey*

no ip ssh-client key [*dsa* | *rsa*]

Parameters

- **dsa**—DSA key type.
- **rsa**—RSA key type.
- **key-pair**—Key that is imported to the device.
- **privkey**—Plaintext private key.
- **encrypted-privkey**—private key is in encrypted format.
- **pubkey**—The plaintext public key.

Default Configuration

The application creates a key automatically, which is the default key.

Command Mode

Global configuration

User Guidelines

When using the keyword **generate**, a private key and a public key of the given type (RSA/DSA) are generated for the SSH client. Downloading a configuration file with a Key Generating command is not allowed, and such download will fail.

When using the keyword **key-pair**, the user can import a key-pair created by another device. In this case, the keys must follow the format specified by RFC 4716.

If the specified key already exists, a warning will be issued before replacing the existing key with a new key.

Use the **no ip ssh-client key** command to remove a key pair. Use this command without specifying a key-type to remove both key pairs.

Table 3 describes the expected behavior of keys, default and users within the various operations.

Table 3: Keys, Defaults and Users

From/To	Show	Show (detailed)	Copy/Upload of Running Config	Copy/Upload of Startup Config	Download text-based CLI (TFTP/Backup)
Startup Config	Only user-defined.	N/A	All keys (default and user)	N/A	All keys (default and user)
Running Config	Keys are not displayed.	All keys (default and user)	N/A	Only user defined.	Same as user configuration
Text-based CLI (TFTP/Backup)	As it was copied.	N/A	All keys (default and user)	Only user defined.	As a text file.

If no keys are included in text-based configuration file, the device generates its own keys during initialization. If the Running Configuration contains default keys (not user-defined), the same default keys remain.

Examples

Example 1 - In the following example, a key pair of the RSA type is created:

```
switchxxxxxx(config)# ip ssh-client key rsa generate
```

The SSH service is generating a private RSA key.

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

Example 2. In the following example, both public and private keys of the RSA type are imported (private key as plaintext):

```
switchxxxxx(config)#ip ssh-client key rsa key-pair
Please paste the input now, add a period (.) on a separate line after the input
-----BEGIN RSA PRIVATE KEY-----
MIICXAIBAAKBgQDH6CU/2KYRl8rYrK5+TivwS4zvhBmiC4I31m9cR/1iRTFViMRuJ++TEr
p9ssqWyI1Ti9d0jzmG0N3jHzp2je5/DUTHZXvYaUzchBDnsPTJo8dyiBl4YBqYHQgCjUhk
tXqvloy+1uxRJTAaLVXCBAmuIU/kMLoEox8/zwjB/jsF9wIBIwKBgC2xZ5mQmvy0+yo2GU
FwLQ05f0yweuM11J8McTmqDgfvTRrdbroXwbs3exVqsfaUPY9wa8Le6JPX+DPP4XovEfC/
iglZBSC8SeDmI2U7D6HrkAyD9HHf/r32jukB+5Z7BLHPz2Xczs2cl00wrnToy+YTzjLUxy
WS7V/IxbBl lipLAKEA/QuVSCfFmdMLXaEfJVzqP01cF8guovsWLteBf/gqHuvbHuNy0t
OWEp0bKZs1m/mtCWppkgcqgrB0oJaYbUFQJBAMo/cCrkyhsiV/+ZsryeD26NbPEKiak16V
Tz2ayDstidGuuvvcvm2YF7DjM6n6NYZ3+/ZLyc5n82okbld1NhDONSQQCmSAas+C4HaHQn
zSU+/lwLDI88As4qJN2DMmGJbtsbVHhQxwIHAG4tBVWa8bV12+RPyuan/jnk8irniGyVza
FPAKEAiQ8oV+1XYxA8V39V/a42d7FvRjMckUmKDL4Rmt32+u9i6sFzaWcdgs87+2vS3AZQ
afQDE5U6YSMiGLVewC4YwwJBA0FZmh0+dIlxT8Irzf2cUZGggopfnX6Y+L+Yl09MuZHbwh
tXaBGj6ayMYvXnlo0NecnapBjGEm37YVwKj02DV2w=
-----END RSA PRIVATE KEY-----
-----BEGIN RSA PUBLIC KEY-----
MIGHAoGBAMfoJT/YphGXytisrn5Mi/BLj0+EGaILgjfwB1xH/WJFMVWixG4n75MSun2yyp
bIjVOL13SP0YbQ3eMf0naN7n8NRMdle9hpTNYEE0ew9Mmjx3KIGXhgGpgdCAKNSGS1eq+W
jL7W7FElMBotVcIECa4hT+QwugSjHz/PCMH+OwX3AgEj
-----END RSA PUBLIC KEY-----
.
```

Example 3. In the following example, both public and private keys of the DSA type are imported (private key as encrypted):

```
switchxxxxx(config)# encrypted ip ssh-client key rsa key-pair
```

(Need to encrypted SSH client RSA key pair, for example:)

```
-----BEGIN RSA ENCRYPTED PRIVATE KEY-----
gxe0js60zGRtL4qstmQg1B/4gexQblfa56RdjgHAMEjvUT02eLYmNi+m4aTu6mlyXPHmYP
lXlXny7jZkHRvvgg8EzcpeEB003yQzq3kNi756cMg40qbkm7TU0tdqYFEz/h8rJJ0QvUfFh
BsEQ3e16E/OPitWgK43WTzedsuyFe0oMXR9BCuxPUJc2UeqQVM2IJt50M0FbVt0S6oqXhG
sEEdoTlhlDwHWg97FcV7x+bEnPfzFGrmbrUxc0xlkFsuCNo3/94PHK8zEXyWtrx2KoCDQ
qFRuM8uecpjmDh6M02GURUVstctoHEWEIVCI0r5SBCbciaxv5oS0jIzXMrJA==
-----END RSA PRIVATE KEY-----
-----BEGIN RSA PUBLIC KEY-----
MIGHAoGBALL0eh3css8tBL8ujFt3trcX0XJyJLlxxt4sGp8Q3ExLSRN25+Mcac6togpIEg
tIzk6t1IEJscuAih9Brwh1ovgMLRaMe25j5Yj04xG6Fp42nhHiRcie+YTS1o309EdZkiXa
QeJtLdnYL/r3uTIRVGbXI5nxwtfWpwEgxxDwfqzHAgEj
-----END RSA PUBLIC KEY-----
```

Example 4 - In the following example, a DSA key pair is removed:

```
switchxxxxxx(config)# no ip ssh-client key dsa
```

Example 5 - In the following example, all key pairs (RSA and DSA types) are removed.

```
switchxxxxxx(config)# no ip ssh-client key
```

6.4 ip ssh-client password

Use the **ip ssh-client password** command in Global Configuration mode to configure the password for SSH client authentication by password. To enter the password as encrypted, use the **encrypted ip ssh-client password** command.

To return to default, use the **no** form of the command.

Syntax

ip ssh-client password *string*

encrypted ip ssh-client password *encrypted-string*

no ip ssh-client password

Parameters

- **string**— Password for the SSH clients (1 - 70 characters). The username cannot include the characters "@" and ":".
- **encrypted-string** - Password for the SSH client in encrypted form.

Default Configuration

The default password is anonymous.

Command Mode

Global configuration

User Guidelines

The password cannot include the characters "@" and ":".

If authentication is configured to use a password (using the command **ip ssh-client authentication**), use the **ip ssh-client password** command to define the password.

If the encrypted key-word is used, the password must be in the encrypted form.

Use the command **ip ssh-client change server password** to change the password on the remote SSH server so that it will match the new password of the SSH client.

Example

The following example specifies a plaintext password for the local SSH clients:

```
switchxxxxxx(config)# ip ssh-client password &&&111aaff
```

6.5 ip ssh-client server authentication

Use the **ip ssh-client server authentication** command in Global Configuration mode to enable remote SSH server authentication by the SSH client.

To disable remote SSH server authentication, use the **no** form of the command.

Syntax

ip ssh-client server authentication

no ip ssh-client server authentication

Parameters

None

Default Configuration

SSH server authentication is disabled

Command Mode

Global configuration

User Guidelines

When remote SSH server authentication is disabled, any remote SSH server is accepted (even if there is no entry for the remote SSH server in the SSH Trusted Remote Server table).

When remote SSH server authentication is enabled, only trusted SSH servers are accepted. Use the [ip ssh-client server fingerprint](#) command to configure trusted SSH servers.

Example

The following example enables SSH server authentication:

```
switchxxxxxx(config)# ip ssh-client server authentication
```

6.6 ip ssh-client server fingerprint

Use the **ip ssh-client server fingerprint** command in Global configuration mode to add a trusted server to the Trusted Remote SSH Server Table. To remove an entry or all entries from the Trusted Remote SSH Server Table, use the **no** form of the command.

Syntax

ip ssh-client server fingerprint [*host*| *ip-address*] *fingerprint*

no ip ssh-client server fingerprint [*host*| *ip-address*]

Parameters

- **host**—DNS name of a SSH server.

- **ip-address**—Specifies the address of a SSH server. The IP address can be an IPv4, IPv6 or IPv6z address. See IPv6z Address Conventions.
- **fingerprint**—Fingerprint of the SSH server public key (32 Hex characters).

Default Configuration

The Trusted Remote SSH Server table is empty.

Command Mode

Global configuration

User Guidelines

Fingerprints are created by applying a cryptographic hash function to a public key. Fingerprints are shorter than the keys they refer to, making it simpler to use (easier to manually input than the original key). Whenever the switch is required to authenticate an SSH server's public key, it calculates the received key's fingerprint and compares it to the previously-configured fingerprint.

The fingerprint can be obtained from the SSH server (the fingerprint is calculated when the public key is generated on the SSH server).

The **no ip ssh-client server fingerprint** command removes all entries from the Trusted Remote SSH Server table.

Example

In the following example, a trusted server is added to the Trusted Servers table (with and without a separator ":"):

```
switchxxxxxx(config)# ip ssh-client server fingerprint 1.1.1.1
DC789788DC88A988127897BCBB789788

switchxxxxxx(config)# ip ssh-client server fingerprint 1.1.1.2
DC:78:97:88:DC:88:A9:88:12:78:97:BC:BB:78:97:88
```

6.7 ip ssh-client username

Use the **ip ssh-client username** command in Global Configuration mode to configure the SSH client username of the switch.

To return to default, use the **no** form of the command.

Syntax

ip ssh-client username *string*

no ip ssh-client username

Parameters

string— Username of the SSH client. The length is 1 - 70 characters. The username cannot include the characters "@" and ":".

Default Configuration

The default username is anonymous

Command Mode

Global configuration

User Guidelines

The username cannot include the characters "@" and ":".

The configured username is used when SSH client authentication is done both by password or by key.

Example

The following example specifies a username of the SSH client:

```
switchxxxxxx(config)# ip ssh-client username jeff
```

6.8 show ip ssh-client

Use the **show ip ssh-client** command in Privilege EXEC mode to display the SSH client credentials, both default and user-defined keys.

Syntax

show ip ssh-client

show ip ssh-client {mypubkey | key} {dsa | rsa}

Parameters

- **dsa**— Specifies displaying the DSA key type.

- **rsa**— Specifies displaying the RSA key type.
- **mypubkey**— Specifies that only the public key is selected to be displayed.

Command Mode

Privileged EXEC mode

User Guidelines

Use the command with a specific key-type to display the SSH client key; You can either specify display of public key or private key, or with no parameter to display both private and public keys. The keys are displayed in the format specified by RFC 4716.

Examples

Example 1 - The following example displays the authentication method and the RSA public key:

```
switchxxxxx# show ip ssh-client mypubkey rsa
Authentication method: RSA key
Username:                John
Key Source:              User Defined
----- BEGIN SSH2 PUBLIC KEY -----
Comment: RSA Public Key
AAAAB3NzaC1yc2EAAAABIwAAAIEAss56Hdyzy0Evy6MW3e2txfRcnIkuXHG
3iwanxDcTGVJE3bn4xxpzq2iCkgSC0j0Tq3UgQmxy4CKH0GvCHWi+AwtFox7
bmPlIM7jEboWnjaeEeJFyJ75hNLWjft0R1mSJdpB4m0t2dgv+ve5MhFUZtcj
mfHC19anASDHEPB+rMc=
----- END SSH2 PUBLIC KEY -----
Public Key Fingerprint: 11:d4:3f:76:a3:ab:dc:e4:28:e4:a6:70:6f:e2:b5:35
```

Example 2. The following example displays the authentication method and DSA private key in encrypted format:

```
switchxxxxx# show ip ssh-client key DSA
Authentication method:  DSA key
```

```

Username:                john
Key Source:              User Defined
Public Key Fingerprint: 77:C7:19:85:98:19:27:96:C9:CC:83:C5:78:89:F8:86
---- BEGIN SSH2 PUBLIC KEY ----
Comment: RSA Public Key
AAAAB3NzaC1kc3MAAACBAPY8Z0HY2yFSJA6XYC9HRwNHxaehvx5w0J0rzZdzoS0XxbET
W6ToHv8D1UJ/z+zHo9Fiko5XybZnDIaBDHtbLQ+Yp7StxyltHnXF1YLFKD1G4T6JYrdH
YI140m1eg9e4NnCRleaQoZPF3UGfZia6bXrGTQf3gJq2e7Yisk/gF+1VAAAAFQDb8D5c
vwHWTZDPfX0D2s9Rd7NBvQAAAIEA lN92+Bb7D4KLYk3IwRbXblwXdkPggA4pfdtw9vGf
J0/RHd+NjB4eo1D+0dix6tXwYGN7PKS5R/FXPNwxHPapcj9uL1Jn2AWQ2dsknf+i/FAA
vioUPkmdMc0zuWoS0EsSNhVDtX3WdvVcGcBq9cetzrtOKW0ocJmJ80qadxTRHtUAAACB
AN7CY+KKv1gHpRzFwdQm7HK9bb1LAo2KwaoXnadFgeptNBQeSXG1v0+JsvphVMBJc9HS
n24VYtYtsMu74qXviYjziVucWKjjKEb11juqnF0GDLB3VmxHLMxnAz643WK42Z7dLM5
sY29ouezv4Xz2PuMch5VGPP+CDqzCM4loWgV
---- END SSH2 PUBLIC KEY ----
---- BEGIN SSH2 PRIVATE KEY ----
Comment: DSA Private Key
AAAAB3NzaC1kc3MAAACBAPY8Z0HY2yFSJA6XYC9HRwNHxaehvx5w0J0rzZdzoS0XxbET
W6ToHv8D1UJ/z+zHo9Fiko5XybZnDIaBDHtbLQ+Yp7StxyltHnXF1YLFKD1G4T6JYrdH
YI140m1eg9e4NnCRleaQoZPF3UGfZia6bXrGTQf3gJq2e7Yisk/gF+1VAAAAFQDb8D5c
vwHWTZDPfX0D2s9Rd7NBvQAAAIEA lN92+Bb7D4KLYk3IwRbXblwXdkPggA4pfdtw9vGf
J0/RHd+NjB4eo1D+0dix6tXwYGN7PKS5R/FXPNwxHPapcj9uL1Jn2AWQ2dsknf+i/FAA
vioUPkmdMc0zuWoS0EsSNhVDtX3WdvVcGcBq9cetzrtOKW0ocJmJ80qadxTRHtUAAACB
AN7CY+KKv1gHpRzFwdQm7HK9bb1LAo2KwaoXnadFgeptNBQeSXG1v0+JsvphVMBJc9HS
n24VYtYtsMu74qXviYjziVucWKjjKEb11juqnF0GDLB3VmxHLMxnAz643WK42Z7dLM5
sY29ouezv4Xz2PuMch5VGPP+CDqzCM4loWgV
---- END SSH2 PRIVATE KEY ----

```

Example 3. The following example displays the SSH client authentication method, the username and the password:

```
switchxxxxxx# show ip ssh-client
```

```
Authentication method: password (default)
Username:                anonymous (default)
password(Encrypted):    KzGgzpYa7GzCHhaveSJDehGJ6L3Yf9ZBAU5nsxSxwic=
```

6.9 show ip ssh-client server

Use the **show ip ssh-client server** command in Privilege EXEC Configuration mode to display the SSH remote server authentication method and the Trusted Remote SSH Server table.

Syntax

show ip ssh--client server [*host* | *ip-address*]

Parameters

- **host** — DNS name of an SSH server.
- **ip-address** — IP Address of an SSH server. The IP address can be an IPv4, IPv6 or IPv6z address. See IPv6z Address Conventions.

Default Configuration

N/A

Command Mode

Privilege EXEC configuration mode

User Guidelines

If a specific SSH server is specified, only the fingerprint of this SSH server is displayed. Otherwise, all known servers are displayed.

Examples

Example 1 - In the following example, the SSH remote server authentication method and all trusted remote SSH servers are displayed:

```
switchxxxxxx# show ip ssh-client server

SSH Server Authentication is enabled

server address: 11.1.0.1
```

```
Server Key Fingerprint: 5a:8d:1d:b5:37:a4:16:46:23:59:eb:44:13:b9:33:e9
server address: 192.165.204.111
```

```
Server Key Fingerprint: a4:16:46:23:5a:8d:1d:b5:37:59:eb:44:13:b9:33:e9
server address: 4002:0011::12
```

```
Server Key Fingerprint: a5:34:44:44:27:8d:1d:b5:37:59:eb:44:13:b9:33:e9
```

Clock Commands

7.1 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.

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

7.2 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 | browser]

no clock source

Parameters

- **sntp**—Specifies that an SNTP server is the external clock source.
- **browser**—Specifies that if the system clock is not already set (either manually or by SNTP) and a user logs on to the device using a WEB browser (either via HTTP or HTTPS), the system clock will be set according to the browser's time information.

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
```

7.3 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
```

7.4 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
```

7.5 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

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

7.6 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*

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

no sntp authentication-key *key-number*

Parameters

- **key-number**—Specifies the key number. (Range: 1–4294967295)
- **key-value**—Specifies the key value. (Length: 1–8 characters)
- **encrypted-key-value**—Specifies the key value in encrypted format.

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
```

7.7 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
```

7.8 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
```

7.9 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
```

7.10 sntp anycast client enable

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

Syntax

sntp anycast client enable

no sntp anycast client enable

Parameters

N/A

Default Configuration

The SNTP anycast client is disabled.

Command Mode

Global Configuration mode

User Guidelines

Use this command to enable the SNTP Anycast client.

Example

The following example enables SNTP Anycast clients.

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

7.11 sntp client enable

The **sntp client enable** Global Configuration mode command enables the SNTP Broadcast and Anycast client on an interface when the device is in Router mode (Layer 3). Use the **no** form of this command to disable the SNTP Broadcast and Anycast client.

Syntax

sntp client enable *{interface-id}*

no sntp client enable *{interface-id}*

Parameters

interface-id—Specifies an interface ID, which can be one of the following types: Ethernet port, Port-channel or VLAN.

Default Configuration

The SNTP client is disabled on an interface.

Command Mode

Global Configuration mode - Ethernet port, Port-channel or VLAN.

User Guidelines

This command only works when the device is in Router mode (Layer 3).

The [sntp broadcast client enable](#) Global Configuration mode command globally enables Broadcast clients.

This command enables both.

Example

The following example enables the SNTP Broadcast and Anycast client on port gi3.

```
switchxxxxxx(config)# sntp client enable gi3
```

7.12 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
```

7.13 **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
```

7.14 **sntp unicast client poll**

The **sntp unicast client poll** Global Configuration mode command enables polling for the SNTP predefined Unicast clients. Use the **no** form of this command to disable the polling for the SNTP client.

Syntax

sntp unicast client poll

no sntp unicast client poll

Default Configuration

Polling is disabled.

Command Mode

Global Configuration mode

Example

The following example enables polling for SNTP predefined unicast clients.

```
switchxxxxx(config)# sntp unicast client poll
```

7.15 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.

The `sntp unicast client poll` Global Configuration mode command globally enables polling.

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
```

7.16 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.

```
switchxxxxx# 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
```

7.17 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.

```

switchxxxxx# show sntp configuration

SNTP port : 123 .
Polling interval: 1024 seconds.
MD5 authentication keys
-----
2   John123
3   Alice456
-----

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.

switchxxxxx#

```

7.18 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 [mSec]	Delay [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 [mSec]	Delay [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

DNS Client Commands

8.1 clear host

Use the **clear host** command in privileged EXEC mode to delete dynamic host-name-to-address mapping entries from the DNS client name-to-address cache.

Syntax

clear host {*hostname* /*}

Parameters

- **hostname**—Name of the host for which host-name-to-address mappings are to be deleted from the DNS client name-to-address cache.
- **/***—Specifies that all the dynamic host-name-to-address mappings are to be deleted from the DNS client name-to-address cache.

Default Configuration

No host-name-to-address mapping entries are deleted from the DNS client name-to-address cache.

Command Mode

Privileged EXEC mode

User Guidelines

To remove the dynamic entry that provides mapping information for a single hostname, use the *hostname* argument. To remove all dynamic entries, use the **/*** keyword.

To define a static host-name-to-address mappings in the DNS host name cache, use the [ip host](#) command.

To delete a static host-name-to-address mappings in the DNS host name cache, use the **no ip host** command.

Example

The following example deletes all dynamic entries from the DNS client name-to-address cache.

```
clear host *
```

82 ip domain lookup

Use the **ip domain lookup** command in Global Configuration mode to enable the IP Domain Naming System (DNS)-based host-name-to-address translation.

Use the **no** form of this command to disable the DNS.

Syntax

ip domain lookup

no ip domain lookup

Parameters

N/A

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
```

83 ip domain name

Use the **ip domain name** command in Global Configuration mode to define a default domain name that the switch uses to complete unqualified host names (names without a dotted domain name).

Use the **no** form of this command to delete the static defined default domain name.

Syntax

ip domain name *hostname*

no ip domain name

Parameters

hostname—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

No default domain name is defined.

Command Mode

Global Configuration mode

User Guidelines

Any IP host name that does not contain a domain name (that is, any name without a dot) will have the dot and the default domain name appended to it before being added to the host table.

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 website.com
```

84 ip domain polling-interval

Use the **ip domain polling-interval** command in Global Configuration mode to specify the polling interval.

Use the **no** form of this command to return to the default behavior.

Syntax

ip domain polling-interval *seconds*

no ip domain polling-interval

Parameters

seconds—Polling interval in seconds. The range is from $(2 \cdot (R+1) \cdot T)$ to 3600.

Default Configuration

The default value is $2 \cdot (R+1) \cdot T$, where

R is a value configured by the **ip domain retry** command.

T is a value configured by the **ip domain timeout** command.

Command Mode

Global Configuration mode

User Guidelines

Some applications communicate with the given IP address continuously. DNS clients for such applications, which have not received resolution of the IP address or have not detected a DNS server using a fixed number of retransmissions, return an error to the application and continue to send DNS Request messages for the IP address using the polling interval.

Example

The following example shows how to configure the polling interval of 100 seconds:

```
ip domain polling-interval 100
```

85 ip domain retry

Use the **ip domain retry** command in Global Configuration mode to specify the number of times the device will send Domain Name System (DNS) queries when there is no answer.

Use the **no** form of this command to return to the default behavior.

Syntax

ip domain retry *number*

no ip domain retry

Parameters

number—Number of times to retry sending a DNS query to the DNS server. The range is from 0 to 16.

Default Configuration

The default value is 2.

Command Mode

Global Configuration mode

User Guidelines

The **number** argument specifies how many times the DNS query will be sent to a DNS server until the switch decides that the DNS server does not exist.

Example

The following example shows how to configure the device to send out 10 DNS queries before giving up:

```
ip domain retry 10
```

86 ip domain timeout

Use the **ip domain timeout** command in Global Configuration mode to specify the amount of time to wait for a response to a DNS query.

Use the **no** form of this command to return to the default behavior.

Syntax

ip domain timeout *seconds*

no ip domain timeout

Parameters

seconds—Time, in seconds, to wait for a response to a DNS query. The range is from 1 to 60.

Default Configuration

The default value is 3 seconds.

Command Mode

Global Configuration mode

User Guidelines

Use the command to change the default time out value. Use the **no** form of this command to return to the default time out value.

Example

The following example shows how to configure the switch to wait 50 seconds for a response to a DNS query:

```
ip domain timeout 50
```

87 ip host

Use the **ip host** Global Configuration mode command to define the static host-name-to-address mapping in the DNS host name cache.

Use the **no** form of this command to remove the static-host name-to-address mapping.

Syntax

```
ip host name address1 [address2...address8]
```

```
no ip host name ip host name [address1...address8]
```

Parameters

- **name**—Name of the host. Length: 1–158 characters. Maximum label length of each domain level is 63 characters.
- **address1**—Associated host IP address (IPv4 or IPv6, if IPv6 stack is supported).

- **address2...address8**—Up to seven additional associated IP addresses, delimited by a single space (IPv4 or IPv6, if IPv6 stack is supported).

Default Configuration

No host is defined.

Command Mode

Global Configuration mode

User Guidelines

Host names are restricted to ASCII letters A through Z (case-insensitive), the digits 0 through 9, the underscore and the hyphen symbols. A period (.) is used to separate labels.

An IP application will receive the IP addresses in the following order:

- IPv6 addresses in the order specified by the command.
- IPv4 addresses in the order specified by the command.

Use the **no** format of the command with the *address1...address8* argument to delete the specified addresses. The entry is deleted if all its addresses are deleted.

Example

The following example defines a static host-name-to-address mapping in the host cache.

```
ip host accounting.website.com 176.10.23.1
```

88 ip name-server

Use the **ip name-server** command in Global Configuration mode to specify the address of one or more name servers to use for name and address resolution.

Use the **no** form of this command to remove the static specified addresses.

Syntax

```
ip name-server server1-address [server-address2...erver-address8]
```

```
no ip name-server [server-address1...server-address8]
```

Parameters

- **server-address1**—IPv4 or IPv6 addresses of a single name server.
- **server-address2...server-address8**—IPv4 or IPv6 addresses of additional name servers.

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.

Each **ip name-server** command replaces the configuration defined by the previous one (if one existed).

Example

The following example shows how to specify IPv4 hosts 172.16.1.111, 172.16.1.2, and IPv6 host 2001:0DB8::3 as the name servers:

```
ip name-server 172.16.1.111 172.16.1.2 2001:0DB8::3
```

89 show hosts

Use the **show hosts** command in privileged EXEC mode to display the default domain name, the style of name lookup service, a list of name server hosts, and the cached list of host names and addresses.

Syntax

show hosts [**all** | *hostname*]

Parameters

- **all**—The specified host name cache information is to be displayed for all configured DNS views. This is the default.

- **name**—The specified host name cache information displayed is to be limited to entries for a particular host name.

Command Mode

Privileged EXEC

Default Configuration

Default is **all**.

User Guidelines

This command displays the default domain name, a list of name server hosts, and the cached list of host names and addresses.

Example

The following is sample output of this command with no parameters specified:

show hosts

Name/address lookup is enabled

Domain Timeout: 3 seconds

Domain Retry: 2 times

Domain Polling Interval: 18 seconds

Default Domain Table

Domain	Source	Interface	Preference
-----	-----	-----	-----
a222	static		
gren1	DHCPv6	vlan 1	1
unit1	DHCPv6	vlan 1	2
exp1	DHCPv6	vlan 1	3
cisco.com	DHCPv4	gi2/1/24	1

Name Server Table

IP Address	Source	Interface	Preference
-----	-----	-----	-----
4.4.4.1	static		1

```

1::1                DHCPv6  vlan 1    1
2::2                DHCPv6  vlan 1    2
3::3                DHCPv6  vlan 1    3
10.5.102.110        DHCPv4  gi2/1/24  1
10.5.102.111        DHCPv4  gi2/1/24  2

```

Cache Table

Flags: (STA/DYN/FIX, OK/NE/??)

STA - Static, DYN - Dynamic, FIX - Fixed

OK - Okay, NE - Negative Cache, ?? - No Response

Remaining

Host	Addresses	Type	State	TTL
-----	-----	----	-----	-----
google.com	173.194.34.96	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.101	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.104	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.110	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.103	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.105	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.97	IPv4	DYN,OK	0000:01:14
google.com	173.194.34.99	IPv4	DYN,OK	0000:01:06
pt-lt0109.a222	no resolution	IPv4	DYN,NE	0000:14:37
pt-lt0109.gren1	no resolution	IPv4	DYN,NE	0000:14:38
pt-lt0109.unit1	no resolution	IPv4	DYN,NE	0000:14:37
pt-lt0109.cisco.com	10.5.80.50	IPv4	DYN,OK	0000:19:37

Configuration and Image File Commands

9.1 copy

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

Syntax

copy *source-url destination-url* [**exclude** | **include-encrypted** | **include-plaintext**]

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).
- **"Flash://"** —The source or destination URL scheme that specifies the access method to the local flash memory. It stands for the root directory of the local flash. It is the default scheme for a URL that does not explicitly contain a scheme/access method (e.g. for copying the running configuration file, the user may either use flash://running-config or just running-conig).
- **exclude**—Do not include sensitive data in the file being copied.
- **include-encrypted**—Include sensitive data in its encrypted form.
- **include-plaintext**—Include sensitive data in its plaintext form

The following table displays the URL options.

Source and/or Destination URL	Source or Destination
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.

Source and/or Destination URL	Source or Destination
boot	Boot file.
tftp://	Source or destination URL for a TFTP network server. The syntax for this alias is <i>tftp://host/[directory]/filename</i> . The host can be either an IP address or a host name.
scp://	Source or destination URL for a Secure Copy Protocol (SCP) network server. The syntax for this alias is: scp://[username,password@]host/[directory]/filename. The host can be either the IP address or hostname. The default on the switch is SSH authentication by password with username and password anonymous. The SSH authentication parameters can be reconfigured to match the SSH/SCP server's parameters.
xmodem:	Source for the file from a serial connection that uses the Xmodem protocol.
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.

Source and/or Destination URL	Source or Destination
unit://member/localization	The secondary language file on one of the units. To copy to all units, specify * in the member field. Example: copy tftp://10.5.234.203/french.txt unit:// */localization.
logging	Specifies the SYSLOG file.
Word<1-128>	Name of file (e.g. backup-config).

Default Configuration

Sensitive data is excluded if no method was specified

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.

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.
- **ftp://** 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.
- **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.

Various Copy Options Guidelines

- **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.

SCP Copy Authentication Options

The following options are possible for using the SCP copy feature:

- **scp://host/[directory]/filename**

In this option, the SSH authentication method (either by password or by key) and the credentials are specified by the CLI commands for ip ssh client (**ip ssh-client authentication**, **ip ssh-client key-type** or **ip ssh-client password/username**, and also the server authentication configuration commands),.

- **scp://username:password@host/[directory]/filename..**

This option specifies SSH authentication by password, and the user name and password for this specific SCP session (one-time only).

Examples

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

```
switchxxxxx# 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.

```
switchxxxxx# 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.

```
switchxxxxx# copy mirror-config startup-config
```

Example 4 - Copy file1 from SSH server to startup config

The following example copies file1 to the Startup Configuration file. The username and password used for SCP session authentication are: jeff and admin1. The IP address of the server containing file1 is 102.1.2.2.

```
switchxxxxxx# copy scp://jeff:admin1@102.1.2.2/file1 startup-config
```

9.2 write

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

Syntax

write [memory]

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
```

9.3 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)

"Flash://" is the source or destination URL scheme that specifies the access method to the local flash memory. It simply stands for the root directory of the local flash. It is the default scheme for a URL that does not explicitly contain a scheme/access method (e.g. for copying the running configuration file, the user may either use flash://running-config or just running-config).

The following table displays keywords and URL prefixes:

URL	
startup-config	Startup configuration file.
WORD	Name of file (e.g. backup-config).

Default Configuration

N/A

Command Mode

Privileged EXEC mode

User Guidelines

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

Example

The following example deletes the file called 'backup-config' from the flash memory.

```
switchxxxxx# delete flash://backup-config
Delete flash:backup-config? [confirm]
```

9.4 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

```
switchxxxxx# dir
```

Directory of flash:

File Name	Permission	Flash Size	Data Size	Modified
-----	-----	-----	-----	-----
backuplo	rw	851760	525565	22-Dec-2010 10:50:32
backup-config	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
mirror-config	rw	524288	104	01-Jan-2010 05:35:04
dhcpcsn.prv	--	262144	--	01-Jan-2010 05:25:07
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

9.5 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).

"Flash://" is the source or destination URL scheme that specifies the access method to the local flash memory. It simply stands for the root directory of the local flash. It is the default scheme for a URL that does not explicitly contain a scheme/access method (e.g. for copying the running configuration file, the user may either use flash://running-config or just running-config).

The following table displays options for the URL parameter:

Keyword	Source or Destination
running-config	Current running configuration file.
startup-config	Startup configuration file.
mirror-config	Mirrored configuration file.
WORD	Name of file (e.g. backup-config).

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.

```
switchxxxxx# more running-config
```

```
no spanning-tree
interface range gi1-48
speed 1000
exit
no lldp run
line console
exec-timeout 0
```

9.6 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 [rename](#) 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 [rename](#).

```
switchxxxxx# boot system image-1

switchxxxxx#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

9.7 rename

The **rename** Privileged EXEC mode command renames a file.

Syntax

rename *url new-url*

Parameters

- **url**—Specifies the file location URL. (Length: 1–160 characters)
- **new-url**—Specifies the file's new URL. (Length: 1–160 characters)

"Flash://" is the source or destination URL scheme that specifies the access method to the local flash memory. It simply stands for the root directory of the local flash. It is the default scheme for a URL that does not explicitly contain a scheme/access method (e.g. for copying the running configuration file, the user may either use flash://running-config or just running-conig).

The following table displays options for the URL parameter:

Keyword	Source or Destination
WORD<1-128>	Name of file (e.g. backup-config)..

Default Configuration

N/A

Command Mode

Privileged EXEC mode

User Guidelines

mirror-config, *.sys and *.prv files cannot be renamed.

Example

The following example renames the configuration backup file.

```
switchxxxxx# rename backup-config m-config.bak
```

9.8 **show bootvar**

Use the **show bootvar** EXEC mode command to display the active system image file that was loaded by the device at startup, and to display the system image file that will be loaded after rebooting the switch.

Syntax

show bootvar

Parameters

N/A

Command Mode

EXEC mode

Example

The following example displays the active system image file that was loaded by the device at startup and the system image file that will be loaded after rebooting the switch.

```
switchxxxxx# 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.

9.9 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* | *detailed* | *brief*]

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.
- ***detailed***—Displays configuration with SSL and SSH keys.
- ***brief***—Displays configuration without SSL and SSH keys.

Default Configuration

All interfaces are displayed. If *detailed* or *brief* is not specified, the default is *detailed*.

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.

Examples

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 fastethernet1/1/1-2
interface fastethernet1/1/1
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
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 fastethernet1/1/2
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
```

9.10 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 a list of interface IDs. The interface IDs can be one of the following types: Ethernet port, port-channel or VLAN.

Default Configuration

All interfaces are displayed.

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
  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 fastethernet1/1/2
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
```

9.11 service mirror-configuration

Use the **service mirror-configuration** Global Configuration mode command to enable the mirror-configuration service. Use **no service mirror-configuration** command to disable the service.

Syntax

service mirror-configuration

no service mirror-configuration

Parameters

N/A

Default Configuration

The default configuration is mirror-configuration service enabled.

Command Mode

Global Configuration mode

User Guidelines

The mirror-configuration service automatically keeps a copy of the last known stable configuration (startup configuration that wasn't modified for 24H). The mirror-configuration file is not deleted when restoring to factory defaults.

When this service is disabled, the mirror-configuration file is not created and if such file already exists, it is deleted.

Note that enabling the service doesn't implicitly creates a mirror-configuration file.

Examples

Example 1: The following example disables the mirror-configuration service

```
no service mirror-configuration
```

This operation will delete the mirror-config file if exists. Do you want to continue? (Y/N) [N]

Example 2: The following example enables the mirror-configuration service

```
service mirror-configuration
```

Service is enabled.

Note that the running-configuration must be first copied to the startup-configuration in order to initiate backing up the startup-config to the mirror-config.

9.12 show mirror-configuration service

Use the **show mirror-configuration service** EXEC mode command to display the mirror-configuration service status.

Syntax

show mirror-configuration service

Command Mode

EXEC mode

Example

The following example displays the status of the mirror-configuration service

```
show mirror-configuration service
```

```
Mirror-configuration service is enabled
```


Auto-Configuration

10.1 boot host auto-config

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

Syntax

boot host auto-config [tftp | scp | auto [*extension*]]

no boot host auto-config

Parameters

- **ftp**—Only the TFTP protocol is used by auto-configuration.
- **scp**—Only the SCP protocol is used by auto-configuration.
- **auto**—(Default) Auto-configuration uses the TFTP or SCP protocol depending on the configuration file's extension. If this option is selected, the extension parameter may be specified or, if not, the default extension is used.
 - **extension**—The SCP file extension. When no value is specified, 'scp' is used. (Range: 0–128)

Default Configuration

The auto option is the default.

Command Mode

Global Configuration mode

Default Configuration

Enabled by default.

Examples

Example 1 - The following example specifies the auto mode and specifies "scon" as the SCP extension:

```
boot host auto-config auto scon
```

Example 2 - The following example specifies the auto mode and does not provide an SCP extension. In this case "scp" is used.

```
boot host auto-config auto
```

Example 3. The following example specifies that only the SCP protocol will be used:

```
boot host auto-config scp
```

10.2 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
Download Protocol Mode is SCP
SCP extension is scp
Next Boot Config Download via DHCP: default
```

10.3 ip dhcp tftp-server ip address

Use the **ip dhcp tftp-server ip address** Global Configuration mode command to set the TFTP or SCP 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

User Guidelines

The backup server can be either a TFTP server or an SCP server.

Examples

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

10.4 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 or SCP 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

User Guidelines

The path/file name, used in the download process, can be received from DHCP or this command as well.

Examples

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

10.5 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

```
switchxxxxx# show ip dhcp tftp server
```

```
tftp server address
```

```
server address
```

```
active      1.1.1.1 from sname
```

```
manual      2.2.2.2
```

```
file path on tftp server
```

```
file path on server
```

```
active      conf/conf-file from option 67
```

Management ACL Commands

11.1 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.

Examples

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
```

11.2 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
```

11.3 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
```

11.4 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 **m1ist** as the active management access list.

```
switchxxxxxx(config)# management access-class m1ist
```

11.5 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.

```
switchxxxxx# show management access-list mlist
-only
-----
deny
! (Note: all other access implicitly denied)
mlist
-----
permit gi1
permit gi9
! (Note: all other access implicitly denied)
switchxxxxx#
```

11.6 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
```

Network Management Protocol (SNMP) Commands

12.1 **snmp-server server**

Use the **snmp-server server** Global Configuration mode command to enable the device to be configured by the SNMP protocol. Use the **no** form of this command to disable this function.

Syntax

snmp-server server

no snmp-server server

Parameters

N/A

Default Configuration

Enabled

Command Mode

Global Configuration mode

Example

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

12.2 **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*]

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.

Default Configuration

No community is defined

Command Mode

Global Configuration mode

User Guidelines

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),

Example

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
```

12.3 snmp-server community-group

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. This command configures both SNMP v1 and v2.

Syntax

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

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.
- **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

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.

Example

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

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

12.4 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
```

12.5 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

12.6 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
```

12.7 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.

```
switchxxxxx# 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.

12.8 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. Use the **encrypted** form of this command to enter the authentication and privacy passwords in encrypted form (see SSD).

Syntax

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

encrypted snmp-server user *username groupname {v1 | v2c | [remote host] v3}* *auth { md5 | sha }* *encrypted-auth-password [priv encrypted-priv-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**—IP address (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.
- **encrypted-auth-password**—Specifies the authentication password in encrypted format.
- **priv-password**—Specifies the privacy password (The encryption algorithm used is data encryption standard - DES). Range: Up to 64 characters.**encrypted-priv-password**—Specifies the privacy password in encrypted format.

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 local** or **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
```

12.9 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

Example

The following examples displays the configured SNMP users.
console#show snmp users

```
User name           : u1rem
Group name          : group1
Authentication Algorithm : None
```


Privacy Algorithm : None
Remote :11223344556677
Auth Password :
Priv Password :

User name : qq
Group name : www
Authentication Algorithm : MD5
Privacy Algorithm : None
Remote :
Auth Password : helloworld1234567890987665
Priv Password :

User name : hello
Group name : world
Authentication Algorithm : MD5
Privacy Algorithm : DES
Remote :
Auth Password (encrypted):
Z/tC3UF5j0pYfmXm8xeMvclOQ6LQ4GOACCGYLRdAgOE6XQKTCqMlrnpWuHra
RIZj

Priv Password (encrypted) :
kN1ZHzSLo6WWxIkuZVzhLOo1gl5waaNf7Vq6yLBpJdS4N68tL1tbTRSz2H4c4Q4
User name : u1noAuth
Group name : group1
Authentication Algorithm : None
Privacy Algorithm : None
Remote :
Auth Password (encrypted):

Priv Password (encrypted) :

User name : u1OnlyAuth

Group name : group1

Authentication Algorithm : SHA

Privacy Algorithm : None

Remote :

Auth Password (encrypted):

8nPzy2hzuba9pG3iiC/q0451RynUn7kq94L9WORFrRM=

Priv Password (encrypted) :

12.10 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 defined in 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
```

12.11 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

12.12 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 list - 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](#) and [snmp-server group](#) to create a user or a group.

Example

The following defines a host at the IP address displayed.

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

12.13 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.

12.14 snmp-server engineID local

The **snmp-server engineID local** Global Configuration mode command specifies the SNMP engineID on the local device for SNMP v3. Use the **no** form of this command to remove this engine ID.

Syntax

snmp-server engineID local {*engineid-string* | **default**}

no snmp-server engineID local

Parameters

- **engineid-string**—Specifies a concatenated hexadecimal character string identifying the engine ID. Each byte in a hexadecimal character string is two hexadecimal digits. Bytes are separated by a period or colon. If an odd number of hexadecimal digits are entered, the system automatically prefixes the digit 0 to the string. (Length: 5–32 characters, 9–64 hexadecimal digits)
- **default**—Specifies that the engine ID is created automatically based on the device MAC address.

Default Configuration

The default engine ID is defined per standard as:

- First 4 octets: First bit = 1, the rest is IANA Enterprise number = 674.
- Fifth octet: Set to 3 to indicate the MAC address that follows.
- Last 6 octets: The device MAC address.

Command Mode

Global Configuration mode

User Guidelines

To use SNMPv3, an engine ID must be specified for the device. Any ID can be specified or the default string, which is generated using the device MAC address, can be used.

Since the engineID should be unique within an administrative domain, use the default keyword to configure the Engine ID.

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

The SNMP EngineID cannot be all 0x0 or all 0xF or 0x000000001

Example

The following example enables SNMPv3 on the device and sets the device local engine ID to the default value.

```
switchxxxxxx(config)# snmp-server engineid local default
```

```
The engine-id must be unique within your administrative domain.
```

```
Do you wish to continue? [Y/N]Y
```

```
The SNMPv3 database will be erased. Do you wish to continue? [Y/N]Y
```

12.15 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
```

12.16 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
```

12.17 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
```

12.18 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
```

12.19 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
```

12.20 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
```

12.21 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 Port	Filter Name	T0 Sec	Retries
-----	----	-----	-----	----	-----	---	-----
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 Level	UDP Port	Filter name	T0 Sec	Retries
-----	----	-----	-----	----	-----	---	-----
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.

Web Server Commands

13.1 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
```

13.2 ip http port

The **ip http port** Global Configuration mode command specifies the TCP port used by the web browser interface. Use the **no** form of this command to restore the default configuration.

Syntax

ip http port *port-number*

no ip http port

Parameters

port *port-number*—For use by the HTTP server. (Range: 0–65534)

Default Configuration

The default port number is 80.

Command Mode

Global Configuration mode

Example

The following example configures the http port number as 100.

```
switchxxxxx(config)# ip http port 100
```

13.3 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
```

13.4 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
```

13.5 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
```

13.6 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
```

13.7 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, O= 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, O= General Motors, C= US

Finger print: 1873B936 88DC3411 BC8932EF 782134BA

Telnet, Secure Shell (SSH) and Secure Login (Slogin) Commands

14.1 ip telnet server

Use the **ip telnet server** Global Configuration mode command to enable the device as a Telnet server that accepts connection requests from remote Telnet clients. Remote Telnet clients can configure the device through the Telnet connections.

Use the no form of this command to disable the Telnet server functionality on the device.

Syntax

ip telnet server

no ip telnet server

Default Configuration

The Telnet server functionality on the device is disabled by default

Command Mode

Global Configuration mode

User Guidelines

The device can be enabled to accept connection requests from both remote SSH and Telnet clients. It is recommended that the remote client connects to the device using SSH (as opposed to Telnet), since SSH is a secure protocol and Telnet is not. To enable the device to be a SSH server, use the **ip ssh server** Global Configuration mode command

Example

The following example enables the device to be configured from a Telnet server.

```
switchxxxxxx(config)# ip telnet server
```

14.2 ip ssh server

The **ip ssh server** Global Configuration mode command enables the device to be an SSH server and so to accept connection requests from remote SSH clients. Remote SSH clients can manage the device through the SSH connection.

Use the **no** form of this command to disable the SSH server functionality from the device.

Syntax

ip ssh server

no ip ssh server

Default Configuration

The SSH server functionality is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

The device as a SSH server generates the encryption keys automatically.

To generate new 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 to be an SSH server.

```
switchxxxxxx(config)# ip ssh server
```

14.3 ip ssh port

The **ip ssh port** Global Configuration mode command specifies the port used by the SSH server. Use the **no** form of this command to restore the default configuration.

Syntax

ip ssh port *port-number*

no ip ssh port

Parameters

port-number—Specifies the port number to be used by the SSH server. (Range: 1–65535)

Default Configuration

The default port number is 22.

Command Mode

Global Configuration mode

Example

The following example specifies that port number 8080 is used by the SSH server.

```
switchxxxxxx(config)# ip ssh port 8080
```

14.4 ip ssh pubkey-auth

Use the **ip ssh pubkey-auth** Global Configuration mode command to enable public key authentication of incoming SSH sessions.

Use the **no** form of this command to disable this function.

Syntax

ip ssh pubkey-auth [auto-login]

no ip ssh pubkey-auth

Parameters

auto-login— Specifies that the device management AAA authentication is not needed. By default, this login is required after the SSH authentication.

Default Configuration

Public key authentication of incoming SSH sessions is disabled.

Auto-login is not enabled.

Command Mode

Global Configuration mode

User Guidelines

This command enables public key authentication by a local SSH server of remote SSH clients.

The local SSH server advertises all enabled SSH authentication methods and remote SSH clients are responsible for selecting one of them.

After a remote SSH client is successfully authenticated by public key, the client must still be AAA-authenticated to gain management access to the device, except if the `auto-login` parameter was specified.

If no SSH authentication method is enabled, remote SSH clients must still be AAA-authenticated before being granted management access to the device.

The **auto-login** keyword works as follows:

- **Specified**—Management access is granted if SSH authentication succeeds and the name of SSH used is found in the local user database. The device management AAA authentication is transparent to the user. If the user name is not in the local user database, the user receives a warning message, and the user must pass the device management AAA authentication independently of the SSH authentication.
- **Not Specified**—Management access is granted only if the user passes both SSH authentication and device management AAA authentication independently. If no SSH authentication method is enabled, management access is granted only if the user is AAA-authenticated by the device management. No SSH authentication method means SSH is enabled, but neither SSH authentication by public key nor password is enabled.

Example

The following example enables authentication of the SSH client with no double authentication.

```
switchxxxxxx(config)# ip ssh pubkey-auth auto-login
```

14.5 ip ssh password-auth

Use the **ip ssh password-auth** Global Configuration mode command to enable password authentication of incoming SSH sessions.

Use the **no** form of this command to disable this function.

Syntax

ip ssh password-auth

no ip ssh password-auth

Default Configuration

Password authentication of incoming SSH sessions is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command enables password authentication by a local SSH server of remote SSH clients.

The local SSH server advertises all locally-enabled SSH authentication methods and a remote SSH client must select one of them.

If the password method was chosen by the client, management access is granted after the client is authenticated by SSH using the regular user authentication (AAA). No login is needed from the device management.

If no SSH authentication method is enabled, management access is granted only if the user is authenticated by the device management (through AAA). If no SSH authentication method is selected, SSH is enabled, but neither SSH authentication by public key nor password is enabled.

Example

The following example enables password authentication of the SSH client.

```
switchxxxxxx(config)# ip ssh password-auth
```

14.6 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'.

```

switchxxxxx(config)# crypto key pubkey-chain ssh
switchxxxxx(config-pubkey-chain)# user-key bob rsa
switchxxxxx(config-pubkey-key)# key-string
AAAAB3NzaC1yc2EAAAADAQABAAQACvTnRwPWl
Al4kpqIw9GBRonZQZxjHKcqKL6rMlQ+
ZNXfZSkvHG+QusIZ/76ILmFT34v7u7ChFAE+
Vu4GRfpSwoQUvV35LqJJk67IOU/zfw0l1g
kTwml75QR9gHujS6KwGN2QWXgh3ub8gDjTSq
muSn/Wd05iDX2IExQWu08licglk02LYciz
+Z4TrEU/9FJxwPiVQ0jc+KBXuR0juNg5nFYsY
0ZCk0N/W9a/tnkm1shRE7Di71+w3fNi0A
6w9o44t6+AINEICCCA4YcF6zMzaT1wefWwX6f+
Rmt5nhhqAtN/4oJfce166DqVX1gWmN
zNR4DYDvSzg0LDnwCAC8Qh
Fingerprint: a4:16:46:23:5a:8d:1d:b5:37:59:eb:44:13:b9:33:e9

```

14.7 user-key

The **user-key** SSH Public Key-string Configuration mode command associates a username with a manually-configured SSH public key.

Use the **no user-key** command to remove an SSH user and the associated 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

After entering this command, the existing key, if any, associated with the user will be deleted. You must follow this command with the **key-string** command to configure the key to the user.

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
```

```
AAAAB3NzaC1yc2EAAAADAQABAAQACvTnRwPWl
```

14.8 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. The maximum length of a row is 160 characters.
- **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.

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'.

```
switchxxxxx(config)# crypto key pubkey-chain ssh
```

```

switchxxxxxx(config-pubkey-chain)# user-key bob rsa
switchxxxxxx(config-pubkey-key)# key-string
AAAAB3NzaC1yc2EAAAADAQABAAQACvTnRwPWl
Al4kpqIw9GBRonZQZxjHKcqKL6rMlQ+
ZNXfZSkvHG+QusIZ/76ILmFT34v7u7ChFAE+
Vu4GRfpSwoQUvV35LqJJk67IOU/zfw0l1g
kTwml75QR9gHujS6KwGN2QWXgh3ub8gDjTSq
muSn/Wd05iDX2IExQWu08licglk02LYciz
+Z4TrEU/9FJxwPiVQ0jc+KBXuR0juNg5nFYsY
0ZCk0N/W9a/tnkm1shRE7Di71+w3fNi0A
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

```

14.9 show ip ssh

The **show ip ssh** Privileged EXEC mode command displays the SSH server configuration.

Syntax

show ip ssh

Parameters

N/A

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 with auto-login.
SSH Password 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
182.20.2.1   Bob Smith      1.5          3DES        Password
```

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) or Password

14.10 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	Fingerprint

bob	9A:CC:01:C5:78:39:27:86:79:CC:23:C5:98:59:F1:86
john	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	Fingerprint

bob	9A:CC:01:C5:78:39:27:86:79:CC:23:C5:98:59:F1:86

Line Commands

15.1 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)#
```

15.2 speed

Use the **speed** command in Line Configuration mode to set 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 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 only 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
```

15.3 autobaud

Use the **autobaud** command in Line Configuration mode to configure the line for automatic baud rate detection (autobaud).

Use the **no** form of this command to disable automatic baud rate detection.

Syntax

autobaud

no autobaud

Default Configuration

Automatic baud rate detection is enabled.

Command Mode

Line Configuration mode

User Guidelines

When this command is enabled, it is activated as follows: connect the console to the device and press the **Enter** key twice. The device detects the baud rate automatically.

Example

The following example enables autobaud.

```
switchxxxxxx(config)# line console  
switchxxxxxx(config-line)# autobaud
```

15.4 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 telnet session idle time interval before automatic logoff to 20 minutes and 10 seconds.

```
switchxxxxxx(config)# line telnet
switchxxxxxx(config-line)# exec-timeout 20 10
```

15.5 show line

The **show line** EXEC mode command displays line parameters.

Syntax

show line [*console* / *telnet* / *ssh*]

Parameters

- **console**—Displays the console 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
Console 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
```

Bonjour Commands

16.1 **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(config)# bonjour enable
```

16.2 **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
```

16.3 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
-----	-----	-----
cisco-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
-----	-----	-----
cisco-sb	enabled	enabled
http	enabled	enabled
https	enabled	disabled
ssh	enabled	disabled
telnet	enabled	disabled

Authentication, Authorization and Accounting (AAA) Commands

17.1 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
```

17.2 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.
tacacs	Uses the list of all TACACS+ servers for authentication.

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.

The default and list names created by this command are used with [enable authentication](#).

All **aaa authentication enable** requests sent by the device to a RADIUS server include the username **\$enabx\$**, where x is the requested privilege level.

All **aaa authentication enable** requests sent by the device to a TACACS+ server include the username that is entered for login authentication.

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
```

17.3 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 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
```

17.4 enable authentication

The **enable authentication** Line Configuration mode command specifies the authentication method for accessing a higher privilege level from a remote Telnet or console. Use the **no** form of this command to restore the default authentication method.

Syntax

enable authentication *{default / list-name}*

no enable authentication

Parameters

- **default**—Uses the default list created with the [aaa authentication enable](#) command.
- **list-name**—Uses the specified list created with the [aaa authentication enable](#) command.

Default Configuration

The default is the [aaa authentication enable](#) command default.

Command Mode

Line Configuration mode

Examples

Example 1 - The following example specifies the authentication method as the default method when accessing a higher privilege level from a console.

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

Example 2 - The following example sets a list of authentication methods 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
```

17.5 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
```

17.6 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
```

17.7 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
```

17.8 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 be 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
4b529f21c93d4706090285b0c10172eb073ffe4bc4
```

17.9 service password-recovery

Use the **service password-recovery** Global Configuration mode command to enable the password-recovery mechanism. This mechanism allows an end user, with physical access to the console port of the device, to enter the boot menu and trigger the password recovery process. Use the **no service password-recovery** command to disable the password-recovery mechanism. When the password-recovery mechanism is disabled, accessing the boot menu is still allowed and the user can trigger the password recovery process. The difference is, that in this case, all the configuration files and all the user files are removed. The following log message is generated to the terminal: “All the configuration and user files were removed”.

Syntax

service password-recovery

no service password-recovery

Parameters

N/A

Default Configuration

The service password recovery is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

- If password recovery is enabled, the user can access the boot menu and trigger the password recovery in the boot menu. All configuration files and user files are kept.

- If password recovery is disabled, the user can access the boot menu and trigger the password recovery in the boot menu. The configuration files and user files are removed.
- If a device is configured to protect its sensitive data with a user-defined passphrase for (Secure Sensitive Data), then the user cannot trigger the password recovery from the boot menu even if password recovery is enabled.

Example

The following command disables password recovery:

```
switchxxxxxx(config)# no service password recovery
```

Note that choosing to use Password recovery option in the Boot Menu during the boot process will remove the configuration files and the user files.
Would you like to continue ? Y/N.

17.10 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 MD5 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.

- The Last level 15 user (regardless of whether it is the default user or any user) cannot be removed.
- Last level 15 user (regardless of whether it is the default user or any user) cannot be demoted

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
```

17.11 show users accounts

The **show users 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.

```
switchxxxxx# show users 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.

17.12 aaa accounting login

Use the **aaa accounting login** command in Global Configuration mode to enable accounting of device management sessions.

Use the **no** form of this command to disable accounting of device management sessions.

Syntax

aaa accounting login start-stop group {radius | tacacs+}

no aaa accounting login start-stop

Parameters

- **radius**—Uses a RADIUS server for accounting.
- **tacacs+**—Uses a TACACS+ server for accounting.

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

This command enables the recording of device management sessions (Telnet, serial and WEB but not SNMP).

It records only users that are identified with a username (e.g. a user that is logged in with a line password is not recorded).

If accounting is activated, the device sends “start/stop” messages to the RADIUS/TACACS+ server when a user logs in/logs out respectively.

The device uses the configured priorities of the available RADIUS/TACACS+ servers to select the RADIUS/TACACS+ server.

The following table describes the supported RADIUS accounting attributes values, and in which messages they are sent by the switch.

Name	Description	Sent in Start Message	Sent in Stop Message
User-Name (1)	User's identity.	Yes	Yes
NAS-IP-Address (4)	The switch IP address that is used for the session with the RADIUS server.	Yes	Yes
Class (25)	Arbitrary value is included in all accounting packets for a specific session.	Yes	Yes
Called-Station-ID (30)	The switch IP address that is used for the management session.	Yes	Yes

Name	Description	Sent in Start Message	Sent in Stop Message
Calling-Station-ID (31)	The user IP address.	Yes	Yes
Acct-Session-ID (44)	A unique accounting identifier.	Yes	Yes
Acct-Authentic (45)	Indicates how the supplicant was authenticated.	Yes	Yes
Acct-Session-Time (46)	Indicates how long the user was logged in.	No	Yes
Acct-Terminate-Cause (49)	Reports why the session was terminated.	No	Yes

The following table describes the supported TACAC+ accounting attributes values, and in which messages they are sent by the switch.

Name	Sent in Start Message	Sent in Stop Message	Description
task_id	Yes	Yes	A unique accounting session identifier.
user	Yes	Yes	Username that is entered for login authentication
rem-addr	Yes	Yes	IP address.of the user
elapsed-time	No	Yes	Indicates how long the user was logged in.
reason	No	Yes	Reports why the session was terminated.

Example

```
switchxxxxxx(config)# aaa accounting login start-stop group tacacs
```

17.13 aaa accounting dot1x

To enable accounting of 802.1x sessions, use the **aaa accounting dot1x** Global Configuration mode command. Use the **no** form of this command to disable accounting.

Syntax

aaa accounting dot1x *start-stop group radius*

no aaa accounting dot1x *start-stop group radius*

Parameters

N/A

Default Configuration

Disabled

Command Mode

Global Configuration mode

User Guidelines

This command enables the recording of 802.1x sessions.

If accounting is activated, the device sends a “start”/“stop” messages to a Radius server when a user logs in / logs out to the network, respectively.

The device uses the configured priorities of the available Radius servers in order to select the Radius server.

If a new supplicant replaces an old supplicant (even if the port state remains authorized), the software sends a “stop” message for the old supplicant and a “start” message for the new supplicant.

In multiple sessions mode (dot1x multiple-hosts authentication), the software sends “start”/“stop” messages for each authenticated supplicant.

In multiple hosts mode (dot1x multiple-hosts), the software sends “start”/“stop” messages only for the supplicant that has been authenticated.

The software does not send “start”/“stop” messages if the port is force-authorized.

The software does not send “start”/“stop” messages for hosts that are sending traffic on the guest VLAN or on the unauthenticated VLANs.

The following table describes the supported Radius accounting Attributes Values and when they are sent by the switch.

Name	Start	Stop	Description
User-Name (1)	Yes	Yes	Supplicant's identity.

NAS-IP-Address (4)	Yes	Yes	The switch IP address that is used for the session with the Radius server.
NAS-Port (5)	Yes	Yes	The switch port from where the supplicant has logged in.
Class (25)	Yes	Yes	Arbitrary value is included in all accounting packets for a specific session.
Called-Station-ID (30)	Yes	Yes	The switch MAC address.
Calling-Station-ID (31)	Yes	Yes	The supplicant MAC address.
Acct-Session-ID (44)	Yes	Yes	A unique accounting identifier.
Acct-Authentic (45)	Yes	Yes	Indicates how the supplicant was authenticated.
Acct-Session-Time (46)	No	Yes	Indicated how long the supplicant was logged in.
Acct-Terminate-Cause (49)	No	Yes	Reports why the session was terminated.
Nas-Port-Type (61)	Yes	Yes	Indicates the supplicant physical port type.

Example

```
switchxxxxxx(config)# aaa accounting dot1x start-stop group radius
```

17.14 show accounting

The **show accounting** EXEC mode command displays information about the status of login accounting.

Syntax

show accounting

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays information about the accounting status.

```
switchxxxxx# show accounting
Login: TACACS+
802.1x: Disabled
```

17.15 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

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.

```
switchxxxxx(config)# passwords complexity enable
switchxxxxx#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#
```

17.16 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.

```
switchxxxxx (config)# passwords complexity min-length 8
```

17.17 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
```

17.18 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

```
switchxxxxx#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 single character can be repeated in the password.
Level	The applied password privilege level.
Aging	The password aging time in days.

RADIUS Commands

18.1 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.

Use the **encrypted** form of the command to enter a key in its encrypted form.

Syntax

radius-server host *{ip-address | hostname}* [**auth-port** *auth-port-number*] [**acct-port** *acct-port-number*] [**timeout** *timeout*] [**retransmit** *retries*] [**deadtime** *deadtime*] [**key** *key-string*] [**source** *{source-ip}*] [**priority** *priority*] [**usage** *{login | 802.1x | all}*]

encrypted radius-server host *{ip-address | hostname}* [**auth-port** *auth-port-number*] [**acct-port** *acct-port-number*] [**timeout** *timeout*] [**retransmit** *retries*] [**deadtime** *deadtime*] [**key** *encrypted-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)
- **acct-port-number**—Port number for accounting requests. The host is not used for accountings if set to 0. If unspecified, the port number defaults to 1813.
- **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). If this parameter is omitted, the globally-configured radius key will be used.
- **key** *encrypted-key-string*—same as *key-string*, but the key is in encrypted format.
- **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.
- **encrypted-key-string**—Same as the *key-string* parameter, but the key is in encrypted form.

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
```

18.2 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*]

encrypted radius-server key [*encrypted-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)

- **encrypted-key-string**—Same as the key-string parameter, but the key is in encrypted form.

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
```

18.3 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
```

18.4 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
```

18.5 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
```

18.6 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
```

18.7 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
```

18.8 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
```

IP address	Port Auth	Port Acct	Time Out	Retransmission	Dead time	Source IP	Priority	Usage
172.16.1.1	1812	1813	Global	Global	Global	Global	1	All
172.16.1.2	1812	1813	11	8	Global	Global	2	All

```

Global values
-----
TimeOut: 3
Retransmit: 3
Deadtime: 0
Source IP: 172.16.8.1

```

18.9 show radius-servers key

Use the **show radius-servers key** Privileged EXEC mode command to display the RADIUS server key settings.

Syntax

show radius-servers key

Command Mode

Privileged EXEC mode

Example

The following example displays RADIUS server key settings.

```
switchxxxxx# show radius-servers key
IP address                Key (Encrypted)
-----
172.16.1.1                sdfsdjklkoisjdoiklsjdf

Global key (Encrypted)
-----
scklfjdkljfwkljksdj
```


TACACS+ Commands

19.1 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*]

encrypted tacacs-server host {*ip-address*| *hostname*} [*single-connection*] [**port** *port-number*] [*timeout timeout*] [**key** *encrypted-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. Specifies the RADIUS server host IP address. The IP address can be an IPv4, IPv6 or IPv6z 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). If this parameter is omitted, the globally-defined key (set in [tacacs-server key](#)) will be used.

- **key** *encrypted-key-string*—Same as **key-string**, but the key is in encrypted format.
- **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 the TACACS+ servers are used, where 0 is the highest priority. (Range: 0-65535)

Default Configuration

No TACACS+ host is specified.

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](#) or [tacacs-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 [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
```

19.2 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*

encrypted tacacs-server key *encrypted-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)
- **encrypted-key-string**—Same as key-string, but the key is in encrypted format.

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
```

19.3 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.

```
switchxxxxx(config)# tacacs-server timeout 30
```

19.4 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
```

19.5 tacacs-server source-ipv6

Use the **tacacs-server source-ipv6** Global Configuration mode command to configure the source IPv6 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-ipv6 {source}

no tacacs-server source-ipv6 {source}

Parameters

source—Specifies the source IPv6 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.

```
switchxxxxx(config)# tacacs-server source-ipv6
3ffe:1900:4545:3:200:f8ff:fe21:67cf
```

19.6 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, IP or IPv6 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.

```
switchxxxxx# show tacacs
```

IP address	Status	Port	Single Connection	Time Out	Source IP	Priority
-----	-----	----	-----	-----	-----	-----
172.16.1.1	Connected	49	No	Global	Global	1

```
Global values
-----
Time Out: 3
Source IP: 172.16.8.1
```

19.7 show tacacs key

Use the **show tacacs key** Privileged EXEC mode command to display the configured key of the TACACS+ server.

Syntax

show tacacs key [*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.

```
switchxxxxx# show tacacs key
```

```
IP address                Key (Encrypted)
```

```
Global key (Encrypted)
```

```
-----
```

Syslog Commands

20.1 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
```

20.2 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
```

20.3 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
```

20.4 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
```

20.5 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]
```

20.6 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
```

20.7 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.

```
switchxxxxx# clear logging file
Clear Logging File [y/n]
```

20.8 aaa logging

Use the **aaa logging** Global Configuration mode command to enable logging of the logins of authenticated users.

Use the **no** form of this command to disable logging of authenticated users.

Syntax

```
aaa logging {login}
no aaa logging {login}
```

Parameters

login—Enables logging messages related to successful AAA login events, unsuccessful AAA login events and other AAA login-related events.

Default Configuration

Enabled.

Command Mode

Global Configuration mode

User Guidelines

This command enables logging messages related to successful login events, unsuccessful login events and other login-related events. Other types of authenticated user events are not subject to this command.

Example

The following example enables logging of authenticated users.

```
switchxxxxx(config)# aaa logging login
```

20.9 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
```

20.10 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:

```
switchxxxxx(config)# no logging aggregation on
```

20.11 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
```

20.12 logging origin-id

Use the **logging origin-id** Global Configuration mode command to configure the origin field of the SYSLOG message packet headers sent to the SYSLOG server. Use the **no** form of this command to return to the default.

Syntax

logging origin-id {*hostname* | *IP* | *IPv6* | *string user-defined-id*}

no logging origin-id

Parameters

- **hostname**—Message origin identifier.
- **IP**—IP address of the sending interface that is used as the message origin identifier.
- **IPv6**—IPv6 address of the sending interface that is used as the message origin identifier. If the sending interface is IPv4, the IPv4 address will be used instead.
- **string user-defined-id**—Specifies an identifying description chosen by the user. The *user-defined-id* argument is the identifying description string.

Default Configuration

No header is send apart from PRI field.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# logging origin-id string "Domain 1, router B"
```

20.13 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.
Origin id: hostname
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

20.14 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 z6NHgZwKI5xKqF7cBtdl1xmFgSEWuDhho5UedydAjVvKS5XR2... 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
console#

20.15 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	

Remote Network Monitoring (RMON) Commands

21.1 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).

21.2 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).

21.3 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 Samples	Granted Samples	Owner
-----	-----	-----	-----	-----	-----
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.

21.4 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 Align	Under size	Oversize	Fragments	Jabbers
-----	-----	-----	-----	-----	----
Jan 18 2005 21:57:00	1	1	0	49	0
Jan 18 2005 21:57:30	1	1	0	27	0

```

switchxxxxx# 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.

21.5 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.

```
switchxxxxx(config)# rmon alarm 1000 1.3.6.1.2.1.2.2.1.10.1 360000 1000000  
1000000 10 20
```

21.6 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.

21.7 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.

21.8 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
```

21.9 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.

```
switchxxxxx# 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.

21.10 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
```

21.11 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
```

802.1X Commands

22.1 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
```

22.2 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
```

22.3 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 gi 15 to auto mode.

```
switchxxxxxx(config)# interface gi15  
switchxxxxxx(config-if)# dot1x port-control auto
```

22.4 dot1x reauthentication

Use the **dot1x reauthentication** Interface Configuration mode command to enable periodic re-authentication of the client. Use the **no** form of this command to return to the default setting.

Syntax

dot1x reauthentication
no dot1x reauthentication

Parameters

N/A

Default Configuration

Periodic re-authentication is disabled.

Command Mode

Interface configuration (Ethernet)

Example

```
switchxxxxxx(config)# interface gi1  
switchxxxxxx(config-if)# dot1x reauthentication
```

22.5 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

```
switchxxxxx(config)# interface gi1  
switchxxxxx(config-if)# dot1x timeout reauth-period 5000
```

22.6 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
```

22.7 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
```

22.8 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
```

22.9 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
```

22.10 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
```

22.11 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
```

22.12 show dot1x

Use the **show dot1x** Privileged EXEC mode command to display the 802.1X interfaces or specified interface status.

Syntax

show dot1x [***interface** interface-id* | ***detailed***]

Parameters

- **interface-id**—Specify an Ethernet port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all ports. If detailed is not used, only present ports are displayed.

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 Mode	Oper Mode	Reauth Control	Reauth Period	Username
----	-----	-----	-----	-----	-----
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 Mode	Oper Mode	Reauth Control	Reauth Period	Username
----	-----	-----	-----	-----	-----
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.

22.13 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 Time	Auth Method	MAC Address	VLAN
-----	-----	-----	-----	-----	----
gi1	Bob	1d 09:07:38	Remote	0008.3b79.8787	3

22.14 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.

22.15 clear dot1x statistics

Use the **clear dot1x statistics** Privileged EXEC mode command to clear 802.1X statistics.

Syntax

clear dot1x statistics [*interface-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
```

22.16 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
```

22.17 dot1x auth-not-req

Use the **dot1x auth-not-req** Interface Configuration (VLAN) mode command to enable unauthorized devices access to the VLAN. Use the **no** form of this command to disable access to the VLAN.

Syntax

```
dot1x auth-not-req  
no dot1x auth-not-req
```

Parameters

N/A

Default Configuration

Access is enabled.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

An access port cannot be a member in an unauthenticated VLAN.

The native VLAN of a trunk port cannot be an unauthenticated VLAN.

For a general port, the PVID can be an unauthenticated VLAN (although only tagged packets are accepted in the unauthorized state).

Example

The following example enables unauthorized devices access to VLAN 5.

```
switchxxxxxx(config)# interface vlan 5  
switchxxxxxx(config-if)# dot1x auth-not-req
```

22.18 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.

BPDUs whose MAC address is not the supplicant MAC address wouldn't be discarded in the protect mode.

BPDUs whose MAC address is not the supplicant MAC address would cause a shutdown in the shutdown mode.

Example

```
switchxxxxx(config)# interface gi1  
switchxxxxx(config-if)# dot1x violation-mode protect
```

22.19 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.

```
switchxxxxx(config)# interface vlan 2
```

```
switchxxxxxx(config-if)# dot1x guest-vlan
```

22.20 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
```

22.21 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
```

22.22 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
```

22.23 dot1x radius-attributes vlan

Use the **dot1x radius-attributes vlan** Interface Configuration mode command to enable user-based VLAN assignment.

Use the **no** form of this command to disable user-based VLAN assignment.

Syntax

dot1x radius-attributes vlan [**reject** | *vlan-id*]

no dot1x radius-attributes vlan

Parameters

- **reject**—If the RADIUS server authenticated the supplicant, but did not provide a supplicant VLAN, the supplicant is rejected. If the parameter is omitted, this option is applied by default.
- **vlan-id**—If the RADIUS server authenticated the supplicant, but did not provide a supplicant VLAN, the supplicant is accepted, and the configured VLAN is assigned to the supplicant.

Default Configuration

Disabled

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The configuration of this command is allowed only when the port is Forced Authorized.

RADIUS attributes are supported only in Multiple Sessions mode (multiple hosts with authentication)

When RADIUS attributes are enabled and the RADIUS accept message does not contain the supplicant's VLAN as an attribute, the supplicant is rejected.

Packets to the supplicant are sent untagged.

After successful authentication, the port remains a member in the unauthenticated VLANs and in the guest VLAN. Other static VLAN configurations are not applied on the port.

Example

Example 1—The example enables user-based VLAN assignment. If the RADIUS server authenticated the supplicant but did not provide a supplicant VLAN, the supplicant is rejected.

```
switchxxxxxx(config)# interface 151  
switchxxxxxx(config-if)# dot1x radius-attributes vlan  
switchxxxxxx(config-if)# exit
```

Example 2—The example enables user-based VLAN assignment. If the RADIUS server authenticated the supplicant but did not provide a supplicant VLAN the supplicant is accepted and VLAN 100 is assigned to the supplicant.

```
switchxxxxxx(config)# interface 151  
switchxxxxxx(config-if)# dot1x radius-attributes vlan 100  
switchxxxxxx(config-if)# exit
```

22.24 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* / *detailed*]

Parameters

- **interface-id**—Specify an Ethernet port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all ports. If the **detailed** parameter is not used, only present ports are displayed.

Command Mode

Privileged EXEC mode

Examples

The following example displays the 802.1x advanced features for the device. Notice that port 3 has a user-defined alternative VLAN (1023).

```
switchxxxxxx# show dot1x advanced
```

```
Guest VLAN: 3978
```

```
Guest VLAN Timeout:
```

```
Unauthenticated VLANs: 91, 92
```

Interface	Multiple Hosts	Guest VLAN	MAC Authentication	VLAN Assignment

151	Disabled	Enabled	MAC-and-802.1X	Enabled
152	Enabled	Disabled	Disabled	Enabled
153	Disabled	Enabled	MAC-and-802.1X	En[1023]

```
switchxxxxxx# show dot1x advanced 151
```

Interface	Multiple Hosts	Guest VLAN	MAC Authentication	VLAN Assignment

151	Disabled	Enabled	MAC-and-802.1X	Enabled

```
Legacy-Supp mode is disabled
```

```
Policy assignment resource err handling: Accept
```

```
Single host parameters
```

```
Violation action: Discard
```

```
Trap: Enabled
```

```
Status: Single-host locked
```

```
Violations since last trap: 9
```

Ethernet Configuration Commands

23.1 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 3 - For port channels (LAGs):

```
switchxxxxxx(config)# interface po1
switchxxxxxx(config-if)#
```

23.2 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

```
switchxxxxx(config)# interface range gi1-20  
switchxxxxx(config-if-range)#
```

23.3 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

Examples

Example 1 - The following example disables gi5 operations.

```
switchxxxxx(config)# interface gi5
switchxxxxx(config-if)# shutdown
switchxxxxx(config-if)#
```

Example 2 - The following example restarts the disabled Ethernet port.

```
switchxxxxx(config)# interface gi5
switchxxxxx(config-if)# no shutdown
switchxxxxx(config-if)
```

23.4 operation time

Use the **operation time** Interface Configuration (Ethernet) mode command to control the time that the port is up. Use the **no** form of this command to cancel the time range for the port operation time.

Syntax

operation time *time-range-name*

no operation time

Parameters

- **time-range-name**—Specifies a time range the port operates (in up state). When the Time Range is not in effect, the port is shutdown. (Range: 1–32 characters)

Default Configuration

There is no time range configured on the port 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 operation time command influences the port if the port status is up. This command defines the time frame during which the port stays up and at which time the port will be shutdown. While the port is in shutdown because of other reasons, this command has no effect.

The following example activates an operation time range (named "morning") on gigabitethernet port 1/1/15.

```
switchxxxxxx(config)# interface gi15  
switchxxxxxx(config-if)# operation time morning
```

23.5 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.

```
switchxxxxx(config)# interface gi5
switchxxxxx(config-if)# description SW#3
```

23.6 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 / 10000}

no speed

Parameters

- **10**—Forces 10 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.

```
switchxxxxx(config)# interface gi5  
switchxxxxx(config-if)# speed 100
```

23.7 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.

```
switchxxxxx(config)# interface gi5  
switchxxxxx(config-if)# duplex full
```

23.8 negotiation

Use the **negotiation** Interface Configuration (Ethernet, Port-channel) mode command to enable auto-negotiation operation for the speed and duplex parameters and master-slave mode of a given interface. Use the **no** form of this command to disable auto-negotiation.

Syntax

negotiation [*capability* [*capability2... capability5*]] [preferred {master | slave}]

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
- Preferred - Specifies the master-slave preference:
 - Master - Advertise master preference
 - Slave - Advertise slave preference

Default Configuration

If capability is unspecified, defaults to list of all the capabilities of the port and preferred master mode.

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
```

23.9 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

```
switchxxxxx(config)# interface gi1
switchxxxxx(config-if)# flowcontrol on
```

23.10 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.

```
switchxxxxx(config)# interface gi5
switchxxxxx(config-if)# mdix auto
```

23.11 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
```

23.12 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.

```
switchxxxxx(config)# port jumbo-frame
```

23.13 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.
```

23.14 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
```

23.15 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 / detailed]*

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

The following example displays the configuration of all configured interfaces:

```
switchxxxxx# show interfaces configuration
```

Port	Type	Duplex	Speed	Neg	Flow control	Admin State	Back Pressure	Mdix Mode
-----	-----	-----	-----	-----	-----	-----	-----	-----
gi1	1G-Copper	Full	10000	Disabled	Off	Up	Disabled	Off
gi2	1G-Copper	Full	1000	Disabled	Off	Up	Disabled	Off

P0	Type	Speed	Neg	Flow Control	Admin State
-----	-----	-----	-----	-----	-----
Po1			Disabled	Off	Up

23.16 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 / detailed]
```

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

- **detailed**—Displays information for non-present ports in addition to present ports.

Command Mode

EXEC mode

Default Configuration

Display for all interfaces. If detailed is not used, only present ports are displayed.

Example

The following example displays the status of all configured interfaces.

```
switchxxxxx# show interfaces status
```

Port	Type	Duplex	Speed	Neg	Flow ctrl	Link State	Back Pressure	Mdix Mode
-----	-----	-----	-----	-----	----	-----	-----	--
gi1	1G-Copper	Full	1000	Disabled	Off	Up	Disabled	Off
gi2	1G-Copper	--	--	--	--	Down	--	--

P0	Type	Duplex	Speed	Neg	Flow control	Link State
-----	-----	-----	-----	-----	----	-----
Po1	1G	Full	10000	Disabled	Off	Up

23.17 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* | **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Examples

The following examples display auto-negotiation information.

```
switchxxxxxx# show interfaces advertise
```

Port	Type	Neg	Prefered	Operational Link Advertisement
gi1	1G-Copper	Enable	Master	-----
gi2	1G-Copper	Enable	Slave	-
				1000f, 100f, 10f, 10h
				1000f

```
switchxxxxxx# show interfaces advertise gi1
```

Port:gi1

Type: 1G-Copper

Link state: Up

Auto Negotiation: enabled

Preference: Master

	10h	10f	100h	100	1000f
Admin Local link Advertisement	yes	yes	yes	---	yes
Oper Local link Advertisement	yes	yes	yes	-	yes
Remote Local link Advertisement	no	no	yes	yes	yes
Priority Resolution	-	-	-	yes	yes
				-	

```
switchxxxxxx# show interfaces advertise gi1
```

Port: gi1

Type: 1G-Copper

Link state: Up

Auto negotiation: disabled.

Preference: Slave

23.18 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* / **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display description for all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

The following example displays the description of all configured interfaces.

```
switchxxxxx# show interfaces description
Port          Descriptions
gi1           -----
gi2           Port that should be used for management only
gi3
gi4
P0            Description
-----
Po1           Output
```

23.19 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* / **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display counters for all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

The following example displays traffic seen by all the physical interfaces.

```
switchxxxxx# 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	Number 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.

23.20 show ports jumbo-frame

Use the **show ports jumbo-frame** EXEC mode command to display the whether jumbo frames are enabled on the device.

Syntax

show ports jumbo-frame

Parameters

N/A

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays whether jumbo frames are enabled on the device.

```
switchxxxxx# show ports jumbo-frame
Jumbo frames are disabled
Jumbo frames will be enabled after reset
```

23.21 show errdisable interfaces

Use the **show errdisable interfaces** EXEC mode command to display the Err-Disable state of all interfaces or of a specific interface.

Syntax

show errdisable interfaces *[interface-id]*

Parameters

- **interface**—Interface number
- **port-channel-number**—Port channel index.

Default Configuration

Display for all interfaces.

Command Mode

EXEC mode

Example

The following example displays the Err-Disable state of all interfaces.

```
switchxxxxx# show errdisable interfaces
```

Interface	Reason
-----	-----
gi20	stp-bpdu-guard

23.22 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

```
switchxxxxx(config)# interface gi1
switchxxxxx(config-if)# storm-control broadcast enable
```

23.23 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
```

23.24 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

```
switchxxxxx(config)# interface gi1
switchxxxxx(config-if)# storm-control include-multicast
```

23.25 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

```
switchxxxxx# show storm-control
```

Port	State	Admin Rate	Oper Rate [Kb/Sec]	Included
-----	-----	-----	-----	-----
gi1	Enabled	12345 Kb/Sec	12345	Broadcast, Multicast, Unknown Unicast
gi2	Disabled	100000 Kb/Sec	100000	Broadcast
gi3	Enabled	10%	000000	Broadcast

PHY Diagnostics Commands

24.1 test cable-diagnostics tdr

Use the **test cable-diagnostics tdr** Privileged EXEC mode command to use Time Domain Reflectometry (TDR) technology to diagnose the quality and characteristics of a copper cable attached to a port.

Syntax

test cable-diagnostics tdr interface *interface-id*

Parameters

interface-id—Specifies an Ethernet port ID.

Command Mode

Privileged EXEC mode

User Guidelines

The port to be tested should be shut down during the test, unless it is a combination port with fiber port active.

The maximum length of cable for the TDR test is 120 meters.

Example

The following examples test the copper cables attached to ports 7 and 8.

```
switchxxxxxx# test cable-diagnostics tdr interface gi7
Cable is open at 64 meters

switchxxxxxx# test cable-diagnostics tdr interface gi8
Can't perform the test on fiber ports
```

24.2 show cable-diagnostics tdr

Use the **show cable-diagnostics tdr** EXEC mode command to display information on the last Time Domain Reflectometry (TDR) test performed on all copper ports or on a specific copper port.

Syntax

show cable-diagnostics tdr [*interface interface-id* / *detailed*]

Parameters

- **interface-id**—Specify an Ethernet port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

All ports are displayed. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

User Guidelines

The maximum length of cable for the TDR test is 120 meters.

Example

The following example displays information on the last TDR test performed on all copper ports.

```
switchxxxxxx# show cable-diagnostics tdr
```

Port	Result	Length	Date
----	-----	[meters]	-----

gi1	OK		
gi2	Short	50	13:32:00 23 July 2010
gi3	Test has not been performed		
gi4	Open	64	13:32:00 23 July 2010
gi5	Fiber	-	-

24.3 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* / *detailed*]

Parameters

- **interface-id**—Specify an Ethernet port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

All ports are displayed. If detailed is not used, only present 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
```

24.4 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**—Specify an Ethernet port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

All ports are displayed. If detailed is not used, only present ports are displayed.

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 Power	Input Power	LOS
-----	-----	-----	-----	-----	-----	---
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
```

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

Power over Ethernet (PoE) Commands

25.1 power inline

Use the **power inline** Interface Configuration mode command to configure the power on an interface.

Syntax

power inline *{auto / never}* [*time-range time-range-name*]

Parameters

- **auto**—Turns on the device discovery protocol and applies power to the device.
- **never**—Turns off the device discovery protocol and stops applying power to the device.
- **auto time-range-name**—Turns on the power in the specified time range. When the time range is not in effect the power is not supplied to the attached device. If a time range is not specified, there is no time range bound to the port.
- **never time-range-name**—Turns off the power to the device in the specified time range. When the time range is not in effect the power is supplied to the attached device. If a time range is not specified, there is no time range bound to the port.

Default Configuration

The default configuration is set to **auto**.

Command Mode

Interface Configuration (Ethernet) mode

Usage Guidelines

The time range is defined in the **time-range** command.

Examples

Exercise 1—The following example turns on the inline power administrative mode on an interface.

```
switchxxxxxx(config)# interface 154
switchxxxxxx(config-if)# power inline auto
```

Exercise 2—The following example shows defining a time range called **morning**, and then applying it to the power administrative mode.

```
switchxxxxxx(config)#time-range morning
switchxxxxxx(config-time-range)#periodic list 07:00 to 11:59 mon wed fri
switchxxxxxx(config)#interface 151
switchxxxxxx(config-if)#power inline auto time-range morning
```

25.2 power inline powered-device

Use the **power inline powered-device** Interface Configuration mode command to add a description of the powered device type. Use the **no** form of this command to remove the description.

Syntax

power inline powered-device *pd-type*

no power inline powered-device

Parameters

pd-type—Enters a comment or a description to assist in recognizing the type of the powered device attached to this interface. (Length: 1–24 characters)

Default Configuration

There is no description.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example adds the description 'ip phone' of the device connected to port 4.

```
switchxxxxxx(config)# interface gi4
switchxxxxxx(config-if)# power inline powered-device ip_phone
```

25.3 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
```

25.4 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
```

25.5 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.

```
switchxxxxx(config)# power inline traps enable
```

25.6 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:The parameter range depends on the current working mode:In POE mode: 0-15400, In POE+ mode: 0-30000)

Default Configuration

The default value is the maximum power allowed in the specific working mode: 15.4W.

- In POE mode: 15.4W
- In POE+ mode: 30W

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example sets inline power on a port.

```
switchxxxxx(config)# interface gi1  
switchxxxxx(config-if)# power inline limit 2222
```

25.7 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.

```
switchxxxxx(config)# power inline limit-mode class
```

25.8 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* / *detailed*]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID must be an Ethernet port.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Show information for all ports. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

The following example displays information about the inline power for all ports (port power based).

```
switchxxxxx(config)# show power inline
Power limit: 15 W
Power limit (for port based power-limit mode): 15 W
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
Power limit: 15 W
Power limit (for port based power-limit mode): 15 W
```

Port	Powered Device	State	Status	Priority	Class
-----	-----	-----	-----	-----	-----
gi1	IP Phone Model A	Auto	On	High	Class0

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.

Field	Description
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

25.9 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*] *detailed*]

Parameters

- **Interface-id**—Specifies an interface ID. The interface ID must be an Ethernet port.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Show information for all ports. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

The following example displays information about the inline power consumption.

```
switchxxxxx# 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

EEE Commands

26.1 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-Negotiation 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(config)#eee enable
```

26.2 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(config)#interface gi1
witchxxxxxx(config-if)#eee enable
```

26.3 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(config)#interface gi1
witchxxxxxx(config-if)#eee lldp enable
```

26.4 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 Administrative status is enabled on ports: gi1-6, gi7
EEE Operational status is enabled on ports: gi1, gi3-6, gi2, gi5
EEE LLDP Administrative 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 Administrative status: enabled
EEE LLDP Administrative status: enabled
EEE LLDP Administrative 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 Administrative status: enabled
    EEE LLDP Administrative 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 LLDP Administrative 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 Administrative status: enabled
EEE Operational status: disabled (neighbor does not support)
EEE LLDP Administrative 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 Administrative status: disabled
EEE Operational status: disabled
EEE LLDP Administrative 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 Administrative status: enabled
EEE Operational status: enabled
EEE LLDP Administrative 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 Administrative status: enabled
EEE Operational status: enabled
EEE LLDP Administrative 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 Administrative status: enabled  
  
EEE Operational status: enabled  
  
EEE LLDP Administrative 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 Administrative status: enabled
EEE Operational status: enabled
EEE LLDP Administrative 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
```


Green Ethernet

27.1 **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

Disabled.

Command Mode

Global Configuration mode

Example

```
switchxxxxxx(config)# green-ethernet energy-detect
```

27.2 **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

```
switchxxxxx(config)# interface gi1
switchxxxxx(config-if)# green-ethernet energy-detect
```

27.3 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

```
switchxxxxx(config)# green-ethernet short-reach
```

27.4 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

```
switchxxxxx(config)# interface gi1  
switchxxxxx(config-if)# green-ethernet short-reach
```

27.5 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

```
switchxxxxx(config)# green-ethernet power-meter reset
```

27.6 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* / *detailed*]

Parameters

- **interface-id**—Specifies an Ethernet port

- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all ports. If detailed is not used, only present ports are displayed.

Command Mode

Privileged EXEC mode

User Guidelines

The power savings displayed only includes the power saved by short reach, energy detect and the power saved by disabling the ports LEDs; the EEE power saving is dynamic by nature since it is based on port utilization and is therefore not taken into consideration.

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

(If a mode is not supported, its columns are removed from the output).

```
switchxxxxxx# show green-ethernet
```

```
Energy-Detect mode: Enabled
```

```
Short-Reach mode: Disabled
```

```
Disable Port LEDs mode: Enabled
```

```
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
-----	-----	-----	-----	-----	-----	-----	-----	-----
151	on	on		off	off	off		
152	on	off	LU	on	off	off		< 50
153	on	off	LU	off	off	off		

Port Channel Commands

28.1 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
```

28.2 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

Example

```
switchxxxxxx(config)# port-channel load-balance src-dst-mac
switchxxxxxx(config)# port-channel load-balance src-dst-mac-ip
```

28.3 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.

```
switchxxxxx# 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

```
switchxxxxx# 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

Address Table Commands

29.1 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.

```
switchxxxxx(config)# bridge multicast filtering
```

29.2 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
```

29.3 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
```

29.4 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.

```
switchxxxxx(config)# interface vlan 8
switchxxxxx(config-if)# bridge multicast address 0100.5e02.0203
switchxxxxx(config-if)# bridge multicast forbidden address 0100.5e02.0203
add gi9
```

29.5 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
```

```
switchxxxxx(config-if)# bridge multicast ip-address 239.2.2.2 add gi9
```

29.6 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.

```
switchxxxxx(config)# interface vlan 8
switchxxxxx(config-if)# bridge multicast ip-address 239.2.2.2
switchxxxxx(config-if)# bridge multicast forbidden ip-address 239.2.2.2 add
gi9
```

29.7 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
```

29.8 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
```

29.9 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	<code>bridge multicast address</code>	<code>bridge multicast forbidden address</code>
ipv6-group	<code>bridge multicast ipv6 ip-address</code>	<code>bridge multicast ipv6 forbidden ip-address</code>
ipv6-src-group	<code>bridge multicast ipv6 source group</code>	<code>bridge multicast ipv6 forbidden source group</code>

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.

```
switchxxxxx(config)# interface vlan 2
switchxxxxx(config-if)# bridge multicast ipv6 mode ip-group
```

29.10 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.

Examples

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
```

29.11 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
```

```
switchxxxxx(config-if)# bridge multicast ipv6 forbidden ip-address  
FF00:0:0:0:4:4:4:1 add gi9
```

29.12 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:

```
switchxxxxx(config)# interface vlan 8  
switchxxxxx(config-if)# bridge multicast source 2001:0:0:0:4:4:4 group  
FF00:0:0:0:4:4:4:1
```

29.13 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:

```
switchxxxxx(config)# interface vlan 8
switchxxxxx(config-if)# bridge multicast source 2001:0:0:0:4:4:4 group
FF00:0:0:0:4:4:4:1
switchxxxxx(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
```

29.14 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
```

29.15 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.

```
switchxxxxx(config)# interface vlan 2
switchxxxxx(config-if)# bridge multicast forward-all add gi8
```

29.16 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.

```
switchxxxxx(config)# interface vlan 2
switchxxxxx(config-if)# bridge multicast forbidden forward-all add ethernet
gi1
```

29.17 bridge unicast unknown

Use the **bridge unicast unknown** Interface Configuration mode command to enable egress filtering of Unicast packets where the destination MAC address is unknown to the device. Use the **no** form of this command to restore the default configuration.

Syntax

bridge unicast unknown { *filtering* | *forwarding* }

no bridge unicast unknown

Parameters

- **filtering**— Filter unregistered Unicast packets.
- **forwarding**— Forward unregistered Unicast packets.

Default Configuration

Forwarding.

Command Mode

Interface Configuration mode

Example

The following example drops Unicast packets on VLAN 2 when the destination is unknown.

```
switchxxxxxx(config)# interface vlan 2
switchxxxxxx(config-if)# bridge unicast unknown filtering
```

29.18 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(config)#mac address-table static 00:3f:bd:45:5a:b1 vlan 1 gi1
switchxxxxxx(config)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(config)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(config)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(config)mac address-table static 00:3f:bd:45:5a:b2 vlan 1 gi1
secure
```

29.19 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.

```
switchxxxxx# clear mac address-table dynamic
```

Example 2 - Delete all secure entries from the FDB learned on secure port gi1.

```
switchxxxxx# clear mac address-table secure interface gi1
```

29.20 show bridge unicast unknown

Use the **show bridge unicast unknown** command to display the unknown Unicast filtering configuration.

Syntax

```
show bridge unicast unknown [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**Command Mode**

EXEC

Example

```
switchxxxxxx# show bridge unicast unknown
```

Port	Unregistered
-----	-----
1/1	Forward
1/2	Filter
1/3	Filter

29.21 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:10–10-630)

Default Configuration

300

Command Mode

Global Configuration mode

Example

```
switchxxxxx(config)# mac address-table aging-time 600
```

29.22 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 [bridge unicast unknown](#) 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
```

29.23 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 | secure permanent | secure delete-on-reset}

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 [bridge unicast unknown](#) command.
- **lock**— Secure mode without MAC learning. The static and secure MAC addresses may be added on the port manually by the [bridge unicast unknown](#) command.
- **secure permanent**— Secure mode with limited learning permanent secure MAC addresses with the **permanent** time-of-live. The static and secure MAC addresses may be added on the port manually by the **mac address-table static** command.
- **secure delete-on-reset**— Secure mode with limited learning secure MAC addresses with the **delete-on-reset** time-of-live. 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 [bridge unicast unknown](#) 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
```

29.24 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 is 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
```

29.25 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**—SDisplays 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.

Examples

Example 1 - Displays entire address table.

```
switchxxxxx# 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.

```
switchxxxxx# 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

29.26 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
```

29.27 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 - GROUP	IPv4 - SRC - GROUP	IPv6 - SRC - GROUP	IPv6 - SRC - GROUP

29.28 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:fe00:200	Static	

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

```

29.29 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 address	Ports
----	-----	-----	-----

```
Forbidden ports for multicast addresses:
```

Vlan	Group Address	Source address	Ports
----	-----	-----	-----

```
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
-----
192        FF12::8          FE80::201:C9A9:FE40:8988
gi1-8
Forbidden ports for multicast addresses:
Vlan      Group Address    Source          Ports
-----
192        FF12::3          FE80::201:C9A9:FE40:8988
gi8
```

29.30 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.

```
switchxxxxx# show bridge multicast filtering 1
```

```
Filtering: Enabled
```

```
VLAN: 1
```

Port	Forward-All	
-----	Static	Status
gi1	-----	-----
gi2	Forbidden	Filter
gi3	Forward	Forward(s)
	-	Forward(d)

29.31 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.

```
switchxxxxx# show bridge multicast unregistered
```

Port	Unregistered
-----	-----
gi1	Forward
gi2	Filter
gi3	Filter

29.32 show ports security

Use the **show ports security** Privileged EXEC mode command to display the port-lock status.

Syntax

show ports security [*interface-id* / **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

Privileged EXEC mode

Example

The following example displays the port-lock status of all ports.

```
switchxxxxx# 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.

29.33 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* / **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all interfaces. If detailed is not used, only present ports are displayed.

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
...				

29.34 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 *ethertype***—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 - 0xFFFFFFFFFFFF)
- **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(config)#bridge multicast reserved-address 00:3f:bd:45:5a:b1
```

29.35 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

Port Monitor Commands

30.1 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 an 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).
2. 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.

3. 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
```

30.2 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

Spanning-Tree Commands

31.1 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
```

31.2 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
```

31.3 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:

$$2 * (\text{Forward-Time} - 1) \geq \text{Max-Age}$$

Example

The following example configures the spanning tree bridge forwarding time to 25 seconds.

```
switchxxxxxx(config)# spanning-tree forward-time 25
```

31.4 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:

$$\text{Max-Age} \geq 2 * (\text{Hello-Time} + 1)$$

Example

The following example configures the spanning-tree bridge hello time to 5 seconds.

```
switchxxxxx(config)# spanning-tree hello-time 5
```

31.5 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:

$$2 * (\text{Forward-Time} - 1) \geq \text{Max-Age}$$

$$\text{Max-Age} \geq 2 * (\text{Hello-Time} + 1)$$

Example

The following example configures the spanning-tree bridge maximum age to 10 seconds.

```
switchxxxxx(config)# spanning-tree max-age 10
```

31.6 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
```

31.7 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
```

31.8 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
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.

```
switchxxxxx(config)# interface gi15
switchxxxxx(config-if)# spanning-tree cost 35000
```

31.9 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
```

31.10 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.

```
switchxxxxx(config)# interface gi15
switchxxxxx(config-if)# spanning-tree portfast
```

31.11 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
```

31.12 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
```

31.13 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 bpdn flooding
```

31.14 spanning-tree bpdn (Interface)

Use the **spanning-tree bpdn** 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 bpdn {*filtering* / *flooding*}

no spanning-tree bpdn

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 bpdn \(Global\)](#) 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 bpdn flooding
```

31.15 spanning-tree guard root

use the **spanning-tree guard root** Interface Configuration (Ethernet, Port-channel) mode command to enable Root Guard on all spanning-tree instances on the interface. Root guard prevents the interface from becoming the root port of the device. Use the **no** form of this command to disable the root guard on the interface.

Syntax

spanning-tree guard root

no spanning-tree guard root

Default Configuration

Root guard is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

Root Guard can be enabled when the device operates in any mode (STP, RSTP and MSTP).

When Root Guard is enabled, the port changes to the alternate state if the spanning-tree calculations select the port as the root port.

Example

The following example prevents gi1 from being the root port of the device.

```
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# spanning-tree guard root
```

31.16 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
```

31.17 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.

```
switchxxxxx# clear spanning-tree detected-protocols
```

31.18 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:1–15)
- **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
```

31.19 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 BPDU 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 BPDU 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
```

31.20 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
```

31.21 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
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
```

31.22 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
```

31.23 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: 1–15)
- **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
```

31.24 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
```

31.25 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
```

31.26 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)#

31.27 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)#
```

31.28 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
```

31.29 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: 1–15)
- **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

```

31.30 show spanning-tree bpd

Use the **show spanning-tree bpd** EXEC mode command to display the BPDU handling when spanning-tree is disabled.

Syntax

show spanning-tree bpd [*interface-id* / *detailed*]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Show information for all interfaces. If detailed is not used, only present ports are displayed.

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

Virtual Local Area Network (VLAN) Commands

32.1 **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)#
```

32.2 **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)#
```

32.3 **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	11	gi5-16	Static	Required
20	20	gi7-18	Static	Required
21	21		Static	Required
30	30		Static	Required
31	31		Static	Required
91	91	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

32.4 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.

32.5 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* / *detailed*]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Membership in the default VLAN is displayed for all interfaces. If **detailed** is not used, only present ports are displayed.

Command Mode

Privileged EXEC

Example

```
switchxxxxxx # show default-vlan-membership
```

Port	Forbidden	Membership
----	-----	-----
gi1	TRUE	FALSE
gi2	FALSE	TRUE
gi3	FALSE	FALSE

32.6 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

Example

The following example configures VLAN 1 with IP address 131.108.1.27 and subnet mask 255.255.255.0.

```
switchxxxxx (config)# interface vlan 1
switchxxxxx (config-if)# ip address 131.108.1.27 255.255.255.0
```

32.7 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.

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)#
```

32.8 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
```

32.9 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
```

32.10 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* / **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Show all protected interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

```
switchxxxxx#show interfaces protected-ports
```

Interface	State

gi1	Protected
gi2	Protected
gi3	Unprotected
gi4	Unprotected

32.11 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
```

32.12 switchport access vlan

An interface in access mode can belong to only one VLAN. Use the **switchport access vlan** Interface Configuration command to reassign 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 specified VLAN.

If the interface is a forbidden member of the specified VLAN, it does not become a member of the VLAN. An error message is displayed ("An interface cannot become a member of a forbidden VLAN. This message will only be displayed once.") and the command continues to execute if there are more interfaces in the interface list.

Examples

Example 1—The following example sets 152 as an access port and assigns it to VLAN 2 (and removes it from its previous VLAN).

```
switchxxxxxx(config)# interface 152
```

```
switchxxxxxx(config-if)# switchport mode access
switchxxxxxx(config-if)# switchport access vlan 2
```

```
switchxxxxxx#show vlan
```

Vlan	Name	Ports	Type	Authorization
1	1	gi1-28,Po1-8	Default	Required

Example 2—The following example shows a case where a macro is defined that adds ports to VLANs. Some of the ports are forbidden members in some of the VLANs. The example shows that the system notifies the user that it cannot add the forbidden ports, but does not fail the macro and it continues to a normal end.

```
switchxxxxxx# configure
switchxxxxxx(config)# vlan database
switchxxxxxx(config-vlan)# vlan 2-5
switchxxxxxx(config-vlan)# exit
switchxxxxxx(config)#interface range 151-2
switchxxxxxx(config-if-range)# switchport forbidden vlan add 2-3
switchxxxxxx(config-if-range)#exit
switch345780(config)#
switch345780(config)# macro name Trunk_VLAN
Enter macro commands one per line. End with the character '@'.
switchport mode trunk
switchport trunk allowed vlan add $1stVLAN-$2ndVLAN
@
switchxxxxxx(config)# interface range 151-4
switchxxxxxx(config-if-range)# macro apply Trunk_VLAN $1stVLAN 2 $2ndVLAN 5
An interface cannot become a member of a forbidden VLAN <System notifies user
that an illegal action has been requested but continues executing the macro>
switchxxxxxx(config-if-range)# end
switchxxxxxx#show vlan
```

Vlan	Name	Ports	Type	Authorization
1	1	151-28, Po1-8	Default	Required
2	2	153-4	static	Required
3	3	153-4	static	Required
4	4	151-4	static	Required
5	5	151-4		

32.13 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. Use the **switchport trunk allowed vlan** Interface Configuration mode command to add/remove 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

User Guidelines

If the interface is a forbidden member of the specified VLAN, it does not become a member of the VLAN. An error message is displayed ("An interface cannot become a member of a forbidden VLAN. This message will only be displayed

once.") and the command continues to execute if there are more VLANs in the VLAN list. See the example in [switchport access vlan](#).

Example

To add VLANs 2,3 and 100 to trunk ports 1 to 13:

```
switchxxxxx(config)# interface range 151-13
switchxxxxx(config-if)# switchport mode trunk
switchxxxxx(config-if)# switchport trunk allowed vlan add 2-3,100
switchxxxxx(config-if)#
```

32.14 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.

If the interface is a forbidden member of the specified VLAN, it does not become a member of the VLAN, but the command does not fail. Instead, an error message is

displayed ("An interface cannot become a member of a forbidden VLAN. This message will only be displayed once.") and the command continues to execute if there are more VLANs in the VLAN list. See the example in [switchport access 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 151
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 151
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 151
switchxxxxxx(config-if)# switchport mode trunk
switchxxxxxx(config-if)# switchport trunk allowed vlan add 2
switchxxxxxx(config-if)#
```

32.15 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.

If the interface is a forbidden member of the specified VLAN, it does not become a member of the VLAN, but the command does not fail. Instead, an error message is displayed ("An interface cannot become a member of a forbidden VLAN. This

message will only be displayed once.") and the command continues to execute if there are more VLANs in the VLAN list. See the example in [switchport access vlan](#).

Example

Sets port 1 to general mode and adds VLAN 2 and 3 to it. Packets are tagged on the egress.

```
switchxxxxxx(config)# interface 151
switchxxxxxx(config-if)# switchport mode general
switchxxxxxx(config-if)# switchport general allowed vlan add 2-3 tagged
```

32.16 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

Examples

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)#
```

32.17 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
```

32.18 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
```

32.19 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
```

32.20 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
```

32.21 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).
1. Subnet-based VLAN (Best match among the rules).
2. Protocol-based VLAN.
3. 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
```

32.22 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.

```
switchxxxxx# 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

32.23 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
```

32.24 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
```

32.25 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
```

32.26 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:

```
switchxxxxx# 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	8	tagged	Dynamic
11	11	tagged	Static

19	IPv6VLAN	untagged	Static
72	72	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:

```
switchxxxxx# 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	72	untagged
91	IP Telephony	tagged

Forbidden VLANs:

VLAN	Name

```

-----
73      Out

```

Example 3 - The following example displays the command output for an access port:

```

switchxxxxx# 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:

```

32.27 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
```

32.28 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

32.29 switchport access multicast-tv vlan

Use the **switchport access multicast-tv vlan** Interface Configuration (Ethernet, Port-channel) mode command to enable receiving Multicast transmissions on an interface that is not the access port VLAN, while keeping the L2 segregation with subscribers on different access port VLANs. Use the **no** form of this command to disable receiving Multicast transmissions.

Syntax

switchport access multicast-tv vlan *vlan-id*

no switchport access multicast-tv vlan

Parameters

vlan-id—Specifies the Multicast TV VLAN ID.

Default Configuration

Receiving Multicast transmissions is disabled.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

The user cannot transmit Multicast transmissions on the Multicast TV VLAN.

A Multicast TV VLAN cannot be enabled if a Guest VLAN is enabled on the interface.

Example

The following example enables gi5 to receive Multicast transmissions from VLAN 11.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# switchport access multicast-tv vlan 11
```

32.30 switchport customer multicast-tv vlan

Use the **switchport customer multicast-tv vlan** Interface Configuration mode command to enable receiving Multicast transmissions from a VLAN that is not the customer port's VLAN, while keeping the L2 segregation with subscribers on different customer port VLANs.

Syntax

switchport customer multicast-tv vlan *{add vlan-list / remove vlan-list}*

Parameters

- **add** *vlan-list*—Specifies a list of Multicast TV VLANs to add to interface.
- **remove** *vlan-list*—Specifies a list of Multicast TV VLANs to remove from interface.

Default Configuration

The port is not a member in any Multicast TV VLAN.

Command Mode

Interface Configuration (Ethernet, port-channel) mode

User Guidelines

The user cannot transmit Multicast transmissions on Multicast TV VLANs.

A Multicast TV VLAN cannot be enabled if a Guest VLAN is enabled on the interface.

Example

The following example enables gi5 to receive Multicast transmissions from VLANs 5, 6, 7.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# switchport customer multicast-tv vlan add 5-7
```

32.31 show vlan multicast-tv

Use the **show vlan Multicast-tv** EXEC mode command to display the source and receiver ports of Multicast-TV VLAN. Source ports can transmit and receive traffic to/from the VLAN, while receiver ports can only receive traffic from the VLAN.

Syntax

show vlan Multicast-tv vlan *vlan-id*

Parameters

vlan-id—Specifies the VLAN ID.

Default Configuration

N/A

Command Mode

EXEC mode

Example

The following example displays information on the source and receiver ports of Multicast-TV VLAN 1000.

```
switchxxxxx# show vlan multicast-tv vlan 1000
```

Source Ports	Receiver Ports
-----	-----
gi8, gi9	gi1-18

32.32 vlan prohibit-internal-usage

Use the **vlan prohibit-internal-usage** command in Global configuration mode to specify VLANs that cannot be used by the switch as internal VLANs.

Syntax

vlan prohibit-internal-usage [**none** | **except**] *vlan-list*

Parameters

- **none**—Remove all VLANs from User Reserved VLAN list.
- **except**—The User Reserved VLAN list includes all VLANs except the given ones.
- *vlan-list*—List of VLANs. Separate nonconsecutive VLAN IDs with a comma and no spaces. Use a hyphen to designate a range of IDs. The VLAN IDs that can be used are from 1 through 4094.

Default Configuration

The User Reserved VLAN list is empty.

Command Mode

Global Configuration mode

User Guidelines

The switch requires an internal VLAN in the following cases:

- When an IP interface is defined directly on an Ethernet port or on a Port channel

- For each IPv6 tunnel, if IPv6 Routing is supported by the switch.

When a switch requires an internal VLAN, it takes a free VLAN with the highest VLAN_ID.

Use the **vlan prohibit-internal-usage** command to define a list of VLANs that cannot be selected as internal VLANs after reload.

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 the following

- Add the VLAN to the prohibited User Reserved VLAN list.
- Copy the Running Configuration file to the Startup Configuration file
- Reload the switch
- Create the VLAN

Example

The following example specifies that VLANs 4010, 4012, and 4090-4094 cannot be used as internal VLANs:

```
vlan prohibit-internal-usage except 4010,4012,4090-4094
```

32.33 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 the VLANs that are used internally by the switch:

show vlan internal usage

User Reserved VLAN list after reset: 4080-4094

Current User Reserved VLAN list: 4090-4094

VLAN	Usage
----	-----
4094	gi12
4093	gi23
4092	tunnel 1

Voice VLAN Commands

33.1 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 Voice 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 that is not a device of the same family as the current 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**.
- The administrative state cannot be set to **oui-enabled** if the voice VLAN is the default VLAN (VLAN 1). For **oui-enabled** mode, the voice VLAN cannot be 1.

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
```

33.2 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
```

33.3 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 35 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
```

33.4 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 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 00:24:52 %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
```

33.5 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 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 00:31:07 %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
```

33.6 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
```

33.7 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
```

33.8 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
```

33.9 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
```

33.10 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
```

33.11 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* | **detailed**]

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.
- **detailed**—Displays information for non-present ports in addition to present ports. Only valid when type is oui.

Default Configuration

If the **type** parameter is omitted the current Voice VLAN type is used.

If the **interface-id** parameter is omitted then information about all interfaces is displayed.

All ports are displayed. If detailed is not used, only present ports are 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 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
switchxxxxx#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
switchxxxxx#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		

...

33.12 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 -4FX0-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

SSD Commands

34.1 **ssd config**

Use **ssd config** in Global Configuration to enter the Secure Sensitive Data (SSD) command mode. In this command mode, an administrator can configure how the sensitive data on the device, such as keys and passwords, is to be protected.

Syntax

ssd config

Command Mode

Global Configuration mode

User Guidelines

Only users with sufficient permission can use this command, which edits and displays the SSD configuration. See [ssd rule](#) for a description of these permissions.

Example

```
switchxxxxxx(config)# ssd config  
switchxxxxxx(ssd-config)#
```

34.2 **passphrase**

Use **passphrase** in SSD Command mode to change the passphrase in the system. A device protects its sensitive data by encrypting them using the key generated from the passphrase.

Use the **no passphrase** to reset the passphrase to the default passphrase.

Syntax

passphrase *{passphrase}*

encrypted passphrase *{encrypted-passphrase}*

no passphrase

Parameters

- **passphrase**-New system passphrase.
- **encrypted-passphrase**-The passphrase in its encrypted form.

Default Usage

If this command is not entered, the default passphrase is used.

Command Mode

SSD Command Mode

User Guidelines

To user this command, enter passphrase and Enter, a confirmation message is displayed and the user must confirm the intention to change the passphrase. Then the passphrase can be entered (see example).

Encrypted passphrase is allowed only in the SSD Control Block of a source file that is being copied to the startup configuration file (user cannot manually enter this command).

When generating a passphrase, the user must use 4 different character classes (similar to strong password/passwords complexity). These can be: uppercase letters, lowercase letters, numbers, and special characters available on a standard keyboard.

Example

The following example defines a decrypted passphrase.

```
switchxxxxxx(ssd-config)# passphrase
```

```
This operation will change the system SSD passphrase. Are you sure? (Y/N)[N] Y
```

```
Please enter SSD passphrase:*****
```

```
Please reenter SSD passphrase:*****
```

34.3 **ssd rule**

Use **ssd rule** in SSD Command mode to configure an SSD rule. A device grants read permission of sensitive data to user based on the SSD rules. A user that is granted **Both** or **Plaintext** read permission is also granted permission to enter SSD Command Mode.

Use **no ssd rule** to delete user-defined rules and restore default rules.

Syntax

```
[encrypted] SSD rule {all| level-15| default-user| user user-name}
                        {secure| insecure| secure-xml-snmp| insecure-xml-snmp}
                        permission {encrypted-only| plaintext-only| both| exclude}
                        default-read {encrypted| plaintext| exclude}

no ssd rule [ {all| level-15| default-user| user user-name}
              {secure| insecure| secure-xml-snmp| insecure-xml-snmp}]
```

Command Mode

SSD command mode.

Default Rules

The device has the following factory default rules:

Table 4: Default SSD Rules

Rule Key		Rule Action	
User	Channel	Read Permission	Default Read Mode
level-15	secure-xml-snmp	Plaintext Only	Plaintext
level-15	secure	Both	Encrypted
level-15	insecure	Both	Encrypted
all	insecure-xml-snmp	Exclude	Exclude
all	secure	Encrypted Only	Encrypted
all	insecure	Encrypted Only	Encrypted

User Guidelines

Use **no ssd rule** to delete a user-defined rule or to restore the default of a modified default rule.

Use **no ssd rule** (without parameters) to remove all SSD rules and restore the default SSD rules. A confirmation message will be displayed asking permission to do this.

To delete specific rules (applicable for the user defined), provide parameters specifying the user and security of the channel.

encrypted SSD rule is used to copy an SSD rule from one device to another in a secure manner.

You can modify but cannot delete the default SSD rules.

The following is the order in which SSD rules are applied:

- The SSD rules for specified *users*.
- The SSD rule for the **default-user (cisco)**.
- The SSD rules for **level-15** users.
- The remaining SSD rules for **all**.

The user can enter the commands in any order. The ordering is done implicitly by the device.

Examples

Example 1 - The following example modifies a rule.

```
switchxxxxxx(ssd-config)#ssd rule level-15 secure permission encrypted-only  
default-read encrypted
```

Example 2 - The following example adds a rule.

```
switchxxxxxx(ssd-config)#ssd rule user james secure permission both default-read  
encrypted
```

Example 3 - The following example adds a rule as encrypted format.

```
switchxxxxxx(ssd-config)#encrypted ssd rule iurwe874jho32iu9ufjo32i83232fdefsd
```

Example 4 - The following example deletes a default rule.

```
switchxxxxxx(ssd-config)#no ssd rule all secure
```

Example 5 - The following example deletes a user-defined rule.

```
switchxxxxxx(ssd-config)#no ssd rule user james secure
```

Example 6 - The following example deletes all rules.

```
switchxxxxxx(ssd-config)#no ssd rule
```

This operation will delete all user-defined rules and retrieve the default rules instead.

Are you sure (Y/N): N

34.4 show SSD

Use **show ssd rules** in SSD Command mode to present the current SSD rules; the rules will be displayed as plaintext.

Syntax

show SSD [*rules*|*brief*]

Parameters

- **rules** - Display only the SSD rules.
- **brief** - Display the encrypted passphrase, File Passphrase Control and File Integrity attributes.

Command Mode

SSD Command mode

Privileged EXEC mode

Default Configuration

Display all SSD information.

Examples

Example 1 - The following example displays all SSD information.

```
switchxxxxxx(ssd-config)#show ssd
```

SSD current parameters:

Local Passphrase: Default

File Passphrase Control: Unrestricted

File Integrity Control: Disabled

SSD parameters after reset:

Local Passphrase: Default

File Passphrase Control: Unrestricted

File Integrity Control: Disabled

User Type	User Name	Channel	Read Permission	Default Read	Type
Specific	admin11	secure	Both	Encrypted	User-Define
Specific	admin2	secure	Encrypted-Only	Encrypted	User-Define
Level-15		secure-xml-snmp	Plaintext-Only	Plaintext	Default

Level-15	secure	Both	Encrypted	Default
Level-15	insecure	Both	Encrypted	Default
All	secure	Encrypted-Only	Encrypted	Default
All	insecure	Encrypted-Only	Encrypted	Default
All	insecure-xml-snmp	Plaintext-Only	Plaintext	*Default

* Modified default entry

Example 2 - The following example displays the SSD rules.

```
switchxxxxxx(ssd-config)#show ssd rules
```

User Type	User Name	Channel	Read Permission	Default Read	Type
Specific	admin11	secure	Both	Encrypted	User-Define
Specific	admin2	secure	Encrypted-Only	Encrypted	User-Define
Level-15		secure-xml-snmp	Plaintext-Only	Plaintext	Default
Level-15		secure	Both	Encrypted	Default
Level-15		insecure	Both	Encrypted	Default
All		secure	Encrypted-Only	Encrypted	Default
All		insecure	Encrypted-Only	Encrypted	Default
All		insecure-xml-snmp	Plaintext-Only	Plaintext	*Default

* Modified default entry

Example 3 - The following example displays the SSD attributes.

```
switchxxxxxx(ssd-config)#show ssd brief
```

SSD current parameters:

Local Passphrase: Default

File Passphrase Control: Unrestricted

File Integrity Control: Disabled

SSD parameters after reset:

Local Passphrase: Default

File Passphrase Control: Unrestricted

File Integrity Control: Disabled

34.5 ssd session read

Use **ssd session read** in Global Configuration mode to override the current SSD default read of the current session

Syntax

ssd session read {*encrypted* | *plaintext* | *exclude*}

no ssd session read

Parameters

- **encrypted** - Override the SSD default option to encrypted
- **plaintext** - Override the SSD default option to plaintext
- **exclude** - Override the SSD default option to exclude

Command Mode

Global configuration mode.

Default

The command itself does not have a default. However, note that the read mode of the session itself, defaults to the default read mode of the SSD rule that the device uses to grant SSD permission to the user of the session.

User Guidelines

Use **no ssd session read** to restore the default read option of the SSD rules. This configuration will be allowed only if the user of the current session has sufficient read permissions; otherwise, the command will fail and an error will be displayed. The setting will take effect immediately and will terminate when the user restores the settings or exits the session.

Example

```
switchxxxxxx(config)# ssd session read plaintext
```

34.6 show ssd session

Use **show ssd session** in Exec mode to view the SSD read permission and default read mode of the user of the current session.

Syntax

show ssd session

Command Mode

EXEC mode.

Default

N/A

Examples

```
switchxxxxx# show ssd session
```

```
User Name/Level: James / Level 15
```

```
User Read Permission: Both
```

```
Current Session Read mode: Plaintext
```

34.7 ssd file passphrase control

Use **ssd file passphrase control** in SSD Command mode to provide an additional level of protection when copying configuration files to the startup configuration file. The passphrase in a configuration file is always encrypted with the default passphrase key

Syntax

ssd file passphrase control {*restricted*| *unrestricted*}

no ssd file passphrase control

Parameters

- **Restricted** - In this mode, a device restricts its passphrase from being exported into a configuration file. Restricted mode protects the encrypted sensitive data in a configuration file from devices that do not have the passphrase. The mode should be used when a user does not want to expose the passphrase in a configuration file.
- **Unrestricted** - In this mode, a device will include its passphrase when creating a configuration file. This allows any devices accepting the configuration file to learn the passphrase from the file.

Default

The default is **unrestricted**.

Command Mode

SSD Command mode.

User Guidelines

To revert to the default state, use the **no `ssd file passphrase control`** command.

Note that after a device is reset to the factory default, its local passphrase is set to the default passphrase. As a result, the device will not be able to decrypt sensitive data encrypted with a user-defined passphrase key in its own configuration files until the device is manually configured with the user-passphrase again or the files are created in unrestricted mode.

If a user-defined passphrase in Unrestricted mode is configured, it is highly recommended to enable SSD File Integrity Control. Enabling SSD File Integrity Control protects configuration files from tampering.

Any modification made to a configuration file that is integrity-protected is considered to be tampering.

Examples

```
console(ssd-config)# ssd file passphrase control restricted
```

```
console(ssd-config)# no ssd file passphrase control
```

34.8 `ssd file integrity control`

Use **`ssd file integrity control`** command in SSD Command Mode to instruct the device to protect newly-generated configuration files that contain encrypted sensitive data from tampering.

Use **`no ssd file integrity control`** to disable Integrity Control.

Syntax

`ssd file integrity control` *enabled*

`no ssd file integrity control`

Parameters

- **`enabled`** - Enable file integrity control to protect newly-generated configuration files from tampering.

Default

The default file input control is **disable**.

Command Mode

SSD Command Mode.

User Guidelines

TA user can protect a configuration file from being tampered by creating the file with File Integrity Control enabled. It is recommended that File Integrity Control be enabled when a device uses a user-defined passphrase with Unrestricted Configuration File Passphrase Control.

A device determines whether the integrity of a configuration file is protected by examining the File Integrity Control command in the file. If a file is integrity-protected, but a device finds the integrity of the file is not intact, the device rejects the file. Otherwise, the file is accepted for further processing.

Examples

```
switchxxxxx(ssd-config)# ssd file integrity control enabled
```

When File Integrity is enabled, an internal digest command is added to the end of the entire configuration file. This is used in downloading the configuration file to the startup configuration.

```
config-file-digest 0AC78001122334400AC780011223344
```

Smartport Commands

35.1 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
```

35.2 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:

```
switchxxxxx(config)#interface gi1  
switchxxxxx(config-if)# macro auto smartport
```

35.3 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.

```
switchxxxxx(config)#macro auto trunk refresh switch
```

35.4 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(config)#interface gi1
switchxxxxxx(config-if)#macro auto resume
```

35.5 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.

```
switchxxxxx(config)#interface range gi1-2
switchxxxxx(config-if-range)#macro auto persistent
switchxxxxx(config-if-range)#exit
switchxxxxx(config)#interface range gi3-4
switchxxxxx(config-if-range)#no macro auto persistent
```

35.6 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(config)interface gi1
switchxxxxxx(config-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(config-if)#exit
switchxxxxxx(config-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)#
```

35.7 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(config)#macro auto processing cdp
```

35.8 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(config)#macro auto processing lldp
```

35.9 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.

```
switchxxxxx(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
switchxxxxx(config)#macro auto processing type ap enabled
```

35.10 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(config)#macro auto user smartport macro ip_phone_desktop
my_ip_phone_desktop $p1 1 $p2 2
```

35.11 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:

```
switchxxxxx(config)#macro auto built-in parameters switch $native_vlan 2
```

35.12 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

```
switchxxxxx#show macro auto processing
```

```
CDB: enabled
LLDP: enabled
host          :disabled
ip_phone      :enabled
ip_phone_desktop:enabled
switch        :enabled
router        :disabled
ap            :enabled
```

35.13 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#
```


35.14 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* / *detailed*]

Parameters

- **interface-id**—Interface Identifier (Ethernet interface, port channel)
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display information for all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC

Examples

Example 1 - Note that Smartport on switch and phone types was configured automatically. Smartport on routers was configured statically.

```
switchxxxxx# show macro auto ports
```

```
Smartport is enabled
```

```
Administrative Globally Auto Smartport is enabled
```

```
Operational Globally Auto Smartport is enabled
```

Interface	Auto Smartport Admin State	Persistent State	Smartport Type
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:

```
switchxxxxx(config-if)#interface gi2
switchxxxxx(config-if)#no macro auto smartport
switchxxxxx(config-if)#end
switchxxxxx#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:

```
switchxxxxx(config-if)#interface gi1
switchxxxxx(config-if)#macro auto smartport
switchxxxxx(config-if)#end
switchxxxxx#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
```

35.15 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(config)#interface gi1
```

```
switchxxxxxx(config-if)#smartport switchport trunk allowed vlan add 1-5
```

35.16 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(config)interface gi1
switchxxxxxx(config-if)#smartport switchport trunk native vlan 1
```

35.17 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

```
switchxxxxx(config)interface gi1  
switchxxxxx(config-if)#smartport storm-control broadcast enable
```

35.18 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 *{level| kbps kbps}*

no smartport 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 (Ethernet, port-channel) mode

Examples

Example 1 - Set the maximum number of kilobits per second of Broadcast traffic on port 1 to 10000.

```
switchxxxxx(config)interface gi1  
switchxxxxx(config-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%.

```
switchxxxxx(config)interface gi1  
switchxxxxx(config-if)#smartport storm-control broadcast level 30
```

35.19 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

smartport storm-control include-multicast [*unknown-unicast*]

no smartport 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

```
switchxxxxx(config)# interface gi1  
switchxxxxx(config-if)# smartport storm-control include-multicast
```

CDP Commands

36.1 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(config) cdp run
```

36.2 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(config) cdp run  
switchxxxxxx(config) interface gi1  
switchxxxxxx(config-if)cdp enable
```

36.3 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(config) cdp run  
switchxxxxxx(config) cdp pdu flooding
```

36.4 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(config) cdp run
switchxxxxxx(config) cdp advertise-v2
```

36.5 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(config) cdp appliance-tlv enable
```

36.6 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(config) no cdp mandatory-tlvs validation
```

36.7 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(config) cdp source-interface gi1
```

36.8 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(config) interface gi1  
switchxxxxxx(config-if) cdp log mismatch duplex
```

36.9 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(config) interface gi1  
switchxxxxxx(config-if) cdp log mismatch voip
```

36.10 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(config) interface gi1  
switchxxxxxx(config-if) cdp log mismatch native
```

36.11 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(config) cdp device-id format serial-number
```

36.12 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(config) cdp timer 100
```

36.13 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(config) cdp holdtime 100
```

36.14 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(config) clear cdp counters
```

36.15 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(config) clear cdp table
```

36.16 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
```

36.17 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

```
switchxxxxxx#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
```

```
switchxxxxx#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
```

```
switchxxxxx#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
```

36.18 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

```
switchxxxxx#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
```

36.19 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

```
switchxxxxxx#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 Interface	Adv Ver.	Time To Live	Capability	Platform	Port ID
PTK-SW-A-86.marvel l.com	gi48	2	147	S I	cisco WS-C4510R-E	GigabitEthe 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 SG500-28P (PID:SG500-2 8P-K9)-VSD	fa2/2/1
001828100211	gi48	2	173	S I	Cisco SF 200-48P (PID:SLM248P T)-VSD	fa20
c47d4fed9302	gi48	2	137	S I	Cisco SF 200-48	fa12

```
switchxxxxxx#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): fa1/1/0  
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  
Device ID: SEP000427D400ED  
Advertisement version: 2  
Entry address(es):  
    IP address: 1.6.1.81  
Platform: Cisco IP Phone 7940, Capabilities: Host  
Interface: fa1/1/1, Port ID (outgoing port): Port 1  
Time To Live: 150 sec  
Version :  
P00303020204  
Duplex: full  
sysName: a-switch  
Power drawn: 6.300 Watts  
-----
```



```
switchxxxxx#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
fa1/1/1	00:00:01:23a:86:9c	157	R,S	10	206VXRYC
fa1/1/1	00:00:05:53a:86:9c	163	R,S	10	ABCD-VSD
fa1/1/3	00:00:01:23b:86:9c	140	R		QACSZ
fa1/1/3	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.

36.20 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.

```
switchxxxxxx#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.

```
switchxxxxxx#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.

```
switchxxxxxx#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.

```
switchxxxxxx#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
sysName: a-switch
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.

```

switchxxxxxx#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: 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
sysName: a-switch
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
```

36.21 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 [**global** | *interface-id*]

Parameters

- **global**—Display only the global counters

- **interface-id**—Port for which counters should be displayed.

Default Configuration

If interface-id is not specified, global counters are displayed for all ports on which CDP is enabled and who are up.

Command Mode

Privileged EXEC mode

User Guidelines

Use the **show cdp traffic global** to display only the global counters. Use the **show cdp traffic interface-id** command to display the counters of the given port. Use the command **show cdp traffic** without parameters to display all the counters.

Example

```
switchxxxxxx#show cdp traffic
```

```
CDP Global 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
```

```
fastethernet 1/1/1
```

```
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
```

```
fastethernet 1/1/2
```

```
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 Definition:

- **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 — 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.

Link Layer Discovery Protocol (LLDP) Commands

37.1 **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
```

37.2 **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
```

37.3 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
```

37.4 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
```

37.5 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:

$$\text{TTL} = \min(65535, \text{LLDP-Timer} * \text{LLDP-hold-multiplier})$$

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
```

37.6 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
```

37.7 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
```

37.8 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.

For 802.1, see the [lldp optional-tlv 802.1](#) command.

Syntax

lldp optional-tlv *tlv* [*tlv2* ... *tlv5*] *none*

Parameters

- **tlv**—Specifies the TLVs to be included. Available optional TLVs are: 802.1, port-desc, sys-name, sys-desc, sys-cap, 802.1, 802.3-mac-phy, 802.3-lag, 802.3-max-frame-size.
- **none**—Clear all optional TLVs from the interface

If the 802.1 protocol is selected, see the command below.

Default Configuration

No optional TLV is transmitted.

Command Mode

Interface Configuration (Ethernet) mode

Example

The following example specifies that the port description TLV is transmitted on gi2.

```
switchxxxxxx(config)# interface gi2
switchxxxxxx(config-if)# lldp optional-tlv port-desc
```

37.9 lldp optional-tlv 802.1

Use the **lldp optional-tlv** Interface Configuration mode command to specify which optional TLVs to transmit. Use the **no** form of this command to revert to the default setting.

Syntax

lldp optional-tlv 802.1 pvid - The PVID is advertised.

no lldp optional-tlv 802.1 pvid - The PVID is not advertised

lldp optional-tlv 802.1 ppvid *add ppvid* - The Protocol Port VLAN ID (PPVID) is advertised. The PPVID is the PVID that is used depending on the packet's protocol.

lldp optional-tlv 802.1 ppvid *remove ppvid* - The PPVID is not advertised.

lldp optional-tlv 802.1 vlan *add vlan-id* - This *vlan-id* is advertised.

lldp optional-tlv 802.1 vlan *remove vlan-id* - This *vlan-id* is not advertised.

lldp optional-tlv 802.1 protocol *add {stp / rstp / mstp / pause / 802.1x / lacp / gvrp}* -
The protocols selected are advertised.

lldp optional-tlv 802.1 protocol *remove {stp / rstp / mstp / pause / 802.1x / lacp / gvrp}*
- The protocols selected are not advertised.

Parameters

- **lldp optional-tlv 802.1 pvid**—Advertises the PVID of the port.
- **lldp optional-tlv 802.1 pvid add/remove *ppvid***—Adds/removes PPVID for advertising. (range: 0–4094). PPVID = 0 indicates that the port is not capable of supporting port and protocol VLANs and/or the port is not enabled with any protocol VLANs.
- **add/remove *vlan-id***—Adds/removes VLAN for advertising (range: 0–4094).
- **add/remove *{stp / rstp / mstp / pause / 802.1x / lacp / gvrp}***—Add specifies to advertise the specified protocols; remove specifies not to advertise the specified protocol.

Default Configuration

No optional TLV is transmitted.

Command Mode

Interface Configuration (Ethernet) mode

Example

```
switchxxxxxx(config)# lldp optional-tlv 802.1 protocol add stp
```

37.10 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
```

37.11 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
```

37.12 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
```

37.13 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
```

37.14 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* [*t/v* ... *t/v4*] | *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
```

37.15 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
```

37.16 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
```

37.17 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-signaling 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
```

37.18 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
```

37.19 **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
```

37.20 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
```

37.21 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.

```
switchxxxxx(config)# interface gi2
switchxxxxx(config-if)# lldp med location civic-address 616263646566
```

37.22 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* / **detailed**]

Parameters

- **interface-id**—Specifies the port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

Display for all ports. If detailed is not used, only present ports are displayed.

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.
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.

37.23 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* / **detailed**]

Parameters

- **interface-id**—Specifies the port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

If no port ID is entered, the command displays information for all ports. If detailed is not used, only present ports are displayed.

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.

```
switchxxxxx# 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

37.24 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		

37.25 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.
```

37.26 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* / **detailed**]

Parameters

- **interface-id**—Specifies the port ID.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

If no port ID is entered, the command displays information for all ports. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

```
switchxxxxxx# 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

Port	TX Frames		RX Frame		RX TLVs		RX Ageouts
	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
```

37.27 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.
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)

Field	Description
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.
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.

Field	Description
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.

IGMP Snooping Commands

38.1 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
```

38.2 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

```
switchxxxxx(config)# ip igmp snooping vlan 2
```

38.3 ip igmp snooping vlan mrouter

Use the **ip igmp snooping vlan 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
```

38.4 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** *interface-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

```
switchxxxxx(config)# ip igmp snooping vlan 1 mrouter interface gi1
```

38.5 ip igmp snooping vlan forbidden mrouter

Use the **ip igmp snooping vlan forbidden mrouter** 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

```
switchxxxxx(config)# ip igmp snooping vlan 1 forbidden mrouter interface gi1
```

38.6 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** *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 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

```
switchxxxxx(config)# ip igmp snooping vlan 1 static 239.2.2.2 interface gi1
```

38.7 ip igmp snooping vlan multicast-tv

Use the **ip igmp snooping vlan multicast-tv** Global Configuration mode command to define the Multicast IP addresses that are associated with a Multicast TV VLAN. Use the **no** form of this command to remove all associations.

Syntax

ip igmp snooping vlan *vlan-id* **multicast-tv** *ip-multicast-address* [**count** *number*]

no ip igmp snooping vlan *vlan-id* **multicast-tv** *ip-multicast-address* [**count** *number*]

Parameters

- **vlan-id**—Specifies the VLAN
- **count number**—Configures multiple contiguous Multicast IP addresses. If not specified, the default is 1. (Range: 1–256)

Default Configuration

No Multicast IP address is associated.

Command Mode

Global Configuration mode

User Guidelines

Use this command to define the Multicast transmissions on a Multicast-TV VLAN. The configuration is only relevant for an Access port that is a member in the configured VLAN as a Multicast-TV VLAN.

If an IGMP message is received on such an Access port, it is associated with the Multicast-TV VLAN only if it is for one of the Multicast IP addresses that are associated with the Multicast-TV VLAN.

Up to 256 VLANs can be configured.

Example

```
switchxxxxxx(config)# ip igmp snooping vlan 1 multicast-tv 239.2.2.2 count 3
```

38.8 ip igmp snooping map cpe vlan

The **ip igmp snooping map cpe vlan** Global Configuration mode command maps CPE VLANs to Multicast-TV VLANs. Use the **no** form of this command to remove the mapping.

Syntax

ip igmp snooping map cpe vlan *vlan-id* *multicast-tv* **vlan** *vlan-id*

no ip igmp snooping map cpe vlan *vlan-id*

Parameters

- **cpe vlan** *vlan-id*—Specifies the CPE VLAN ID.
- **multicast-tv vlan** *vlan-id*—Specifies the Multicast-TV VLAN ID.

Default Configuration

No mapping exists.

Command Mode

Global Configuration mode

User Guidelines

Use this command to associate the CPE VLAN with a Multicast-TV VLAN.

If an IGMP message is received on a customer port tagged with a CPE VLAN, and there is mapping from that CPE VLAN to a Multicast-TV VLAN, the IGMP message is associated with the Multicast-TV VLAN.

Example

The following example maps CPE VLAN 2 to Multicast-TV VLAN 31.

```
switchxxxxxx(config)# ip igmp snooping map cpe vlan 2 multicast-tv vlan 31
```

38.9 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
```

38.10 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
```

38.11 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
```

38.12 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

```
switchxxxxx(config)# interface vlan 1  
switchxxxxx(config-if)# ip igmp robustness 3
```

38.13 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

```
switchxxxxx(config)# interface vlan 1  
switchxxxxx(config-if)# ip igmp query-interval 200
```

38.14 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

```
switchxxxxx(config)# interface vlan 1  
switchxxxxx(config-if)# ip igmp query-max-response-time 20
```

38.15 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

```
switchxxxxx(config)# interface vlan 1
switchxxxxx(config-if)# ip igmp last-member-query-count 7
```

38.16 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

```
switchxxxxx(config)# interface vlan 1
switchxxxxx(config-if)# ip igmp last-member-query-interval 2000
```

38.17 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.

```
switchxxxxx(config)# ip igmp snooping vlan 1 immediate-leave
```

38.18 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.

```
switchxxxxx# show ip igmp snooping mrouter interface 1000
```

VLAN	Dynamic	Static	Forbidden
----	-----	-----	-----
1000	gi1	gi2	gi3-23

38.19 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

```
switchxxxxx# 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

38.20 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 Address	Source Address	Include Ports	Exclude Ports	Comp-Mode
----	-----	-----	-----	-----	-----
1	239.255.255.250	*	gi1		v3

38.21 show ip igmp snooping multicast-tv

The **show ip igmp snooping multicast-tv** EXEC mode command displays the IP addresses associated with Multicast TV VLANs.

Syntax

show ip igmp snooping multicast-tv [*vlan vlan-id*]

Parameters

vlan *vlan-id*—Specifies the VLAN ID.

Command Mode

EXEC mode

Example

The following example displays the IP addresses associated with all Multicast TV VLANs.

```
switchxxxxxx# show ip igmp snooping multicast-tv
```

```
VLAN IP Address
```

```
-----
```

```
1000 239.255.0.0
```

```
1000 239.255.0.1
```

```
1000 239.255.0.2
```

```
1000 239.255.0.3
```

```
1000 239.255.0.4
```

```
1000 239.255.0.5
1000 239.255.0.6
1000 239.255.0.7
```

38.22 show ip igmp snooping cpe vlans

The **show ip igmp snooping cpe vlans** EXEC mode command displays the CPE VLAN to Multicast TV VLAN mappings.

Syntax

show ip igmp snooping cpe vlans [*vlan vlan-id*]

Parameters

vlan *vlan-id* —Specifies the CPE VLAN ID.

Command Mode

EXEC mode

Example

The following example displays the CPE VLAN to Multicast TV VLAN mappings.

```
switchxxxxxx# show ip igmp snooping cpe vlans
CPE VLAN   Multicast-TV VLAN
-----
2           1118
3           1119
```

IPv6 MLD Snooping Commands

39.1 **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
```

39.2 **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
```

39.3 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
```

39.4 ipv6 mld snooping vlan mrouter

Use the **ipv6 mld snooping vlan 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

```
switchxxxxx(config)# ipv6 mld snooping vlan 1 mrouter learn pim-dvmrp
```

39.5 ipv6 mld snooping vlan mrouter

Use the **ipv6 mld snooping vlan mrouter** Interface 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

Interface 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 and for a range of ports as shown in the example.

Example

```
switchxxxxx(config)interface gi1/1/1  
switchxxxxx(config-if)# ipv6 mld snooping vlan 1 mrouter interface gi1/1/1 -  
10
```

39.6 ipv6 mld snooping vlan forbidden mrouter

Use the **ipv6 mld snooping vlan forbidden mrouter** 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 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
```

39.7 ipv6 mld snooping vlan static

Use the **ipv6 mld snooping vlan 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
```

39.8 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
```

39.9 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
```

39.10 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 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 last-member-query-count 3
```

39.11 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 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
```

39.12 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

```
switchxxxxx(config)# ipv6 mld snooping vlan 1 immediate-leave
```

39.13 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

39.14 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
```

39.15 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 show ipv6 mld snooping groups.

switchxxxxxx# show ipv6 mld snooping groups					
VLAN	Group Address	Source Address	Include Ports	Exclude Ports	Compatibility Mode
----	-----	-----	-----	-----	-----
1	FF12::3	FE80::201:C9FF:FE40:8001			
1	FF12::3	FE80::201:C9FF:FE40:8002	gi1		1
19	FF12::8	FE80::201:C9FF:FE40:8003	gi2		1
19	FF12::8	FE80::201:C9FF:FE40:8004	gi9		2
19	FF12::8	FE80::201:C9FF:FE40:8005	gi1	gi2	2
			gi10-11	gi3	2
MLD Reporters that are forbidden statically:					
VLAN	Group Address	Source Address	Ports		
----	-----	-----	-----		
1	FF12::3	FE80::201:C9FF:FE40:8001	gi8		
19	FF12::8	FE80::201:C9FF:FE40:8001	gi9		

Link Aggregation Control Protocol (LACP) Commands

40.1 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
```

40.2 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
```

40.3 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
```

40.4 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

40.5 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.

```
switchxxxxx# 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:	

GARP VLAN Registration Protocol (GVRP) Commands

41.1 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
```

41.2 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
```

41.3 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
```

41.4 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
```

41.5 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.

```
switchxxxxx# clear gvrp statistics gi5
```

41.6 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* / **detailed**]

Parameters

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or port-channel.
- **detailed**—Displays information for non-present ports in addition to present ports.

Default Configuration

All GVRP statistics are displayed for all interfaces. If detailed is not used, only present ports are displayed.

Command Mode

EXEC mode

Example

The following example displays GVRP configuration.

```
switchxxxxx# show gvrp configuration
```

GVRP Feature is currently Enabled on the device.

Maximum VLANs: 4094

Port(s)	GVRP-Status	Regist- ration	Dynamic VLAN Creation	Timers(ms)		
				Join	Leave	Leave All
----	-----	-----	-----	----	-----	-----
gi1	Enabled	Forbidden	Disabled	600	200	10000
gi2	Enabled	Normal	Enabled	1200	400	20000

41.7 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

41.8 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.

```
switchxxxxx# 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

DHCP Snooping and ARP Inspection Commands

42.1 ip dhcp snooping

Use the **ip dhcp snooping** Global Configuration mode command to enable Dynamic Host Configuration Protocol (DHCP) Snooping globally. Use the **no** form of this command to restore the default configuration.

Syntax

ip dhcp snooping

no ip dhcp snooping

Parameters

N/A

Default Configuration

DHCP snooping is disabled.

Command Mode

Global Configuration mode

User Guidelines

For any DHCP Snooping configuration to take effect, DHCP Snooping must be enabled globally. DHCP Snooping on a VLAN is not active until DHCP Snooping on a VLAN is enabled by using the **ip dhcp snooping vlan** Global Configuration mode command.

Example

The following example enables DHCP Snooping on the device.

```
switchxxxxxx(config)# ip dhcp snooping
```

42.2 ip dhcp snooping vlan

Use the **ip dhcp snooping vlan** Global Configuration mode command to enable DHCP Snooping on a VLAN. Use the **no** form of this command to disable DHCP Snooping on a VLAN.

Syntax

ip dhcp snooping vlan *vlan-id*

no ip dhcp snooping *vlan-id*

Parameters

vlan-id—Specifies the VLAN ID.

Default Configuration

DHCP Snooping on a VLAN is disabled.

Command Mode

Global Configuration mode

User Guidelines

DHCP Snooping must be enabled globally before enabling DHCP Snooping on a VLAN.

Example

The following example enables DHCP Snooping on VLAN 21.

```
switchxxxxxx(config)# ip dhcp snooping vlan 21
```

42.3 ip dhcp snooping trust

Use the **ip dhcp snooping trust** Interface Configuration (Ethernet, Port-channel) mode command to configure a port as trusted for DHCP snooping purposes. Use the **no** form of this command to restore the default configuration.

Syntax

ip dhcp snooping trust

no ip dhcp snooping trust**Parameters**

N/A

Default Configuration

The interface is untrusted.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

Configure as trusted the ports that are connected to a DHCP server or to other switches or routers. Configure the ports that are connected to DHCP clients as untrusted.

Example

The following example configures gi5 as trusted for DHCP Snooping.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# ip dhcp snooping trust
```

42.4 ip dhcp snooping information option allowed-untrusted

Use the **ip dhcp snooping information option allowed-untrusted** Global Configuration mode command to allow a device to accept DHCP packets with option-82 information from an untrusted port. Use the **no** form of this command to drop these packets from an untrusted port.

Syntax

ip dhcp snooping information option allowed-untrusted

no ip dhcp snooping information option allowed-untrusted

Parameters

N/A

Default Configuration

DHCP packets with option-82 information from an untrusted port are discarded.

Command Mode

Global Configuration mode

Example

The following example allows a device to accept DHCP packets with option-82 information from an untrusted port.

```
switchxxxxxx(config)# ip dhcp snooping information option allowed-untrusted
```

42.5 ip dhcp snooping verify

Use the **ip dhcp snooping verify** Global Configuration mode command to configure a device to verify that the source MAC address in a DHCP packet received on an untrusted port matches the client hardware address. Use the **no** form of this command to disable MAC address verification in a DHCP packet received on an untrusted port.

Syntax

ip dhcp snooping verify

no ip dhcp snooping verify

Default Configuration

The switch verifies that the source MAC address in a DHCP packet received on an untrusted port matches the client hardware address in the packet.

Command Mode

Global Configuration mode

Example

The following example configures a device to verify that the source MAC address in a DHCP packet received on an untrusted port matches the client hardware address.

```
switchxxxxxx(config)# ip dhcp snooping verify
```

42.6 ip dhcp snooping database

Use the **ip dhcp snooping database** Global Configuration mode command to enable the DHCP Snooping binding database file. Use the **no** form of this command to delete the DHCP Snooping binding database file.

Syntax

ip dhcp snooping database

no ip dhcp snooping database

Parameters

N/A

Default Configuration

The DHCP Snooping binding database file is not defined.

Command Mode

Global Configuration mode

User Guidelines

The DHCP Snooping binding database file resides on Flash.

To ensure that the lease time in the database is accurate, the Simple Network Time Protocol (SNTP) must be enabled and configured.

The device writes binding changes to the binding database file only if the device system clock is synchronized with SNTP.

Example

The following example enables the DHCP Snooping binding database file.

```
switchxxxxxx(config)# ip dhcp snooping database
```

42.7 ip dhcp snooping database update-freq

Use the **ip dhcp snooping database update-freq** Global Configuration mode command to set the update frequency of the DHCP Snooping binding database file. Use the **no** form of this command to restore the default configuration.

Syntax

ip dhcp snooping database update-freq *seconds*

no ip dhcp snooping database update-freq

Parameters

seconds—Specifies the update frequency in seconds. (Range: 600–86400)

Default Configuration

The default update frequency value is 1200 seconds.

Command Mode

Global Configuration mode

Example

The following example sets the DHCP Snooping binding database file update frequency to 1 hour.

```
switchxxxxxx(config)# ip dhcp snooping database update-freq 3600
```

42.8 ip dhcp snooping binding

Use the **ip dhcp snooping binding** Privileged EXEC mode command to configure the DHCP Snooping binding database and add binding entries to the database. Use the **no** form of this command to delete entries from the binding database.

Syntax

ip dhcp snooping binding *mac-address vlan-id ip-address interface-id expiry {seconds | infinite}*

no ip dhcp snooping binding *mac-address vlan-id*

Parameters

- **mac-address**— Specifies a MAC address.
- **vlan-id**—Specifies a VLAN number.
- **ip-address**—Specifies an IP address.

- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.
- **expiry**
 - *seconds*—Specifies the time interval, in seconds, after which the binding entry is no longer valid. (Range: 10–4294967295)
 - *infinite*—Specifies infinite lease time.

Default Configuration

No static binding exists.

Command Mode

Privileged EXEC mode

User Guidelines

After entering this command, an entry is added to the DHCP Snooping database. If the DHCP Snooping binding file exists, the entry is also added to that file.

The entry is displayed in the show commands as a DHCP Snooping entry.

The user cannot delete dynamic temporary entries for which the IP address is 0.0.0.0.

The user can add static entry to the DHCP Snooping database by using the command **ip source-guard binding**.

Example

The following example adds a binding entry to the DHCP Snooping binding database.

```
switchxxxxx# ip dhcp snooping binding 0060.704C.73FF 23 176.10.1.1 gi5  
expiry 900
```

42.9 clear ip dhcp snooping database

Use the **clear ip dhcp snooping database** Privileged EXEC mode command to clear the DHCP Snooping binding database.

Syntax

clear ip dhcp snooping database

Parameters

N/A

Command Mode

Privileged EXEC mode

Example

The following example clears the DHCP Snooping binding database.

```
switchxxxxxx# clear ip dhcp snooping database
```

42.10 show ip dhcp snooping

Use the **show ip dhcp snooping** EXEC mode command to display the DHCP snooping configuration for all interfaces or for a specific interface.

Syntax

show ip dhcp snooping *[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 the DHCP snooping configuration.

```
switchxxxxxx# show ip dhcp snooping  
  
DHCP snooping is Enabled  
  
DHCP snooping is configured on following VLANs: 21
```

```
DHCP snooping database is Enabled
Relay agent Information option 82 is Enabled
Option 82 on untrusted port is allowed
Verification of hwaddr field is Enabled
DHCP snooping file update frequency is configured to: 6666 seconds
```

```
Interface    Trusted
-----
gi1          Yes
gi2          Yes
```

42.11 show ip dhcp snooping binding

Use the **show ip dhcp snooping binding** User EXEC mode command to display the DHCP Snooping binding database and configuration information for all interfaces or for a specific interface.

Syntax

```
show ip dhcp snooping binding [mac-address mac-address] [ip-address ip-address] [vlan vlan-id] [interface-id]
```

Parameters

- **mac-address mac-address**—Specifies a MAC address.
- **ip-address ip-address**—Specifies an IP address.
- **vlan vlan-id**—Specifies a VLAN ID.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Command Mode

User EXEC mode

Example

The following examples displays the DHCP snooping binding database and configuration information for all interfaces on a device.-

```
switchxxxxxx# show ip dhcp snooping binding
```

```
Update frequency: 1200
```

```
Total number of binding: 2
```

Mac Address	IP Address	Lease (sec)	Type	VLAN	Interface
-----	-----	-----	-----	----	-----
0060.704C.73FF	10.1.8.1	7983	snooping	3	gi21
0060.704C.7BC1	10.1.8.2	92332	snooping	3	gi22
			(s)		

42.12 ip source-guard

Use the **ip source-guard** command in Configuration or Interface mode to enable IP Source Guard globally on a device or in Interface Configuration (Ethernet, Port-channel) mode to enable IP Source Guard on an interface.

Use the **no** form of this command to disable IP Source Guard on the device or on an interface.

Syntax

ip source-guard

no ip source-guard

Parameters

N/A

Default Configuration

IP source guard is disabled.

Command Mode

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

User Guidelines

IP Source Guard must be enabled globally before enabling IP Source Guard on an interface.

IP Source Guard is active only on DHCP snooping untrusted interfaces, and if at least one of the interface VLANs are DHCP snooping enabled.

Example

The following example enables IP Source Guard on gi5.

```
switchxxxxxx(config)# interface gi5
switchxxxxxx(config-if)# ip source-guard
```

42.13 ip source-guard binding

Use the **ip source-guard binding** Global Configuration mode command to configure the static IP source bindings on the device. Use the **no** form of this command to delete the static bindings.

Syntax

ip source-guard binding *mac-address* *vlan-id* *ip-address* [*interface-id*]

no ip source-guard binding *mac-address* *vlan-id*

Parameters

- **mac-address**—Specifies a MAC address.
- **vlan-id**—Specifies a VLAN number.
- **ip-address**—Specifies an IP address.
- **interface-id**—Specifies an interface ID. The interface ID can be one of the following types: Ethernet port or Port-channel.

Default Configuration

No static binding exists.

Command Mode

Global Configuration mode

User Guidelines

The device currently supports filtering that is based only on the source IP address. In future, the device might support filtering mode that is based on the MAC address and IP source address. Currently the MAC address field is an informative field.

Example

The following example configures the static IP source bindings.

```
switchxxxxx(config)# ip source-guard binding 0060.704C.73FF 23 176.10.1.1  
gi5
```

42.14 ip source-guard tcam retries-freq

Use the **ip source-guard tcam retries-freq** Global Configuration mode command to set the frequency of retries for TCAM resources for inactive IP Source Guard addresses. Use the **no** form of this command to restore the default configuration.

Syntax

ip source-guard tcam retries-freq {*seconds* / *never*}

no ip source-guard tcam retries-freq

Parameters

- **seconds**—Specifies the retries frequency in seconds. (Range: 10–600)
- **never**—Disables automatic searching for TCAM resources.

Default Configuration

The default retries frequency is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

Since the IP Source Guard uses the Ternary Content Addressable Memory (TCAM) resources, there may be situations when IP Source Guard addresses are inactive because of a lack of TCAM resources.

By default, once every minute the software conducts a search for available space in the TCAM for the inactive IP Source Guard addresses. Use this command to change the search frequency or to disable automatic retries for TCAM space.

The **ip source-guard tcam locate** Privileged EXEC mode command manually retries locating TCAM resources for the inactive IP Source Guard addresses.

The **show ip source-guard inactive** EXEC mode command displays the inactive IP Source Guard addresses.

Example

The following example sets the frequency of retries for TCAM resources to 2 minutes.

```
switchxxxxxx(config)# ip source-guard tcam retries-freq 120
```

42.15 ip source-guard tcam locate

Use the **ip source-guard tcam locate** Privileged EXEC mode command to manually retry to locate TCAM resources for inactive IP Source Guard addresses.

Syntax

ip source-guard tcam locate

Parameters

N/A

Command Mode

Privileged EXEC mode

User Guidelines

Since the IP Source Guard uses the Ternary Content Addressable Memory (TCAM) resources, there may be situations when IP Source Guard addresses are inactive because of a lack of TCAM resources.

By default, once every minute the software conducts a search for available space in the TCAM for the inactive IP Source Guard addresses.

Execute the **ip source-guard tcam retries-freq never** Global Configuration mode command to disable automatic retries for TCAM space, and then execute this

command to manually retry locating TCAM resources for the inactive IP Source Guard addresses.

The **show ip source-guard inactive** EXEC mode command displays the inactive IP source guard addresses.

Example

The following example manually retries to locate TCAM resources.

```
switchxxxxxx# ip source-guard tcam locate
```

42.16 show ip source-guard configuration

Use the **show ip source-guard configuration** EXEC mode command to display the IP source guard configuration for all interfaces or for a specific interface.

Syntax

show ip source-guard 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.

Command Mode

EXEC mode

Example

The following example displays the IP Source Guard configuration.

```
switchxxxxx# show ip source-guard configuration
```

```
IP source guard is globally enabled.
```

Interface	State
-----	-----
gi21	Enabled
gi22	Enabled
gi23	Enabled
gi24	Enabled
gi32	Enabled
gi33	Enabled
gi34	Enabled

42.17 show ip source-guard status

Use the **show ip source-guard status** EXEC mode command to display the IP Source Guard status.

Syntax

```
show ip source-guard status [mac-address mac-address] [ip-address ip-address]
[vlan vlan]
[interface-id]
```

Parameters

- **mac-address mac-address**—Specifies a MAC address.
- **ip-address ip-address**—Specifies an IP address.
- **vlan vlan-id**—Specifies a VLAN ID.
- **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 the IP Source Guard status.

```
switchxxxxxx# show ip source-guard status
IP source guard is globally disabled.
switchxxxxxx# show ip source-guard status
```

Interface	Filter	Status	IP Address	MAC Address	VLAN	Type
-----	-----	-----	-----	-----	---	-----
gi21	IP	Active	10.1.8.1	0060.704C.73FF	3	DHCP
gi22	IP	Active	10.1.8.2	0060.704C.7BC1	3	DHCP
gi23	IP	Active	10.1.12.2	0060.704C.7BC3	4	DHCP
gi24	IP	Active	Deny all			
gi25	IP	Active	10.1.8.218	0060.704C.7BAC	3	Static
gi32	IP	Inactive	10.1.8.32	0060.704C.83FF	3	DHCP
gi33	IP	Inactive				
gi34	IP	Inactive				
gi35	IP	Inactive				

42.18 show ip source-guard inactive

Use the **show ip source-guard inactive** EXEC mode command to display the IP Source Guard inactive addresses.

Syntax

show ip source-guard inactive

Parameters

N/A

Command Mode

EXEC mode

User Guidelines

Since the IP Source Guard uses the Ternary Content Addressable Memory (TCAM) resources, there may be situations when IP Source Guard addresses are inactive because of a lack of TCAM resources.

By default, once every minute the software conducts a search for available space in the TCAM for the inactive IP Source Guard addresses.

Use the **ip source-guard tcam retries-freq** Global Configuration mode command to change the retry frequency or to disable automatic retries for TCAM space.

Use the **ip source-guard tcam locate** Privileged EXEC mode command to manually retry locating TCAM resources for the inactive IP Source Guard addresses.

This command displays the inactive IP source guard addresses.

Example

The following example displays the IP source guard inactive addresses.

```
switchxxxxxx# show ip source-guard inactive
```

TBD: TCAM resources search frequency: 10 minutes

Interface	Filter	IP Address	MAC Address	VLAN	Type	Reason
-----	-----	-----	-----	-----	-----	-----
gi32	IP	10.1.8.32	0060.704C.8	3	DHCP	Resource
gi33	IP		3FF			Problem
gi34	I					Trust port
						No snooping
						VLAN

42.19 show ip source-guard statistics

Use the **show ip source-guard statistics** EXEC mode command to display the Source Guard dynamic information (permitted stations).

Syntax

show ip source-guard statistics [*vlan vlan-id*]

Parameters

vlan-id—Display the statistics on this VLAN.

Command Mode

EXEC mode

Example

```
switchxxxxxx#show ip source-guard statistics
```

VLAN	Statically Permitted Stations	DHCP Snooping Permitted Stations
-----	-----	-----
2	2	3

42.20 ip arp inspection

Use the **ip arp inspection** Global Configuration mode command globally to enable Address Resolution Protocol (ARP) inspection. Use the **no** form of this command to disable ARP inspection.

Syntax

ip arp inspection

no ip arp inspection

Parameters

N/A

Default Configuration

ARP inspection is disabled.

Command Mode

Global Configuration mode

User Guidelines

Note that if a port is configured as an untrusted port, then it should also be configured as an untrusted port for DHCP Snooping, or the IP-address-MAC-address binding for this port should be configured statically. Otherwise, hosts that are attached to this port cannot respond to ARPs.

Example

The following example enables ARP inspection on the device.

```
switchxxxxx(config)# ip arp inspection
```

42.21 ip arp inspection vlan

Use the **ip arp inspection vlan** Global Configuration mode command to enable ARP inspection on a VLAN, based on the DHCP Snooping database. Use the **no** form of this command to disable ARP inspection on a VLAN.

Syntax

ip arp inspection vlan *vlan-id*

no ip arp inspection vlan *vlan-id*

Parameters

vlan-id—Specifies the VLAN ID.

Default Configuration

DHCP Snooping based ARP inspection on a VLAN is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command enables ARP inspection on a VLAN based on the DHCP snooping database. Use the **ip arp inspection list assign** Global Configuration mode command to enable static ARP inspection.

Example

The following example enables DHCP Snooping based ARP inspection on VLAN 23.

```
switchxxxxxx(config)# ip arp inspection vlan 23
```

42.22 ip arp inspection trust

Use the **ip arp inspection trust** Interface Configuration (Ethernet, Port-channel) mode command to configure an interface trust state that determines if incoming Address Resolution Protocol (ARP) packets are inspected. Use the **no** form of this command to restore the default configuration.

Syntax

ip arp inspection trust

no ip arp inspection trust

Parameters

N/A

Default Configuration

The interface is untrusted.

Command Mode

Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

The device does not check ARP packets that are received on the trusted interface; it only forwards the packets.

For untrusted interfaces, the device intercepts all ARP requests and responses. It verifies that the intercepted packets have valid IP-to-MAC address bindings before updating the local cache and before forwarding the packet to the appropriate destination. The device drops invalid packets and logs them in the log buffer according to the logging configuration specified with the **ip arp inspection log-buffer vlan** Global Configuration mode command.

Example

The following example configures gi3 as a trusted interface.

```
switchxxxxxx(config)# interface gi3
switchxxxxxx(config-if)# ip arp inspection trust
```

42.23 ip arp inspection validate

Use the **ip arp inspection validate** Global Configuration mode command to perform specific checks for dynamic Address Resolution Protocol (ARP) inspection. Use the **no** form of this command to restore the default configuration.

Syntax

ip arp inspection validate

no ip arp inspection validate

Parameters

N/A

Default Configuration

ARP inspection validation is disabled.

Command Mode

Global Configuration mode

User Guidelines

The following checks are performed:

- **Source MAC address:** Compares the source MAC address in the Ethernet header against the sender MAC address in the ARP body. This check is performed on both ARP requests and responses.
- **Destination MAC address:** Compares the destination MAC address in the Ethernet header against the target MAC address in the ARP body. This check is performed for ARP responses.
- **IP addresses:** Compares the ARP body for invalid and unexpected IP addresses. Addresses include 0.0.0.0, 255.255.255.255, and all IP multicast addresses.

Example

The following example executes ARP inspection validation.

```
switchxxxxxx(config)# ip arp inspection validate
```

42.24 ip arp inspection list create

Use the **ip arp inspection list create** Global Configuration mode command to create a static ARP binding list and enters the ARP list configuration mode. Use the **no** form of this command to delete the list.

Syntax

ip arp inspection list create *name*

no ip arp inspection list create *name*

Parameters

name—Specifies the static ARP binding list name. (Length: 1–32 characters)

Default Configuration

No static ARP binding list exists.

Command Mode

Global Configuration mode

User Guidelines

Use the **ip arp inspection list assign** command to assign the list to a VLAN.

Example

The following example creates the static ARP binding list 'servers' and enters the ARP list configuration mode.

```
switchxxxxxx(config)# ip arp inspection list create servers
switchxxxxxx(config-ARP-list)#
```

42.25 ip mac

Use the **ip mac** ARP-list Configuration mode command to create a static ARP binding. Use the **no** form of this command to delete a static ARP binding.

Syntax

ip *ip-address* **mac** *mac-address*

no ip *ip-address* **mac** *mac-address*

Parameters

- **ip-address**—Specifies the IP address to be entered to the list.
- **mac-address**—Specifies the MAC address associated with the IP address.

Default Configuration

No static ARP binding is defined.

Command Mode

ARP-list Configuration mode

Example

The following example creates a static ARP binding.

```
switchxxxxxx(config)# ip arp inspection list create servers
switchxxxxxx(config-ARP-list)# ip 172.16.1.1 mac 0060.704C.7321
switchxxxxxx(config-ARP-list)# ip 172.16.1.2 mac 0060.704C.7322
```

42.26 ip arp inspection list assign

Use the **ip arp inspection list assign** Global Configuration mode command to assign a static ARP binding list to a VLAN. Use the **no** form of this command to delete the assignment.

Syntax

ip arp inspection list assign *vlan-id name*

no ip arp inspection list assign *vlan-id*

Parameters

- **vlan-id**—Specifies the VLAN ID.
- **name**—Specifies the static ARP binding list name.

Default Configuration

No static ARP binding list assignment exists.

Command Mode

Global Configuration mode

Example

The following example assigns the static ARP binding list Servers to VLAN 37.

```
switchxxxxxx(config)# ip arp inspection list assign 37 servers
```

42.27 ip arp inspection logging interval

Use the **ip arp inspection logging interval** Global Configuration mode command to set the minimum time interval between successive ARP SYSLOG messages. Use the **no** form of this command to restore the default configuration.

Syntax

ip arp inspection logging interval {*seconds* / *infinite*}

no ip arp inspection logging interval

Parameters

- **seconds**—Specifies the minimum time interval between successive ARP SYSLOG messages. A 0 value means that a system message is immediately generated. (Range: 0–86400)
- **infinite**—Specifies that SYSLOG messages are not generated.

Default Configuration

The default minimum ARP SYSLOG message logging time interval is 5 seconds.

Command Mode

Global Configuration mode

Example

The following example sets the minimum ARP SYSLOG message logging time interval to 60 seconds.

```
switchxxxxxx(config)# ip arp inspection logging interval 60
```

42.28 show ip arp inspection

Use the **show ip arp inspection** EXEC mode command to display the ARP inspection configuration for all interfaces or for a specific interface.

Syntax

show ip arp inspection [*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 the ARP inspection configuration.

```
switchxxxxx# show ip arp inspection
IP ARP inspection is Enabled
IP ARP inspection is configured on following VLANs: 1
Verification of packet header is Enabled
IP ARP inspection logging interval is: 222 seconds

Interface    Trusted
-----
gi1          Yes
gi2          Yes
```

42.29 show ip arp inspection list

Use the **show ip arp inspection list** Privileged EXEC mode command to display the static ARP binding list.

Syntax

show ip arp inspection list

Parameters

N/A

Command Mode

Privileged EXEC mode

Example

The following example displays the static ARP binding list.

```
switchxxxxx# show ip arp inspection list
```

```
List name: servers
```

```
Assigned to VLANs: 1,2
```

IP	ARP
-----	-----
172.16.1.1	0060.704C.7322
172.16.1.2	0060.704C.7322

42.30 show ip arp inspection statistics

Use the **show ip arp inspection statistics** EXEC command to display Statistics For The Following Types Of Packets That Have Been Processed By This Feature: Forwarded, Dropped, IP/MAC Validation Failure.

Syntax

show ip arp inspection statistics [*vlan vlan-id*]

Parameters

vlan-id—Specifies VLAN ID.

Command Mode

EXEC mode

User Guidelines

To clear ARP Inspection counters use the **clear ip arp inspection statistics** CLI command. Counters values are kept when disabling the ARP Inspection feature.

Example

```
switchxxxxxx# show ip arp inspection statistics
Vlan    Forwarded Packets Dropped Packets IP/MAC Failures
-----
2       1500100      80
```

42.31 clear ip arp inspection statistics

Use the **clear ip arp inspection statistics** Privileged EXEC mode command to clear statistics ARP Inspection statistics globally.

Syntax

clear ip arp inspection statistics [*vlan vlan-id*]

Parameters

vlan-id—Specifies VLAN ID

Command Mode

Privileged EXEC mode

Example

```
switchxxxxxx# clear ip arp inspection statistics
```

IP Addressing Commands

43.1 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 Layer 3 (Router mode).

ip address *ip-address* {*mask* | /*prefix-length*}

no ip address [*ip-address*]

If the product is in Layer 2 (Switch mode).

ip address *ip-address* {*mask* | /*prefix-length*}

no ip address [*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 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 Layer 3 router mode, it supports multiple IP addresses. The IP addresses must be from different IP subnets.

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.

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
```

43 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
```

43 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
```

43 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
```

43 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 Broadcast	Precedence	Status
-----	-----	-----	-----	-----	-----
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.

```
switchxxxxx# 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

43 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.

```
switchxxxxx(config)# arp 198.133.219.232 00:00:0c:40:0f:bc gi6
```

43 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.

```
switchxxxxx(config)# arp timeout 12000
```

43 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 reenables 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

Disabled 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](#).

Example

The following example globally disables ARP proxy when the switch is in router mode.

```
switchxxxxxx(config)# ip arp proxy disable
```

43 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 to 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 enabled.

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](#).

Example

The following example enables ARP proxy when the switch is in router mode.

```
switchxxxxxx(config-if)# ip proxy-arp
```

43 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
```

43 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
```

43 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

```
switchxxxxx# 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)

43 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](#).

Example

The following example enters the IP interface configuration mode.

```
switchxxxxxx(config)# interface ip 192.168.1.1  
switchxxxxxx(config-ip)#
```

43 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 command can only be used when the device is in Router mode.

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 [set system](#).

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.

```
switchxxxxx(config)# ip helper-address all 172.16.9.9 49 53 1 2
```

43 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 command can only be used when the device is in Router mode.

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 [set system](#).

Example

The following example displays the IP helper addresses configuration on the system.

```
switchxxxxx# 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

43 16 show ip dhcp client interface

Use the **show ip dhcp client interface** command in User EXEC or Privileged EXEC mode to display DHCP client interface information.

Syntax

show ip dhcp client interface [*interface-id*]

Parameters

interface-id— Interface identifier.

Command Mode

User EXEC

Privileged EXEC

User Guidelines

If no interfaces are specified, all interfaces on which DHCP client is enabled are displayed. If an interface is specified, only information about the specified interface is displayed.

Example

The following is sample output of the **show ip dhcp client interface** command:

```
show ip dhcp client interface
```

VLAN 100 is in client mode

Address: 170.10.100.100 Mask: 255.255.255.0 T1 120, T2 192

```
Default Gateway: 170.10.100.1
DNS Servers: 115.1.1.1, 87.12.34.20
DNS Domain Search List: company.com
Host Name: switch_floor7
Configuration Server Addresses: 192.1.1.1 202.1.1.1
Configuration Path Name: qqg/config/aaa_config.dat
POSIX Timezone string: EST5EDT4,M3.2.0/02:00,M11.1.0/02:00
VLAN 1200 is in client mode
Address: 180.10.100.100 Mask: 255.255.255.0 T1 120, T2 192
Default Gateway: 180.10.100.1
DNS Servers: 115.1.1.1, 87.12.34.20
DNS Domain Search List: company.com
Host Name: switch_floor7
Configuration Server Addresses: configuration.company.com
Configuration Path Name: qqg/config/aaa_config.dat
POSIX Timezone string: EST5EDT4,M3.2.0/02:00,M11.1.0/02:00
```

User Guidelines

If no interfaces are specified, all interfaces on which DHCP client is enabled are displayed. If an interface is specified, only information about the specified interface is displayed.

Example

The following is sample output of the **show ip dhcp client interface** command:

```
show ip dhcp client interface
VLAN 100 is in client mode
Address: 170.10.100.100 Mask: 255.255.255.0 T1 120, T2 192
Default Gateway: 170.10.100.1
DNS Servers: 115.1.1.1, 87.12.34.20
DNS Domain Search List: company.com
Host Name: switch_floor7
Configuration Server Addresses: 192.1.1.1 202.1.1.1
Configuration Path Name: qqg/config/aaa_config.dat
```

```
    POSIX Timezone string: EST5EDT4,M3.2.0/02:00,M11.1.0/02:00
VLAN 1200 is in client mode
    Address: 180.10.100.100 Mask: 255.255.255.0 T1 120, T2 192
    Default Gateway: 180.10.100.1
    DNS Servers: 115.1.1.1, 87.12.34.20
    DNS Domain Search List: company.com
    Host Name: switch_floor7
    Configuration Server Addresses: configuration.company.com
    Configuration Path Name: qqg/config/aaa_config.dat
    POSIX Timezone string: EST5EDT4,M3.2.0/02:00,M11.1.0/02:00
```

IPv6 Router Commands

44.1 clear ipv6 neighbors

Use the **clear ipv6 neighbors** command in Privileged EXEC mode to delete all entries in the IPv6 neighbor discovery cache, except static entries.

Syntax

clear ipv6 neighbors

Parameters

N/A

Command Mode

Privileged EXEC

User Guidelines

Example

The following example deletes all entries, except static entries, in the neighbor discovery cache:

```
clear ipv6 neighbors
```

44.2 ipv6 address

Use the **ipv6 address** command in Interface Configuration mode to configure an IPv6 address based on an IPv6 general prefix and enable IPv6 processing on an interface.

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

Syntax

ipv6 address *ipv6-address/prefix-length*

no ipv6 address [*ipv6-address/prefix-length*]

Parameters

- **ipv6-address**—Specifies the IPv6 address assigned to the interface. This argument must be in the form documented in RFC4293 where the address is specified in hexadecimal using 16-bit values between colons.
- **prefix-length**—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 value.

Default Configuration

No IP address is defined for the interface.

Command Mode

Interface Configuration

User Guidelines

The **ipv6 address** command cannot be applied to define an IPv6 address on an ISATAP interface.

Using the **no IPv6 address** command without arguments removes all manually-configured IPv6 addresses from an interface, including link local manually configured addresses.

Example

The following example defines the IPv6 global address 2001:DB8:2222:7272::72 on vlan 100:

```
interface vlan 100

  ipv6 address 2001:DB8:2222:7272::72/64

exit
```

44.3 ipv6 address autoconfig

Use the **ipv6 address autoconfig** command in Interface Configuration mode to enable automatic configuration of IPv6 addresses using stateless auto configuration on an interface and enable IPv6 processing on the interface. Addresses are configured depending on the prefixes received in Router Advertisement messages.

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

Syntax

ipv6 address autoconfig

no ipv6 address autoconfig

Parameters

N/A.

Default Configuration

Stateless Auto configuration is disabled.

Command Mode

Interface Configuration mode.

User Guidelines

This command enables IPv6 on an interface (if it was disabled) and causes the switch to perform IPv6 stateless address auto-configuration to discover prefixes on the link and then to add the eui-64 based addresses to the interface.

Stateless auto configuration is applied only when IPv6 Forwarding is disabled.

When IPv6 forwarding is changed from disabled to enabled, and stateless auto configuration is enabled the switch stops stateless auto configuration and removes all stateless auto configured ipv6 addresses from all interfaces.

When IPv6 forwarding is changed from enabled to disabled and stateless auto configuration is enabled the switch resumes stateless auto configuration.

Using the **no ipv6 address autoconfig** command to disable stateless auto configuration and to remove all stateless auto configured IPv6 addresses from an interface.

Example

The following example assigns the IPv6 address automatically:

```
interface vlan 100
    ipv6 address autoconfig
exit
```

44.4 **ipv6 address link-local**

Use the **ipv6 address link-local** command in Interface Configuration mode to configure an IPv6 link local address for an interface and enable IPv6 processing on the interface.

Use the **no** form of this command to remove the manually configured link local address from the interface.

Syntax

ipv6 address *ipv6-prefix* **link-local**

no ipv6 address [**link-local**]

Parameters

- **ipv6-address**—Specifies the IPv6 address assigned to the interface. This argument must be in the form documented in RFC4293 where the address is specified in hexadecimal using 16-bit values between colons.

Default Configuration

The default Link-local address is defined.

Command Mode

Interface Configuration

User Guidelines

The switch automatically generates a link local address for an interface when IPv6 processing is enabled on the interface, typically when an IPv6 address is configured on the interface. To manually specify a link local address to be used by an interface, use the **ipv6 address link-local** command.

The **ipv6 address link-local** command cannot be applied to define an IPv6 address on an ISATAP interface.

Using the **no IPv6 address** command without arguments removes all manually-configured IPv6 addresses from an interface, including link local manually configured addresses.

Example

The following example enables IPv6 processing on VLAN 1 and configures FE80::260:3EFF:FE11:6770 as the link local address for VLAN 1:

```
interface vlan 1
    ipv6 address FE80::260:3EFF:FE11:6770 link-local
exit
```

44.5 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* | *interface-id*

no ipv6 default-gateway *ipv6-address* | *interface-id*

Parameters

- **ipv6-address**—Specifies the IPv6 address of the next hop that can be used to reach a network.
- **interface-id**—Specifies the Interface Identifier of the outgoing interface that can be used to reach a network.

Default Configuration

No default gateway is defined.

Command Mode

Global Configuration mode

User Guidelines

The command is an alias of the **ipv6 route** command with the predefined (default) route:

```
ipv6 route ::/0 ipv6-address | interface-id
```

See the definition of the **ipv6 route** command for details.

Example The following example configures a default gateway:

```
console(config)# ipv6 default-gateway fe80::abcd%vlan1
```

44.6 **ipv6 enable**

Use the **ipv6 enable** command in Interface Configuration mode to enable IPv6 processing on an interface.

Use the **no** form of this command to disable IPv6 processing on an interface that has not been configured with an explicit IPv6 address.

Syntax

ipv6 enable

no ipv6 enable

Parameters

N/A.

Default Configuration

IPv6 addressing is disabled.

Command Mode

Interface Configuration

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 does not disable IPv6 processing on an interface that is configured with an explicit IPv6 address.

Example

The following example enables VLAN 1 for the IPv6 addressing mode.

```
interface vlan 1  
    ipv6 enable
```

exit

44.7 ipv6 icmp error-interval

Use the **ipv6 icmp error-interval** command in Global Configuration mode to configure the interval and bucket size for IPv6 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*—Time interval between tokens being placed in the bucket. Each token represents a single ICMP error message. The acceptable range is from 0 to 2147483647. A value of 0 disables ICMP rate limiting.
- *bucketsize*—Maximum number of tokens stored in the bucket. The acceptable range is from 1 to 200.

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

Use this command to limit the rate at which IPv6 ICMP error messages are sent. A token bucket algorithm is used with one token representing one IPv6 ICMP error message. Tokens are placed in the virtual bucket at a specified interval until the maximum number of tokens allowed in the bucket is reached.

The *milliseconds* argument specifies the time interval between tokens arriving in the bucket. The optional *bucketsize* argument is used to define the maximum number of tokens allowed in the bucket. Tokens are removed from the bucket when IPv6 ICMP error messages are sent, which means that if the *bucketsize* is set to 20, a rapid succession of 20 IPv6 ICMP error messages can be sent. When the bucket is empty of tokens, IPv6 ICMP error messages are not sent until a new token is placed in the bucket.

Average Packets Per Second = $(1000 / \textit{milliseconds}) * \textit{bucketsize}$.

To disable ICMP rate limiting, set the *milliseconds* argument to zero.

Example

The following example shows an interval of 50 milliseconds and a bucket size of 20 tokens being configured for IPv6 ICMP error messages:

```
ipv6 icmp error-interval 50 20
```

44.8 ipv6 nd dad attempts

Use the **ipv6 nd dad attempts** command in Interface Configuration mode to configure the number of consecutive neighbor solicitation messages that are sent on an interface while duplicate address detection is performed on the Unicast IPv6 addresses of the interface.

Use the **no** form of this command to return the number of messages to the default value.

Syntax

ipv6 nd dad attempts *value*

no ipv6 nd dad attempts

Parameters

value—The number of neighbor solicitation messages. The acceptable range is from 0 to 600. Configuring a value of 0 disables duplicate address detection processing on the specified interface; a value of 1 configures a single transmission without follow-up transmissions.

Default Configuration

1

Command Mode

Interface Configuration

User Guidelines

Duplicate address detection verifies the uniqueness of new Unicast IPv6 addresses before the addresses are assigned to interfaces (the new addresses

remain in a tentative state while duplicate address detection is performed). Duplicate address detection uses neighbor solicitation messages to verify the uniqueness of Unicast IPv6 addresses.

The `DupAddrDetectTransmits` node configuration variable (as specified in RFC 4862, IPv6 Stateless Address Autoconfiguration) is used to automatically determine the number of consecutive neighbor solicitation messages that are sent on an interface, while duplicate address detection is performed on a tentative Unicast IPv6 address.

The interval between duplicate address detection, neighbor solicitation messages (the duplicate address detection timeout interval) is specified by the neighbor discovery-related variable `RetransTimer` (as specified in RFC 4861, Neighbor Discovery for IPv6), which is used to determine the time between retransmissions of neighbor solicitation messages to a neighbor when resolving the address or when probing the reachability of a neighbor. This is the same management variable used to specify the interval for neighbor solicitation messages during address resolution and neighbor unreachability detection. Use the **`ipv6 nd ns-interval`** command to configure the interval between neighbor solicitation messages that are sent during duplicate address detection.

Duplicate address detection is suspended on interfaces that are administratively down. While an interface is administratively down, the Unicast IPv6 addresses assigned to the interface are set to a pending state. Duplicate address detection is automatically restarted on an interface when the interface returns to being administratively up.

An interface returning to administratively up, restarts duplicate address detection for all of the Unicast IPv6 addresses on the interface. While duplicate address detection is performed on the link-local address of an interface, the state for the other IPv6 addresses is still set to `TENTATIVE`. When duplicate address detection is completed on the link-local address, duplicate address detection is performed on the remaining IPv6 addresses.

When duplicate address detection identifies a duplicate address, the state of the address 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 `SYSLOG` message is issued.

If the duplicate address is a global address of the interface, the address is not used and an error `SYSLOG` message is issued.

All configuration commands associated with the duplicate address remain as configured while the state of the address is set to `DUPLICATE`.

If the link-local address for an interface changes, duplicate address detection is performed on the new link-local address and all of the other IPv6 address associated with the interface are regenerated (duplicate address detection is performed only on the new link-local address).

Example

The following example configures five consecutive neighbor solicitation messages to be sent on VLAN 1 while duplicate address detection is being performed on the tentative Unicast IPv6 address of the interface. The example also disables duplicate address detection processing on VLAN 2.

```
interface vlan 1
  ipv6 nd dad attempts 5
exit
interface vlan 2
  ipv6 nd dad attempts 0
exit
```

44.9 ipv6 neighbor

Use the **ipv6 neighbor** command in Global Configuration mode 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-address interface-id mac-address
no ipv6 neighbor [ipv6-address] interface-id
```

Parameters

- **ipv6-address**—Specified IPv6 address. This argument must be in the form documented in RFC4293 where the address is specified in hexadecimal using 16-bit values between colons.
- **interface-id**—Specified interface identifier.
- **mac-address**—Interface MAC address.

Default Configuration

Static entries are not configured in the IPv6 neighbor discovery cache.

Command Mode

Global Configuration

User Guidelines

This command is similar to the **arp** (global) command.

Use the **ipv6 neighbor** command to add a static entry in the IPv6 neighbor discovery cache.

If the specified IPv6 address is a global IPv6 address it must belong to one of static on-link prefixes defined in the interface. When a static on-link prefix is deleted all static entries in the IPv6 neighbor discovery cache corresponding the prefix is deleted to.

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.

Static entries in the IPv6 neighbor discovery cache are not modified by the neighbor discovery process.

Use the **no ipv6 neighbor *ipv6-address interface-id*** command to remove the one given static entry on the given interface. The command does not remove the entry from the cache, if it is a dynamic entry, learned from the IPv6 neighbor discovery process.

Use the **no ipv6 neighbor *interface-id*** command to delete the all static entries on the given interface.

Use the **no ipv6 neighbor** command to remove the all static entries on all interfaces.

Use the **show ipv6 neighbors** command to view static entries in the IPv6 neighbor discovery cache. A static entry in the IPv6 neighbor discovery cache can have one of the following states:

- NCMP (Incomplete)—The interface for this entry is down.
- REACH (Reachable)—The interface for this entry is up.

Note. Reachability detection is not applied to static entries in the IPv6 neighbor discovery cache; therefore, the descriptions for the INCOMPLETE and REACH states are different for dynamic and static cache entries.

Examples

Example 1—The following example configures a static entry in the IPv6 neighbor discovery cache for a neighbor with the IPv6 address 2001:0DB8::45A and link-layer address 0002.7D1A.9472 on VLAN 1:

```
ipv6 neighbor 2001:0DB8::45A vlan1 0002.7D1A.9472
```

Example 2—The following example deletes the static entry in the IPv6 neighbor discovery cache for a neighbor with the IPv6 address 2001:0DB8::45A and link-layer address 0002.7D1A.9472 on VLAN 1:

```
no ipv6 neighbor 2001:0DB8::45A vlan1
```

Example 3 —The following example deletes all static entries in the IPv6 neighbor discovery cache on VLAN 1:

```
no ipv6 neighbor vlan1
```

Example 4—The following example deletes all static entries in the IPv6 neighbor discovery cache on all interfaces:

```
no ipv6 neighbor
```

44.10 ipv6 unreachable

Use the **ipv6 unreachable** command in Interface Configuration mode 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 unreachable

no ipv6 unreachable

Parameters

N/A.

Default Configuration

The sending of ICMP IPv6 unreachable messages is enabled.

Command Mode

Interface Configuration.

User Guidelines

If the switch receives a Unicast packet destined for itself that uses a protocol it does not recognize, it sends an ICMPv6 unreachable message to the source.

If the switch receives a datagram that it cannot deliver to its ultimate destination because it knows of no route to the destination address, it replies to the originator of that datagram with an ICMP host unreachable message.

Example

The following example disables the generation of ICMPv6 unreachable messages, as appropriate, on an interface:

```
interface vlan 100
  no ipv6 unreachable
exit
```

44.11 show ipv6 interface

Use the **show ipv6 interface** command in User EXEC or Privileged EXEC mode to display the usability status of interfaces configured for IPv6.

Syntax

```
show ipv6 interface [brief] | [[interface-id] [prefix]]
```

Parameters

- **brief**—Displays a brief summary of IPv6 status and configuration for each interface where IPv6 is defined.
- **interface-id**—Interface identifier about which to display information.

- **prefix**—Prefix generated from a local IPv6 prefix pool.

Default Configuration

Option **brief** - all IPv6 interfaces are displayed.

Command Mode

User EXEC

Privileged EXEC

User Guidelines

Use this command to validate the IPv6 status of an interface and its configured addresses. This command also displays the parameters that IPv6 uses for operation on this interface and any configured features.

If the interface's hardware is usable, the interface is marked up.

If you specify an optional interface identifier, the command displays information only about that specific interface. For a specific interface, you can enter the **prefix** keyword to see the IPv6 neighbor discovery (ND) prefixes that are configured on the interface.

Examples

Example 1—The **show ipv6 interface** command displays information about the specified interface:

```
show ipv6 interface vlan 1
```

```
VLAN 1 is up/up
```

```
IPv6 is enabled, link-local address is FE80::0DB8:12AB:FA01
```

```
Global unicast address(es):
```

Ipv6 Global Address	Type
2000:0DB8::2/64 (ANY)	Manual
2000:0DB8::2/64	Manual
2000:1DB8::2011/64	Manual

```
Joined group address(es):
```

```
FF02::1
```

```
FF02::2
```

FF02::1:FF11:6770

MTU is 1500 bytes

ICMP error messages limited interval is 100ms; Bucket size is 10 tokens

ND DAD is enabled, number of DAD attempts: 1

ND reachable time is 30000 milliseconds

Stateless autoconfiguration is enabled.

MLD Version is 2

Field Descriptions:

- **vlan 1 is up/up**—Indicates the interface status: administrative/operational.
- **IPv6 is enabled, stalled, disabled (stalled and disabled are not shown in sample output)**—Indicates that IPv6 is enabled, stalled, or disabled on the interface. If IPv6 is enabled, the interface is marked Enabled. If duplicate address detection processing identified the link-local address of the interface as being a duplicate address, the processing of IPv6 packets is disabled on the interface and the interface is marked Stalled. If IPv6 is not enabled, the interface is marked Disabled.
- **link-local address**—Displays the link-local address assigned to the interface.
- **Global unicast address(es)**—Displays the global Unicast addresses assigned to the interface. The type is **manual** or **autoconfig**.
- **Joined group address(es)**—Indicates the Multicast groups to which this interface belongs.
- **—**Maximum transmission unit of the interface.
- **ICMP error messages**—Specifies the minimum interval (in milliseconds) between error messages sent on this interface.
- **ND DAD**—The state of duplicate address detection on the interface (enabled or disabled).
- **number of DAD attempts**—Number of consecutive neighbor solicitation messages that are sent on the interface while duplicate address detection is performed.
- **ND reachable time**—Displays the neighbor discovery reachable time (in milliseconds) assigned to this interface.

- **MLD Version**—Version of MLD

Example 2—The **show ipv6 interface command** displays information about the specified manual ipv6 tunnel:

show ipv6 interface tunnel 2

Tunnel 2 is up/up

IPv6 is enabled, link-local address is FE80::0DB8:12AB:FA01

Global unicast address(es):

Ipv6 Global Address	Type
2000:0DB8::2/64 (ANY)	Manual
2000:0DB8::2/64	Manual
2000:1DB8::2011/64	Manual

Joined group address(es):

FF02::1

FF02::2

FF02::1:FF11:6770

MTU is 1500 bytes

ICMP error messages limited interval is 100ms; Bucket size is 10 tokens

ND DAD is enabled, number of DAD attempts: 1

ND reachable time is 30000 milliseconds

MLD Version is 2

Tunnel mode is manual

Tunnel Local IPv4 address : 10.10.10.1(auto)

Tunnel Remote Ipv4 address : 10.1.1.1

Field Descriptions:

- **vlan 1 is up/up**—Indicates the interface status: administrative/operational.
- **IPv6 is enabled, stalled, disabled (stalled and disabled are not shown in sample output)**—Indicates that IPv6 is enabled, stalled, or disabled on the interface. If IPv6 is enabled, the interface is marked “enabled.” If duplicate address detection processing identified the link-local address of the

interface as being a duplicate address, the processing of IPv6 packets is disabled on the interface and the interface is marked “stalled.” If IPv6 is not enabled, the interface is marked “disabled.”

- **link-local address**—Displays the link-local address assigned to the interface.
- **Global Unicast address(es)**—Displays the global Unicast addresses assigned to the interface. The type is **manual** or **autoconfig**.
- **Joined group address(es)**—Indicates the Multicast groups to which this interface belongs.
- **—**Maximum transmission unit of the interface.
- **ICMP error messages**—Specifies the minimum interval (in milliseconds) between error messages sent on this interface.
- **ND DAD**—The state of duplicate address detection on the interface (enabled or disabled).
- **number of DAD attempts**—Number of consecutive neighbor solicitation messages that are sent on the interface while duplicate address detection is performed.
- **ND reachable time**—Displays the neighbor discovery reachable time (in milliseconds) assigned to this interface.
- **MLD Version**—The version of MLD
- **Tunnel mode**—Specifies the tunnel mode: **manual**, **6to4**, **auto-tunnel** or **isatap**
- **Tunnel Local IPv4 address**—Specifies the tunnel local IPv4 address and have one of the following formats:
 - *ipv4-address*
 - *ipv4-address (auto)*
 - *ipv4-address (interface-id)*
- **Tunnel Remote Ipv4 address**—Specifies the tunnel remote IPv4 address

Example 3. The **show ipv6 interface** command displays information about the specified ISATAP tunnel:

show ipv6 interface tunnel 1

Tunnel 1 is up/up

IPv6 is enabled, link-local address is FE80::0DB8:12AB:FA01

Global unicast address(es):

Ipv6 Global Address	Type
2000:0DB8::2/64 (ANY)	Manual
2000:0DB8::2/64	Manual
2000:1DB8::2011/64	Manual

Joined group address(es):

FF02::1

FF02::2

FF02::1:FF11:6770

is 1500 bytes

ICMP error messages limited interval is 100ms; Bucket size is 10 tokens

ND DAD is enabled, number of DAD attempts: 1

ND reachable time is 30000 milliseconds

MLD Version is 2

Tunnel mode is ISATAP

Tunnel Local IPv4 address : 10.10.10.1(VLAN 1)

ISATAP Router DNS name is isatap

Field Descriptions:

- **vlan 1 is up/up**—Indicates the interface status: administrative/operational.
- **IPv6 is enabled, stalled, disabled (stalled and disabled are not shown in sample output)**—Indicates that IPv6 is enabled, stalled, or disabled on the interface. If IPv6 is enabled, the interface is marked “enabled.” If duplicate address detection processing identified the link-local address of the interface as being a duplicate address, the processing of IPv6 packets is disabled on the interface and the interface is marked “stalled.” If IPv6 is not enabled, the interface is marked “disabled.”
- **link-local address**—Displays the link-local address assigned to the interface.

- **Global Unicast address(es):**—Displays the global Unicast addresses assigned to the interface. The type is **manual** or **autoconfig**.
- **Joined group address(es):**—Indicates the Multicast groups to which this interface belongs.
- —Maximum transmission unit of the interface.
- **ICMP error messages**—Specifies the minimum interval (in milliseconds) between error messages sent on this interface.
- **ND DAD**—The state of duplicate address detection on the interface (enabled or disabled).
- **number of DAD attempts:**—Number of consecutive neighbor solicitation messages that are sent on the interface while duplicate address detection is performed.
- **ND reachable time**—Displays the neighbor discovery reachable time (in milliseconds) assigned to this interface.
- **MLD Version**—The version of MLD
- **Tunnel mode**—Specifies the tunnel mode: **manual**, **6to4**, **auto-tunnel** or **isatap**
- **Tunnel Local IPv4 address**—Specifies the tunnel local IPv4 address and have one of the following formats:
 - *ipv4-address*
 - *ipv4-address* (auto)
 - *ipv4-address* (*interface-id*)
- **Tunnel Remote Ipv4 address**—Specifies the tunnel remote IPv4 address
- **ISATAP Router DNS name is**—The DNS name of the ISATAP Router

Example 4. The following command with the **brief** keyword displays information about all interfaces that IPv6 is defined on:

```
Router# show ipv6 interface brief
```

Interface	Interface IPv6 State	Link Local IPv6 Address	MLD Version	Number of Global Addresses

gi10	up/up	enabled	FE80::0DB8:12AB:FA01	1	1
gi11	up/up	stalled	FE80::0DB8:12AB:FA01	1	1
gi12	up/down	enabled	FE80::0DB8:12AB:FA01	1	3
po1	down/down	enabled	FE80::0DB8:12AB:FA01	2	2
tunnel 1	up/up	enabled	FE80::0DB8:12AB:FA01	1	1
vlan 1	up/up	enabled	FE80::0DB8:12AB:FA01	1	1
vlan 1000	up/up	stalled	FE80::0DB8:12AB:FA01	1	1

Example 5. This sample output shows the characteristics of VLAN 1 that has generated a prefix from a local IPv6 prefix pool:

```

interface vlan 1
  ipv6 address 2001:0DB8:1::1/64
  ipv6 address 2001:0DB8:2::1/64
  ipv6 address 2001:0DB8:3::1/64
  ipv6 nd prefix 2001:0DB8:1::/64 no-advertise
  ipv6 nd prefix 2001:0DB8:3::/64 2912000 564900 off-link
  ipv6 nd prefix 2001:0DB8:4::/64
  ipv6 nd prefix 2001:0DB8:5::/64 2912000 564900 off-link
exit

```

show ipv6 interface vlan 1 prefix

IPv6 Prefix Advertisements VLAN 1

Codes: A - Address, P - Prefix is advertised, R is in Routing Table

Code	Prefix	Flags	Valid Lifetime	Preferred Lifetime
	default	LA	2592000	604800
AR	2001:0DB8:1::/64	LA	infinite	infinite

APR	2001:0DB8:2::/64	LA	infinite	infinite
AP	2001:0DB8:3::/64	A	infinite	infinite
PR	2001:0DB8:4::/64	LA	2592000	604800
P	2001:0DB8:5::/64	A	2912000	564900

44.12 show ipv6 neighbors

Use the **show ipv6 neighbors** command in User EXEC or Privileged EXEC mode to display IPv6 neighbor discovery (ND) cache information.

Syntax

show ipv6 neighbors [*interface-id*] *ipv6-address* | *ipv6-hostname*

Parameters

- **interface-id**—Specifies the identifier of the interface from which IPv6 neighbor information is to be displayed.
- **ipv6-address**—Specifies the IPv6 address of the neighbor. This argument must be in the form documented in RFC4293 where the address is specified in hexadecimal using 16-bit values between colons.
- **ipv6-hostname**—Specifies the IPv6 host name of the remote networking device.

Default Configuration

All IPv6 ND cache entries are listed.

Command Mode

User EXEC

Privileged EXEC

User Guidelines

When the *interface-id* argument is not specified, cache information for all IPv6 neighbors is displayed. Specifying the *interface-id* argument displays only cache information about the specified interface.

Examples

Example 1—The following is sample output from the `show ipv6 neighbors` command when entered with an interface-id:

```
show ipv6 neighbors vlan 1
```

IPv6 Address	Age	Link-layer Addr	State	Interface	Router
2000:0:0:4::2	0	0003.a0d6.141e	REACH	VLAN1	Yes
3001:1::45a	-	0002.7d1a.9472	REACH	VLAN1	-
FE80::203:A0FF:FED6:141E	0	0003.a0d6.141e	REACH	VLAN1	No

Example 2—The following is sample output from the `show ipv6 neighbors` command when entered with an IPv6 address:

```
show ipv6 neighbors 2000:0:0:4::2
```

IPv6 Address	Age	Link-layer Addr	State	Interface	Router
2000:0:0:4::2	0	0003.a0d6.141e	REACH	VLAN1	Yes

Field Descriptions:

- **Total number of entries**—Number of entries (peers) in the cache.
- **IPv6 Address**—IPv6 address of neighbor or interface.
- **Age**—Time (in minutes) since the address was confirmed to be reachable. A hyphen (-) indicates a static entry.
- **Link-layer Addr**—MAC address. If the address is unknown, a hyphen (-) is displayed.
- **Interface**—Interface which the neighbor is connected to.
- **Router**—Specifies if the neighbor is a Router. A hyphen (-) is displayed for static entries.

44.13 show ipv6 route

Use the **show ipv6 route** command in user EXEC or privileged EXEC mode to display the current contents of the IPv6 routing table.

Syntax

show ipv6 route [*ipv6-address*| *ipv6-prefix/prefix-length*| *protocol*|| **interface** *interface-id*]

Parameters

- **ipv6-address**—Displays routing information for a specific IPv6 address. This argument must be in the form documented in RFC4293 where the address is specified in hexadecimal using 16-bit values between colons.
- **ipv6-prefix**—Displays routing information for a specific IPv6 network. This argument must be in the form documented in RFC4293 where the address is specified in hexadecimal using 16-bit values between colons.
- **/prefix-length**—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 value.
- **protocol**—Displays routes for the specified routing protocol using the keyword: **rip** or one of the following.
 - **local**—Displays local routes.
 - **connected**—Displays connected routes.
 - **static**—Displays static routes.
 - **icmp**—Displays ICMP routes.
 - **nd**—Displays router advertisements.
- **interface** *interface-id*—Identifier of an interface whose routes are displayed.

Default Configuration

All IPv6 routing information for all active routing tables is displayed.

Command Mode

User EXEC

Privileged EXEC

User Guidelines

This command provides output similar to the **show ip route** command, except that the information is IPv6-specific.

When the *ipv6-address* or *ipv6-prefix/prefix-length* argument is specified, a longest match lookup is performed from the routing table and only route information for that address or network is displayed.

When the **icmp**, **nd**, **connected**, **local**, or **static** keywords are specified, only that type of route is displayed. When the *interface-id* argument are specified, only the specified interface-specific routes are displayed.

Examples

Example 1—The following is sample output from the **show ipv6 route** command when IPv6 Routing is not enabled and the command is entered without an IPv6 address or prefix specified:

show ipv6 route

Codes: > - Best

S - Static, I - ICMP Redirect, ND - Router Advertisement

[d/m]: d - route's distance, m - route's metric

IPv6 Routing Table - 6 entries

S> ::/0 [1/1]

via fe80::77 VLAN 1

ND> ::/0 [11/0]

via fe80::200:cff:fe4a:dfa8 VLAN 1 Lifetime 1784 sec

ND> 2001::/64 [0/0]

via :: VLAN 100

ND> 2002:1:1:1::/64 [0/0]

via :: VLAN 100

ND> 3001::/64 [0/0]

via :: VLAN 101

ND> 4004::/64 [0/0]

via :: VLAN 110

Example 2—The following is sample output from the **show ipv6 route** command when IPv6 Routing is supported and the command is entered without an IPv6 address or prefix specified and IPv6 Routing is enabled:

show ipv6 route

Codes: > - Best

I - ICMP Redirect, S - Static, C - Connected,

L - Local(on-link prefixes defined by the **ipv6 nd prefix** command with **on-link** keyword,

O - OSPF intra-area, OIA - OSPF inter-area,

OE1 - OSPF external 1, OE2 - OSPF external 2,

[d/m]: d - route's distance, m - route's metric

IPv6 Routing Table - 5 entries

B> 3000::/64 [20/0]

via FE80::A8BB:CCFF:FE02:8B00 VLAN 100

OE1> 4000::2/128 [0/0]

via FE80::A8BB:CCFF:FE02:8B01 VLAN 101

O> 4000::/64 [0/0]

via FE80::A8BB:CCFF:FE02:8B02 VLAN 101

C> 4001::/64 [0/0]

via :: VLAN 100

L> 4002::/64 [0/0]

via :: VLAN 100 Lifetime 9000 sec

Example 3—The following is sample output from the **show ipv6 route** command when entered with the IPv6 prefix 2001:200::/35 and IPv6 Routing is supported:

show ipv6 route 2001:200::/35

Codes: > - Best

I - ICMP Redirect, S - Static, C - Connected,

L - Local(on-link prefixes defined by the **ipv6 nd prefix** command with **on-link** keyword,

O - OSPF intra-area, OIA - OSPF inter-area,
OE1 - OSPF external 1, OE2 - OSPF external 2,
[d/m]: d - route's distance, m - route's metric

IPv6 Routing Table - 261 entries

```
OE1> 2001:200::/35 [20/3]
      via FE80::60:5C59:9E00:16 Tunnel1
```

Tunnel Commands

45.1 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 number.

Default Configuration

N/A

Command Mode

Global Configuration mode

Example

The following example enters the Interface Configuration (Tunnel) mode.

```
interface tunnel 1
    tunnel source auto
exit
```

45.2 tunnel isatap solicitation-interval

Use the **tunnel isatap solicitation-interval** Global Configuration mode command to set the time interval between unsolicited 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 unsolicited router solicitation messages sent to discovery an ISATAP router.

Example

The following example sets the time interval between ISATAP router solicitation messages to 30 seconds.

```
tunnel isatap solicitation-interval 30
```

45.3 tunnel isatap robustness

Use the **tunnel isatap robustness** Global Configuration mode command to configure the number of 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 router solicitation refresh messages that the device sends. (Range: 1–20)

Default Configuration

The default number of router solicitation refresh messages that the device sends is 3.

Command Mode

Global Configuration mode

User Guidelines

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 router solicitation refresh messages that the device sends to 5.

```
tunnel isatap robustness 5
```

45.4 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.

The empty string means that automatic lookup is not applied.

Example

The following example configures the global string ISATAP2 as the automatic tunnel router domain name.

```
interface tunnel 1
    tunnel isatap router ISATAP2
exit
```

45.5 tunnel mode ipv6ip

Use the **tunnel mode ipv6ip** command in Interface Configuration mode to configure a static IPv6 tunnel interface. To remove an IPv6 tunnel interface, use the **no** form of this command.

Syntax

tunnel mode ipv6ip {isatap}

no tunnel mode ipv6ip

Parameters

isatap— Specifies IPv6 automatic tunneling mode as ISATAP to connect IPv6 nodes (hosts and routers) within IPv4 networks.

Default Configuration

IPv6 tunnel interfaces are not configured.

Command Mode

Tunnel Interface Configuration

User Guidelines

IPv6 tunneling consists of encapsulating IPv6 packets within IPv4 packets for transmission across an IPv4 routing infrastructure.

ISATAP Tunnels

Using this command with the **isatap** keyword specifies automatic ISATAP tunnel. ISATAP tunnels enable transport of IPv6 packets within network boundaries. ISATAP tunnels allow individual IPv4/IPv6 dual-stack hosts within a site to connect to an IPv6 network using the IPv4 infrastructure.

Unlike IPv4-compatible addresses, ISATAP IPv6 addresses can use any initial Unicast /64 prefix. The final 64 bits are an interface identifier. Of these, the leading 32 bits are the fixed pattern 0000:5EFE; the last 32 bits carry the tunnel endpoint IPv4 address.

Example

Example 1 - The following example configures a ISATAP tunnel:

```
interface tunnel 1
    tunnel mode ipv6ip isatap
exit
```

45.6 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* | *interface-id*}

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

- **interface-id**—Interface which the minimum IPv4 address is used as the source address for packets sent on the tunnel interface. If the minimum IPv4 address is removed from the interface (removed at all, moved to another interface) then the next minimum IPv4 address is chosen as the local IPv4 address.

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

```
interface tunnel 1
    tunnel source auto
exit
```

45.7 show ipv6 tunnel

Use the **show ipv6 tunnel** EXEC mode command to display information on the ISATAP tunnel.

Syntax

show ipv6 tunnel [all]

Parameters

all— The switch displays all parameters of the tunnel. If the keyword is not configured only the tunnel parameters corresponding to its type are displayed.

Command Mode

EXEC mode

Example

Example 1. The following example displays information on the ISATAP tunnel, when the all keyword is not configured:

```
switchxxxxxx# show ipv6 tunnel

Tunnel 1

  Tunnel type           : ISATAP
  Tunnel status         : UP
  Tunnel Local address type : VLAN 100
  Tunnel Local Ipv4 address : 192.1.3.4
  Tunnel Remote Ipv4 address : 192.3.4.5

Tunnel 2

  Tunnel type           : ISATAP
  Tunnel status         : UP
  Tunnel Local address type : auto
  Tunnel Local Ipv4 address : 192.1.3.4
  Router DNS name        : ISATAP
  Router IPv4 addresses

    1.1.1.1             Detected
    100.1.1.1           Detected
    14.1.100.1          Not Detected
  Router Solicitation interval : 10 seconds
  Robustness             : 2
```

Example 2. The following example displays information when the all keyword is configured:

```
switchxxxxxx# show ipv6 tunnel all

Tunnel 1
```

```
Tunnel type           : ISATAP
Tunnel status         : UP
Tunnel Local address type : VLAN 100
Tunnel Local Ipv4 address : 192.1.3.4
ISATAP Parameters
  Router DNS name      : ISATAP
  Router Solicitation interval : 10 seconds
  Robustness           : 2
```

Tunnel 2

```
Tunnel type           : ISATAP
Tunnel status         : UP
Tunnel Local address type : auto
ISATAP Parameters
  Tunnel Local Ipv4 address : 192.1.3.4
  Router DNS name          : ISATAP
  Router IPv4 addresses
    1.1.1.1                Detected
    100.1.1.1              Detected
    14.1.100.1             Not Detected
  Router Solicitation interval : 10 seconds
  Robustness               : 2
```

DHCP Relay Commands

46.1 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
```

46.2 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.

```
switchxxxxx(config)# interface vlan 21
switchxxxxx(config-if)# ip dhcp relay enable
```

46.3 ip dhcp relay address (Global)

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 the server 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

User Guidelines

Use the **ip dhcp relay address** command to define a global DHCP Server IP address. To define a few DHCP Servers, use the command a few times.

To remove a DHCP Server, use the **no** form of the command with the *ip-address* argument.

The **no** form of the command without the *ip-address* argument deletes all global defined DHCP servers.

Example

The following example defines the DHCP server on the device.

```
switchxxxxxx(config)# ip dhcp relay address 176.16.1.1
```

46.4 ip dhcp relay address (Interface)

Use the **ip dhcp relay address** Interface Configuration (VLAN, Ethernet, Port-channel) command to define the DHCP servers available by the DHCP relay for DHCP clients connected to the interface. Use the **no** form of this command to remove the server 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

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

User Guidelines

Use the **ip dhcp relay address** command to define a DHCP Server IP address per the interface. To define multiple DHCP Servers, use the command multiple times.

Before using this command, set the device in router mode with the command **set system mode**.

To remove a DHCP Server, use the **no** form of the command with the *ip-address* argument.

The **no** form of the command without the *ip-address* argument deletes all DHCP servers defined per the interface.

You can use the command regardless if DHCP Relay is enabled on the interface.

Example

The following example defines the DHCP server on the device.

```
switchxxxxxx(config)# ip dhcp relay address 176.16.1.1
```

46.5 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

Examples

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
Global Servers: 1.1.1.1 , 2.2.2.2
```

Example 3. Option 82 is supported (enabled):

```
switchxxxxx# 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,p03-4
Active: gi5
Inactive: po3-4
DHCP relay is enabled on VLANs: 1, 2, 4, 5
Active: 1, 2, 4, 5
Inactive:
Global Servers: 1.1.1.1 , 2.2.2.2
```

Example 3. Option 82 is supported (enabled) and there DHCP Servers defined per interface:

```
switchxxxxx# 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,p03-4
Active: gi5
Inactive: po3-4
DHCP relay is enabled on VLANs: 1, 2, 4, 5
Active: 1, 2, 4, 5
Inactive:
Global Servers: 1.1.1.1 , 2.2.2.2
VLAN 1: 1.1.1.1, 100.10.1.1
```

VLAN 2: 3.3.3.3, 4.4.4.4, 5.5.5.5

VLAN 10: 6.6.6.6

46.6 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

```
switchxxxxx(config)# ip dhcp information option
```

46.7 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.

```
switchxxxxx# show ip dhcp information option
```

```
Relay agent Information option is Enabled
```

IP Routing Protocol-Independent Commands

47.1 ip route

Use the **ip route** command in Global Configuration mode to establish static routes. Use the **no** form of this command to remove static routes.

Syntax

```
ip route prefix {mask | /prefix-length} [{ip-address [metric cost]} | reject-route]  
no ip route prefix {mask | prefix-length} [ip-address]
```

Parameters

- **prefix**—IP route prefix for the destination.
- **mask**—Prefix mask for the destination.
- **/prefix-length**—Prefix mask for the destination. 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**—IP address of the next hop that can be used to reach that network.
- **reject-route**—Stops routing to the destination network via all gateways.
- **metric cost**—Cost (metric) of the route. The default cost is 1. Range: 1–255.

Default Configuration

No static routes are established. The default metric cost is 1.

Command Mode

Global configuration (config)

User Guidelines

Use the **no ip route** command without the *ip-address* parameter to remove all static routes to the given subnet.

Use the **no ip route** command with the *ip-address* parameter to remove only one static route to the given subnet via the given next hop.

Example

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:

```
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 :

```
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:

```
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:

```
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:

```
no ip route 194.1.1.0 /24 1.1.1.1
```

47.2 show ip route

Use the **show ip route** command in user EXEC or privileged EXEC mode to display the current state of the routing table.

Syntax

show ip route [address *IP_address* {*mask* [longer-prefixes]}] [static | rejected | connected | summary]

Parameters

- **address** *IP_address*—IP address about which routing information should be displayed.
- **mask**—The subnet mask.
- **longer-prefixes**—Specifies that only routes matching the IP address and mask pair should be displayed.
- **static**—Displays static routes only.
- **connected**—Displays connected routes only.
- **rejected**—Displays rejected routes only.
- **summary**—Displays current contents of the IP routing table in summary format.

Example

Example 1 - The following is sample output from this command when IP Routing is not enabled:

```
Router# show ip route
Maximum Parallel Paths: 1 (1 after reset)
IP Forwarding: disabled
```

Example 2 - The following is sample output from this command when IP Routing is enabled:

```
SG300-10SFP-L3#show ip route
Maximum Parallel Paths: 1 (1 after reset)
IP Forwarding: enabled
Codes: > - best, C - connected, S - static
S   0.0.0.0/0 [1/1] via 10.5.234.254, 25:7:2, vlan 1
C   10.5.234.0/24 is directly connected, vlan 1
```

ACL Commands

48.1 ip access-list (IP extended)

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 [service-acl input](#) 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-acl)#
```

48.2 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*] [**time-range** *time-range-name*]

permit *icmp* {**any** | *source source-wildcard*} {**any** | *destination destination-wildcard*} [**any** | *icmp-type*] [**any** | *icmp-code*] [**dscp** *number* | **precedence** *number*] [**time-range** *time-range-name*]

permit *igmp* {**any** | *source source-wildcard*} {**any** | *destination destination-wildcard*} [*igmp-type*] [**dscp** *number* | **precedence** *number*] **time-range** *time-range-name*]

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*] [**time-range** *time-range-name*]

permit *udp* {**any** | *source source-wildcard*} {**any** | *source-port/port-range*} {**any** | *destination destination-wildcard*} {**any** | *destination-port/port-range*} [**dscp** *number* | **precedence** *number*] [**time-range** *time-range-name*]

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 (111), 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.
- **time-range-name**—Name of the time range that applies to this permit statement. (Range: 1–32)

Default Configuration

No IPv4 access list is defined.

Command Mode

IP Access-list Configuration mode

User Guidelines

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
```

48.3 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*] [**time-range** *time-range-name*]

deny *icmp* {**any** / *source source-wildcard*} {**any** / *destination destination-wildcard*} [**any** / *icmp-type*] [**any** / *icmp-code*] [**dscp** *number* / **precedence** *number*] <*all but Cisco*> [**time-range** *time-range-name*]

deny *igmp* {**any** / *source source-wildcard*} {**any** / *destination destination-wildcard*} [*igmp-type*] [**dscp** *number* / **precedence** *number*] <*all but Cisco*> **time-range** *time-range-name*

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*] <*all but Cisco*> [**time-range** *time-range-name*]

deny udp *{any / source source-wildcard} {any / source-port / port-range} {any / destination destination-wildcard} {any / destination-port / port-range} [dscp number / precedence number] [time-range time-range-name]*

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.
- **time-range-name**—Name of the time range that applies to this permit statement. (Range: 1–32)
- **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

The number of TCP/UDP ranges that can be defined in ACLs is limited. 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-acl)# deny ip 176.212.0.0 00.255.255
```

48.4 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 **service-acl input** 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
```

48.5 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] [time-range time-range-name]}*

permit icmp *{any | {source-prefix/length}{any | destination-prefix/length} {any|icmp-type} {any|icmp-code} [dscp number | precedence number] <all but Cisco> [time-range time-range-name]}*

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] <all but Cisco> [time-range time-range-name]}*

permit udp *{any | {source-prefix/length} {any | source-port/port-range}}{any | destination-prefix/length} {any | destination-port/port-range} [dscp number | precedence number] <all but Cisco> [time-range time-range-name]}*

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.
- **time-range-name**—Name of the time range that applies to this permit statement. (Range: 1–32)

Default Configuration

No IPv6 access list is defined.

Command Mode

Ipv6 Access-list Configuration mode

User Guidelines

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.

The number of TCP/UDP ranges that can be defined in ACLs is limited. 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
```

48.6 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][time-range time-range-name] [disable-port | log-input]}*

deny icmp *{any | {source-prefix/length}{any | destination- prefix/length} {any|icmp-type} {any|icmp-code} [dscp number | precedence number][time-range time-range-name] [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][time-range time-range-name] [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]<[time-range time-range-name] [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.
- **time-range-name**—Name of the time range that applies to this permit statement. (Range: 1–32)
- **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. 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
```

48.7 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 **service-acl input** 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
```

48.8 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]*

[time-range time-range-name]

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.
- **time-range-name**—Name of the time range that applies to this permit statement. (Range: 1–32)

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** 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
```

48.9 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] [time-range time-range-name]  
[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.
- **time-range-name**—Name of the time range that applies to this permit statement.(Range: 1–32)
- **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
```

48.10 service-acl input

Use the **service-acl input** command in interface Configuration mode to bind an access list(s) (ACL) to an interface.

Use the **no** form of this command to remove all ACLs from the interface.

Syntax

service-acl input *acl-name1* [*acl-name2*] **default-action** {*deny-any*|*permit-any*}

no service-acl input

Parameters

- **acl-name**—Specifies an ACL to apply to the interface. See the user guidelines. (Range: 1–32 characters).
- **permit-any**—If the packet does not match the ACL criteria, it is forwarded by default.
- **deny-any**—If the packet does not match the ACL criteria, it is dropped by default.

Default Configuration

No ACL is assigned.

Command Mode

Interface Configuration (Ethernet, Port-Channel) mode.

User Guidelines

The following rules govern when ACLs can be bound or unbound from an interface:

- IPv4 ACLs and IPv6 ACLs can be bound together to an interface.
- A MAC ACL cannot be bound on an interface which already has an IPv4 ACL or IPv6 ACL bound to it.
- Two ACLs of the same type cannot be bound to a port.
- An ACL cannot be bound to a port that is already bound to an ACL, without first removing the current ACL. Both ACLs must be mentioned at the same time in this command.

Example

```
switchxxxxxx(config)# mac access-list extended server-acl
switchxxxxxx(config-mac-acl)# permit 00:00:00:00:00:01 00:00:00:00:00:ff any
switchxxxxxx(config-mac-acl)# exit
switchxxxxxx(config)# interface gi1
switchxxxxxx(config-if)# service-acl input server-acl default-action deny-any
```

48.11 time-range

Use the **time-range** Global Configuration mode command to define time ranges for functions or ACLs. In addition, this command enters the Time-range Configuration mode. All commands after this one refer to the time-range being defined.

This command sets a time-range name. Use the [absolute](#) and [periodic](#) commands to actually configure the time-range.

Use the **no** form of this command to remove the time range from the device.

Syntax

time-range *time-range-name*

no time-range *time-range-name*

Parameters

time-range-name—Specifies the name for the time range. (Range: 1–32 characters)

Default Configuration

No time range is defined

Command Mode

Global Configuration mode

User Guidelines

After adding the name of a time range with this command, use the [absolute](#) and [periodic](#) commands to actually configure the time-range. Multiple periodic commands are allowed in a time range. Only one absolute command is allowed.

If a time-range command has both absolute and periodic values specified, then the periodic items are evaluated only after the absolute start time is reached, and are not evaluated again after the absolute end time is reached.

All time specifications are interpreted as local time.

To ensure that the time range entries take effect at the desired times, the software clock should be set by the user or by SNTP. If the software clock is not set by the user or by SNTP, the time range ACEs are not activated.

The user cannot delete a time-range that is bound to any features, such as ACLs.

When a time range is defined, it can be used in the following commands:

- dot1x port-control
- power inline
- permit (IP)
- deny (IP)
- permit (IPv6)
- deny (IPv6)
- permit (MAC)
- deny (MAC)

Example

```
switchxxxxxx(config)# time-range http-allowed  
switchxxxxxx(config-time-range)# absolute start 12:00 1 jan 2005  
switchxxxxxx(config-time-range)# absolute end 12:00 31 dec 2005
```

48.12 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 http-allowed  
switchxxxxxx(config-time-range)# absolute start 12:00 1 jan 2005  
switchxxxxxx(config-time-range)# absolute end 12:00 31 dec 2005
```

48.13 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 http-allowed
switchxxxxxx(config-time-range)# periodic Monday 12:00 to Wednesday 12:00
```

48.14 show time-range

Use the **show time-range** EXEC command to display the time range configuration.

Syntax

show time-range *time-range-name*

Parameters

time-range-name—Specifies the name of an existing time range.

Command Mode

EXEC mode

Example

```
switchxxxxxx# show time-range
http-allowed
```

```
-----  
absolute start 12:00 1 jan 2005  
absolute end 12:00 31 dec 2005  
periodic monday 8:00 to friday 20:00
```

48.15 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 *time-range-active* [*name*]

Parameters

- **name**—Specifies the name of the ACL.
- **time-range-active**—Shows only the Access Control Entries (ACEs) whose time-range is currently active (including those that are not associated with time-range).

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 time-range weekdays
permit 234 172.30.23.8 0.0.0.255 any time-range weekdays
```

```
switchxxxxxx#show access-lists time-range-active

Extended IP access list ACL1
permit 234 172.30.40.1 0.0.0.0 any
permit 234 172.30.8.8 0.0.0.0 any

Extended IP access list ACL2
permit 234 172.30.19.1 0.0.0.255 any time-range weekdays
```

```
switchxxxxxx#show access-lists ACL1

Standard IP access list ACL1
permit 0.0.0.0
permit 192.168.0.2, wildcard bits 0.0.0.255

Extended IP access list ACL1
permit 234 172.30.40.1 0.0.0.0 any
permit 234 172.30.8.8 0.0.0.0 any
```

48.16 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

switchxxxxx# # show interfaces access-lists

Interface	Ingress ACL	Egress ACL
-----	-----	-----
gi1	ACL1	ACL2
gi2	ACL3	
gi3	blockcdp, blockvtp	

Quality of Service (QoS) Commands

49.1 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
```

49.2 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
```

49.3 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
```

49.4 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

- **class-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
```

49.5 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.

```
switchxxxxx# show class-map class1
Class Map match-any class1 (id4)
Match IP dscp 11 21
```

49.6 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
```

49.7 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 create 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)#
```

49.8 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
```

49.9 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
```

49.10 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
```

49.11 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
```

49.12 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
```

49.13 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* default-action [*permit-any*| *deny-any*]

no service-policy input

Parameters

- **policy-map-name**—Specifies the policy map name to apply to the input interface. (Length: 1–32 characters)

- **deny-any**—Deny all the packets (which were ingress of the port) that do not meet the rules in a policy.
- **permit-any**—Forward all the packets (which were ingress of the port) that do not meet the rules in a policy.

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.

```
switchxxxxx(config-if)# service-policy input policy1 permit-any
```

49.14 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
```

49.15 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
```

49.16 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
```

49.17 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
```

49.18 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 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
```

49.19 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.

```
switchxxxxx(config)# priority-queue out num-of-queues 2
```

49.20 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
```

49.21 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
```

49.22 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 (3000–19 173 960). 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
```

49.23 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. It does not work in conjunction with IP Source Guard.

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
```

49.24 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(config)#>qos wrr-queue wrtd
```

This setting will take effect only after copying running configuration to startup configuration and resetting the device

```
switchxxxxxx(config)#
```

49.25 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

```
switchxxxxx# show qos wrr-queue wrtd
Weighted Random Tail Drop is disabled
Weighted Random Tail Drop will be enabled after reset
```

49.26 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

```
witchxxxxxx# show qos interface queueing gi1
Ethernet gi1

wrr bandwidth weights and EF priority:

qid-weights      Ef - Priority
1 - N/A          ena- 1
2 - N/A          ena- 2
3 - N/A          ena- 3
4 - N/A          ena- 4

Cos-queue map:

cos-qid
0 - 1
1 - 1
2 - 2
3 - 3
4 - 3
```

5 - 4

6 - 4

7 - 4

Example 2 - This is an example of the output from the **show qos interface shapers** command

Ethernet gi1

Port shaper: disable

Committed rate: N/A

Committed burst: N/A

qid	Status	Target	Target
		Committed Rate [Kbps]	Committed Burst [bytes]
1	disable	N/A	N/A
2	disable	N/A	N/A
3	disable	N/A	N/A
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
Committed rate: 192000 bps
Committed burst: 9600 bytes
Exceed-action: policed-dscp-transmit
Class map: B
Policer type: single
Committed rate: 192000 bps
Committed burst: 9600 bytes
Exceed-action: drop
Class map: C
Policer type: none
Committed rate: N/A
Committed 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 [Bytes]
-----
gi1           1000                  512K
```

49.27 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 is 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
```

49.28 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
```

49.29 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
```

49.30 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	0-15	16-23	24-39, 48-63	40-47
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
```

49.31 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
```

49.32 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
```

49.33 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 gi 15 to the default trust state.

```
switchxxxxxx(config)# interface gi5  
switchxxxxxx(config-if)# qos trust
```

49.34 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
```

49.35 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
```

49.36 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
```

49.37 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

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 02 02 02 02
2 :   02 02 02 02 03 03 03 03 03 03
3 :   03 03 03 03 03 03 03 03 03 03
4 :   04 04 04 04 04 04 04 04 03 03
5 :   03 03 03 03 03 03 03 03 03 03
6 :   03 03 03 03

```

49.38 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
```

49.39 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
```

49.40 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
```

49.41 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
```

49.42 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 Map	In-profile bytes	Out-of-profile 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%

Denial of Service (DoS) Commands

50.1 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
```



```
switchxxxxx(config-if)#
```

50.2 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
```

50.3 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 SYN 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.

50.4 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.

Address block	Present Use
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
```

50.5 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.

50.6 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.

50.7 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.

50.8 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

50.9 security-suite deny syn-fin

Use the **security-suite deny syn-fin** Global Configuration mode command to drop all ingressing TCP packets in which both SYN and FIN flags are set.

Use the **no** form of this command to permit TCP packets in which both SYN and FIN are set.

Syntax

security-suite deny syn-fin

no security-suite deny syn-fin

Parameters

N/A

Default Configuration

Drop all ingressing TCP packets in which both SYN and FIN are set.

Command Mode

Global Configuration mode

Example

The following example blocks TCP packets in which both SYN and FIN flags are set.

```
switchxxxxxx(config)# security-suite deny syn-fin
```

50.10 security-suite syn protection mode

Use the **security-suite syn protection mode** Global Configuration mode command to set the TCP SYN protection mode.

Use the **no** form of this command to set the TCP SYN protection mode to default.

Syntax

security-suite syn protection mode {*disabled*| *report*| *block*}

no security-suite syn protection mode

Parameters

- **disabled**—The feature is disabled.
- **report**—The feature reports about TCP SYN traffic per port (including rate-limited SYSLOG messages when an attack is identified).
- **block** – the TCP SYN traffic from attacking ports destined to the local system is blocked, and a rate-limited SYSLOG message (one per minute) is generated.

Default Configuration

The default mode is **block**.

Command Mode

Global Configuration mode

User Guidelines

On ports in which an ACL is defined, this feature cannot block TCP SYN packets. If the protection mode is **block**, but SYN traffic cannot be blocked, a relevant SYSLOG message is created, e.g.: “port gi1 is under TCP SYN attack. TCP SYN traffic cannot be blocked on this port since the port is bound to an ACL.”

Examples

Example 1—The following example sets the TCP SYN protection feature to report TCP SYN attack on ports in case an attack is identified from these ports.

```
switchxxxxxx(config)# security-suite syn protection mode report
```

```
...
```

01-Jan-2012 05:29:46: A TCP SYN Attack was identified on port gi1

Example 2—The following example sets the TCP SYN protection feature to block TCP SYN attack on ports if an attack is identified from these ports.

```
switchxxxxxx(config)# security-suite syn protection mode block
```

...

01-Jan-2012 05:29:46: A TCP SYN Attack was identified on port gi1. TCP SYN traffic destined to the local system is automatically blocked for 100 seconds.

50.11 security-suite syn protection threshold

Use the **security-suite syn protection threshold** Global Configuration mode command to set the threshold for the SYN protection feature.

Use the **no** form of this command to set the threshold to its default value.

Syntax

security-suite syn protection threshold *syn-packet-rate*

no security-suite syn protection threshold

Parameters

syn-packet-rate—Defines the rate from a specific port that triggers identification of a TCP SYN attack. (Range: 20-200 Packets Per Second (pps))

Default Configuration

The default threshold is 80 pps (packets per second).

Command Mode

Global Configuration mode

Example

The following example sets the TCP SYN protection threshold to 40 pps.

```
switchxxxxxx(config)# security-suite syn protection threshold 40
```

50.12 security-suite syn protection recovery

Use the **security-suite syn protection recovery** Global Configuration mode command to set the time period for the SYN Protection feature to block an attacked interface.

Use the **no** form of this command to reset the time period to its default value.

Syntax

security-suite syn protection recovery *timeout*

no security-suite syn protection recovery

Parameters

timeout—Defines the timeout (in seconds) by which an interface from which SYN packets are blocked gets unblocked. Note that if a SYN attack is still active on this interface it might become blocked again. (Range: 10-600 secs)

Default Configuration

The default timeout is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

If the timeout is modified, the new value is only used on interfaces that are not currently under attack.

Example

The following example sets the TCP SYN period to 100 seconds.

```
switchxxxxxx(config)# security-suite syn protection recovery 100
```

50.13 show security-suite syn protection

Use the **show security-suite syn protection** EXEC mode command to display the security-suite configuration.

Syntax

show security-suite syn protection *interface-id*

Parameters

interface-id—Specifies an interface-ID. The interface-ID can be one of the following types: Ethernet port or Port-Channel. If this parameter is not provided, information is displayed for all interfaces.

Command Mode

EXEC mode

Example

The following example displays the TCP SYN protection feature configuration and current status on all interfaces. In this example, port 152 is attacked but since there is a user-ACL on this port, it cannot become blocked so its status is **Reported** and not **Blocked and Reported**.

```
switchxxxxx# show security-suite syn protection
```

```
Protection Mode: Block
```

```
Threshold: 40 Packets Per Second
```

```
Period: 100 Seconds
```

Interface Name	Current Status	Last Attack
-----	-----	-----
151	Attacked	19:58:22.289 PDT Feb 19 2012 Blocked and Reported
152	Attacked	19:58:22.289 PDT Feb 19 2012 Reported
153	Attacked	19:58:22.289 PDT Feb 19 2012 Blocked and Reported

Router Resources Commands

51.1 system router resources

Use the **system router resources** command in Global Configuration mode to configure the system router resources.

Use the **no** form of this command to return to the default.

Syntax

system router resources [**ip-entries** *max-number*]

no system router resources

Parameters

- **ip-entries**—The maximum number of IPv4 **entries**.

Default Configuration

Product specific

Command Mode

Global configuration

User Guidelines

Use the **system router resources** command to enter new settings for routing entries. After entering the command, the current routing entries configuration will be displayed, and the user will be required to confirm saving the new setting to the startup-configuration and to reboot the system.

Data Validation:

If the new settings exceed the maximum number of routing entries, the command is rejected and a message is displayed to the user.

If the new settings are lower than the currently in-use routing entries, a confirmation message is displayed to the user (before the save confirmation message).

Use the **no system router resources** command to the default settings.

The following table displays the conversion between logical entities to HW entries:

Examples

Example 1

The following example defines the supported number of IPv4 and IPv6 routing entries. In the example, the configured router entries are less than the router entries which are currently in use. Using this configurations means that the system will not have enough resources for the running again in the existing network:

```
switchxxxxxx#system router resources ip-routes 128 ipv6-routes 32
```

The maximal number of IPv4 and IPv6 Routing Entries plus non-IP Entries is 2048.

	In-Use	Reserved (Current)	Reserved (New)
	-----	-----	-----
IPv4 Entries	232	1024	128
Number of Routes	20		
Number of Neighbors	12		
Number of Interfaces	100		

Non-IP Entries:

93% 400

The new configuration of route entries is less than the route entries which are currently in use by the system, do you want to continue (note that setting the new configuration of route entries requires saving the running-configuration file to startup-configuration file and rebooting the system)? (Y/N) [N] Y

Example 2

The following example defines the supported number of IPv4 routing entries.

```
switchxxxxxx#system router resources ip-routes 256
```

The maximal number of IPv4 and IPv6 Routing Entries plus Non-IP Entries is 2048.

In-Use	Reserved (Current)	Reserved (New)
-----	-----	-----

IPv4 Entries	232	1024	256
Number of Routes	20		
Number of Neighbors	12		
Number of Interfaces	100		
IPv6 Entries	233	1024	32
Number of Routes	20		
Number of Neighbors	12		
Number of Interfaces	100		
Number of On-Link Prefixes	1		

Non-IP Entries:

93% 400

Setting the new configuration of route entries requires saving the running-configuration file to startup-configuration file and rebooting the system, do you want to continue? (Y/N) [N] Y

51.2 show system router resources

Use the **show system router resources** command in EXEC mode to display the router resources.

Syntax

show system router resources

Parameters

This command has no arguments or keywords.

Command Mode

EXEC mode

Examples

Example 1—In the following example, the configured router entries are displayed:

```
switchxxxxxx#show system router resources
```

The maximal number of IPv4 and IPv6 Routing Entries plus Non-IP Entries is 2048.

	In-Use	Reserved
	-----	-----
IPv4 Entries	232	1024
Number of Routes	20	
Number of Neighbors	12	
Number of Interfaces	100	
IPv6 Entries	233	1024
Number of Routes	20	
Number of Neighbors	12	
Number of Interfaces	100	
Non-IP Entries:		
93%	400	

DHCPv6 Commands

52.1 **ipv6 dhcp client stateless**

Use the **ipv6 dhcp client stateless** command in Interface Configuration mode to enable DHCP for an IPv6 client process and to enable a request for stateless configuration through the interface on which the command is run.

Use the **no** form of this command to disable requests for stateless configuration.

Syntax

ipv6 dhcp client stateless

no ipv6 dhcp client stateless

Parameters

This command has no arguments or keywords.

Default Configuration

Information request is disabled on an interface.

Command Mode

Interface configuration

User Guidelines

Enabling this command starts the DHCPv6 client process if this process is not yet running and IPv6 interface is enabled on the interface.

This command enables the DHCPv6 Stateless service on the interface. The service allows to receive the some configuration from a DHCP server passed in the following options:

- **Option 23:** OPTION_DNS_SERVERS - List of DNS Servers IPv6 Addresses
- **Option 24:** OPTION_DOMAIN_LIST - Domain Search List
- **Option 31:** OPTION_SNTP_SERVERS - List of SNTP Servers IPv6 Addresses

- **Option 32:** OPTION_INFORMATION_REFRESH_TIME - Information Refresh Time Option
- **Option 41:** OPTION_NEW_POSIX_TIMEZONE - New Timezone Posix String
- **Option 59:** OPT_BOOTFILE_URL - Configuration Server URL
- **Option 60:** OPT_BOOTFILE_PARAM, the first parameter - Configuration File Path Name

The DHCPv6 client, server, and relay functions are mutually exclusive on an interface.

Example

The following example enables the Stateless service:

```
interface vlan 100
    ipv6 dhcp client stateless
exit
```

52.2 clear ipv6 dhcp client

Use the **clear ipv6 dhcp client** command in Privileged EXEC mode to restart DHCP for an IPv6 client on an interface.

Syntax

clear ipv6 dhcp client *interface-id*

Parameters

interface-id—Interface identifier.

Default Configuration

N/A

Command Mode

Privileged EXEC

User Guidelines

This command restarts DHCP for an IPv6 client on a specified interface after first releasing and un-configuring previously-acquired prefixes and other configuration options (for example, DNS servers).

Example

The following example restarts the DHCP for IPv6 client on VLAN 100:

```
clear ipv6 dhcp client vlan 100
```

52.3 ipv6 dhcp client information refresh

Use the **ipv6 dhcp client information refresh** command in Interface Configuration mode to configure the refresh time for IPv6 client information on a specified interface if the DHCPv6 Server reply does not include the Information Refresh Time option.

Use the **no** form of this command to return to the default value of the refresh time.

Syntax

ipv6 dhcp client information refresh *seconds* /infinite

no ipv6 dhcp client information refresh

Parameters

- **seconds**—The refresh time, in seconds. The value cannot be less than the minimal acceptable refresh time configured by the **ipv6 dhcp client information refresh minimum** command. The maximum value that can be used is 4,294,967,294 seconds (0xFFFFFFFF).
- **infinite**—Infinite refresh time.

Default Configuration

The default is 86,400 seconds (24 hours).

Command Mode

Interface configuration (config-if).

User Guidelines

This command specifies the information refresh time. If the server does not send an information refresh time option, the value configured by the command is used.

Use the **infinite** keyword to delete refresh, if the DHCP server does not send an information refresh time option.

Example

The following example configures an upper limit of 2 days:

```
interface vlan 100
    ipv6 dhcp client stateless
    ipv6 dhcp client information refresh 172800
exit
```

52.4 ipv6 dhcp client information refresh minimum

Use the **ipv6 dhcp client information refresh minimum** command in Interface Configuration mode to configure the minimum acceptable refresh time on the specified interface.

Use the **no** form of this command to remove the configured refresh time.

Syntax

ipv6 dhcp client information refresh minimum *seconds* /infinite

no ipv6 dhcp client information refresh minimum

Parameters

- **seconds**—The refresh time, in seconds. The minimum value that can be used is 600 seconds. The maximum value that can be used is 4,294,967,294 seconds (0xFFFFFFFF).
- **infinite**—Infinite refresh time.

Default Configuration

The default is 86,400 seconds (24 hours).

Command Mode

Interface configuration (config-if).

User Guidelines

This command specifies the minimum acceptable information refresh time. If the server sends an information refresh time option of less than the configured minimum refresh time, the configured minimum refresh time will be used instead.

This command may be configured in several situations:

- In unstable environments where unexpected changes are likely to occur.
- For planned changes, including renumbering. An administrator can gradually decrease the time as the planned event nears.
- Limit the amount of time before new services or servers are available to the client, such as the addition of a new Simple Network Time Protocol (SNTP) server or a change of address of a Domain Name System (DNS) server.

If you configure the **infinite** keyword, the client never refreshes the information.

Example

The following example configures an upper limit of 2 days:

```
interface vlan 100
  ipv6 dhcp client stateless
  ipv6 dhcp client information refresh minimum 172800
exit
```

52.5 ipv6 dhcp duid-en

Use the **ipv6 dhcp duid-en** command in Global Configuration mode to set the Vendor Based on Enterprise Number DHCPv6 Unique Identified (DUID-EN) format.

Use the **no** form of this command to return to the default value.

Syntax

ipv6 dhcp duid-en *enterprise-number identifier*

no ipv6 dhcp duid-en

Parameters

- **enterprise-number**—The vendor's registered Private Enterprise number as maintained by IANA.
- **identifier**—The vendor-defined hex string (up to 64 hex characters). If the number of the character is not even, an '0' is added at the right. Each 2 hex characters can be separated by a period or colon.

Default Configuration

DUID Based on Link-layer Address (DUID-LL) is used. The base MAC Address is used as a Link-layer Address.

Command Mode

Global Configuration.

User Guidelines

By default, the DHCPv6 uses the DUID Based on Link-layer Address (see RFC3315) with the Base MAC Address as a Link-layer Address.

Use this command to change the UDID format to the Vendor Based on Enterprise Number.

Examples

Example 1—The following sets the DIID-EN format:

```
ipv6 dhcp udid-en 9 0CC084D303000912
```

Example 2—The following sets the DIID-EN format using colons as delimiter:

```
ipv6 dhcp udid-en 9 0C:C0:84:D3:03:00:09:12
```

52.6 ipv6 dhcp relay destination (Global)

Use the **ipv6 dhcp relay destination** command in global configuration mode to specify a globally-defined relay destination address to which client messages are forwarded.

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

Syntax

ipv6 dhcp relay destination {*ipv6-address* [*interface-id*]} | *interface-id*

no ipv6 dhcp relay destination [*ipv6-address* [*interface-id*]] | *interface-id*

Parameters

- **ipv6-address**—Relay destination address. There are the following types of relay destination address:
 - Link-local unicast. A user must specify an output interface for this kind of address.
 - Global unicast IPv6 address. An output interface cannot be specified for this kind of address.

This argument must be in the form documented in RFC 4291 where the address is specified in hexadecimal using 16-bit values between colons.

If the argument is not configured then the well known link-local multicast address All_DHCP_Relay_Agents_and_Servers (FF02::1:2) is defined.

- **interface-id**—Interface identifier that specifies the output interface for a destination. If this argument is configured, client messages are forwarded to the destination address through the link to which the output interface is connected. If this argument is omitted then the Routing table is used.

Default Configuration

There is no globally defined relay destination.

Command Mode

Global configuration mode

User Guidelines

The **ipv6 dhcp relay destination** command specifies a destination address to which client messages are forwarded. The address is used by all DHCPv6 relay running in the switch.

When relay service is running on an interface, a DHCP for IPv6 message received on that interface will be forwarded to all configured relay destinations configured per the interface and globally.

Multiple destinations can be configured on one interface, and multiple output interfaces can be configured for one destination. When the relay agent relays

messages to a multicast address, it sets the hop limit field in the IPv6 packet header to 32.

Unspecified, loopback, and node-local multicast addresses are not acceptable as the relay destination.

Use the **no** form of the command with the *ipv6-address* and *interface-id* arguments to remove only the given globally defined address with the given output interface.

Use the **no** form of the command with the *ipv6-address* argument to remove only the given globally defined address for all output interfaces.

The **no** form of the command without the arguments removes all the globally defined addresses.

Examples

Example 1—The following example sets the relay unicast link-local destination address per VLAN 200:

```
ipv6 dhcp relay destination FE80::1:2 vlan 200
```

Example 2—The following example sets the relay well known multicast link-local destination address per VLAN 200:

```
ipv6 dhcp relay destination vlan 200
```

Example 3—The following example sets the unicast global relay destination address:

```
ipv6 dhcp relay destination 3002::1:2
```

52.7 ipv6 dhcp relay destination (Interface)

Use the **ipv6 dhcp relay destination** command in Interface configuration mode to specify a destination address to which client messages are forwarded and to enable DHCP for IPv6 relay service on the interface.

Use the **no** form of this command to remove a relay destination on the interface or to delete an output interface for a destination.

Syntax

ipv6 dhcp relay destination [*ipv6-address* [*interface-id*]] | *interface-id*

no ipv6 dhcp relay destination [*ipv6-address* [*interface-id*]] | *interface-id*

Parameters

- **ipv6-address**—Relay destination address. The following types of relay destination addresses exist:
 - Link-local unicast. A user must specify an output interface for this kind of address.
 - Global unicast IPv6 address. An output interface cannot be specified for this kind of address.

This argument must be in the form documented in RFC 4291 where the address is specified in hexadecimal using 16-bit values between colons.

If the argument is not configured then the well-known link-local Multicast address All_DHCP_Relay_Agents_and_Servers (FF02::1:2) is defined.

- **interface-id**—Specifies the output interface for a destination. If this argument is configured, client messages are forwarded to the destination address through the link to which the output interface is connected.

Default Configuration

The relay function is disabled, and there is no relay destination on an interface.

Command Mode

Interface configuration (config-if)

User Guidelines

This command specifies a destination address to which client messages are forwarded, and it enables DHCP for IPv6 relay service on the interface.

DHCPv6 Relay inserts the Interface-id option if an IPv6 global address is not defined on the interface on which the relay is running. The Interface-id field of the option is the interface name (a value of the **ifName** field of the **ifTable**) on which the relay is running.

When relay service is running on an interface, a DHCP for IPv6 message received on that interface will be forwarded to all configured relay destinations configured per the interface and globally.

The incoming DHCP for IPv6 message may have come from a client on that interface, or it may have been relayed by another relay agent.

The relay destination can be a Unicast address of a server or another relay agent, or it may be a Multicast address. There are two types of relay destination addresses:

- A link-local Unicast or Multicast IPv6 address, for which a user must specify an output interface.
- A global Unicast IPv6 address. A user can optionally specify an output interface for this kind of address.

If no output interface is configured for a destination, the output interface is determined by routing tables. In this case, it is recommended that a Unicast or Multicast routing protocol be running on the router.

Multiple destinations can be configured on one interface, and multiple output interfaces can be configured for one destination. When the relay agent relays messages to a Multicast address, it sets the hop limit field in the IPv6 packet header to 32.

Unspecified, loopback, and node-local Multicast addresses are not acceptable as the relay destination.

Note that it is not necessary to enable the relay function on an interface for it to accept and forward an incoming relay reply message from servers. By default, the relay function is disabled, and there is no relay destination on an interface.

Use the **no** form of the command with arguments to remove a specific address.

Use the **no** form of the command without arguments to remove all the defined addresses and to disable the relay on the interface.

Examples

Example 1—The following example sets the relay Unicast link-local destination address per VLAN 200 and enables the DHCPv6 Relay on VLAN 100 if it was not enabled:

```
interface vlan 100
    ipv6 dhcp relay destination FE80::1:2 vlan 200
exit
```

Example 2—The following example sets the relay well known Multicast link-local destination address per VLAN 200 and enables the DHCPv6 Relay on VLAN 100 if it was not enabled:

```
interface vlan 100
    ipv6 dhcp relay destination vlan 200
exit
```

Example 3—The following example sets the Unicast global relay destination address and enables the DHCPv6 Relay on VLAN 100 if it was not enabled:

```
interface vlan 100
    ipv6 dhcp relay destination 3002::1:2
exit
```

Example 4. The following example enables the DHCPv6 relay on VLAN 100:

```
interface vlan 100
    ipv6 dhcp relay destination
exit
```

Example 5. The following example disables the DHCPv6 relay on VLAN 100:

```
interface vlan 100
    no ipv6 dhcp relay destination
exit
```

52.8 show ipv6 dhcp

Use the **show ipv6 dhcp** command in User EXEC or Privileged EXEC mode to display the Dynamic DHCP Unique Identifier (DUID) on a specified device. This information is relevant for DHCPv6 client and DHCPv6 relay.

Syntax**show ipv6 dhcp****Parameters**

NA

Command Mode

User EXEC

Privileged EXEC

User Guidelines

This command uses the DUID, based on the link-layer address for both client and server identifiers. The device uses the MAC address from the lowest-numbered interface to form the DUID. The network interface is assumed to be permanently attached to the device.

Examples

Example 1—The following is sample output from this command when the switch's UDID format is Vendor Based on Enterprise Number:

show ipv6 dhcp

The switch's DHCPv6 unique identifier(DUID)is 0002000000090CC084D303000912

Format: 2

Enterprise Number: 9

Identifier: 0CC084D303000912

Example 2—The following is sample output from this command when the switch's UDID format is the vendor-based on a link-layer address:

show ipv6 dhcp

The switch's DHCPv6 unique identifier(DUID)is 000300010024012607AA

Format: 3

Hardware type: 1

MAC Address: 0024.0126.07AA

52.9 show ipv6 dhcp interface

Use the **show ipv6 dhcp interface** command in User EXEC or Privileged EXEC mode to display DHCP for IPv6 interface information.

Syntax

show ipv6 dhcp interface [*interface-id*]

Parameters

interface-id—Interface identifier.

Command Mode

User EXEC

Privileged EXEC

User Guidelines

If no interfaces are specified in the command, all interfaces on which DHCP for IPv6 (client or server) is enabled are displayed. If an interface is specified in the command, only information about the specified interface is displayed.

Examples

Example 1—The following is sample output from this command when only the Stateless service is enabled:

```
show ipv6 dhcp interface
  gi is in client mode
  DHCP Operational mode is enabled
  Stateless Service is enabled
  Reconfigure service is enabled
  Information Refresh Minimum Time: 600 seconds
  Information Refresh Time: 86400 seconds
  Received Information Refresh Time: 3600 seconds
  Remain Information Refresh Time: 411 seconds
  DHCP server:
    Address FE80::202:FCFF:FEA1:7439, DUID 000300010002FCA17400
```

```
Preference: 20
DNS Servers: 1001::1, 2001::10
DNS Domain Search List: company.com beta.org
SNTP Servers: 2004::1
POSIX Timezone string: EST5EDT4,M3.2.0/02:00,M11.1.0/02:00
Configuration Server: config.company.com
Configuration Path Name: qqg/config/aaa_config.dat
gi2 is in client mode
DHCP Operational mode is disabled (IPv6 is not enabled)
Stateless Service is enabled
Reconfigure service is enabled
Information Refresh Minimum Time: 600 seconds
Information Refresh Time: 86400 seconds
Remain Information Refresh Time: 0 seconds
gi3 is in client mode
DHCP Operational mode is disabled (Interface status is DOWN)
Stateless Service is enabled
Reconfigure service is enabled
Information Refresh Minimum Time: 600 seconds
Information Refresh Time: 86400 seconds
Remain Information Refresh Time: 0 seconds
gi4 is in relay mode
DHCP Operational mode is enabled
Relay source interface: VLAN 101
Relay destinations:
    2001:001:250:A2FF:FEBF:A056
    FE80::250:A2FF:FEBF:A056 via gi10
gi5 is in client mode
DHCP Operational mode is disabled (Interface status is DOWN)
Stateless Service is enabled
Reconfigure service is enabled
```

```
Information Refresh Minimum Time: 600 seconds
Information Refresh Time: 86400 seconds
Remain Information Refresh Time: 0 seconds
DHCP server:
    Address FE80::202:FCFF:FEA1:7439, DUID 000300010002FCA17400
Preference: 20
Received Information Refresh Time: 3600 seconds
DNS Servers: 1001::1, 2001::10
DNS Domain Search List: company.com beta.org
SNTP Servers: 2004::1
POSIX Timezone string: EST5EDT4,M3.2.0/02:00,M11.1.0/02:00
Configuration Server: config.company.com
Configuration Path Name: qqg/config/aaa_config.dat
```

DHCP Server Commands

53.1 ip dhcp server

Use the **ip dhcp server** Global Configuration mode command to enable the DHCP server features on the device.

Use the **no** form of this command to disable the DHCP server.

Syntax

ip dhcp server

no ip dhcp server

Default Configuration

The DHCP server is disabled.

Command Mode

Global Configuration mode

Example

The following example enables the DHCP server on the device:

```
Console(config)# ip dhcp server
```

53.2 ip dhcp pool host

Use the **ip dhcp pool host** Global Configuration mode command to configure a DHCP static address on a DHCP Server and enter the DHCP Pool Host Configuration mode.

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

Syntax

ip dhcp pool host *name*

no ip dhcp pool host *name*

Parameters

name—Specifies the DHCP address pool name. It can be either a symbolic string (such as Engineering) or an integer (such as 8). (Length: 1–32 characters)

Default Configuration

DHCP hosts are not configured.

Command Mode

Global Configuration mode

User Guidelines

During execution of this command, the configuration mode changes to the DHCP Pool Configuration mode, which is identified by the (config-dhcp)# prompt. In this mode, the administrator can configure host parameters, such as the IP subnet number and default router list.

Example

The following example configures **station** as the DHCP address pool:

```
Console(config)# ip dhcp pool host station
```

```
Console(config-dhcp)#
```

53.3 ip dhcp pool network

Use the **ip dhcp pool network** Global Configuration mode command to configure a DHCP address pool on a DHCP Server and enter DHCP Pool Configuration mode.

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

Syntax

ip dhcp pool network *name*

no ip dhcp pool network *name*

Parameters

name—Specifies the DHCP address pool name. It can be either a symbolic string (such as 'engineering') or an integer (such as 8). (Length: 1–32 characters)

Default Configuration

DHCP address pools are not configured.

Command Mode

Global Configuration mode

User Guidelines

During execution of this command, the configuration mode changes to DHCP Pool Network Configuration mode, which is identified by the (config-dhcp)# prompt. In

this mode, the administrator can configure pool parameters, such as the IP subnet number and default router list.

Example

The following example configures Pool1 as the DHCP address pool.

```
Console(config)# ip dhcp pool network Pool1
```

```
Console(config-dhcp)#
```

53 4 address (DHCP Host)

Use the **address** DHCP Pool Host Configuration mode command to manually bind an IP address to a DHCP client.

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

Syntax

address *ip-address* {*mask* | *prefix-length*} [*client-identifier* *unique-identifier* / *hardware-address* *mac-address*]

no address

Parameters

- **address**—Specifies the client IP address.
- **mask**—Specifies the client network mask.
- **prefix-length**—Specifies the number of bits that comprise the address prefix. The prefix is an alternative way of specifying the client network mask. The prefix length must be preceded by a forward slash (/).
- **unique-identifier**—Specifies the distinct client identification in dotted hexadecimal notation. Each byte in a hexadecimal character string is two hexadecimal digits. Bytes are separated by a period or colon. For example, 01b7.0813.8811.66.
- **hardware-address**—Specifies the MAC address.

Default Configuration

No address are bound.

Command Mode

DHCP Pool Host Configuration mode

Example

The following example manually binds an IP address to a DHCP client.

```
Console(config-dhcp)# address 10.12.1.99 255.255.255.0 01b7.0813.8811.66
```

53.5 address (DHCP Network)

Use the **address** DHCP Pool Network Configuration mode command to configure the subnet number and mask for a DHCP address pool on a DHCP server.

Use the **no** form of this command to remove the subnet number and mask.

Syntax

address *{network-number /low low-address high high-address}* *{mask / prefix-length}*
no address

Parameters

- **network-number**—Specifies the IP address of the DHCP address pool.
- **mask**—Specifies the pool network mask.
- **prefix-length**—Specifies the number of bits that comprise the address prefix. The prefix is an alternative way of specifying the client network mask. The prefix length must be preceded by a forward slash (/).
- **low low-address**—Specifies the first IP address to use in the address range.
- **high high-address**—Specifies the last IP address to use in the address range.

Default Configuration

DHCP address pools are not configured.

If the **low address** is not specified, it defaults to the first IP address in the network.

If the **high address** is not specified, it defaults to the last IP address in the network.

Command Mode

DHCP Pool Network Configuration mode

Example

The following example configures the subnet number and mask for a DHCP address pool on DHCP server.

```
Console(config-dhcp)# address 10.12.1.0 255.255.255.0
```

53.6 lease

Use the **lease** DHCP Pool Network Configuration mode command to configure the time duration of the lease for an IP address that is assigned from a DHCP server to a DHCP client.

Use the **no** form of this command to restore the default value.

Syntax

lease {*days* [{*hours*} [*minutes*]] / *infinite*}

no lease

Parameters

- **days**—Specifies the number of days in the lease.
- **hours**—Specifies the number of hours in the lease. A **days** value must be supplied before configuring an *hours* value.
- **minutes**—Specifies the number of minutes in the lease. A **days** value and an **hours** value must be supplied before configuring a **minutes** value.
- **infinite**—Specifies that the duration of the lease is unlimited.

Default Configuration

The default lease duration is 1 day.

Command Mode

DHCP Pool Network Configuration mode

Examples

The following example shows a 1-day lease.

```
Console(config-dhcp)# lease 1
```

The following example shows a one-hour lease.

```
Console(config-dhcp)# lease 0 1
```

The following example shows a one-minute lease.

```
Console(config-dhcp)# lease 0 0 1
```

The following example shows an infinite (unlimited) lease.

```
Console(config-dhcp)# lease infinite
```

53.7 client-name

Use the **client-name** DHCP Pool Host Configuration mode command to define the name of a DHCP client. The client name should not include the domain name.

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

Syntax

client-name *name*

no client-name

Parameters

name—Specifies the client name, using standard ASCII characters. The client name should not include the domain name. For example, the name Mars should not be specified as mars.yahoo.com. (Length: 1–32 characters)

Command Mode

DHCP Pool Host Configuration mode

Default Configuration

No client name is defined.

Example

The following example defines the string **client1** as the client name.

```
Console(config-dhcp)# client-name client1
```

53.8 default-router

Use the **default-router** DHCP Pool Configuration mode command to configure the default routerlist for a DHCP client.

Use the **no** form of this command to remove the default router.

Syntax

default-router *ip-address* [*ip-address2* ... *ip-address8*]

no default-router

Parameters

ip-address—Specifies the IP address of a router. One IP address is required, although up to eight addresses can be specified in one command line.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration

No default router is defined.

User Guidelines

The router IP address should be on the same subnet as the client subnet.

Example

The following example specifies 10.12.1.99 as the default router IP address.

```
Console(config-dhcp)# default-router 10.12.1.99
```

53.9 dns-server

Use the **dns-server** DHCP Pool Configuration mode command to configure the Domain Name System (DNS) IP servers available to a DHCP client.

Use the **no** form of this command to remove the DNS serverlist.

Syntax

dns-server *ip-address* [*ip-address2* ... *ip-address8*]

no dns-server

Parameters

ip-address—Specifies a DNS server IP address. One IP address is required, although up to eight addresses can be specified in one command line.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration

No DNS server is defined.

User Guidelines

If DNS IP servers are not configured for a DHCP client, the client cannot correlate host names to IP addresses.

Example

The following example specifies 10.12.1.99 as the client domain name server IP address.

```
Console(config-dhcp)# dns-server 10.12.1.99
```

53.10 domain-name

Use the **domain-name** DHCP Pool Configuration mode command to specify the domain name for a DHCP client.

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

Syntax

domain-name *domain*

no domain-name

Parameters

domain—Specifies the DHCP client domain name string. (Length: 1–32 characters)

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration

No domain name is defined.

Example

The following example specifies yahoo.com as the DHCP client domain name string.

```
Console(config-dhcp)# domain-name yahoo.com
```

53.11 netbios-name-server

Use the **netbios-name-server** DHCP Pool Configuration mode command to configure the NetBIOS Windows Internet Naming Service (WINS) servers that are available to Microsoft DHCP clients.

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

Syntax

netbios-name-server *ip-address*

no netbios-name-server

Parameters

ip-address—Specifies the NetBIOS WINS name server IP address.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration

No bios server is defined.

Example

The following example specifies the IP address of a NetBIOS name server available to the DHCP client.

```
Console(config-dhcp)# netbios-name-server 10.12.1.90
```

53.12 netbios-node-type

Use the **netbios-node-type** DHCP Pool Configuration mode command to configure the NetBIOS node type for Microsoft DHCP clients.

Use the **no** form of this command to return to default.

Syntax**netbios-node-type** {**b-node** /**p-node** /**m-node** /**h-node**}**no netbios-node-type****Parameters**

- **b-node**—Specifies the Broadcast NetBIOS node type.
- **p-node**—Specifies the Peer-to-peer NetBIOS node type.
- **m-node**—Specifies the Mixed NetBIOS node type.
- **h-node**—Specifies the Hybrid NetBIOS node type.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration**h-node** (Hybrid NetBIOS node type).**Example**

The following example specifies the client's NetBIOS type as mixed.

```
Console(config-dhcp)# netbios node-type m-node
```

53.13 next-server

Use the **next-server** DHCP Pool Configuration mode command to configure the next server (siaddr) in the boot process of a DHCP client. The client will connect, using SCP/TFTP, to this server in order to download the boot file.

Use the **no** form of this command to remove the boot server.

Syntax**next-server** *ip-address***no next-server****Parameters**

ip-address—Specifies the IP address of the next server in the boot process, which is typically a Trivial File Transfer Protocol (TFTP) server.

Default Configuration

If the **next-server** command is not used to configure a boot server list, the DHCP server uses inbound interface helper addresses as boot servers.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Example

The following example specifies 10.12.1.99 as the IP address of the next server in the boot process.

```
Console(config-dhcp)# next-server 10.12.1.99
```

53.14 next-server-name

Use the **next-server-name** DHCP Pool Configuration mode command to configure the next server name (sname) in the boot process of a DHCP client. The client will connect, using SCP/TFTP, to this server in order to download the bootfile.

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

Syntax

next-server-name *name*

no next-server-name

Parameters

name—Specifies the name of the next server in the boot process. (Length: 1–64 characters)

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration

No next server name is defined.

Example

The following example specifies www.bootserver.com as the name of the next server in the boot process of a DHCP client.

```
Console(config-dhcp)# next-server www.bootserver.com
```

53.15 bootfile

Use the **bootfile** DHCP Pool Configuration mode command to specify the default boot image file name for a DHCP client.

Use the **no** form of this command to delete the boot image file name.

Syntax

bootfile *filename*

no bootfile

Parameters

filename—Specifies the file name used as a boot image. (Length: 1–128 characters)

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Example

The following example specifies `boot_image_file` as the default boot image file name for a DHCP client.

```
Console(config-dhcp)# bootfile boot_image_file
```

53.16 time-server

Use the **time-server** DHCP Pool Configuration mode command to specify the time server for a DHCP client.

Use the **no** form of this command to remove the time servers.

Syntax

time-server *ip-address*

no time-server

Parameters

ip-address—Specifies the IP address of a time server.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

Default Configuration

No time server name is defined.

User Guidelines

The time server's IP address should be on the same subnet as the client subnet.

Example

The following example specifies 10.12.1.99 as the time server IP address.

```
Console(config-dhcp)# time-server 10.12.1.99
```

53.17 option

Use the **option** DHCP Pool Configuration mode command to configure the DHCP server options.

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

Syntax

option *code* {*ascii ascii-string* / *hex hex-string* / *ip ip-address*}

option ip-list *code ip-address1* [*ip-address2* ...]

no option *code*

Parameters

- **code**—Specifies the DHCP option code.
- **ascii ascii-string**—Specifies an NVT ASCII character string. ASCII character strings, which contain white space, must be delimited by quotation marks.
- **hex hex-string**—Specifies dotted hexadecimal data: Each byte in hexadecimal character strings is two hexadecimal digits. Bytes are separated by a period or colon.
- **ip ip-address**—Specifies an IP address.
- **ip-list**—Specifies that a list of IP addresses immediately follows the option code.

- ***ip-address1* [*ip-address2* ...]**—Specifies a list of one or more IP addresses.

Command Mode

DHCP Pool Host Configuration mode

DHCP Pool Network Configuration mode

User Guidelines

DHCP provides a framework for passing configuration information to hosts on a TCP/IP network. Configuration parameters and other control information are carried in tagged data items that are stored in the DHCP message options field. The data items themselves are also called options. The current set of DHCP options are documented in RFC 2131, *Dynamic Host Configuration Protocol*.

For options in hexadecimal format, the string parameter should include all the bytes in the option value, including leading zeros.

Examples

Example 1 - The following example configures DHCP option 19, which specifies whether the client should configure its IP layer for packet forwarding. A value of 0 means disable IP forwarding. A value of 1 means enable IP forwarding. IP forwarding is enabled in the following example.

```
Console(config-dhcp)# option 19 hex 01
```

Example 2 - The following example configures DHCP option 2, which specifies the offset of the client's subnet in seconds from Coordinated Universal Time (UTC). A value of 0xE10 in the following example indicates a location 1 hour east of the meridian.

```
Console(config-dhcp)# option 2 hex 00000E10
```

The following example configures DHCP option 72, which specifies the World Wide Web servers for DHCP clients. World Wide Web servers 172.16.3.252 and 172.16.3.253 are configured in the following example.

```
Console(config-dhcp)# option ip-list 72 172.16.3.252 172.16.3.253
```

53.18 ip dhcp excluded-address

Use the **ip dhcp excluded-address** Global Configuration mode command to specify the IP addresses that a DHCP server should not assign to DHCP clients. Use the **no** form of this command to remove the excluded IP addresses.

Syntax

ip dhcp excluded-address *low-address* [*high-address*]

no ip dhcp excluded-address *low-address* [*high-address*]

Parameters

- **low-address**—Specifies the excluded IP address, or first IP address in an excluded address range.
- **high-address**—Specifies the last IP address in the excluded address range.

Default Configuration

All IP pool addresses are assignable.

Command Mode

Global Configuration mode

User Guidelines

The DHCP server assumes that all pool addresses can be assigned to clients. Use this command to exclude a single IP address or a range of IP addresses.

Example

The following example configures an excluded IP address range from 172.16.1.100 through 172.16.1.199.

```
Console(config)# ip dhcp excluded-address 172.16.1.100 172.16.1.199
```

53.19 clear ip dhcp binding

The **clear ip dhcp binding** Privileged EXEC mode command deletes the dynamic address binding from the DHCP server database.

Syntax

clear ip dhcp binding {*address* | *}

Parameters

- **address** —Specifies the binding address to delete from the DHCP database.
- ***** —Clears all automatic bindings.

Command Mode

Privileged EXEC mode

User Guidelines

Typically, the address supplied denotes the client IP address. If the asterisk (*) character is specified as the address parameter, DHCP clears all dynamic bindings.

Use the **no ip dhcp pool** Global Configuration mode command to delete a manual binding.

Example

The following example deletes the address binding 10.12.1.99 from a DHCP server database:

```
Console# clear ip dhcp binding 10.12.1.99
```

53.20 show ip dhcp

The **show ip dhcp** EXEC mode command displays the DHCP configuration.

Syntax

show ip dhcp

Command Mode

EXEC mode

Example

The following example displays the DHCP configuration.

```
console# show ip dhcp
```

```
DHCP server is enabled.
```

```
DHCP ping packets is enabled with 2 retries and 500 milliseconds.
```

53.21 show ip dhcp excluded-addresses

The **show ip dhcp excluded-addresses** EXEC mode command displays the excluded addresses.

Syntax

show ip dhcp excluded-addresses

Command Mode

EXEC mode

Example

The following example displays the excluded addresses.

```
console# show ip dhcp excluded-addresses

The number of excluded addresses ranges is 2

Excluded addresses:

10.1.1.212- 10.1.1.219, 10.1.2.212- 10.1.2.219
```

53.22 show ip dhcp pool host

The **show ip dhcp pool host** EXEC mode command displays the DHCP pool host configuration.

Syntax

show ip dhcp pool host [*address*|*name*]

Parameters

- **address** —Specifies the client IP address.
- **name** —Specifies the DHCP pool name. (Length: 1-32 characters)

Command Mode

EXEC mode

Example s

Example 1 - The following example displays configuration of all DHCP host pools:

```
console# show ip dhcp pool host
```

The number of host pools is 1

Name	IP Address	Hardware Address	Client Identifier
-----	-----	-----	-----
station	172.16.1.11		01b7.0813.8811.66

Example 2 - The following example displays the DHCP pool host configuration with name **station**:

console# **show ip dhcp pool host** station

Name	IP Address	Hardware Address	Client Identifier
-----	-----	-----	-----
station	172.16.1.11		01b7.0813.8811.66

Mask: 255.255.0.0

Default router: 172.16.1.1

Client name: client1

DNS server: 10.12.1.99

Domain name: yahoo.com

NetBIOS name server: 10.12.1.90

NetBIOS node type: h-node

Next server: 10.12.1.99

Next-server-name: 10.12.1.100

Bootfile: Bootfile

Time server 10.12.1.99

Options:

Code	Type	Value
---	-----	-----
2	integer	3600
14	ascii	qq/aaaa/bbb.txt
19	boolean	false
21	ip	134.14.14.1
31	ip-list	1.1.1.1, 12.23.45.2

```
47    hex    02af00aa00
```

53.23 show ip dhcp pool network

The **show ip dhcp pool network** EXEC mode command displays the DHCP network configuration.

Syntax

show ip dhcp pool network [*name*]

Parameters

name — Specifies the DHCP pool name. (Length: 1-32 characters)

Command Mode

EXEC mode

Example

The following example displays configuration of all DHCP network pools:

```
Router> show ip dhcp pool network

The number of network pools is 2

Name Address range mask Lease
-----
marketing 10.1.1.17-10.1.1.178 255.255.255.0 0d:12h:0m
finance 10.1.2.8-10.1.2.178 255.255.255.0 0d:12h:0m
Router> show ip dhcp pool network marketing

Name Address range mask Lease
-----
marketing 10.1.1.17-10.1.1.178 255.255.255.0 0d:12h:0m

Statistics:

All-range Available Free Pre-allocated Allocated Expired Declined
-----
162 150 68 50 20          3          9

Default router: 10.1.1.1

Ping packets: enabled
```

```
DNS server: 10.12.1.99
Domain name: yahoo.com
NetBIOS name server: 10.12.1.90
NetBIOS node type: h-node
Next server: 10.12.1.99
Next-server-name: 10.12.1.100
Bootfile: Bootfile
Time server 10.12.1.99
Options:
Code  Value
---  -----
2      3600
14     qq/aaaa/bbb.txt
19     false
21     134.14.14.1
31     1.1.1.1, 12.23.45.2
47     02af00aa00
```

53.24 show ip dhcp binding

Use the **show ip dhcp binding** EXEC mode command to display the specific address binding or all the address bindings on the DHCP server.

Syntax

show ip dhcp binding [*ip-address*]

Parameters

ip-address —Specifies the IP address

Command Mode

EXEC mode

Examples

The following examples display the DHCP server binding address parameters.

Router> **show ip dhcp binding**

DHCP server enabled

The number of used (all types) entries is 6

The number of pre-allocated entries is 1

The number of allocated entries is 1

The number of expired entries is 1

The number of declined entries is 2

The number of static entries is 1

The number of dynamic entries is 2

The number of automatic entries is 1

IP address	Hardware Address	Lease Expiration	Type	State
1.16.1.11	00a0.9802.32de	Feb 01 1998	dynamic	allocated
1.16.3.23	02c7.f801.0422	12:00AM	dynamic	expired
1.16.3.24	02c7.f802.0422		dynamic	declined
1.16.3.25	02c7.f803.0422		dynamic	pre-allocated
1.16.3.26	02c7.f804.0422		dynamic	declined

Router> **show ip dhcp binding 1.16.1.11**

DHCP server enabled

IP address	Hardware Address	Lease Expiration	Type	State
1.16.1.11	00a0.9802.32de	Feb 01 1998	dynamic	allocated
		12:00 AM		

Router> **show ip dhcp binding 1.16.3.24**

IP address	Hardware Address	Lease Expiration	Type	State
1.16.3.24	02c7.f802.0422		dynamic	declined

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

Field	Description
IP address	The host IP address as recorded on the DHCP server.
Hardware address	The MAC address or client identifier of the host as recorded on the DHCP server.
Lease expiration	The lease expiration date of the host IP address.
Type	The manner in which the IP address was assigned to the host.
State	The IP Address state.

53.25 show ip dhcp server statistics

Use the **show ip dhcp server statistics** EXEC command to display DHCP server statistics.

Syntax

show ip dhcp server statistics

Command Mode

EXEC mode

Example

The following example displays DHCP server statistics

```
DHCP server enabled
The number of network pools is 7
The number of excluded pools is 2
The number of used (all types) entries is 7
The number of pre-allocated entries is 1
The number of allocated entries is 3
The number of expired entries is 1
The number of declined entries is 2
The number of static entries is 1
The number of dynamic entries is 2
The number of automatic entries is 1
```

53.26 show ip dhcp allocated

Use the **show ip dhcp allocated** EXEC mode command to display the specific allocated address or all the allocated addresses on the DHCP server.

Syntax

show ip dhcp allocated [*ip-address*]

Parameters

ip-address —Specifies the IP address

Command Mode

EXEC mode

Example

The following example displays the DHCP server allocated IP addresses.

```
Router> show ip dhcp allocated

DHCP server enabled

The number of allocated entries is 3

IP Address    Hardware Address Lease Expiration    Type
-----
172.16.1.11   00a0.9802.32de    Feb 01 1998 12:00 AM Dynamic
172.16.3.253  02c7.f800.0422    Infinite            Automatic
172.16.3.254  02c7.f800.0422    Infinite            Static

Router> show ip dhcp allocated 172.16.1.11

DHCP server enabled

The number of allocated entries is 2

IP Address    Hardware Address Lease Expiration    Type
-----
172.16.1.11   00a0.9802.32de    Feb 01 1998 12:00 AM Dynamic

Router> show ip dhcp allocated 172.16.3.254

DHCP server enabled

The number of allocated entries is 2

IP Address    Hardware Address Lease Expiration    Type
```



```
-----
172.16.3.254 02c7.f800.0422   Infinite           Static
```

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

Field	Description
IP address	The host IP address as recorded on the DHCP server.
Hardware address	The MAC address or client identifier of the host as recorded on the DHCP server.
Lease expiration	The lease expiration date of the host IP address.
Type	The manner in which the IP address was assigned to the host.

53.27 show ip dhcp declined

Use the **show ip dhcp declined** EXEC command to display the specific declined address or all of the declined addresses on the DHCP server.

show ip dhcp declined Field Descriptions

Syntax

show ip dhcp declined [*ip-address*]

Parameters

ip-address—Specifies the IP address.

Command Mode

EXEC mode

Example

```
Router> show ip dhcp declined

DHCP server enabled

The number of declined entries is 2

IP address   Hardware address
172.16.1.11  00a0.9802.32de
172.16.3.254 02c7.f800.0422
```

```
Router> show ip dhcp declined 172.16.1.11
```

```
DHCP server enabled
```

```
The number of declined entries is 2
```

```
IP address      Hardware address
```

```
172.16.1.11    00a0.9802.32de
```

53.28 show ip dhcp expired

Use the **show ip dhcp expired** EXEC command to display the specific expired address or all of the expired addresses on the DHCP server.

Syntax

show ip dhcp expired [*ip-address*]

Parameters

ip-address—Specifies the IP.

Command Mode

EXEC mode

Example

```
Router> show ip dhcp expired
```

```
DHCP server enabled
```

```
The number of expired entries is 1
```

```
IP address      Hardware address
```

```
172.16.1.11    00a0.9802.32de
```

```
172.16.3.254   02c7.f800.0422
```

```
Router> show ip dhcp expired 172.16.1.11
```

```
DHCP server enabled
```

```
The number of expired entries is 1
```

```
IP address      Hardware address
```

```
172.16.1.13    00a0.9802.32de
```

53.29 show ip dhcp pre-allocated

Use the **show ip dhcp pre-allocated** EXEC command to display the specific pre-allocated address or all the pre-allocated addresses on the DHCP server.

Syntax

show ip dhcp pre-allocated *[ip-address]*

Parameters

ip-address—Specifies the IP.

Command Mode

EXEC mode

Examples

```
Router> show ip dhcp pre-allocated
```

```
DHCP server enabled
```

```
The number of pre-allocated entries is 1
```

```
IP address    Hardware address
```

```
172.16.1.11  00a0.9802.32de
```

```
172.16.3.254 02c7.f800.0422
```

```
Router> show ip dhcp pre-allocated 172.16.1.11
```

```
DHCP server enabled
```

```
The number of pre-allocated entries is 1
```

```
IP address    Hardware address
```

```
172.16.1.15  00a0.9802.32de
```