

User Manual for the NETGEAR 7300S Series Layer 3 Managed Switch Software



NETGEAR

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Regulatory Compliance Information

This device is restricted to indoor use due to reduce the potential for harmful interference to co-channel Mobile Satellite and Radar Systems.

Canadian Department of Communications Compliance Statement

This Class B Digital apparatus (NETGEAR 7300S Series Layer 3 Managed Switch) meets all the requirements of the Canadian Interference Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte les exigences du Règlement sur le matériel brouilleur du Canada.

This device complies with Class B limits of Industry of Canada. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

EN 55 022 Declaration of Conformance

This is to certify that the NETGEAR 7300S Series Layer 3 Managed Switch is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class B (CISPR 22).

Product and Publication Details

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Chapter 1

About This Guide

Thank you for purchasing the NETGEAR™ 7300S Series L3 Switch.

Audience

This reference manual assumes that the reader has basic-to-intermediate computer and Internet skills. However, basic computer network, Internet, and wireless technology tutorial information is provided in the Appendices.

This document describes configuration commands for the 7300S Series L3 Switch software. The commands can be accessed from the CLI, telnet, and Web interfaces.

Why the Document was Created

This document was created primarily for system administrators configuring and operating a system using 7300S Series L3 Switch software. It is intended to provide an understanding of the configuration options of 7300S Series L3 Switch software.

It is assumed that the reader has an understanding of the relevant switch platforms. It is also assumed that the reader has a basic knowledge of Ethernet and networking concepts.

How to Use This Document

This document describes configuration commands for the 7000 Series L3 Managed Switch software. The commands can be accessed from the CLI, telnet, and Web interfaces.

- [Chapter 6, “Quick Start up”](#) details the procedure to quickly become acquainted with the 7000 Series L3 Managed Switch Software.
- [Chapter 8, “Switching Commands”](#) describes the Switching commands.
- [Chapter 9, “Security Commands”](#) describes the Security commands.

- Chapter 10, “Routing Commands” describes the Routing commands.
- Chapter 11, “Quality of Service (QoS) Commands” describes the QoS commands.
- Chapter 12, “Managing Switch Stacks” describes the switch stacking.

Note: Refer to the release notes for the 7000 Series L3 Managed Switch Software application level code. The release notes detail the platform specific functionality of the Switching, Routing, SNMP, Config, Management, and Bandwidth Provisioning packages.

Typographical Conventions


This guide uses the following typographical conventions:

Table 1. Typographical conventions

<i>italics</i>	Emphasis.
bold	User input.
[Enter]	Named keys in text are shown enclosed in square brackets. The notation [Enter] is used for the Enter key and the Return key.
[Ctrl]+C	Two or more keys that must be pressed simultaneously are shown in text linked with a plus (+) sign.
SMALL CAPS	DOS file and directory names.

Special Message Formats

This guide uses the following formats to highlight special messages:

	Note: This format is used to highlight information of importance or special interest.
---	--

This manual is written for the 7300S Series L3 Switch according to these specifications:

Table 1-1. Manual Specifications

Product Version	NETGEAR 7300S Series Layer 3 Managed Switch
Manual Publication Date	March 2005



Note: Product updates are available on the NETGEAR, Inc. Web site at <http://www.netgear.com/support/main.asp>.

Chapter 2

Switch Management Overview

This chapter gives an overview of switch management, including the methods you can use to manage your NETGEAR 7300S Series Layer 3 Managed Switch.

- Management Access Overview
- SNMP Access
- Protocols

Scope

The NETGEAR 7300S Series Layer 3 Managed Switch software has two purposes:

- Assist attached hardware in switching frames, based on Layer 2 or 3 information contained in the frames.
- Provide a complete switch management portfolio for the network administrator.

Switch Management Overview

Fast Ethernet (FEN) and Gigabit Ethernet (GEN) switching continues to evolve from high-end backbone applications to desktop switching applications. The price of the technology continues to decline, while performance and feature sets continue to improve. Devices that are capable of switching Layers 2, 3, and 4 are increasingly in demand. The NETGEAR 7300S Series Layer 3 Managed Switch provides a flexible solution to these ever-increasing needs.

The NETGEAR 7300S Series Layer 3 Managed Switch provides the network administrator with a set of comprehensive management functions for managing both the FSM7328S, FSM7352S and the network. The network administrator has a choice of three easy-to-use management methods:

- Web-based
- VT100 interface

Note: The maximum number of configuration file command lines is 2000.

- Simple Network Protocol Management (SNMP)

Each management method enables the network administrator to configure, manage, and control the managed switch locally or remotely using in-band or out-of-band mechanisms. Management is standards-based, with configuration parameters and a private MIB providing control for functions not completely specified in the MIBs.

Table 2-1. Comparing Switch Management Methods

Management Method	Advantages	Disadvantages
Administration console	<ul style="list-style-type: none"> • Out-of-band access via direct cable connection means network bottlenecks, crashes, and downtime do not slow or prevent access • No IP address or subnet needed • CLI based • HyperTerminal access to full functionality (HyperTerminal is built into Microsoft Windows 95/98/NT/2000/XP operating systems) • Secure – make sure the switch is installed in a secure area. 	<ul style="list-style-type: none"> • Must be near switch or use dial-up connection • Not convenient for remote users • Not graphical
Web browser or Telnet	<ul style="list-style-type: none"> • Can be accessed from any location via the switch's IP address • Ideal for configuring the switch remotely • Compatible with Internet Explorer and Netscape Navigator Web browsers • Familiar browser interface • Graphical data available • Most visually appealing • CLI interfaces available • Can be secured via SSL or SSH 	<ul style="list-style-type: none"> • May encounter lag times on poor connections • Displaying graphical objects over a browser interface may slow navigation
SNMP Agent	<ul style="list-style-type: none"> • Communicates with switch functions at the Management Information Base (MIB) level • Based on open standards • Can be secured via SNMPv3 	<ul style="list-style-type: none"> • Requires SNMP management software • Least visually appealing of all three methods • Limited amount of information available • Some settings require calculations

Chapter 3

Administration Console Interface

The administration console is an internal, character-oriented, VT-100/ANSI command-driven user interface for performing management activities. Using this method, you can view the administration console from a terminal, PC, Apple Macintosh, or UNIX workstation connected to the switch's console port. [Figure 3-1](#) shows an example of this management method.

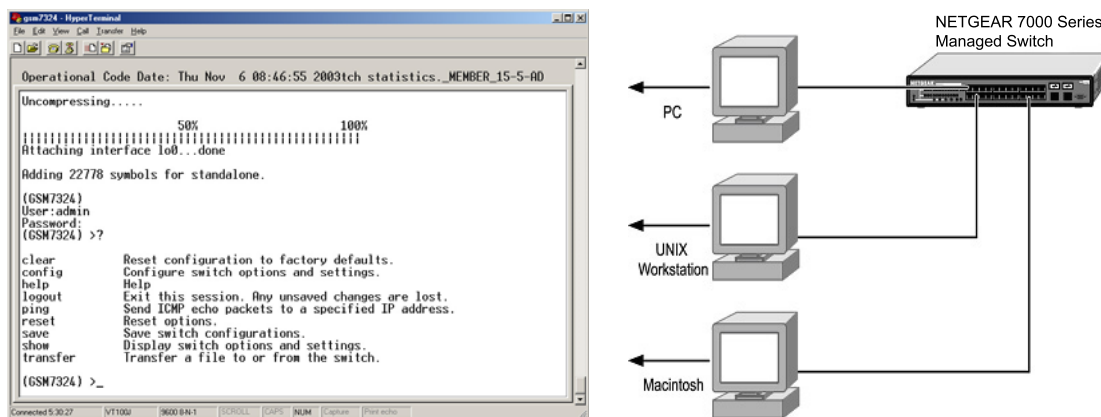


Figure 3-1: Administration Console Management Method

Set Up Your Switch Using Direct Console Access

The direct access management method is required when you initially set up your switch. Thereafter, the convenience and additional features of the Web management access method make it the best method to manage the switch. See [“Web Based Management Overview” on page 4-2](#) for more information.

Direct access to the switch console is achieved by connecting the switch's console port to a VT-100 or compatible terminal or to a PC, Apple Macintosh, or UNIX workstation equipped with a terminal-emulation program. This connection is made using the null-modem cable supplied with the switch.

Examples of terminal-emulation programs include:

- HyperTerminal, which is included with Microsoft Windows operating systems
- ZTerm for the Apple Macintosh
- TIP for UNIX workstations

This example describes how to set up the connection using a HyperTerminal on a PC, but other systems follow similar steps.

1. Click the Windows Start button. Select Accessories and then Communications. HyperTerminal should be one of the options listed in this menu. Select HyperTerminal
2. The following screen will appear. Enter a name for this connection. In the example below, the name of the connection is FSM726. Click OK.



Figure 3-2: Connection Description

3. The following screen will appear. In the bottom, drop down box labeled **Connect Using:**, click the arrow and choose the COM port to which the switch will connect. In the example below, COM1 is the port selected. Click **OK**.



Figure 3-3: COM Port Selection

4. When the following screen appears, make sure that the port setting are as follows:

Baud Rate: 9600
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

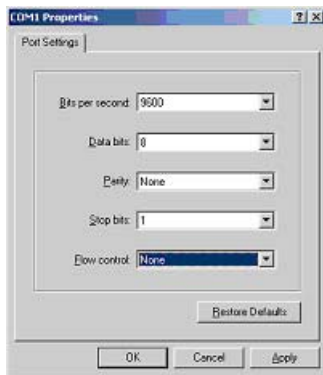


Figure 3-4: Connection Settings

5. Click OK.

The HyperTerminal window will open and you should be connected to the switch. If you do not get a welcome screen or a system menu, press the return key.

When attached to the User Interface via a console connection, the following must be set in order to use the arrow keys: Under the terminal pull down menu, choose Properties and make sure the VT100 Arrows option is turned on.

Chapter 4

Web-Based Management Interface

Your NETGEAR 7300S Series Layer 3 Managed Switch provides a built-in browser interface that lets you configure and manage it remotely using a standard Web browser such as Microsoft Internet Explorer 5.0 or later or Netscape Navigator 6.0 or later.

This interface also allows for system monitoring and management of the switch. The 'help' page covers many of the basic functions and features of the switch and it's web interface.



Note: The details of the graphical user interface for the Netgear 7000 Series Managed Switch you are using may differ slightly from those depicted in the chapter.

When you configure the switch for the first time from the console, you can assign an IP address and subnet mask to the switch. Thereafter, you can access the switch's Web interface directly using your Web browser by entering the switch's IP address into the address bar. In this way, you can use your Web browser to manage the switch from a central location, just as if you were directly connected to the switch's console port. [Figure 4-1](#) shows this management method.

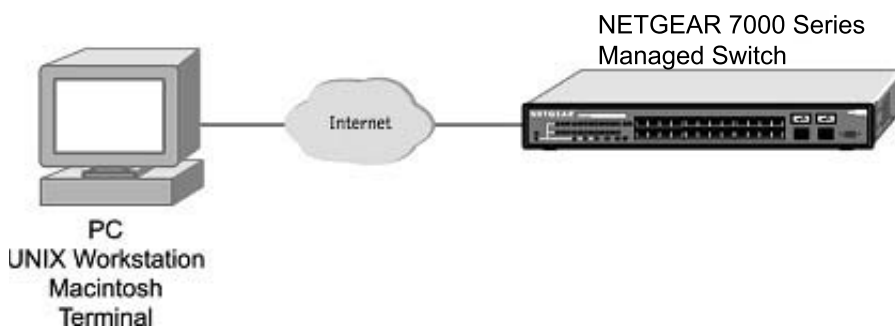


Figure 4-1: Web Management Method

Web Based Management Overview

The menu options available are: System Management, Switch, Routing, Traffic Management, and Smart Wizard. There is a help menu in the top of right side of screen; you can click the 'help' or the question mark to read the help menu.

The help menu contains:

- Web-Based Management Introduction to the Web management features.
- Device Management Introduction of the basic icons and management of the device
- Interface Operations Describes Web browser requirements, and common commands
- Product Overview Describes supported SNMP and Web management features
- Summary of Features Feature List

How to Log In to the Managed Switch

The NETGEAR 7300S Series Layer 3 Managed Switch can be configured remotely from Microsoft Internet Explorer browser version 5.0 or above, or Netscape Navigator web browser version 4.78 or above.

1. Determine the IP address of your managed switch.
2. Open a Web browser such as Internet Explorer or Netscape Navigator.
3. Log in to the managed switch using whatever IP address the unit is currently configured with. Use the default user name of **admin** and default of no password, or whatever LAN address and password you have set up.



Figure 4-2: FSM7328S, FSM7352S IP address in browser address bar

A login window opens:

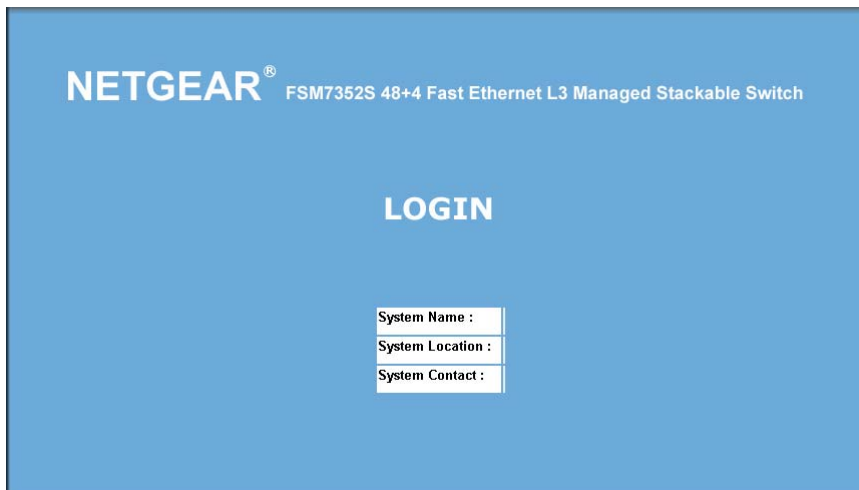


Figure 4-3: Login splash screen for the Managed Switch

Click the Login link.

A user name and password dialog box opens like this one.



Figure 4-4: User name/password dialog box

4. Type the default user name of **admin** and default of no password, or whatever password you have set up.

Once you have entered your user name and password, your Web browser should automatically retrieve and display the home page, as shown below.

Web-Based Management Utility Features

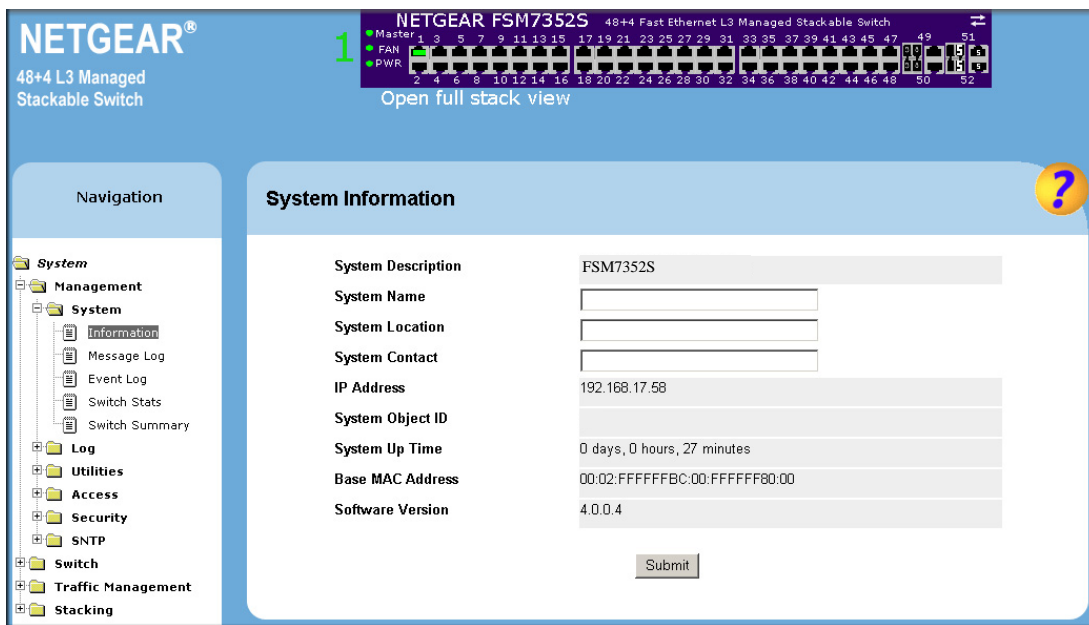


Figure 4-5: System Information page

This welcome page displays system information, such as:

- System Description
- System Name
- System Location
- System Contact
- IP Address
- System Object ID (OID)
- System Up Time

Interactive Switch Image

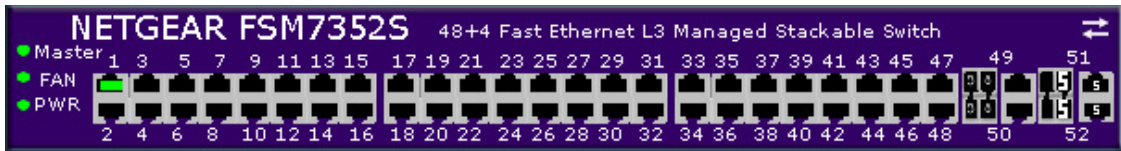


Figure 4-6: Interactive switch image

This dynamic image shows various real time conditions about the switch, including the status, fan operation, power, and the connectivity and traffic indication for each port. In addition, using the popup menus described below, you can directly access a wealth of information by right-clicking on a port and selecting a menu item from the popup-menu that displays.

Menus

The Web-based interface enables navigation through several menus. The main navigation menu is on the left of every page and contains the screens that let you access all the commands and statistics the switch provides.

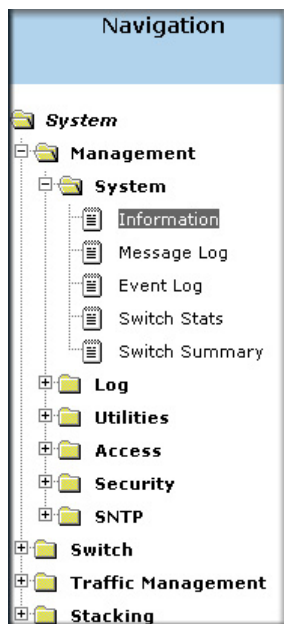


Figure 4-7: Menu navigation

Main Menus

- Management
- Switch
- Routing
- Traffic Management
- Smart Wizard

Secondary Menus

The Secondary Menus under the Main Menu contain a host of options that you can use to configure your switch. The online help contains a detailed description of the features on each screen. You can click the 'help' or the question mark at the top right of each screen to view the help menu topics.

The Secondary Menus are detailed below, with cross-references to the sections in this manual that contain the corresponding command descriptions.

Management

- System — see [“System Information and Statistics Commands” on page 8-1](#)
- Utilities — see [“System Utility Commands” on page 8-59](#)
- Access — see the following sections:
 - [“Administration Console Interface” on page 3-1](#)
 - [“System Management Commands” on page 8-15](#)
- Security — see [Chapter 9, “Security Commands and “User Account Commands” on page 8-77](#)
 - Port Access Control — [“Port Based Network Access Control \(IEEE 802.1X\) Commands” on page 9-5](#)
 - RADIUS — see [“Remote Authentication Dial In User Service \(RADIUS\) Commands” on page 9-17](#)

Switch

- Port — see [“show port” on page 8-46](#)
- MAC Addresses — see [“System Information and Statistics Commands” on page 8-1](#)
- Spanning Tree — see [“Spanning Tree \(STP\) Commands” on page 8-118](#)
- Link Aggregation — see [“Link Aggregation \(LAG\)/Port-Channel \(802.3AD\) Commands” on page 8-113](#)
- VLAN — see [“show vlan” on page 8-56](#)
- Mcast Fwding DB — see [“show forwardingdb agetime” on page 8-24](#)

Routing

- Routing Commands — see [“Routing Commands” on page 10-1](#)

Traffic Management

- Diffserv — see [“Differentiated Services \(DiffServ\) Commands” on page 11-7](#)
- Traffic Control — see [“System Management Commands” on page 8-15](#)

Smart Wizard

- VLAN Routing Wizard — see [“Routing Commands” on page 10-1](#)

System-Wide Popup Menus

The 7300S Series L3 Switch also provides several popup menus.

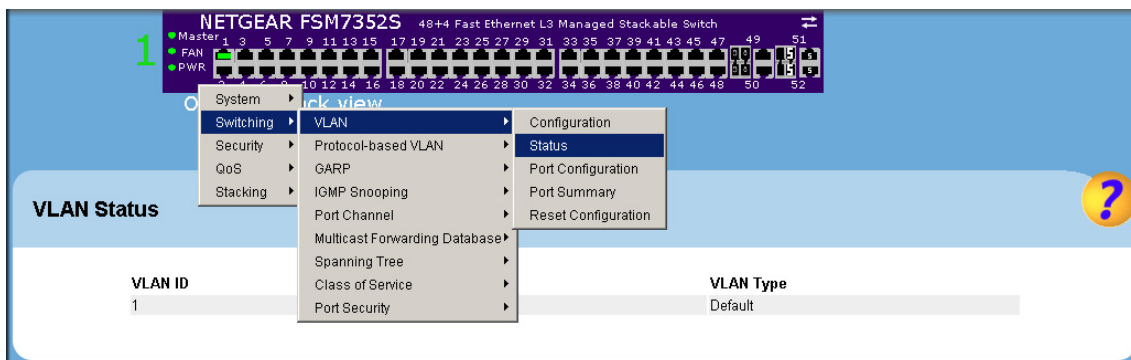


Figure 4-8: Switch popup menu

You can also access the main navigation menu by right clicking on the image of the switch and browsing to the menu you want to use.

Port-Specific Popup Menus

The 7300S Series L3 Switch also provides several popup menus for each port.

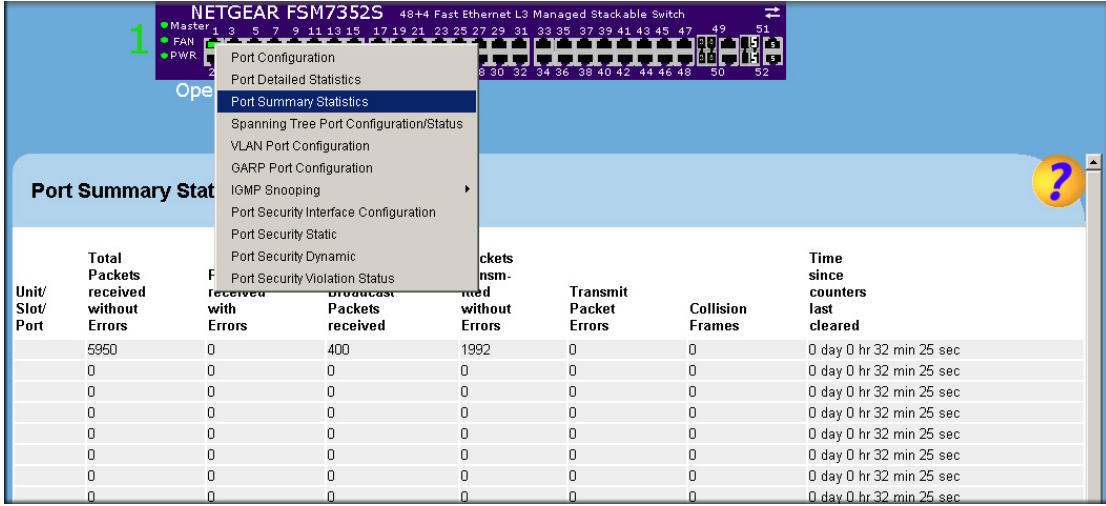


Figure 4-9: Switch popup menus

You can access a port-specific popup menu by right clicking on the port in the image of the switch and browsing to the menu you want to use.

Chapter 5

Command Line Interface Structure

The Command Line Interface (CLI) syntax, conventions and terminology are described in this section. Each CLI command is illustrated using the structure outlined below.

CLI Command Format

Commands are followed by values, parameters, or both.

Example 1

```
network parms <ipaddr> <netmask> [<gateway>]
```

- **network parms** is the command name.
- <ipaddr> <netmask> are the required values for the command.
- [**<gateway>**] is the optional value for the command.

Example 2

```
snmp-server location <loc>
```

- **snmp-server location** is the command name.
- <loc> is the required parameter for the command.

Example 3

```
clear vlan
```

- **clear vlan** is the command name.

Command

The text in bold, non-italic font must be typed exactly as shown.

Parameters

Parameters are order dependent.

The text in bold italics should be replaced with a name or number. To use spaces as part of a name parameter, enclose it in double quotes like this: "System Name with Spaces".

Parameters may be mandatory values, optional values, choices, or a combination.

- *<parameter>*. The *<* angle brackets indicate that a mandatory parameter must be entered in place of the brackets and text inside them.
- [*parameter*]. The [] square brackets indicate that an optional parameter may be entered in place of the brackets and text inside them.
- *choice1 | choice2*. The | indicates that only one of the parameters should be entered.
- The { } curly braces indicate that a parameter must be chosen from the list of choices.

Values

ipaddr

This parameter is a valid IP address, made up of four decimal bytes ranging from 0 to 255. The default for all IP parameters consists of zeros (that is, 0.0.0.1). The interface IP address of 0.0.0.0 is invalid. In some cases, the IP address can also be entered as a 32-bit number.

macaddr

The MAC address format is six hexadecimal numbers separated by colons, for example 00:06:29:32:81:40.

areaid

Area IDs may be entered in dotted-decimal notation (for example, 0.0.0.1). An area ID of 0.0.0.0 is reserved for the backbone. Area IDs have the same form as IP addresses, but are distinct from IP addresses. The IP network number of the sub-netted network may be used for the area ID.

routerid

The value of *<router id>* must be entered in 4-digit dotted-decimal notation (for example, 0.0.0.1). A router ID of 0.0.0.0 is invalid.

slot/port

This parameter denotes a valid slot number and a valid port number. For example, 0/1 represents slot number 0 and port number 1. The *<slot/port>* field is composed of a valid slot number and a valid port number separated by a forward slash (/).

logical slot/port

This parameter denotes a logical slot number and logical port number assigned. This is applicable in the case of a port-channel (LAG). The operator can use the logical slot number and the logical port number to configure the port-channel.

Conventions

Network addresses are used to define a link to a remote host, workstation or network. Network addresses are shown using the following syntax:

Table 5-1. Network Address Syntax

Address Type	Format	Range
ipaddr	A.B.C.D	0.0.0.0 to 255.255.255.255 (decimal)
macaddr	YY:YY:YY:YY:YY:YY	hexidecimal digit pairs

Double quotation marks such as "System Name with Spaces" set off user defined strings. If the operator wishes to use spaces as part of a name parameter then it must be enclosed in double quotation marks.

Empty strings ("") are not valid user defined strings.

Command completion finishes spelling the command when enough letters of a command are typed to uniquely identify the command word. The command may be executed by typing <enter> (command abbreviation) or the command word may be completed by typing the <tab> or <space bar> (command completion).

The value 'Err' designates that the requested value was not internally accessible. This should never happen and indicates that there is a case in the software that is not handled correctly.

The value of '-----' designates that the value is unknown.

Annotations

The CLI allows the user to type single-line annotations at the command prompt for use when writing test or configuration scripts and for better readability. The exclamation point ('!') character flags the beginning of a comment. The comment flag character can begin a word anywhere on the command line and all input following this character is ignored. Any command line that begins with the character '!' is recognized as a comment line and ignored by the parser.

Some examples are provided below:

! Script file for displaying the ip interface

! Display information about interfaces

show ip interface 0/1 !Displays the information about the first interface

! Display information about the next interface

show ip interface 0/2

! End of the script file

Chapter 6

Quick Start up

The CLI Quick Start up details procedures to quickly become acquainted with the 7300S Series L3 Switch.

Quick Starting the Switch

1. Read the device Installation Guide for the connectivity procedure. In-band connectivity allows access to the 7300S Series L3 Switch locally or from a remote workstation. The device must be configured with IP information (IP address, subnet mask, and default gateway).
2. Turn the Power ON.
3. Allow the device to load the software until the login prompt appears. The device initial state is called the default mode.
4. When the prompt asks for operator login, execute the following steps:
 - Type the word **admin** in the login area. Since a number of the Quick Setup commands require administrator account rights, NETGEAR suggests logging into an administrator account.
 - Enter the password you have defined or simply press the enter key if it is the first time you are logging in.
 - Press the enter key two times.
 - The CLI User EXEC prompt will be displayed.
 - Use “enable” to switch to the Privileged EXEC mode from User EXEC.
 - Use “configure” to switch to the Global Config mode from Privileged EXEC.
 - Use “exit” to return to the previous mode.

System Info and System Setup

Quick Start up Software Version Information

Table 6-1. Quick Start up Software Version Information

Command	Details
<code>show hardware</code> (in Privileged EXEC)	Allows the user to see the software version the device contains
	Machine Model (The type and number of ports the device provides.)
	For example: Machine Model FSM7328S 24 = 24 10/100 ports 04 = 4 Uplink ports on front of switch

Quick Start up Physical Port Data

Table 6-2. Quick Start up Physical Port Data

Command	Details
<code>show port all</code> (in Privileged EXEC)	Displays the Ports
	slot/port
	Type - Indicates if the port is a special type of port
	Admin Mode - Selects the Port Control Administration State
	Physical Mode - Selects the desired port speed and duplex mode
	Physical Status - Indicates the port speed and duplex mode
	Link Status - Indicates whether the link is up or down
	Link Trap - Determines whether or not to send a trap when link status changes
	LACP Mode - Displays whether LACP is enabled or disabled on this port.

Quick Start up User Account Management

Table 6-3. Quick Start up User Account Management

Command	Details
<code>show users</code> (in Privileged EXEC)	Displays all of the users that are allowed to access the switch
	Access Mode - Shows whether the user is able to change parameters on the switch(Read/Write) or is only able to view then (Read Only). As a factory default, admin has Read/Write access and guest has Read Only access. There can only be one Read/Write user and up to 5 Read Only users.
<code>show login session</code> (in User EXEC)	Displays all of the login session information
<code>users passwd <username></code> (in Global Config)	Allows the user to set passwords or change passwords needed to login A prompt will appear after the command is entered requesting the users old password. In the absence of an old password leave the area blank. The operator must press enter to execute the command. The system then prompts the user for a new password then a prompt to confirm the new password. If the new password and the confirmed password match a message will be displayed. User password should not be more than eight characters in length.
<code>copy system:running-config nvram:startup-config</code> (in Privileged EXEC)	This will save passwords and all other changes to the device. If you do not save config, all configurations will be lost when a power cycle is performed on the switch or when the switch is reset
<code>logout</code> (in User EXEC and Privileged EXEC)	Logs the user out of the switch

Quick Start up IP Address

To view the network parameters the operator can access the device by the following three methods.

- Simple Network Management Protocol - SNMP
- Telnet
- Web Browser

Note: The user should do a **copy system:running-config nvram:startup-config** after configuring the network parameters so that the configurations are not lost.

Table 6-4. Quick Start-up IP Address Using Switch as Layer-2 Device

Command	Details
show network (in User EXEC)	Displays the Network Configurations
	IP Address - IP Address of the interface Default IP is 0.0.0.0
	Subnet Mask - IP Subnet Mask for the interface Default is 0.0.0.0
	Default Gateway - The default Gateway for this interface Default value is 0.0.0.0
	Burned in MAC Address - The Burned in MAC Address used for in-band connectivity
	Locally Administered MAC Address - Can be configured to allow a locally administered MAC address
	MAC Address Type - Specifies which MAC address should be used for in-band connectivity
	Network Configurations Protocol Current - Indicates which network protocol is being used Default is none
	Management VLAN Id - Specifies VLAN id
	Web Mode - Indicates whether HTTP/Web is enabled.
	Java Mode - Indicates whether java mode is enabled.
network parms (in Privileged EXEC)	network parms <ipaddr> <netmask> [<gateway>]
	IP Address range from 0.0.0.0 to 255.255.255.255
	Subnet Mask range from 0.0.0.0 to 255.255.255.255
	Gateway Address range from 0.0.0.0 to 255.255.255.255

Note: The IP address assigned to **network** in the above table will not be routable. If access to management CPU via the routable interface is desired, use the **ip** command.

Table 6-5. Quick Start-up IP Address Using Switch as Layer-3 Device

Command	Details
# vlan data base	Enter VLAN configuration mode
(vlan) # vlan routing 1	Enable VLAN routing interface, "0/2/1" created
(vlan) # exit	Exit from VLAN configuration mode
# config	Enter global configuration mode
(config) # ip routing	Enable global IP routing mode
(config) # interface 0/2/1	Enter interface configuration mode
(config) # ip address <ip addr> <netmask>	Enter desired IP address and netmask
(config) # exit	Exit from global configuration mode

Quick Start up Uploading from Switch to Out-of-Band PC (Only XMODEM)

Table 6-6. Quick Start up Uploading from Switch to Out-of-Band PC (XMODEM)

Command	Details
<pre>copy { nvram:startup-config / nvram:errorlog / nvram:msglog / nvram:traplog} <url></pre>	<p>The types are:</p> <p>config - configuration file</p> <p>errorlog - error log</p> <p>system trace - system trace</p> <p>traplog - trap log</p> <p>The URL must be specified as:</p> <p>xmodem:filepath/fileName</p>
	<p>This starts the upload and also displays the mode of uploading and the type of upload it is and confirms the upload is taking place.</p> <p>For example:</p> <p>If the user is using HyperTerminal, the user must specify where the file is going to be received by the PC.</p>

Quick Start up Downloading from Out-of-Band PC to Switch (Only XMODEM)

Table 6-7. Quick Start up Downloading from Out-of-Band PC to Switch (Only XMODEM)

Command	Details
<code>copy <url> {nvram:startup-config system:image}</code>	Sets the download datatype to be an image or config file. The URL must be specified as: xmodem:filepath/fileName
	For example: If the user is using HyperTerminal, the user must specify which file is to be sent to the switch. The Switch will restart automatically once the code has been downloaded.

Quick Start up Downloading from TFTP Server

Before starting a TFTP server download, the operator must complete the Quick Start up for the IP Address.

Table 6-8. Quick Start up Downloading from TFTP Server

Command	Details
<code>copy <url> {nvram:startup-config system:image}</code>	Sets the download datatype to be an image or config file. The URL must be specified as: tftp://ipAddr/filepath/fileName. The nvram:startup-config option downloads the config file using tftp and system:image option downloads the code file.

Quick Start up Factory Defaults

Table 6-9. Quick Start up Factory Defaults

Command	Details
<code>clear config</code>	Enter yes when the prompt pops up to clear all the configurations made to the switch.

Table 6-9. Quick Start up Factory Defaults

Command	Details
copy system:running-config nvram:startup-config	Enter yes when the prompt pops up that asks if you want to save the configurations made to the switch.
reload OR Cold Boot the Switch	Enter yes when the prompt pops up that asks if you want to reset the system. This is the users choice either reset the switch or cold boot the switch, both work effectively.

Chapter 7

Mode-based CLI

The CLI groups all the commands in appropriate modes according to the nature of the command. A sample of the CLI command modes are described below. Each of the command modes support specific 7300S Series L3 Switch commands.

- User Exec Mode
- Privileged Exec Mode
- Global Config Mode
- Vlan Mode
- Interface Config Mode
- Line Config Mode
- Policy Map Mode
- Policy Class Mode
- Class Map Mode
- Router Config RIP Mode
- DHCP Pool Configuration Mode

The Command Mode table captures the command modes, the prompts visible in that mode and the exit method from that mode.

Table 7-1. Command Mode

Command Mode	Access Method	Prompt	Exit or Access Next Mode
User Exec Mode	This is the first level of access. Perform basic tasks and list system information.	Switch>	Enter Logout command
Privileged Exec Mode	From the User Exec Mode, enter the enable command.	Switch#	To exit this mode, enter exit or press Ctrl-Z.

Table 7-1. Command Mode (continued)

Command Mode	Access Method	Prompt	Exit or Access Next Mode
VLAN Mode	From the Privileged User Exec mode, enter the vlan database command.	Switch (Vlan) #	To exit to the Privileged Exec mode, enter the exit command, or press Ctrl-Z to switch to user exec mode.
Global Config Mode	From the Privileged Exec mode, enter the configure command.	Switch (Config)#	To exit to the Privileged Exec mode, enter the exit command, or press Ctrl-Z to switch to user exec mode.
Interface Config Mode	From the Global Configuration mode, enter the interface config <slot/port> command.	Switch (Interface-"if number")#	To exit to the Global Config mode enter exit. To return to user EXEC mode enter ctrl-Z.
Line Config Mode	From the Global Configuration mode, enter the lineconfig command.	Switch (line) #	To exit to the Global Config mode enter exit. To return to User Exec mode enter ctrl-Z.
Policy Map Mode	From the Global Configuration mode, enter the policy map command.	Switch (Config-policy-map)#	To exit to the Global Config mode enter exit. To return to user EXEC mode enter ctrl-Z.
Policy Class Mode	From the Policy Map mode enter the class command.	Switch (Config-policy-classmap)#	To exit to Policy Map mode enter exit. To return to User Exec mode enter ctrl-Z.
Class Map Mode	From the Global Config mode, enter the class-map command.	Switch (Config-class-map)#	To exit to Global Config mode enter exit. To return to User Exec mode enter ctrl-Z.
Router Config RIP Mode	From the Global Config mode, enter the router rip command	Switch (Config-router)#	To exit to the Global Config mode enter exit. To return to User Exec mode enter ctrl-Z.
DHCP Pool Configuration Mode	From the Global Configuration mode, enter the ip dhcp pool <pool-name> command.	Routing (Config-dhcp-pool)	To exit to Global Configuration mode enter exit. To return to user EXEC mode, enter ctrl-Z

Mode-based Topology

The CLI tree is built on a mode concept where the commands are available according to the interface. Some of the modes are depicted in the mode-based CLI Figure 1.

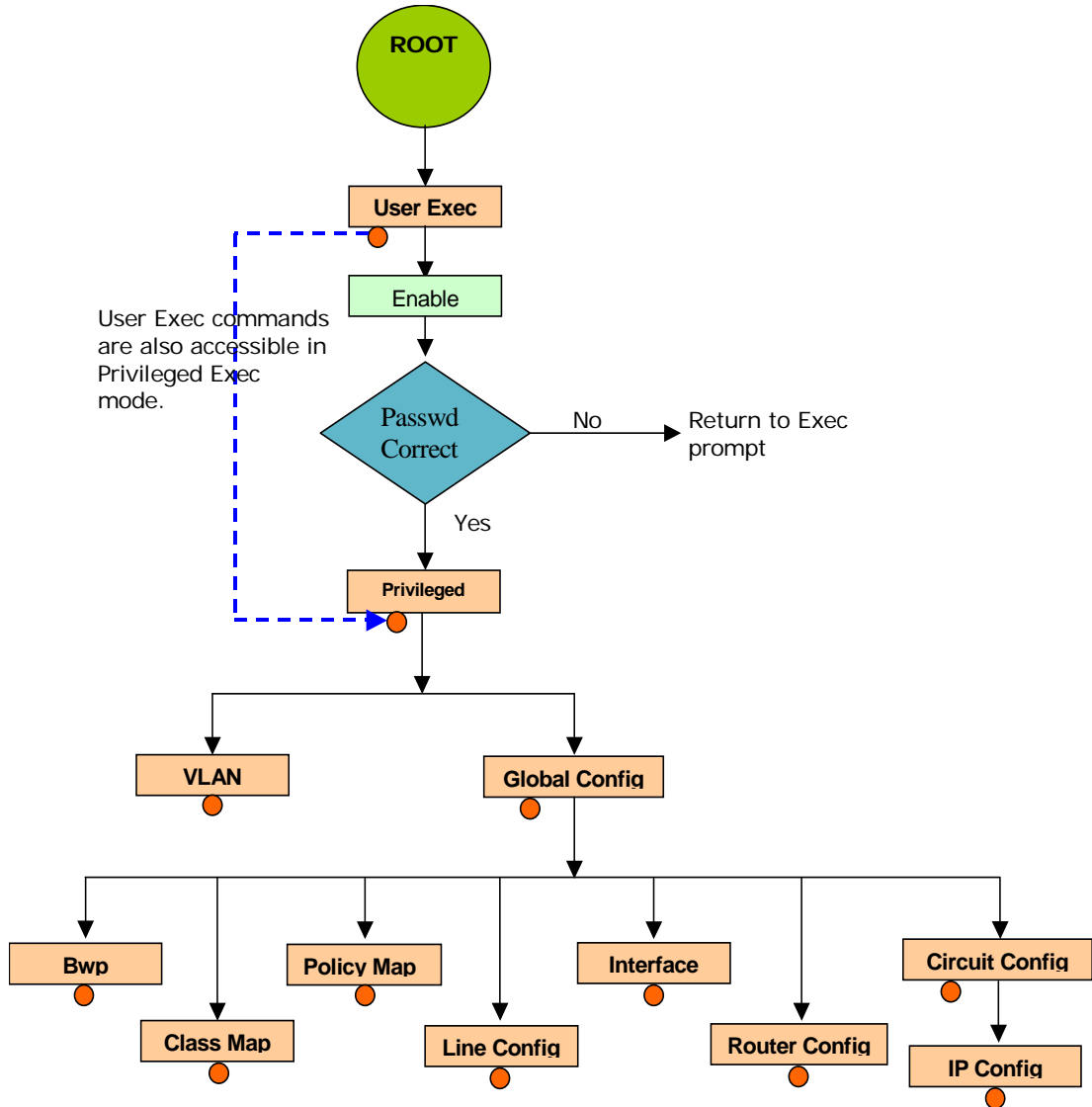


FIGURE 1. Mode-based CLI

Access to all commands in the Privileged Exec mode and below are restricted through a password.

Mode-based Command Hierarchy

The CLI is divided into various modes. The Commands in one mode are not available until the operator switches to that particular mode, with the exception of the User Exec mode commands. The User Exec mode commands may also be executed in the Privileged Exec mode.

The commands available to the operator at any point in time depend upon the mode. Entering a question mark (?) at the CLI prompt, displays a list of the available commands and descriptions of the commands.

The CLI provides the following modes:

- | | |
|-----------------------------|--|
| User Exec Mode | When the operator logs into the CLI, the User Exec mode is the initial mode. The User Exec mode contains a limited set of commands. The command prompt shown at this level is:
Command Prompt: \$(Exec)> |
| Privileged Exec Mode | To have access to the full suite of commands, the operator must enter the Privileged Exec mode. The Privileged Exec mode requires password authentication. From Privileged Exec mode, the operator can issue any Exec command or enter the Global Configuration mode. The command prompt shown at this level is:
Command Prompt: \$(Exec)# |
| Global Config Mode | This mode permits the operator to make modifications to the running configuration. General setup commands are grouped in this mode. From the Global Configuration mode, the operator can enter the System Configuration mode, the Physical Port config, the Interface Configuration mode, or the Protocol Specific modes specified below. The command prompt at this level is:
Command Prompt: \$(Config)# |

From the Global Config mode, the operator may enter the following config modes:

- | | |
|------------------------------|---|
| VLAN Mode | This mode groups all the commands pertaining to VLANs. The command prompt shown at this level is:
Command Prompt: \$(VLAN)# |
| Interface Config Mode | Many features are enabled for a particular interface. The Interface commands enable or modify the operation of an interface. |

In this mode, a physical port is set up for a specific logical connection operation. The Interface Config mode provides access to the router interface configuration commands. The command prompt at this level is:

Command Prompt: \$(Interface <slot/port>)#

The resulting prompt for the interface configuration command entered in the Global Configuration mode is shown below:

\$(Config)# interface 2/1

\$(Interface 2/1)#

Line Config Mode

This mode allows the operator to configure the console interface. The operator may configure the interface from the directly connected console or the virtual terminal used with Telnet. The command prompt at this level is:

Command Prompt: \$(Line)#

Policy Map Mode

Use the policy-map command to access the QoS policy map configuration mode to configure the QoS policy map.

\$(Config)# policy-map

Command Prompt: \$(Config policy-map)#

Policy Class Mode

Use the "class" command to access the QoS policy- classmap mode to configure the QoS policy map.

\$(Config-policy-map)# class

Command Prompt: \$(Config - policy-classmap)#

Class Map Mode

This mode consists of class creation/deletion and matching commands. The class match commands specify layer 2, layer 3 and general match criteria. Use the class-map commands to access the QoS class map configuration mode to configure QoS class maps.

\$(Config)# class map

Command Prompt: \$(Config - class)#

Router Config RIP Mode

In this mode, the operator is allowed to access the router RIP configuration commands. The command prompt at this level is:

\$(Config)# router rip

Command Prompt: \$(Config-router)#

DHCP Pool Configuration Mode Use the ip dhcp pool <pool-name> command to access the DHCP Pool Config Mode.

\$(Config)# ip dhcp pool <pool-name>

Command Prompt: (Config-dhcp-pool)#

Flow of Operation

This section captures the flow of operation for the CLI:

1. The operator logs into the CLI session and enters the User Exec mode. In the User Exec mode the \$(exec)> prompt is displayed on the screen.

The parsing process is initiated whenever the operator types a command and presses <ENTER>. The command tree is searched for the command of interest. If the command is not found, the output message indicates where the offending entry begins. For instance, command node A has the command "show arp brief" but the operator attempts to execute the command "show arpp brief" then the output message would be \$(exec)> show arpp brief^. *%Invalid input detected at '^' marker*. If the operator has given an invalid input parameter in the command, then the message conveys to the operator an invalid input was detected. The layout of the output is depicted below:

```
(exec) #show arpp brief
          ^
%Invalid input detected at '^' marker.
```

FIGURE 2. Syntax Error Message

After all the mandatory parameters are entered, any additional parameters entered are treated as optional parameters. If any of the parameters are not recognized a syntax error message will be displayed.

2. After the command is successfully parsed and validated, the control of execution goes to the corresponding CLI callback function.
3. For mandatory parameters, the command tree extends till the mandatory parameters make the leaf of the branch. The callback function is only invoked when all the mandatory parameters are provided. For optional parameters, the command tree extends till the mandatory parameters and the optional parameters make the leaf of the branch. However, the call back function is associated with the node where the mandatory parameters are fetched. The call back function then takes care of the optional parameters.
4. Once the control has reached the callback function, the callback function has complete information about the parameters entered by the operator.

“No” Form of a Command

"No" is a specific form of an existing command and does not represent a new or distinct command. Only the configuration commands are available in the "no" form. The behavior and the support details of the “no” form is captured as part of the mapping sheets. The mapping sheets are contained in the [Appendix A, “IS CLI Mapping](#) section.

Support for “No” Form

Almost every configuration command has a “no” form. In general, use the no form to reverse the action of a command or reset a value back to the default. For example, the “no shutdown interface” configuration command reverses the shutdown of an interface. Use the command without the keyword no to re-enable a disabled feature or to enable a feature that is disabled by default.

Behavior of Command Help ("?")

The "no" form is treated as a specific form of an existing command and does not represent a new or distinct command. This implies that the behavior of the "?" and help text is the same for the “no” form:

- The help message is the same for all forms of the command. The help string may be augmented with details about the "no" form behavior.
- For the (no config interface?) and (no config inte?) cases of the "?", the options displayed are identical to the case when the "no" token is not specified.

Chapter 8

Switching Commands

This chapter provides detailed explanation of the Switching commands. The commands are divided into five functional groups:

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

This chapter includes the following configuration types:

- System information and statistics commands
- System Management commands
- Device configuration commands
- User account management commands
- Security commands
- System utilities

System Information and Statistics Commands

This chapter provides a detailed explanation of the software platform commands. The commands are divided into five functional groups:

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

show arp switch

This command displays connectivity between the switch and other devices. The Address Resolution Protocol (ARP) cache identifies the MAC addresses of the IP stations communicating with the switch.

Format	<code>show arp switch</code>
Mode	Privileged EXEC
MAC Address	A unicast MAC address for which the switch has forwarding and/or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB
IP Address	The IP address assigned to each interface.
slot/port	Valid slot and port number separated by forward slashes.

show eventlog

This command displays the event log, which contains error messages from the system. The event log is not cleared on a system reset.

Format	<code>show eventlog</code>
Mode	Privileged EXEC
File	The file in which the event originated.
Line	The line number of the event
Task Id	The task ID of the event.
Code	The event code.
Time	The time this event occurred.

Note: *Event log information is retained across a switch reset.*

show hardware

This command displays inventory information for the switch.

Format	<code>show hardware</code>
Mode	Privileged EXEC
Switch Description	Text used to identify the product name of this switch.

Machine Type	Specifies the machine model as defined by the Vital Product Data.
Machine Model	Specifies the machine model as defined by the Vital Product Data.
Serial Number	The unique box serial number for this switch.
FRU Number	The field replaceable unit number.
Part Number	Manufacturing part number.
Maintenance Level	Indicates hardware changes that are significant to software.
Manufacturer	Manufacturer descriptor field.
Burned in MAC Address	Universally assigned network address.
Software Version	The release.version.revision number of the code currently running on the switch.
Operating System	The operating system currently running on the switch.
Network Processing Element	The type of the processor microcode.
Additional Packages	This displays the additional packages that are incorporated into this system, such as BGP-4 or Multicast.

show interface

This command displays a summary of statistics for a specific port or a count of all CPU traffic based upon the argument.

Format	<code>show interface {<slot/port> / switchport}</code>
Mode	<code>Privileged EXEC</code>

The display parameters, when the argument is '`<slot/port>`', is as follows :

- Packets Received Without Error** The total number of packets (including broadcast packets and multicast packets) received by the processor.
- Packets Received With Error** The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
- Broadcast Packets Received** The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.
- Packets Transmitted Without Error** The total number of packets transmitted out of the interface.

Transmit Packets Errors The number of outbound packets that could not be transmitted because of errors.

Collisions Frames The best estimate of the total number of collisions on this Ethernet segment.

Time Since Counters Last Cleared The elapsed time, in days, hours, minutes, and seconds since the statistics for this port were last cleared.

The display parameters, when the argument is 'switchport', is as follows :

Packets Received Without Error The total number of packets (including broadcast packets and multicast packets) received by the processor.

Broadcast Packets Received The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.

Packets Received With Error The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.

Packets Transmitted Without Error The total number of packets transmitted out of the interface.

Broadcast Packets Transmitted The total number of packets that higher-level protocols requested to be transmitted to the Broadcast address, including those that were discarded or not sent.

Transmit Packet Errors The number of outbound packets that could not be transmitted because of errors.

Address Entries Currently In Use The total number of Forwarding Database Address Table entries now active on the switch, including learned and static entries.

VLAN Entries Currently In Use The number of VLAN entries presently occupying the VLAN table.

Time Since Counters Last Cleared The elapsed time, in days, hours, minutes, and seconds since the statistics for this switch were last cleared.

show interface ethernet

This command displays detailed statistics for a specific port or for all CPU traffic based upon the argument.

Format `show interface ethernet {<slot/port> | switchport}`
Mode `Privileged EXEC`

The display parameters, when the argument is '<slot/port>', are as follows :

Packets Received

Octets Received - The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including Frame Check Sequence (FCS) octets). This object can be used as a reasonable estimate of ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. ----- The result of this equation is the value Utilization which is the percent utilization of the ethernet segment on a scale of 0 to 100 percent.

Packets Received < 64 Octets - The total number of packets (including bad packets) received that were < 64 octets in length (excluding framing bits but including FCS octets).

Packets Received 64 Octets - The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).

Packets Received 65-127 Octets - The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Received 128-255 Octets - The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Received 256-511 Octets - The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Received 512-1023 Octets - The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Received 1024-1518 Octets - The total number of packets (including bad packets) received that were between 1024 and

1518 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Received 1519-1522 Octets - The total number of packets (including bad packets) received that were between 1519 and 1522 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Received > 1522 Octets - The total number of packets received that were longer than 1522 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.

Packets Received Successfully

Total - The total number of packets received that were without errors.

Unicast Packets Received - The number of subnetwork-unicast packets delivered to a higher-layer protocol.

Multicast Packets Received - The total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address.

Broadcast Packets Received - The total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets.

Packets Received with MAC Errors

Total - The total number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.

Jabbers Received - The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). Note that this definition of jabber is different than the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms.

Fragments/Undersize Received - The total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets).

Alignment Errors - The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with a non-integral number of octets.

Rx FCS Errors - The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with an integral number of octets

Overruns - The total number of frames discarded as this port was overloaded with incoming packets, and could not keep up with the inflow.

Received Packets not forwarded

Total - A count of valid frames received which were discarded (i.e. filtered) by the forwarding process.

Local Traffic Frames - The total number of frames dropped in the forwarding process because the destination address was located off of this port.

802.3x Pause Frames Received - A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode.

Unacceptable Frame Type - The number of frames discarded from this port due to being an unacceptable frame type.

VLAN Membership Mismatch - The number of frames discarded on this port due to ingress filtering.

VLAN Viable Discards - The number of frames discarded on this port when a lookup on a particular VLAN occurs while that entry in the VLAN table is being modified, or if the VLAN has not been configured.

Multicast Tree Viable Discards - The number of frames discarded when a lookup in the multicast tree for a VLAN occurs while that tree is being modified.

Reserved Address Discards - The number of frames discarded that are destined to an IEEE 802.1 reserved address and are not supported by the system.

Broadcast Storm Recovery - The number of frames discarded that are destined for FF:FF:FF:FF:FF:FF when Broadcast Storm Recovery is enabled.

CFI Discards - The number of frames discarded that have CFI bit set and the addresses in RIF are in non-canonical format.

Upstream Threshold - The number of frames discarded due to lack of cell descriptors available for that packet's priority level.

Packets Transmitted Octets

Total Bytes - The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets). This object can be used as a reasonable estimate of ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. ----

Packets Transmitted 64 Octets - The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).

Packets Transmitted 65-127 Octets - The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Transmitted 128-255 Octets - The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Transmitted 256-511 Octets - The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Transmitted 512-1023 Octets - The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Transmitted 1024-1518 Octets - The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).

Packets Transmitted 1519-1522 Octets - The total number of packets (including bad packets) received that were between 1519

and 1522 octets in length inclusive (excluding framing bits but including FCS octets).

Max Info - The maximum size of the Info (non-MAC) field that this port will receive or transmit.

Packets Transmitted Successfully

Total - The number of frames that have been transmitted by this port to its segment.

Unicast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.

Multicast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to a Multicast address, including those that were discarded or not sent.

Broadcast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to the Broadcast address, including those that were discarded or not sent.

Transmit Errors

Total Errors - The sum of Single, Multiple, and Excessive Collisions.

Tx FCS Errors - The total number of packets transmitted that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with an integral number of octets

Oversized - The total number of frames that exceeded the max permitted frame size. This counter has a max increment rate of 815 counts per sec. at 10 Mb/s.

Underrun Errors - The total number of frames discarded because the transmit FIFO buffer became empty during frame transmission.

Transmit Discards

Total Discards - The sum of single collision frames discarded, multiple collision frames discarded, and excessive frames discarded.

Single Collision Frames - A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by exactly one collision.

Multiple Collision Frames - A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by more than one collision.

Excessive Collisions - A count of frames for which transmission on a particular interface fails due to excessive collisions.

Port Membership - The number of frames discarded on egress for this port due to egress filtering being enabled.

VLAN Viable Discards - The number of frames discarded on this port when a lookup on a particular VLAN occurs while that entry in the VLAN table is being modified, or if the VLAN has not been configured.

Protocol Statistics

BPDU's received - The count of BPDU's (Bridge Protocol Data Units) received in the spanning tree layer.

BPDU's Transmitted - The count of BPDU's (Bridge Protocol Data Units) transmitted from the spanning tree layer.

802.3x Pause Frames Received - A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode.

GVRP PDU's Received - The count of GVRP PDU's received in the GARP layer.

GVRP PDU's Transmitted - The count of GVRP PDU's transmitted from the GARP layer.

GVRP Failed Registrations - The number of times attempted GVRP registrations could not be completed.

GMRP PDU's received - The count of GMRP PDU's received in the GARP layer.

GMRP PDU's Transmitted - The count of GMRP PDU's transmitted from the GARP layer.

GMRP Failed Registrations - The number of times attempted GMRP registrations could not be completed.

STP BPDUs Transmitted - Spanning Tree Protocol Bridge Protocol Data Units sent

STP BPDUs Received - Spanning Tree Protocol Bridge Protocol Data Units received

RST BPDUs Transmitted - Rapid Spanning Tree Protocol Bridge Protocol Data Units sent

RSTP BPDUs Received - Rapid Spanning Tree Protocol Bridge Protocol Data Units received

MSTP BPDUs Transmitted - Multiple Spanning Tree Protocol Bridge Protocol Data Units sent

MSTP BPDUs Received - Multiple Spanning Tree Protocol Bridge Protocol Data Units received

Dot1x Statistics

EAPOL Frames Received - The number of valid EAPOL frames of any type that have been received by this authenticator.

EAPOL Frames Transmitted - The number of EAPOL frames of any type that have been transmitted by this authenticator.

Time Since Counters Last Cleared The elapsed time, in days, hours, minutes, and seconds since the statistics for this port were last cleared.

The display parameters, when the argument is 'switchport, are as follows :

Octets Received - The total number of octets of data received by the processor (excluding framing bits but including FCS octets).

Total Packets Received Without Error- The total number of packets (including broadcast packets and multicast packets) received by the processor.

Unicast Packets Received - The number of subnetwork-unicast packets delivered to a higher-layer protocol.

Multicast Packets Received - The total number of packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address.

Broadcast Packets Received - The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.

Receive Packets Discarded - The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.

Octets Transmitted - The total number of octets transmitted out of the interface, including framing characters.

Packets Transmitted without Errors - The total number of packets transmitted out of the interface.

Unicast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.

Multicast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to a Multicast address, including those that were discarded or not sent.

Broadcast Packets Transmitted - The total number of packets that higher-level protocols requested be transmitted to the Broadcast address, including those that were discarded or not sent.

Transmit Packets Discarded - The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.

Most Address Entries Ever Used - The highest number of Forwarding Database Address Table entries that have been learned by this switch since the most recent reboot.

Address Entries in Use - The number of Learned and static entries in the Forwarding Database Address Table for this switch.

Maximum VLAN Entries - The maximum number of Virtual LANs (VLANs) allowed on this switch.

Most VLAN Entries Ever Used - The largest number of VLANs that have been active on this switch since the last reboot.

Static VLAN Entries - The number of presently active VLAN entries on this switch that have been created statically.

Dynamic VLAN Entries - The number of presently active VLAN entries on this switch that have been created by GVRP registration.

VLAN Deletes - The number of VLANs on this switch that have been created and then deleted since the last reboot.

Time Since Counters Last Cleared The elapsed time, in days, hours, minutes, and seconds, since the statistics for this switch were last cleared.

show logging

This command displays the trap log maintained by the switch. The trap log contains a maximum of 256 entries that wrap.

Format	<code>show logging</code>
Mode	Privileged EXEC
Number of Traps since last reset	The number of traps that have occurred since the last reset of this device.
Number of Traps since log last displayed	The number of traps that have occurred since the traps were last displayed. Getting the traps by any method (terminal interface display, Web display, upload file from switch etc.) will result in this counter being cleared to 0.
Log	The sequence number of this trap.
System Up Time	The relative time since the last reboot of the switch at which this trap occurred.
Trap	The relevant information of this trap.
Note:	<i>Trap log information is not retained across a switch reset.</i>

show mac-addr-table

This command displays the forwarding database entries. If the command is entered with no parameter, the entire table is displayed. This is the same as entering the optional `all` parameter. Alternatively, the administrator can enter a MAC Address to display the table entry for the requested MAC address and all entries following the requested MAC address.

Format	<code>show mac-addr-table [<macaddr> all]</code>
Mode	Privileged EXEC
Mac Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 or 8 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as 8 bytes.
Slot/Port	The port which this address was learned.
if Index	This object indicates the ifIndex of the interface table entry associated with this port.
Status	The status of this entry. The meanings of the values are:

Static	The value of the corresponding instance was added by the system or a user when a static MAC filter was defined. It cannot be relearned.
Learned	The value of the corresponding instance was learned by observing the source MAC addresses of incoming traffic, and is currently in use.
Management	The value of the corresponding instance (system MAC address) is also the value of an existing instance of dot1dStaticAddress. It is identified with interface 0/1 and is currently used when enabling VLANs for routing.
Self	The value of the corresponding instance is the address of one of the switch's physical interfaces (the system's own MAC address).
GMRP Learned	The value of the corresponding was learned via GMRP and applies to Multicast.
Other	The value of the corresponding instance does not fall into one of the other categories.

show msglog

This command displays the message log maintained by the switch. The message log contains system trace information.

The trap log contains a maximum of 256 entries that wrap.

Format	<code>show msglog</code>
Mode	Privileged EXEC
Message	The message that has been logged.

Note: Message log information is not retained across a switch reset.

show running-config

This command is used to display the current setting of different protocol packages supported on switch. This command displays only those parameters, the values of which differ from default value. The output is displayed in the script format, which can be used to configure another switch with same configuration.

Format	<code>show running-config</code>
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Mode Privileged EXEC

show sysinfo

This command displays switch information.

Format	<code>show sysinfo</code>
Mode	Privileged EXEC
Switch Description	Text used to identify this switch.
System Name	Name used to identify the switch.
System Location	Text used to identify the location of the switch. May be up to 31 alpha-numeric characters. The factory default is blank.
System Contact	Text used to identify a contact person for this switch. May be up to 31 alpha-numeric characters. The factory default is blank.
System ObjectID	The base object ID for the switch's enterprise MIB.
System Up Time	The time in days, hours and minutes since the last switch reboot.
MIBs Supported	A list of MIBs supported by this agent.

snmp-server

This command sets the name and the physical location of the switch, and the organization responsible for the network. The range for name, location and contact is from 1 to 31 alphanumeric characters.

Default	none
Format	<code>snmp-server {sysname <name> location <loc> contact <con>}</code>
Mode	Global Config

System Management Commands

These commands manage the switch and show current management settings. The commands are divided into two functional groups:

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

telnet

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

Format	<code>telnet <host> [port] [debug] [line] [noecho]</code>
Modes	Privileged EXEC User EXEC

transport input telnet

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

Default	enabled
Format	<code>transport input telnet</code>
Mode	Line Config

no transport input telnet

This command disables telnet sessions. If sessions are disabled, no new telnet sessions are established.

Format	<code>no transport input telnet</code>
Mode	Line Config

transport output telnet

This command regulates new outbound telnet connections. If enabled, new outbound telnet sessions can be established until it reaches the maximum number of simultaneous outbound telnet sessions allowed. If disabled, no new outbound telnet session can be established. An established session remains active until the session is ended or an abnormal network error ends it.

Default	enabled
Format	transport output telnet
Mode	Line Config

no transport output telnet

This command disables new outbound telnet connections. If disabled, no new outbound telnet connection can be established.

Format	no transport output telnet
Mode	Line Config

session-limit

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

Default	5
Format	session-limit <0-5>
Mode	Line Config

no session-limit

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

Format	no session-limit
Mode	Line Config

session-timeout

This command sets the outbound telnet session timeout value. The timeout value unit of time is minutes. A value of 0 indicates that a session remains active indefinitely.

Default 0

Format `session-timeout <0-160>`

Mode `Line Config`

no session-timeout

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

Format `no session-timeout`

Mode `Line Config`

bridge aging-time

This command configures the forwarding database address aging timeout in seconds. In an IVL system, the [fdbid | all] parameter is required.

Default 300

Format `bridge aging-time <10-1,000,000> [fdbid | all]`

Mode `Global Config`

Seconds The <seconds> parameter must be within the range of 10 to 1,000,000 seconds.

Forwarding Database ID Fdbid (Forwarding database ID) indicates which forwarding database's aging timeout is being configured. The All option is used to configure all forwarding database's agetime.

no bridge aging-time

This command sets the forwarding database address aging timeout to 300 seconds. In an IVL system, the [fdbid | all] parameter is required.

Format `no bridge aging-time [fdbid | all]`

Mode `Global Config`

Forwarding Database ID Fdbid (Forwarding database ID) indicates which forwarding database's aging timeout is being configured. All is used to configure all forwarding database's agetime.

mtu

This command sets the maximum transmission unit (MTU) size (in bytes) for physical and port-channel (LAG) interfaces. For the standard implementation, the range of <mtusize> is a valid integer between 1522-9216.

Default	1522
Format	mtu <1522-9216>
Mode	Interface Config

no mtu

This command sets the default maximum transmission unit (MTU) size (in bytes) for the interface.

Format	no mtu
Mode	Interface Config

network javamode

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

Default	enabled
Format	network javamode
Mode	Privileged EXEC

no network javamode

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

Format	no network javamode
Mode	Privileged EXEC

network mac-address

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

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

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

Format `network mac-address <macaddr>`
Mode `Privileged EXEC`

network mac-type

This command specifies whether the burned in MAC address or the locally-administered MAC address is used.

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

no network mac-type

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

Format `no network mac-type`
Mode `Privileged EXEC`

network parms

This command sets the IP Address, subnet mask and gateway of the router. The IP Address and the gateway must be on the same subnet.

Format `network parms <ipaddr> <netmask> [<gateway>]`
Mode `Privileged EXEC`

network protocol

This command specifies the network configuration protocol to be used. If you modify this value change is effective immediately. The parameter `bootp` indicates that the switch periodically sends requests to a Bootstrap Protocol (BootP) server or a dhcp server until a response is received. `none` indicates that the switch should be manually configured with IP information.

Default	none
Format	network protocol {none bootp dhcp}
Mode	Privileged EXEC

telnetcon maxsessions

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

Default	5
Format	telnetcon maxsessions <0-5>
Mode	Privileged EXEC

no telnetcon maxsessions

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

Format	no telnetcon maxsessions
Mode	Privileged EXEC

telnetcon timeout

This command sets the telnet connection session timeout value, in minutes. A session is active as long as the session has been idle for the value set. A value of 0 indicates that a session remains active indefinitely. The time is a decimal value from 0 to 160.

Note: Changing the timeout value for active sessions does not become effective until the session is reaccessed. Any keystroke will also activate the new timeout duration.

Default	5
Format	telnetcon timeout <0-160>
Mode	Privileged EXEC

no telnetcon timeout

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

Note: Changing the timeout value for active sessions does not become effective until the session is reaccessed. Any keystroke will also activate the new timeout duration.

Format `no telnetcon timeout`

Mode `Privileged EXEC`

serial baudrate

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

Default `9600`

Format `serial baudrate {1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200}`

Mode `Line Config`

no serial baudrate

This command sets the communication rate of the terminal interface.

Format `no serial baudrate`

Mode `Line Config`

serial timeout

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

Default `5`

Format `serial timeout <0-160>`

Mode `Line Config`

no serial timeout

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

Format `no serial timeout`

Mode **Line Config**

set prompt

This command changes the name of the prompt. The length of name may be up to 64 alphanumeric characters.

Format `set prompt <prompt string>`
Mode **Privileged EXEC**

serviceport ip

This command sets the IP address, the netmask and the gateway of the router.

Format `serviceport ip <ipaddr> <netmask> [gateway]`
Mode **Privileged EXEC**

serviceport protocol

This command specifies the servicePort configuration protocol. If you modify this value, the change takes effect immediately.

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

show telnet

This command displays the current outbound telnet settings.

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

Outbound Telnet Login Timeout (in minutes) Indicates the number of minutes an outbound telnet session is allowed to remain inactive before being logged off. A value of 0, which is the default, results in no timeout.

Maximum Number of Outbound Telnet Sessions Indicates the number of simultaneous outbound telnet connections allowed.

Allow New Outbound Telnet Sessions Indicates whether outbound telnet sessions will be allowed.

show forwardingdb agetime

This command displays the timeout for address aging. In an IVL system, the [fdbid | all] parameter is required.

Default	all
Format	show forwardingdb agetime [fdbid / all]
Mode	Privileged EXEC
Forwarding DB ID	Fdbid (Forwarding database ID) indicates the forwarding database whose aging timeout is to be shown. The all option is used to display the aging timeouts associated with all forwarding databases. This field displays the forwarding database ID in an IVL system.
Agetime	In an IVL system, this parameter displays the address aging timeout for the associated forwarding database.

show network

This command displays configuration settings associated with the switch's network interface. The network interface is the logical interface used for in-band connectivity with the switch via any of the switch's front panel ports. The configuration parameters associated with the switch's network interface do not affect the configuration of the front panel ports through which traffic is switched or routed.

Format	show network
Mode	Privileged EXEC and User EXEC
IP Address	The IP address of the interface. The factory default value is 0.0.0.0
Subnet Mask	The IP subnet mask for this interface. The factory default value is 0.0.0.0
Default Gateway	The default gateway for this IP interface. The factory default value is 0.0.0.0
Burned In MAC Address	The burned in MAC address used for in-band connectivity.

Locally Administered MAC Address If desired, a locally administered MAC address can be configured for in-band connectivity. To take effect, 'MAC Address Type' must be set to 'Locally Administered'. Enter the address as twelve hexadecimal digits (6 bytes) with a colon between each byte. Bit 1 of byte 0 must be set to a 1 and bit 0 to a 0, i.e. byte 0 should have the following mask 'xxxx xx10'. The MAC address used by this bridge when it must be referred to in a unique fashion. It is recommended that this be the numerically smallest MAC address of all ports that belong to this bridge. However it is only required to be unique. When concatenated with dot1dStpPriority a unique BridgeIdentifier is formed which is used in the Spanning Tree Protocol.

MAC Address Type Specifies which MAC address should be used for in-band connectivity. The choices are the burned in or the Locally Administered address. The factory default is to use the burned in MAC address.

Network Configuration Protocol Current Indicates which network protocol is being used. The options are bootp | dhcp | none.

Java Mode Specifies if the switch should allow access to the Java applet in the header frame. Enabled means the applet can be viewed. The factory default is disabled.

Management VLAN ID Specifies the management VLAN ID.

show telnetcon

This command displays telnet settings.

Format `show telnetcon`

Mode Privileged EXEC and User EXEC

Remote Connection Login Timeout (minutes) This object indicates the number of minutes a remote connection session is allowed to remain inactive before being logged off. A zero means there will be no timeout. May be specified as a number from 0 to 160. The factory default is 5.

Maximum Number of Remote Connection Sessions This object indicates the number of simultaneous remote connection sessions allowed. The factory default is 5.

Allow New Telnet Sessions Indicates that new telnet sessions will not be allowed when set to no. The factory default value is yes.

show serial

This command displays serial communication settings for the switch.

Format	<code>show serial</code>
Mode	Privileged EXEC and User EXEC
Serial Port Login Timeout (minutes)	Specifies the time, in minutes, of inactivity on a Serial port connection, after which the Switch will close the connection. Any numeric value between 0 and 160 is allowed, the factory default is 5. A value of 0 disables the timeout.
Baud Rate	The default baud rate at which the serial port will try to connect. The available values are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 baud. The factory Default is 9600 baud.
Character Size	The number of bits in a character. The number of bits is always 8.
Flow Control	Whether Hardware Flow-Control is enabled or disabled. Hardware Flow Control is always disabled.
Stop Bits	The number of Stop bits per character. The number of Stop bits is always 1.
Parity Type	The Parity Method used on the Serial Port. The Parity Method is always None.

show serviceport

This command displays service port configuration information.

Format	<code>show serviceport</code>
Mode	Privileged EXEC
IP Address	The IP address of the interface. The factory default value is 0.0.0.0
Subnet Mask	The IP subnet mask for this interface. The factory default value is 0.0.0.0
Default Gateway	The default gateway for this IP interface. The factory default value is 0.0.0.0

ServPort Configuration Protocol Current Indicates what network protocol was used on the last, or current power-up cycle, if any.

Burned in MAC Address The burned in MAC address used for in-band connectivity.

SNMP Community Commands

show snmpcommunity

This command displays SNMP community information. Six communities are supported. You can add, change, or delete communities. The switch does not have to be reset for changes to take effect.

The SNMP agent of the switch complies with SNMP Version 1 (for more about the SNMP specification, see the SNMP RFCs). The SNMP agent sends traps through TCP/IP to an external SNMP manager based on the SNMP configuration (the trap receiver and other SNMP community parameters).

Format `show snmpcommunity`

Mode `Privileged EXEC`

SNMP Community Name The community string to which this entry grants access. A valid entry is a case-sensitive alphanumeric string of up to 16 characters. Each row of this table must contain a unique community name.

Client IP Address - An IP address (or portion thereof) from which this device will accept SNMP packets with the associated community. The requesting entity's IP address is ANDed with the Subnet Mask before being compared to the IP Address. Note: that if the Subnet Mask is set to 0.0.0.0, an IP Address of 0.0.0.0 matches all IP addresses. The default value is 0.0.0.0

Client IP Mask - A mask to be ANDed with the requesting entity's IP address before comparison with IP Address. If the result matches with IP Address then the address is an authenticated IP address. For example, if the IP Address = 9.47.128.0 and the corresponding Subnet Mask = 255.255.255.0 a range of incoming IP addresses would match, i.e. the incoming IP Address could equal 9.47.128.0 - 9.47.128.255. The default value is 0.0.0.0

Access Mode	The access level for this community string.
Status	The status of this community access entry.

show snmptrap

This command displays SNMP trap receivers. Trap messages are sent across a network to an SNMP Network Manager. These messages alert the manager to events occurring within the switch or on the network. Six trap receivers are simultaneously supported.

Format	<code>show snmptrap</code>
Mode	<code>Privileged EXEC</code>
SNMP Trap Name	The community string of the SNMP trap packet sent to the trap manager. This may be up to 16 alphanumeric characters. This string is case sensitive.
IP Address	The IP address to receive SNMP traps from this device. Enter four numbers between 0 and 255 separated by periods.
Status	A pull down menu that indicates the receiver's status (enabled or disabled) and allows the administrator/user to perform actions on this user entry: Enable - send traps to the receiver Disable - do not send traps to the receiver. Delete - remove the table entry.

show trapflags

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

Format	<code>show trapflags</code>
Mode	<code>Privileged EXEC</code>
Authentication Flag	May be enabled or disabled. The factory default is enabled. Indicates whether authentication failure traps will be sent.
Link Up/Down Flag	May be enabled or disabled. The factory default is enabled. Indicates whether link status traps will be sent.

- Multiple Users Flag** May be enabled or disabled. The factory default is enabled. Indicates whether a trap will be sent when the same user ID is logged into the switch more than once at the same time (either via telnet or serial port).
- Spanning Tree Flag** May be enabled or disabled. The factory default is enabled. Indicates whether spanning tree traps will be sent.
- Broadcast Storm Flag** May be enabled or disabled. The factory default is enabled. Indicates whether broadcast storm traps will be sent.

snmp-server community

This command adds (and names) a new SNMP community. A community name is a name associated with the switch and with a set of SNMP managers that manage it with a specified privileged level. The length of name can be up to 16 case-sensitive characters.

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

- Default** Two default community names: Public and Private. You can replace these default community names with unique identifiers for each community. The default values for the remaining four community names are blank.
- Format** `snmp-server community <name>`
- Mode** Global Config

no snmp-server community

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

- Format** `no snmp-server community <name>`
- Mode** Global Config

snmp-server community ipaddr

This command sets a client IP address for an SNMP community. The address is the associated community SNMP packet sending address and is used along with the client IP mask value to denote a range of IP addresses from which SNMP clients may use that community to access the device. A value of 0.0.0.0 allows access from any IP address. Otherwise, this value is ANDed with the mask to determine the range of allowed client IP addresses. The name is the applicable community name.

Default	0.0.0.0
Format	<code>snmp-server community ipaddr <ipaddr> <name></code>
Mode	Global Config

no snmp-server community ipaddr

This command sets a client IP address for an SNMP community to **0.0.0.0**. The name is the applicable community name.

Format	<code>no snmp-server community ipaddr <name></code>
Mode	Global Config

snmp-server community ipmask

This command sets a client IP mask for an SNMP community. The address is the associated community SNMP packet sending address and is used along with the client IP address value to denote a range of IP addresses from which SNMP clients may use that community to access the device. A value of 255.255.255.255 will allow access from only one station, and will use that machine's IP address for the client IP Address. A value of 0.0.0.0 will allow access from any IP address. The name is the applicable community name.

Default	0.0.0.0
Format	<code>snmp-server community ipmask <ipmask> <name></code>
Mode	Global Config

no snmp-server community ipmask

This command sets a client IP mask for an SNMP community to **0.0.0.0**. The name is the applicable community name. The community name may be up to 16 alphanumeric characters.

Format	<code>no snmp-server community ipmask <name></code>
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Mode Global Config

snmp-server community mode

This command activates an SNMP community. If a community is enabled, an SNMP manager associated with this community manages the switch according to its access right. If the community is disabled, no SNMP requests using this community are accepted. In this case the SNMP manager associated with this community cannot manage the switch until the Status is changed back to Enable.

Default The default private and public communities are enabled by default. The four undefined communities are disabled by default.

Format `snmp-server community mode <name>`

Mode Global Config

no snmp-server community mode

This command deactivates an SNMP community. If the community is disabled, no SNMP requests using this community are accepted. In this case the SNMP manager associated with this community cannot manage the switch until the Status is changed back to Enable.

Format `no snmp-server community mode <name>`

Mode Global Config

snmp-server community ro

This command restricts access to switch information. The access mode is read-only (also called public).

Format `snmp-server community ro <name>`

Mode Global Config

snmp-server community rw

This command restricts access to switch information. The access mode is read/write (also called private).

Format `snmp-server community rw <name>`

Mode Global Config

snmp-server enable traps

This command enables the Authentication Flag.

Default	enabled
Format	<code>snmp-server enable traps</code>
Mode	Global Config

no snmp-server enable traps

This command disables the Authentication Flag.

Format	<code>no snmp-server enable traps</code>
Mode	Global Config

snmp-server enable traps bcaststorm

This command enables the broadcast storm trap. When enabled, broadcast storm traps are sent only if the broadcast storm recovery mode setting associated with the port is enabled .

Default	enabled
Format	<code>snmp-server enable traps bcaststorm</code>
Mode	Global Config

no snmp-server enable traps bcaststorm

This command disables the broadcast storm trap. When enabled, broadcast storm traps are sent only if the broadcast storm recovery mode setting associated with the port is enabled .

Format	<code>no snmp-server enable traps bcaststorm</code>
Mode	Global Config

snmp-server enable traps linkmode

This command enables Link Up/Down traps for the entire switch. When enabled, link traps are sent only if the Link Trap flag setting associated with the port is enabled (see ‘snmp trap link-status’ command).

Default	enabled
Format	<code>snmp-server enable traps linkmode</code>

Mode Global Config

no snmp-server enable traps linkmode

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

Format no snmp-server enable traps linkmode

Mode Global Config

snmp-server enable traps multiusers

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

Default enabled

Format snmp-server enable traps multiusers

Mode Global Config

no snmp-server enable traps multiusers

This command disables Multiple User traps.

Format no snmp-server enable traps multiusers

Mode Global Config

snmp-server enable traps stpmode

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

Default enabled

Format snmp-server enable traps stpmode

Mode Global Config

no snmp-server enable traps stpmode

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

Format no snmp-server enable traps stpmode

Mode Global Config

snmptrap

This command adds an SNMP trap name. The maximum length of name is 16 case-sensitive alphanumeric characters.

Default	The default name for the six undefined community names is Delete.
Format	<code>snmptrap <name> <ipaddr></code>
Mode	Global Config

no snmptrap

This command deletes trap receivers for a community.

Format	<code>no snmptrap <name> <ipaddr></code>
Mode	Global Config

snmptrap ipaddr

This command assigns an IP address to a specified community name. The maximum length of name is 16 case-sensitive alphanumeric characters.

Note: IP addresses in the SNMP trap receiver table must be unique. If you make multiple entries using the same IP address, the first entry is retained and processed. All duplicate entries are ignored.

Format	<code>snmptrap ipaddr <name> <ipaddrold> <ipaddrnew></code>
Mode	Global Config

snmptrap mode

This command activates or deactivates an SNMP trap. Enabled trap receivers are active (able to receive traps). Disabled trap receivers are inactive (not able to receive traps).

Format	<code>snmptrap mode <name> <ipaddr></code>
Mode	Global Config

no snmptrap mode

This command deactivates an SNMP trap. Disabled trap receivers are inactive (not able to receive traps).

Format `no snmptrap mode <name> <ipaddr>`
Mode Global Config

snmp trap link-status

This command enables link status traps by interface.

Note: This command is valid only when the Link Up/Down Flag is enabled. See ‘snmp-server enable traps linkmode’ command.

Format `snmp trap link-status`
Mode Interface Config

no snmp trap link-status

This command disables link status traps by interface.

Note: This command is valid only when the Link Up/Down Flag is enabled. See ‘snmp-server enable traps linkmode’ command).

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

snmp trap link-status all

This command enables link status traps for all interfaces.

Note: This command is valid only when the Link Up/Down Flag is enabled (see “snmp-server enable traps linkmode”).

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

no snmp trap link-status all

This command disables link status traps for all interfaces.

Note: This command is valid only when the Link Up/Down Flag is enabled (see “snmp-server enable traps linkmode”).

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

Management VLAN Command

This command is used to set the Management VLAN.

network mgmt_vlan

This command configures the Management VLAN ID.

Default	1
Format	network mgmt_vlan <1-4094>
Mode	Privileged EXEC

System Configuration Commands

This chapter provides a detailed explanation of the System configuration commands. The commands are divided into two functional groups:

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

addport

This command adds one port to the port-channel (LAG). The first interface is a logical slot and port number of a configured port-channel.

Note: Before adding a port to a port-channel, set the physical mode of the port. See ‘speed’ command.

Format	addport <logical slot/port>
Mode	Interface Config

auto-negotiate

This command enables automatic negotiation on a port. The default value is enable.

Format	auto-negotiate
---------------	----------------

Mode `Interface Config`

no auto-negotiate

This command disables automatic negotiation on a port.

Note: Automatic sensing is disabled when automatic negotiation is disabled.

Format `no auto-negotiate`

Mode `Interface Config`

auto-negotiate all

This command enables automatic negotiation on all ports. The default value is enable.

Format `auto-negotiate all`

Mode `Global Config`

no auto-negotiate all

This command disables automatic negotiation on all ports.

Format `no auto-negotiate all`

Mode `Global Config`

deleteport (Interface Config)

This command deletes the port from the port-channel (LAG). The interface is a logical unit, slot and port slot and port number of a configured port-channel.

Format `deleteport <logical slot/port>`

Mode `Interface Config`

deleteport (Global Config)

This command deletes all configured ports from the port-channel (LAG). The interface is a logical unit, slot and port slot and port number of a configured port-channel.

Format `deleteport {<logical slot/port> | all}`

Mode `Global Config`

macfilter

This command adds a static MAC filter entry for the MAC address <macaddr> on the VLAN <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The restricted MAC Addresses are: 00:00:00:00:00:00, 01:80:C2:00:00:00 to 01:80:C2:00:00:0F, 01:80:C2:00:00:20 to 01:80:C2:00:00:21, and FF:FF:FF:FF:FF:FF.

The <vlanid> parameter must identify a valid VLAN.

Up to 100 static MAC filters may be created.

Format	<code>macfilter <macaddr> <vlanid></code>
Mode	Global Config

no macfilter

This command removes all filtering restrictions and the static MAC filter entry for the MAC address <macaddr> on the VLAN <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format	<code>no macfilter <macaddr> <vlanid></code>
Mode	Global Config

macfilter adddest

This command adds the interface to the destination filter set for the MAC filter with the given <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format	<code>macfilter adddest <macaddr> <vlanid></code>
Mode	Interface Config

no macfilter adddest

This command removes a port from the destination filter set for the MAC filter with the given <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format	<code>no macfilter adddest <macaddr> <vlanid></code>
Mode	<code>Interface Config</code>

macfilter adddest all

This command adds all interfaces to the destination filter set for the MAC filter with the given <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format	<code>macfilter adddest {all / <macaddr> <vlanid>}</code>
Mode	<code>Global Config</code>

no macfilter adddest all

This command removes all ports from the destination filter set for the MAC filter with the given <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format	<code>no macfilter adddest [all / <macaddr> <vlanid>}</code>
Mode	<code>Global Config</code>

macfilter addsrc

This command adds the interface to the source filter set for the MAC filter with the MAC address of <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format	<code>macfilter addsrc <macaddr> <vlanid></code>
---------------	--

Mode **Interface Config**

no macfilter addsrc

This command removes a port from the source filter set for the MAC filter with the MAC address of <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format `no macfilter addsrc <macaddr> <vlanid>`

Mode **Interface Config**

macfilter addsrc all

This command adds all interfaces to the source filter set for the MAC filter with the MAC addressf <macaddr> and <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The <vlanid> parameter must identify a valid VLAN.

Format `macfilter addsrc {all | <macaddr> <vlanid> }`

Mode **Global Config**

no macfilter addsrc all

This command removes all interfaces to the source filter set for the MAC filter with the MAC address of <macaddr> and VLAN of <vlanid>. The <macaddr> parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The <vlanid> parameter must identify a valid VLAN.

Format `no macfilter addsrc {all | <macaddr> <vlanid> }`

Mode **Global Config**

monitor session

This command configures a probe port and a monitored port for monitor session (port monitoring). The first slot/port is the source monitored port and the second slot/port is the destination probe port. If this command is executed while port monitoring is enabled, it will have the effect of changing the probe and monitored port values.

Format	<code>monitor session source <slot/port> <destination> <slot/port></code>
Mode	Global Config

no monitor session

This command removes the monitor session (port monitoring) designation from both the source probe port and the destination monitored port and removes the probe port from all VLANs. The port must be manually re-added to any desired VLANs.

Format	<code>no monitor session</code>
Mode	Global Config

monitor session mode

This command configures the monitor session (port monitoring) mode to enable. The probe and monitored ports must be configured before monitor session (port monitoring) can be enabled. If enabled, the probe port will monitor all traffic received and transmitted on the physical monitored port. It is not necessary to disable port monitoring before modifying the probe and monitored ports.

Default	disabled
Format	<code>monitor session mode</code>
Mode	Global Config

no monitor session mode

This command sets the monitor session (port monitoring) mode to disable.

Format	<code>no monitor session mode</code>
Mode	Global Config

shutdown

This command disables a port.

Default	enabled
Format	<code>shutdown</code>
Mode	Interface Config

no shutdown

This command enables a port.

Format	<code>no shutdown</code>
Mode	<code>Interface Config</code>

shutdown all

This command disables all ports.

Default	<code>enabled</code>
Format	<code>shutdown all</code>
Mode	<code>Global Config</code>

no shutdown all

This command enables all ports.

Format	<code>no shutdown all</code>
Mode	<code>Global Config</code>

speed

This command sets the speed and duplex setting for the interface.

Format	<code>speed {<100 / 10> <half-duplex / full-duplex>}</code>
Mode	<code>Interface Config</code>

Acceptable values are:

100h	100BASE-T half duplex
100f	100BASE-T full duplex
10h	10BASE-T half duplex
10f	10BASE-T full duplex

speed all

This command sets the speed and duplex setting for all interfaces.

Format `speed all {<100 / 10> <half-duplex / full-duplex>}`
Mode `Global Config`

Acceptable values are:

100h 100BASE-T half-duplex
100f 100BASE-T full duplex
10h 10BASE-T half duplex
10f 10BASE-T full duplex

storm-control broadcast

This command enables broadcast storm recovery mode. If the mode is enabled, broadcast storm recovery with high and low thresholds is implemented.

The threshold implementation follows a percentage pattern. If the broadcast traffic on any Ethernet port exceeds the high threshold percentage (as represented in [Table 1](#)) of the link speed, the switch discards the broadcasts traffic until the broadcast traffic returns to the low threshold percentage or less. The full implementation is depicted in the [Table 1](#).

Table 1. Broadcast Storm Recovery Thresholds

Link Speed	High	Low
10M	20	10
100M	5	2
1000M	5	2

Format `storm-control broadcast`
Mode `Global Config`

no storm-control broadcast

This command disables broadcast storm recovery mode.

The threshold implementation follows a percentage pattern. If the broadcast traffic on any Ethernet port exceeds the high threshold percentage (as represented in [Table 2](#)) of the link speed, the switch discards the broadcasts traffic until the broadcast traffic returns to the low threshold percentage or less. The full implementation is depicted in the [Table 2](#).

Table 2. Broadcast Storm Recovery Thresholds

Link Speed	High	Low
10M	20	10
100M	5	2
1000M	5	2

Format `no storm-control broadcast`

Mode `Global Config`

storm-control flowcontrol

This command enables 802.3x flow control for the switch.

Note: This command only applies to full-duplex mode ports.

Default `disabled`

Format `storm-control flowcontrol`

Mode `Global Config`

no storm-control flowcontrol

This command disables 802.3x flow control for the switch.

Note: This command only applies to full-duplex mode ports.

Format `no storm-control flowcontrol`

Mode `Global Config`

show mac-address-table multicast

This command displays the Multicast Forwarding Database (MFDB) information. If the command is entered with no parameter, the entire table is displayed. This is the same as entering the optional *all* parameter. The user can display the table entry for one MAC Address by specifying the MAC address as an optional parameter.

Format `show mac-address-table multicast <macaddr / all>`

Mode `Privileged EXEC`

Mac Address A multicast MAC address for which the switch has forwarding and or filtering information. The format is two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as a MAC address and VLAN ID combination of 8 bytes.

Type	This displays the type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Component	The component that is responsible for this entry in the Multicast Forwarding Database. Possible values are IGMP Snooping, GMRP, and Static Filtering.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).
Forwarding Interfaces	The resultant forwarding list is derived from combining all the component's forwarding interfaces and removing the interfaces that are listed as the static filtering interfaces.

show mac-address-table static

This command displays the Static MAC Filtering information for all Static MAC Filters. If <all> is selected, all the Static MAC Filters in the system are displayed. If a macaddr is entered, a vlan must also be entered and the Static MAC Filter information will be displayed only for that MAC address and VLAN.

Format	<code>show mac-address-table static {<macaddr> <vlanid> / all}</code>
Mode	Privileged EXEC
MAC Address	Is the MAC Address of the static MAC filter entry.
VLAN ID	Is the VLAN ID of the static MAC filter entry.
Source Port(s)	Indicates the source port filter set's slot and port(s).
Destination Port(s)	Indicates the destination port filter set's slot and port(s).

show mac-address-table staticfiltering

This command displays the Static Filtering entries in the Multicast Forwarding Database (MFDB) table.

Format	<code>show mac-address-table staticfiltering</code>
Mode	Privileged EXEC
Mac Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 or 8 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as 8 bytes.

Type	This displays the type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

show mac-address-table stats

This command displays the Multicast Forwarding Database (MFDB) statistics.

Format	<code>show mac-address-table stats</code>
Mode	<code>Privileged EXEC</code>

Total Entries This displays the total number of entries that can possibly be in the Multicast Forwarding Database table.

Most MFDB Entries Ever Used This displays the largest number of entries that have been present in the Multicast Forwarding Database table. This value is also known as the MFDB high-water mark.

Current Entries This displays the current number of entries in the Multicast Forwarding Database table.

show monitor

This command displays the Port monitoring information for the system.

Format	<code>show monitor</code>
Mode	<code>Privileged EXEC</code>

Port Monitor Mode indicates whether the Port Monitoring feature is enabled or disabled. The possible values are enable and disable.

Probe Port slot/port is the slot/port configured as the probe port. If this value has not been configured, 'Not Configured' will be displayed.

Monitored Port slot/port is the slot/port configured as the monitored port. If this value has not been configured, 'Not Configured' will be displayed.

show port

This command displays port information.

Format	<code>show port {<slot/port> / all}</code>
Mode	Privileged EXEC
Slot/Port	Valid slot and port number separated by forward slashes.
Type	If not blank, this field indicates that this port is a special type of port. The possible values are: Mon - this port is a monitoring port. Look at the Port Monitoring screens to find out more information. Lag - this port is a member of a port-channel (LAG). Probe - this port is a probe port.
Admin Mode	Selects the Port control administration state. The port must be enabled in order for it to be allowed into the network. - May be enabled or disabled. The factory default is enabled.
Physical Mode	Selects the desired port speed and duplex mode. If auto-negotiation support is selected, then the duplex mode and speed will be set from the auto-negotiation process. Note that the port's maximum capability (full duplex -100M) will be advertised. Otherwise, this object will determine the port's duplex mode and transmission rate. The factory default is Auto.
Physical Status	Indicates the port speed and duplex mode.
Link Status	Indicates whether the Link is up or down.
Link Trap	This object determines whether or not to send a trap when link status changes. The factory default is enabled.
LACP Mode	Displays whether LACP is enabled or disabled on this port.

show port protocol

This command displays the Protocol-Based VLAN information for either the entire system, or for the indicated Group.

Format	<code>show port protocol <groupid / all></code>
Mode	Privileged EXEC
Group Name	This field displays the group name of an entry in the Protocol-based VLAN table.
Group ID	This field displays the group identifier of the protocol group.
Protocol(s)	This field indicates the type of protocol(s) for this group.

VLAN	This field indicates the VLAN associated with this Protocol Group.
Interface(s)	This field lists the slot/port interface(s) that are associated with this Protocol Group.

show storm-control

This command displays switch configuration information.

Format	<code>show storm-control</code>
Mode	Privileged EXEC
Broadcast Storm Recovery Mode	May be enabled or disabled. The factory default is disabled.
802.3x Flow Control Mode	May be enabled or disabled. The factory default is disabled.

Virtual LAN (VLAN) Commands

vlan

This command creates a new VLAN and assigns it an ID. The ID is a valid VLAN identification number (ID 1 is reserved for the default VLAN). VLAN range is 2-4094.

Format	<code>vlan <2-4094></code>
Mode	VLAN database

no vlan

This command deletes an existing VLAN. The ID is a valid VLAN identification number (ID 1 is reserved for the default VLAN). VLAN range is 2-4094.

Format	<code>no vlan <2-4094></code>
Mode	VLAN database

vlan acceptframe

This command sets the frame acceptance mode per interface. For VLAN Only mode, untagged frames or priority frames received on this interface are discarded. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Default	admit all
Format	<code>vlan acceptframe <vlanonly / all></code>
Mode	Interface Config

no vlan acceptframe

This command sets the frame acceptance mode per interface to **Admit All**. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Format	<code>vlan acceptframe <vlanonly / all></code>
Mode	Interface Config

vlan ingressfilter

This command enables ingress filtering. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Default	disabled
Format	<code>vlan ingressfilter</code>
Mode	Interface Config

no vlan ingressfilter

This command disables ingress filtering. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Format	<code>no vlan ingressfilter</code>
Mode	Interface Config

vlan makestatic

This command changes a dynamically created VLAN (one that is created by GVRP registration) to a static VLAN (one that is permanently configured and defined). The ID is a valid VLAN identification number. VLAN range is 2-4094.

Format `vlan makestatic <2-4094>`

Mode `VLAN database`

vlan name

This command changes the name of a VLAN. The name is an alphanumeric string of up to 32 characters, and the ID is a valid VLAN identification number. ID range is 1-4094.

Default The name for VLAN ID 1 is always Default. The name for other VLANs is defaulted to a blank string.

Format `vlan name <2-4094> <name>`

Mode `VLAN database`

no vlan name

This command sets the name of a VLAN to a blank string. The VLAN ID is a valid VLAN identification number. ID range is 1-4094.

Format `no vlan name <2-4094>`

Mode `VLAN database`

vlan participation

This command configures the degree of participation for a specific interface in a VLAN. The ID is a valid VLAN identification number, and the interface is a valid interface number .

Format `vlan participation <exclude / include / auto> <1-4094>`

Mode `Interface Config`

Participation options are:

include The interface is always a member of this VLAN. This is equivalent to registration fixed.

- exclude** The interface is never a member of this VLAN. This is equivalent to registration forbidden.
- auto** The interface is dynamically registered in this VLAN by GVRP. The interface will not participate in this VLAN unless a join request is received on this interface. This is equivalent to registration normal.

vlan participation all

This command configures the degree of participation for all interfaces in a VLAN. The ID is a valid VLAN identification number.

- Format** `vlan participation all <exclude / include / auto> <1-4094>`
- Mode** Global Config

Participation options are:

- include** The interface is always a member of this VLAN. This is equivalent to registration fixed.
- exclude** The interface is never a member of this VLAN. This is equivalent to registration forbidden.
- auto** The interface is dynamically registered in this VLAN by GVRP. The interface will not participate in this VLAN unless a join request is received on this interface. This is equivalent to registration normal.

vlan port acceptframe all

This command sets the frame acceptance mode for all interfaces. For VLAN Only mode, untagged frames or priority frames received on this interface are discarded. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

- Default** admit all
- Format** `vlan port acceptframe all <vlanonly / all>`
- Mode** Global Config

no vlan port acceptframe all

This command sets the frame acceptance mode for all interfaces to **Admit All**. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Format	<code>no vlan port acceptframe all</code>
Mode	Global Config

vlan port ingressfilter all

This command enables ingress filtering for all ports. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Default	disabled
Format	<code>vlan port ingressfilter all</code>
Mode	Global Config

no vlan port ingressfilter all

This command disables ingress filtering for all ports. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Format	<code>no vlan port ingressfilter all</code>
Mode	Global Config

vlan port pvid all

This command changes the VLAN ID for all interface.

Default	1
Format	<code>vlan port pvid all <1-4094></code>
Mode	Global Config

no vlan port pvid all

This command sets the VLAN ID for all interfaces to 1.

Format `no vlan port pvid all`
Mode `Global Config`

vlan port tagging all

This command configures the tagging behavior for all interfaces in a VLAN to enabled. If tagging is enabled, traffic is transmitted as tagged frames. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format `vlan port tagging all <1-4094>`
Mode `Global Config`

no vlan port tagging all

This command configures the tagging behavior for all interfaces in a VLAN to disabled. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format `no vlan port tagging all`
Mode `Global Config`

vlan protocol group

This command adds protocol-based VLAN group to the system. The *<groupName>* is a character string of 1 to 16 characters. When it is created, the protocol group will be assigned a unique number that will be used to identify the group in subsequent commands.

Format `vlan protocol group <groupname>`
Mode `Global Config`

vlan protocol group add protocol

This command adds the *<protocol>* to the protocol-based VLAN identified by *<groupid>*. A group may have more than one protocol associated with it. Each interface and protocol combination can only be associated with one group. If adding a protocol to a group causes any conflicts with interfaces currently associated with the group, this command will fail and the protocol will not be added to the group. The possible values for protocol are *ip*, *arp*, and *ipx*.

Default `none`
Format `vlan protocol group add protocol <groupid> <protocol>`

Mode Global Config

no vlan protocol group add protocol

This command removes the `<protocol>` from this protocol-based VLAN group that is identified by this `<groupid>`. The possible values for protocol are `ip`, `arp`, and `ipx`.

Format no vlan protocol group add protocol `<groupid>` `<protocol>`

Mode Global Config

vlan protocol group remove

This command removes the protocol-based VLAN group that is identified by this `<groupid>`.

Format vlan protocol group remove `<groupid>`

Mode Global Config

protocol group

This command attaches a `<vlanid>` to the protocol-based VLAN identified by `<groupid>`. A group may only be associated with one VLAN at a time, however the VLAN association can be changed.

The referenced VLAN should be created prior to the creation of the protocol-based VLAN except when GVRP is expected to create the VLAN.

Default none

Format protocol group `<groupid>` `<vlanid>`

Mode VLAN database

no protocol group

This command removes the `<vlanid>` from this protocol-based VLAN group that is identified by this `<groupid>`.

Format no protocol group `<groupid>` `<vlanid>`

Mode VLAN database

protocol vlan group

This command adds the physical <slot/port> interface to the protocol-based VLAN identified by <groupid>. A group may have more than one interface associated with it. Each interface and protocol combination can only be associated with one group. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command will fail and the interface(s) will not be added to the group.

The referenced VLAN should be created prior to the creation of the protocol-based VLAN except when GVRP is expected to create the VLAN.

Default	none
Format	<code>protocol vlan group <groupid></code>
Mode	Interface Config

no protocol vlan group

This command removes the <interface> from this protocol-based VLAN group that is identified by this <groupid>. If <all> is selected, all ports will be removed from this protocol group.

Format	<code>no protocol vlan group <groupid></code>
Mode	Interface Config

protocol vlan group all

This command adds all physical interfaces to the protocol-based VLAN identified by <groupid>. A group may have more than one interface associated with it. Each interface and protocol combination can only be associated with one group. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command will fail and the interface(s) will not be added to the group.

The referenced VLAN should be created prior to the creation of the protocol-based VLAN except when GVRP is expected to create the VLAN.

Default	none
Format	<code>protocol vlan group all <groupid></code>
Mode	Global Config

no protocol vlan group all

This command removes all interfaces from this protocol-based VLAN group that is identified by this <groupid>.

Format `no protocol vlan group all <groupid>`
Mode `Global Config`

vlan pvid

This command changes the VLAN ID per interface.

Default `1`
Format `vlan pvid <1-4094>`
Mode `Interface Config`

no vlan pvid

This command sets the VLAN ID per interface to 1.

Format `no vlan pvid`
Mode `Interface Config`

vlan tagging

This command configures the tagging behavior for a specific interface in a VLAN to enabled. If tagging is enabled, traffic is transmitted as tagged frames. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format `vlan tagging <1-4094>`
Mode `Interface Config`

no vlan tagging

This command configures the tagging behavior for a specific interface in a VLAN to disabled. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format `no vlan tagging <1-4094>`
Mode `Interface Config`

show vlan

This command displays detailed information, including interface information, for a specific VLAN. The ID is a valid VLAN identification number

Format	<code>show vlan <vlanid></code>
Mode	Privileged EXEC and User EXEC
VLAN ID	There is a VLAN Identifier (VID) associated with each VLAN. The range of the VLAN ID is 1 to 4094.
VLAN Name	A string associated with this VLAN as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always has a name of `Default`. This field is optional.
VLAN Type	Type of VLAN, which can be Default, (VLAN ID = 1), a static (one that is configured and permanently defined), or Dynamic (one that is created by GVRP registration).
Slot/Port	Valid slot and port number separated by forward slashes. It is possible to set the parameters for all ports by using the selectors on the top line.
Current	Determines the degree of participation of this port in this VLAN. The permissible values are: Include - This port is always a member of this VLAN. This is equivalent to registration fixed in the IEEE 802.1Q standard. Exclude - This port is never a member of this VLAN. This is equivalent to registration forbidden in the IEEE 802.1Q standard. Autodetect - Specifies to allow the port to be dynamically registered in this VLAN via GVRP. The port will not participate in this VLAN unless a join request is received on this port. This is equivalent to registration normal in the IEEE 802.1Q standard.
Configured	Determines the configured degree of participation of this port in this VLAN. The permissible values are: Include - This port is always a member of this VLAN. This is equivalent to registration fixed in the IEEE 802.1Q standard. Exclude - This port is never a member of this VLAN. This is equivalent to registration forbidden in the IEEE 802.1Q standard. Autodetect - Specifies to allow the port to be dynamically registered in this VLAN via GVRP. The port will not participate in this VLAN unless a join request is received on this port. This is equivalent to registration normal in the IEEE 802.1Q standard.
Tagging	Select the tagging behavior for this port in this VLAN. Tagged - specifies to transmit traffic for this VLAN as tagged frames.

Untagged - specifies to transmit traffic for this VLAN as untagged frames.

show vlan brief

This command displays a list of all configured VLANs.

Format	<code>show vlan brief</code>
Mode	Privileged EXEC and User EXEC
VLAN ID	There is a VLAN Identifier (vlanid) associated with each VLAN. The range of the VLAN ID is 1 to 4094.
VLAN Name	A string associated with this VLAN as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always has a name of `Default`. This field is optional.
VLAN Type	Type of VLAN, which can be Default, (VLAN ID = 1), a static (one that is configured and permanently defined), or a Dynamic (one that is created by GVRP registration).

show vlan port

This command displays VLAN port information.

Format	<code>show vlan port {<slot/port> / all}</code>
Mode	Privileged EXEC and User EXEC
Slot/Port	Valid slot and port number separated by forward slashes. It is possible to set the parameters for all ports by using the selectors on the top line.
Port VLAN ID	The VLAN ID that this port will assign to untagged frames or priority tagged frames received on this port. The value must be for an existing VLAN. The factory default is 1.
Acceptable Frame Types	Specifies the types of frames that may be received on this port. The options are 'VLAN only' and 'Admit All'. When set to 'VLAN only', untagged frames or priority tagged frames received on this port are discarded. When set to 'Admit All', untagged frames or priority tagged frames received on this port are accepted and assigned the value of the Port VLAN ID for this

- port. With either option, VLAN tagged frames are forwarded in accordance to the 802.1Q VLAN specification.
- Ingress Filtering** May be enabled or disabled. When enabled, the frame is discarded if this port is not a member of the VLAN with which this frame is associated. In a tagged frame, the VLAN is identified by the VLAN ID in the tag. In an untagged frame, the VLAN is the Port VLAN ID specified for the port that received this frame. When disabled, all frames are forwarded in accordance with the 802.1Q VLAN bridge specification. The factory default is disabled.
- GVRP** May be enabled or disabled.
- Default Priority** The 802.1p priority assigned to tagged packets arriving on the port.

System Utility Commands

This section describes system utilities. The commands are divided into two functional groups:

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

traceroute

This command is used to discover the routes that packets actually take when traveling to their destination through the network on a hop-by-hop basis. <ipaddr> should be a valid IP address. [port] should be a valid decimal integer in the range of 0(zero) to 65535. The default value is 33434.

The optional port parameter is the UDP port used as the destination of packets sent as part of the traceroute. This port should be an unused port on the destination system.

Format `traceroute <ipaddr> [port]`
Mode `Privileged EXEC`

clear config

This command resets the configuration to the factory defaults without powering off the switch. The switch is automatically reset when this command is processed. You are prompted to confirm that the reset should proceed.

Format	<code>clear config</code>
Mode	Privileged EXEC

clear counters

This command clears the stats for a specified <slot/port> or for all the ports or for the entire switch based upon the argument.

Format	<code>clear counters {<slot/port> / all}</code>
Mode	Privileged EXEC

clear igmpsnooping

This command clears the tables managed by the IGMP Snooping function and will attempt to delete these entries from the Multicast Forwarding Database.

Format	<code>clear igmpsnooping</code>
Mode	Privileged EXEC

clear pass

This command resets all user passwords to the factory defaults without powering off the switch. You are prompted to confirm that the password reset should proceed.

Format	<code>clear pass</code>
Mode	Privileged EXEC

enable passwd

This command changes the Privileged EXEC password. First type the command then hit the enter or the return key.

Format	<code>enable passwd</code>
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Mode Privileged EXEC

clear port-channel

This command clears all port-channels (LAGs).

Format clear port-channel

Mode Privileged EXEC

clear traplog

This command clears the trap log.

Format clear traplog

Mode Privileged EXEC

clear vlan

This command resets VLAN configuration parameters to the factory defaults.

Format clear vlan

Mode Privileged EXEC

logout

This command closes the current telnet connection or resets the current serial connection.

Note: *Save configuration changes before logging out.*

Format logout

Mode Privileged EXEC

ping

This command checks if another computer is on the network and listens for connections. To use this command, configure the switch for network (in-band) connection. The source and target devices must have the ping utility enabled and running on top of TCP/IP. The switch can be pinged from any IP workstation with which the switch is connected through the default VLAN (VLAN 1), as long as there is a physical path between the switch and the workstation. The terminal interface sends, three pings to the target station.

Format	<code>ping <ipaddr></code>
Mode	Privileged EXEC and User EXEC

reload

This command resets the switch without powering it off. Reset means that all network connections are terminated and the boot code executes. The switch uses the stored configuration to initialize the switch. You are prompted to confirm that the reset should proceed. A successful reset is indicated by the LEDs on the switch.

Format	<code>reload</code>
Mode	Privileged EXEC

copy

This command uploads and downloads to/from the switch. Local URLs can be specified using tftp or xmodem. The following can be specified as the source file for uploading from the switch: startup configuration (*nvram:startup-config*), error log (*nvram:errorlog*), message log (*nvram:msglog*), trap log (*nvram:traplog*) and configuration script(*nvram:configscript* <*scriptname*>). A URL is specified for the destination.

The command can also be used to download the startup configuration, code image or configuration script by specifying the source as a URL and destination as *nvram:startup-config*, *.system:image* or *nvram:configscript* respectively.

The <scriptname> is the name of the script file to be uploaded. During download of a configuration script the copy command will validate the script being downloaded. In case of any error, the command will list all the line at the end of validation process and confirm from user for copying the script file.

The command can be used to save the running configuration to nvram by specifying the source as *system:running-config* and the destination as *nvram:startup-config*

The command can also be used to download ssh key files as **nvram:sshkey-rsa**, **nvram:sshkey-rsa2**, and **nvram:sshkey-dsa** and http secure-server certificates as **nvram:sslpem-root**, **nvram:sslpem-server**, **nvram:sslpem-dhweak**, and **nvram:sslpem-dhstrong**.

Default	none
Format	<pre>copy nvram:startup-config <url> copy nvram:errorlog <url> copy nvram:msglog <url> copy nvram:traplog <url> copy nvram:configscript <scriptname> <url> copy <url> nvram:startup-config copy <url> system:image copy <url> nvram:configscript copy system:running-config nvram:startup-config copy <url> nvram:sslpem-root copy <url> nvram:sslpem-server copy <url> nvram:sslpem-dhweak copy <url> nvram:sslpem-dhstrong copy <url> nvram:sshkey-rsa1 copy <url> nvram:sshkey-rsa2 copy <url> nvram:sshkey-dsa copy <url> nvram:clibanner</pre>
Mode	Privileged EXEC

Pre-login Banner

This section provides a detailed explanation of the Pre-login Banner command.

copy

The `copy` command (See “copy” on page 62.) includes the “clibanner” option. This command uploads and downloads to/from the switch. Local URLs can be specified using tftp or xmodem.

Default	none
Format	copy <url> nvram:clibanner
Mode	Privileged EXEC

CLI Command Logging

This section provides a detailed explanation of the CLI Command Logging commands.

logging cli-command

This command enables the CLI command Logging feature. The Command Logging component enables the software to log all Command Line Interface (CLI) commands issued on the system.

Default	enabled
Format	logging cli-command
Mode	Global Config

no logging cli-command

Format	no logging cli-command
Mode	Global Config

Configuration Scripting

Configuration Scripting allows the user to generate text-formatted script files representing the current configuration. These configuration script files can be uploaded to a PC and edited, downloaded to the system and applied to the system. Configuration scripts can be applied to one or more switches with no/minor modifications.

Use the **show running-config** command (See “show running-config” on page 66.) to capture the running configuration into a script. Use the **copy** command (See “copy” on page 62.) to transfer the configuration script to/from the switch.

Note:

- The file extension must be “.scr”.
- A maximum of ten scripts are allowed on the switch.
- The combined size of all script files on the switch shall not exceed 500 KB.

configscript apply

This command applies the commands in the configuration script to the switch. The apply command backs up the running configuration and then starts applying the commands in the script file. Application of the commands stops at the first failure of a command. The <scriptname> parameter is the name of the script to be applied.

Format `configscript apply <scriptname>`

Mode **Privileged EXEC**

configscript delete

This command deletes a specified script where the <scriptname> parameter is the name of the script to be deleted. The 'all' option deletes all the scripts present on the switch.

Format `configscript delete {<scriptname> | all}`

Mode **Privileged EXEC**

configscript list

This command lists all scripts present on the switch as well as the total number of files present.

Format `configscript list`

Mode **Privileged EXEC**

Configuration Script Name of the configuration script.

Size Size of the configuration script.

configscript show

This command displays the contents of a script file. The parameter <scriptname> is the name of the script file.

Format `configscript show <scriptname>`

Mode **Privileged EXEC**

The format of display is

Line <no>: <Line contents>

configscript validate

This command validates a configuration script file by parsing each line in the script file where <scriptname> is the name of the script to be validated. The validation will stop at the first failure of a command..

Format `configscript validate <scriptname>`

Mode `Privileged EXEC`

show running-config

This command is used to display/capture the current setting of different protocol packages supported on switch. This command displays/captures only commands with settings/configurations with values that differ from the default value. The output is displayed in script format, which can be used to configure another switch with the same configuration.

When a script name is provided, the output is redirected to a configuration script. The option [all] will also enable the display/capture of all commands with settings/configurations that include values that are same as the default values. If the optional <scriptname> is provided with a file name extension of “.scr”, the output will be redirected to a script file.

Format `show running-config [all] [<scriptname>]`

Mode `Privileged EXEC`

System Log (Syslog)

This section provides a detailed explanation of the Syslog commands. The commands are divided into two functional groups:

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

logging buffered

This command enables logging to in-memory log where up to 128 logs are kept. The <severitylevel> value is specified as either an integer from 0 to 7 or symbolically through one of the following keywords: emergency (0), alert (1), critical (2), error (3), warning (4), notice (5), informational (6), debug (7).

Default	<code>disabled; critical</code>
Format	<code>logging buffered [severitylevel]</code>
Mode	<code>Global Config</code>

no logging buffered

This command disables logging to in-memory log.

Format	<code>no logging buffered</code>
Mode	<code>Global Config</code>

logging buffered wrap

This command enables wrapping of in-memory logging when full capacity reached. Otherwise when full capacity is reached, logging stops.

Default	<code>wrap</code>
Format	<code>logging buffered wrap</code>
Mode	<code>Privileged EXEC</code>

no logging wrap

This command disables wrapping of in-memory logging and configures logging to stop when capacity is full.

Format	<code>no logging buffered wrap</code>
Mode	<code>Privileged EXEC</code>

logging console

This command enables logging to the console. The <severitylevel> value is specified as either an integer from 0 to 7 or symbolically through one of the following keywords: emergency (0), alert (1), critical (2), error (3), warning (4), notice (5), informational (6), debug (7).

Default	<code>disabled; critical</code>
Format	<code>logging console [severitylevel]</code>
Mode	<code>Global Config</code>

no logging console

This command disables logging to the console.

Format	<code>no logging console</code>
Mode	<code>Global Config</code>

logging history

This command enables logging of system startup and system operation logs to storage. The <severitylevel> value is specified as either an integer from 0 to 7 or symbolically through one of the following keywords: EMERGENCY (0), ALERT (1), CRITICAL (2), ERROR (3), WARNING (4), NOTICE (5), INFORMATIONAL (6), DEBUG (7).

Default	<code>enabled; severitylevel - critical</code>
Format	<code>logging history [severitylevel]</code>
Mode	<code>Global Config</code>

no logging history

This command disables logging. It does not clear the contents of the log.

Format	<code>no logging history</code>
Mode	<code>Global Config</code>

logging host

This command enables logging to a host where up to eight hosts can be configured. AddressType can be ipv4 or dns, port can be of a value from

Default	<code>Port - 514; Level - Critical;</code>
Format	<code>logging host <ipaddress> <addresstype> [port <port>] [level <severitylevel>]</code>
Mode	<code>Global Config</code>

logging host remove

This command disables logging to host. See 'show logging hosts' for a list of host indices.

Format	<code>logging host remove <hostindex></code>
Mode	Global Config

logging port

This command sets the local port number of the LOG client for logging messages. The <portid> can be in the range from 1 to 65535.

Default	514
Format	<code>logging port <portid></code>
Mode	Global Config

no logging port

This command resets the local logging port to the default.

Format	<code>no logging port</code>
Mode	Global Config

logging syslog

This command enables syslog logging.

Default	disabled; local0
Format	<code>logging syslog</code>
Mode	Global Config

no logging syslog

This command disables syslog logging.

Format	<code>no logging syslog</code>
Mode	Global Config

show logging

This command displays logging.

Format `show logging`

Mode `Privileged EXEC`

Client Local Port The port on the collector/relay to which syslog messages are sent

Console Logging Administrative Mode The mode for console logging.

Console Logging Severity Filter The minimum severity to log to the console log. Messages with an equal or lower numerical severity are logged.

Buffered Logging Administrative Mode The mode for buffered logging.

Buffered Logging Severity Filter The minimum severity to log to the buffered log. Messages with an equal or lower numerical severity are logged.

Historical Logging Administrative Mode The mode for historical logging.

Historical Logging Severity Filter The minimum severity to log to the historical log. Messages with an equal or lower numerical severity are logged.

Syslog Logging Administrative Mode The mode for logging to configured syslog hosts. If set to disable logging stops to all syslog hosts.

Log Messages Received The number of messages received by the log process. This includes messages that are dropped or ignored

Log Messages Dropped The number of messages that could not be processed.

show logging history

This command displays logging.

Format `show logging history`

Mode `Privileged EXEC`

Historical Logging Administrative Mode The mode for historical logging.

Historical Logging Severity Filter The minimum severity to log to the historical log. Messages with an equal or lower numerical severity are logged.

Log Messages: The number of messages received by the log process. This includes messages that are dropped or ignored

show logging buffered

This command displays buffered logging (system startup and system operation logs).

Format	<code>show logging buffered</code>
Mode	Privileged EXEC
Admin Status	The current state of the in-memory log.
Severity Level Filter	The minimum severity to log to the in memory log. Messages with an equal or lower numerical severity are logged.
Component Filter	The component(s) from which received messages are to be logged to the in memory log. Either a single component id or "all components" may be specified.
Wrapping Behavior	The behavior of the In Memory log when faced with a log full situation.
Log Count	The count of valid entries in the buffered log.
Log Messages:	The number of messages forwarded by the syslog function to a syslog host. Messages forwarded to multiple hosts are counted once for each host.

show logging hosts

This command displays all configured logging hosts.

Format	<code>show logging hosts</code>
Mode	Privileged EXEC
Host Index (used for deleting)	
Host IP Address	IP Address of the configured server.
Address Type	Address Type of Server.
Severity Level	The minimum severity to log to the specified address.
Port	Server Port Number. This is the port on the local host from which syslog messages are sent.

Host Status

The state of logging to configured syslog hosts. If the status is disable, no logging occurs.

Simple Network Time Protocol (SNTP)

This section provides a detailed explanation of the SNTP commands. The commands are divided into two functional groups:

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

sntp broadcast client poll-interval

This command will set the poll interval for SNTP broadcast clients in seconds as a power of two where <poll-interval> can be a value from 6 to 16.

Default	6
Format	sntp broadcast client poll-interval <poll-interval>
Mode	Global Config

no sntp broadcast client poll-interval

This command will reset the poll interval for SNTP broadcast client back to its default value.

Format	no sntp broadcast client poll-interval
Mode	Global Config

sntp client mode

This command will enable Simple Network Time Protocol (SNTP) client mode and optionally setting the mode to either broadcast, multicast, or unicast.

Default	Disabled
Format	sntp client mode [broadcast multicast unicast]
Mode	Global Config

sntp client mode

This command will disable Simple Network Time Protocol (SNTP) client mode.

Format	<code>no sntp client mode</code>
Mode	Global Config

sntp client port

This command will set the SNTP client port id to a value from 1-65535.

Default	123
Format	<code>sntp client port <portid></code>
Mode	Global Config

no sntp client port

This command will reset the SNTP client port back to its default value.

Format	<code>no sntp client port</code>
Mode	Global Config

sntp unicast client poll-interval

This command will set the poll interval for SNTP unicast clients in seconds as a power of two where <poll-interval> can be a value from 6 to 16.

Default	6
Format	<code>sntp unicast client poll-interval <poll-interval></code>
Mode	Global Config

no sntp unicast client poll-interval

This command will reset the poll interval for SNTP unicast clients to its default value.

Format	<code>no sntp unicast client poll-interval</code>
Mode	Global Config

sntp unicast client poll-timeout

This command will set the poll timeout for SNTP unicast clients in seconds to a value from 1-30.

Default	5
Format	sntp unicast client poll-timeout <poll-timeout>
Mode	Global Config

no sntp unicast client poll-timeout

This command will reset the poll timeout for SNTP unicast clients to its default value.

Format	no sntp unicast client poll-timeout
Mode	Global Config

sntp unicast client poll-retry

This command will set the poll retry for SNTP unicast clients to a value from 0 to 10.

Default	1
Format	sntp unicast client poll-retry <poll-retry>
Mode	Global Config

no sntp unicast client poll-retry

This command will reset the poll retry for SNTP unicast clients to its default value.

Format	no sntp unicast client poll-retry
Mode	Global Config

sntp multicast client poll-interval

This command will set the poll interval for SNTP multicast clients in seconds as a power of two where <poll-interval> can be a value from 6 to 16.

Default	6
Format	sntp multicast client poll-interval <poll-interval>
Mode	Global Config

no sntp multicast client poll-interval

This command will reset the poll interval for SNTP multicast clients to its default value.

Format	<code>no sntp multicast client poll-interval</code>
Mode	Global Config

sntp server

This command configures an SNTP server (with a maximum of three) where the server address can be an ip address or a domain name and the address type either ipv4 or dns. The optional priority can be a value of 1-3, the version a value of 1-4, and the port id a value of 1-65535.

Format	<code>sntp server <ipaddress/domain-name> <addresstype> [<priority> [<version> [<portid>]]]</code>
Mode	Global Config

no sntp server

This command deletes an server from the configured SNTP servers.

Format	<code>no sntp server remove <ipaddress/domain-name></code>
Mode	Global Config

show sntp

This command is used to display SNTP settings and status.

Format	<code>show sntp</code>
Mode	Privileged Exec
Last Update Time	Time of last clock update.
Last Attempt Time	Time of last transmit query (in unicast mode).
Last Attempt Status	Status of the last SNTP request (in unicast mode) or unsolicited message (in broadcast mode).
Broadcast Count	Current number of unsolicited broadcast messages that have been received and processed by the SNTP client since last reboot.

Multicast Count Current number of unsolicited multicast messages that have been received and processed by the SNTP client since last reboot

show sntp client

This command is used to display SNTP client settings.

Format	<code>show sntp client</code>
Mode	Privileged Exec
Client Supported Modes	Supported SNTP Modes (Broadcast, Unicast, or Multicast).
SNTP Version	The highest SNTP version the client supports
Port	SNTP Client Port
Client Mode:	Configured SNTP Client Mode
Poll Interval	Poll interval value for SNTP clients in seconds as a power of two.
Poll Timeout	Poll timeout value in seconds for SNTP clients.
Poll Retry	Poll retry value for SNTP clients.

show sntp server

This command is used to display SNTP server settings and configured servers.

Format	<code>show sntp server</code>
Mode	Privileged Exec
Server IP Address	IP Address of configured SNTP Server
Server Type	Address Type of Server.
Server Stratum	Claimed stratum of the server for the last received valid packet.
Server Reference ID	Reference clock identifier of the server for the last received valid packet.
Server Mode	SNTP Server mode.
Server Max Entries	Total number of SNTP Servers allowed.
Server Current Entries	Total number of SNTP configured.
<i>For each configured server:</i>	
IP Address	IP Address of configured SNTP Server.

Address Type	Address Type of configured SNTP server.
Priority	IP priority type of the configured server.
Version	SNTP Version number of the server. The protocol version used to query the server in unicast mode.
Port	Server Port Number
Last Attempt Time	Last server attempt time for the specified server.
Last Attempt Status	Last server attempt status for the server.
Total Unicast Requests	Number of requests to the server.
Failed Unicast Requests	Number of failed requests from server.

User Account Commands

These commands manage user accounts. The commands are divided into two functional groups:

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

disconnect

This command closes a telnet session.

Format	<code>disconnect {<sessionID> / all}</code>
Mode	Privileged EXEC

show loginsession

This command displays current telnet and serial port connections to the switch.

Format	<code>show loginsession</code>
Mode	Privileged EXEC
ID	Login Session ID
User Name	The name the user will use to login using the serial port or Telnet. A new user may be added to the switch by entering a name in a blank entry. The user name may be up to 8 characters, and is not

	case sensitive. Two users are included as the factory default, 'admin' and 'guest'.
Connection From	IP address of the telnet client machine or EIA-232 for the serial port connection.
Idle Time	Time this session has been idle.
Session Time	Total time this session has been connected.

show users

This command displays the configured user names and their settings. This command is only available for users with Read/Write privileges. The SNMPv3 fields will only be displayed if SNMP is available on the system.

Format	<code>show users</code>
Mode	Privileged EXEC
User Name	The name the user will use to login using the serial port, Telnet or Web. A new user may be added to the switch by entering a name in a blank entry. The user name may be up to eight characters, and is not case sensitive. Two users are included as the factory default, 'admin' and 'guest'
Access Mode	Shows whether the operator is able to change parameters on the switch (Read/Write) or is only able to view them (Read Only). As a factory default, the 'admin' user has Read/Write access and the 'guest' has Read Only access. There can only be one Read/Write user and up to five Read Only users.
SNMPv3 Access Mode	This field displays the SNMPv3 Access Mode. If the value is set to <code>ReadWrite</code> , the SNMPv3 user will be able to set and retrieve parameters on the system. If the value is set to <code>ReadOnly</code> , the SNMPv3 user will only be able to retrieve parameter information. The SNMPv3 access mode may be different than the CLI and Web access mode.
SNMPv3 Authentication	This field displays the authentication protocol to be used for the specified login user.
SNMPv3 Encryption	This field displays the encryption protocol to be used for the specified login user.

users name

This command adds a new user (account) if space permits. The account <username> can be up to eight characters in length. The name may be comprised of alphanumeric characters as well as the dash ('-') and underscore ('_'). The <username> is not case-sensitive.

Six user names can be defined.

Format	<code>users name <username></code>
Mode	<code>Global Config</code>

no users name

This command removes an operator.

Format	<code>no users name <username></code>
Mode	<code>Global Config</code>
Note:	The 'admin' user account cannot be deleted.

users passwd

This command is used to change a password. The password should not be more than eight alphanumeric characters in length. If a user is authorized for authentication or encryption is enabled, the password must be at least eight alphanumeric characters in length. The username and password are not case-sensitive. When a password is changed, a prompt will ask for the former password. If none, press enter.

Default	<i>no password</i>
Format	<code>users passwd <username></code>
Mode	<code>Global Config</code>

no users passwd

This command sets the password of an existing operator to blank. When a password is changed, a prompt will ask for the operator's former password. If none, press enter.

Format	<code>no users passwd <username></code>
Mode	<code>Global Config</code>

users snmpv3 accessmode

This command specifies the snmpv3 access privileges for the specified login user. The valid accessmode values are **readonly** or **readwrite**. The <username> is the login user name for which the specified access mode applies. The default is **readwrite** for 'admin' user; **readonly** for all other users

Default	admin -- readwrite; other -- readonly
Format	users snmpv3 accessmode <username> <readonly / readwrite>
Mode	Global Config

no users snmpv3 accessmode

This command sets the snmpv3 access privileges for the specified login user as **readwrite** for the 'admin' user; **readonly** for all other users. The <username> is the login user name for which the specified access mode will apply.

Format	no users snmpv3 accessmode <username>
Mode	Global Config

users snmpv3 authentication

This command specifies the authentication protocol to be used for the specified login user. The valid authentication protocols are **none**, **md5** or **sha**. If md5 or sha are specified, the user login password is also used as the snmpv3 authentication password and therefore must be at least eight characters in length. The <username> is the login user name associated with the authentication protocol.

Default	no authentication
Format	users snmpv3 authentication <username> <none / md5 / sha>
Mode	Global Config

no users snmpv3 authentication

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

Format	users snmpv3 authentication <username>
Mode	Global Config

users snmpv3 encryption

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

If `des` is specified, the required key may be specified on the command line. The encryption **key** must be 8 to 64 characters long. If the `des` protocol is specified but a key is not provided, the user will be prompted for the key. When using the `des` protocol, the user login password is also used as the `snmpv3` encryption password and therefore must be at least eight characters in length.

If `none` is specified, a key must not be provided. The `<username>` is the login user name associated with the specified encryption.

Default	no encryption
Format	<code>users snmpv3 encryption <username> <none des[key]></code>
Mode	Global Config

no users snmpv3 encryption

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

Format	<code>no users snmpv3 encryption <username></code>
Mode	Global Config

DHCP Server Commands

These commands configure the DHCP Server parameters and address pools. The commands are divided by functionality into these different groups:

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

client-identifier

This command specifies the unique identifier for a DHCP client. Unique-identifier is a valid notation in hexadecimal format. In some systems, such as Microsoft DHCP clients, the client identifier is required instead of hardware addresses. The unique-identifier is a concatenation of the media type and the MAC address. For example, the Microsoft client identifier for Ethernet address c819.2488.f177 is 01c8.1924.88f1.77 where 01 represents the Ethernet media type. Refer to the "Address Resolution Protocol Parameters" section of RFC 1700, Assigned Numbers for a list of media type codes.

Default	None
Format	<code>client-identifier <uniqueidentifier></code>
Mode	DHCP Pool Config

no client-identifier

This command deletes the client identifier.

Format	<code>no client-identifier</code>
Mode	DHCP Pool Config

client-name

This command specifies the name for a DHCP client. Name is a string consisting of standard ASCII characters.

Default	None
Format	<code>client-name <name></code>
Mode	DHCP Pool Config

no client-name

This command removes the client name.

Format	<code>no client-name</code>
Mode	DHCP Pool Config

default-router

This command specifies the default router list for a DHCP client. {*address1*, *address2*... *address8*} are valid IP addresses, each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	None
Format	<code>default-router <address1> [<address2>...<address8>]</code>
Mode	DHCP Pool Config

no default-router

This command removes the default router list.

Format	<code>no default-router</code>
Mode	DHCP Pool Config

dns-server

This command specifies the IP servers available to a DHCP client. Address parameters are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	<code>dns-server <address1> [<address2>...<address8>]</code>
Mode	DHCP Pool Config

no dns-server

This command removes the DNS Server list.

Format	<code>no dns-server</code>
Mode	DHCP Pool Config

hardware-address

This command specifies the hardware address of a DHCP client.

Hardware-address is the MAC address of the hardware platform of the client consisting of 6 bytes in dotted hexadecimal format.

Type indicates the protocol of the hardware platform. It is 1 for 10 MB Ethernet and 6 for IEEE 802.

Default	ethernet
Format	hardware-address <hardwareaddress> [<i>type</i>]
Mode	DHCP Pool Config

no hardware-address

This command removes the hardware address of the DHCP client.

Format	no hardware-address
Mode	DHCP Pool Config

host

This command specifies the IP address and network mask for a manual binding to a DHCP client. Address and Mask are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

The prefix-length is an integer from 0 to 32

Default	none
Format	host <address> [<i>mask</i> / <i>prefix-length</i>]
Mode	DHCP Pool Config

no host

This command removes the IP address of the DHCP client.

Format	no host
Mode	DHCP Pool Config

ip dhcp excluded-address

This command specifies the IP addresses that a DHCP server should not assign to DHCP clients. Low-address and high-address are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	ip dhcp excluded-address <lowaddress> [<i>highaddress</i>]

Mode Global Config

no ip dhcp excluded-address

This command removes the excluded IP addresses for a DHCP client. Low-address and high-address are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Format no ip dhcp excluded-address <lowaddress> [highaddress]

Mode Global Config

ip dhcp ping packets

This command is used to specify the number, in a range from 2-10, of packets a DHCP server sends to a pool address as part of a ping operation. By default the number of packets sent to a pool address is 2(the smallest allowed number when sending packets). Setting the number of packets to 0 disables this command.

Note: The no form of this command sets the number of packets sent to a pool address to 0 and therefore prevents the server from pinging pool addresses.

Default 2

Format ip dhcp ping packets <0,2-10>

Mode Global Config

no ip dhcp ping packets

This command prevents the server from pinging pool addresses and sets the number of packets to 0.

Default 0

Format no ip dhcp ping packets

Mode Global Config

ip dhcp pool

This command configures a DHCP address pool name on a DHCP server and enters DHCP pool configuration mode.

Default none

Format `ip dhcp pool <name>`
Mode `Global Config Mode`

no ip dhcp pool

This command removes the DHCP address pool. The name should be previously configured pool name.

Format `no ip dhcp pool <name>`
Mode `Global Config Mode`

lease

This command configures the duration of the lease for an IP address that is assigned from a DHCP server to a DHCP client. The overall lease time should be between 1-86400 minutes. If *infinite* is specified, lease is set for 60 days. *Days* is an integer from 0 to 59. *Hours* is an integer from 0 to 1439. *Minutes* is an integer from 0 to 86399.

Default 1 (day)
Format `lease {[<days> [hours] [minutes]] | [infinite]}`
Mode `DHCP Pool Config`

no lease

This command restores the default value of the lease time for DHCP Server.

Format `no lease`
Mode `DHCP Pool Config`

network

This command is used to configure the subnet number and mask for a DHCP address pool on the server. Network-number is a valid IP address, made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid. Mask is the IP subnet mask for the specified address pool. The prefix-length is an integer from 0 to 32.

Default none
Format `network <networknumber> [mask | prefixlength]`
Mode `DHCP Pool Config`

no network

This command removes the subnet number and mask.

Format	<code>no network</code>
Mode	DHCP Pool Config

service dhcp

This command enables the DHCP server and relay agent features on the router.

Default	disabled
Format	<code>service dhcp</code>
Mode	Global Config

no service dhcp

This command disables the DHCP server and relay agent features.

Format	<code>no service dhcp</code>
Mode	Global Config

bootfile

The command `bootfile` specifies the name of the default boot image for a DHCP client. The `<filename>` specifies the boot image file.

Default	none
Format	<code>bootfile <filename></code>
Mode	DHCP Pool Config

no bootfile

This command deletes the boot image name.

Format	<code>no bootfile</code>
Mode	DHCP Pool Config

domain-name

This command specifies the domain name for a DHCP client. The <domain> specifies the domain name string of the client.

Default	none
Format	domain-name <domain>
Mode	DHCP Pool Config

no domain-name

This command removes the domain name.

Format	no domain-name
Mode	DHCP Pool Config

ip dhcp bootp automatic

This command enables the allocation of the addresses to the bootp client. The addresses are from the automatic address pool.

Default	disable
Format	ip dhcp bootp automatic
Mode	Global Config

no ip dhcp bootp automatic

This command disables the allocation of the addresses to the bootp client. The address are from the automatic address pool.

Format	no ip dhcp bootp automatic
Mode	Global Config

ip dhcp conflict logging

This command enables conflict logging on DHCP server.

Default	enabled
Format	ip dhcp conflict logging
Mode	Global Config

no ip dhcp conflict logging

This command disables conflict logging on DHCP server.

Format	<code>no ip dhcp conflict logging</code>
Mode	Global Config

netbios-name-server

This command configures NetBIOS Windows Internet Naming Service (WINS) name servers that are available to DHCP clients.

One IP address is required, although one can specify up to eight addresses in one command line. Servers are listed in order of preference (address1 is the most preferred server, address2 is the next most preferred server, and so on).

Default	none
Format	<code>netbios-name-server <address></code> <code>[<address2>...<address8>]</code>
Mode	DHCP Pool Config

no netbios-name-server

This command removes the NetBIOS name server list.

Format	<code>no netbios-name-server</code>
Mode	DHCP Pool Config

netbios-node-type

The command configures the NetBIOS node type for Microsoft Dynamic Host Configuration Protocol (DHCP) clients. Specifies the NetBIOS node type. Valid types are:

- b-node—Broadcast
- p-node—Peer-to-peer
- m-node—Mixed
- h-node—Hybrid (recommended)

Default	none
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Format	<code>netbios-node-type <type></code>
Mode	DHCP Pool Config

no netbios-node-type

This command removes the NetBIOS node Type.

Format	<code>no netbios-node-type</code>
Mode	DHCP Pool Config

next-server

This command configures the next server in the boot process of a DHCP client.

Address is the IP address of the next server in the boot process, which is typically a Trivial File Transfer Protocol (TFTP) server.

Default	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.
Format	<code>next-server <address></code>
Mode	DHCP Pool Config

no next-server

This command removes the boot server list.

Format	<code>no next-server</code>
Mode	DHCP Pool Config

option

The command configures DHCP Server options. *Code* specifies the DHCP option code. Ascii string specifies an NVT ASCII character string. ASCII character strings that contain white space must be delimited by quotation marks. Hex string specifies hexadecimal data. in hexadecimal character strings is two hexadecimal digits—each byte can be separated by a period, colon, or white space.

Example :a3:4f:22:0c / a3 4f 22 0c / a34f.220c.9fed The <address> specifies an IP address.

Default	none
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Format	<code>option <code> {ascii string hex <string1> [<string2>...<string8>] ip <address1> [<address2>...<address8>]}</code>
Mode	DHCP Pool Config

no option

This command removes the options.

Format	<code>no option <code></code>
Mode	DHCP Pool Config

show ip dhcp binding

This command displays address bindings for the specific IP address on the DHCP server. If no IP address is specified, the bindings corresponding to all the addresses are displayed.

Format	<code>show ip dhcp binding [address]</code>
Modes	Privileged EXEC User EXEC
IP address	The IP address of the client.
Hardware Address	The MAC Address or the client identifier.
Lease expiration	The lease expiration time of the IP Address assigned to the client.
Type	The manner in which IP Address was assigned to the client.

show ip dhcp global configuration

This command displays address bindings for the specific IP address on the DHCP server. If no IP address is specified, the bindings corresponding to all the addresses are displayed.

Format	<code>show ip dhcp global configuration</code>
Modes	Privileged EXEC User EXEC
Service DHCP	The field to display the status of dhcp protocol.
Number of Ping Packets	The maximum number of Ping Packets that will be sent to verify that an ip address id not already assigned.

Excluded Address The ranges of IP addresses that a DHCP server should not assign to DHCP clients.

show ip dhcp pool configuration

This command displays pool configuration. If **all** is specified, configuration for all the pools is displayed.

Format	<code>show ip dhcp pool configuration {<name> all}</code>
Modes	Privileged EXEC User EXEC
Pool Name	The name of the configured pool.
Pool Type	The pool type.
Lease Time	The lease expiration time of the IP Address assigned to the client.
DNS Servers	The list of DNS servers available to the DHCP client
Default Routers	The list of the default routers available to the DHCP client

Following additional field is displayed for Dynamic pool type:

Network	The network number and the mask for the DHCP address pool.
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Following additional fields are displayed for Manual pool type:

Client Name	The name of a DHCP client.
Client Identifier	The unique identifier of a DHCP client.
Hardware Address	The hardware address of a DHCP client.
Hardware Address Type	The protocol of the hardware platform.
Host	The IP address and the mask for a manual binding to a DHCP client.

show ip dhcp server statistics

This command displays DHCP server statistics.

Format	<code>show ip dhcp server statistics</code>
Modes	Privileged EXEC User EXEC
Address Pool	The number of configured address pools in the DHCP server.
Automatic bindings	The number of IP addresses that have been automatically mapped to the MAC addresses of hosts that are found in the DHCP database.

Manual bindings The number of IP addresses that have been manually mapped to the MAC addresses of hosts that are found in the DHCP database.

Expired bindings The number of expired leases.

Malformed messages The number of truncated or corrupted messages that were received by the DHCP server.

Message Received

DHCPREQUEST The number of DHCPREQUEST messages that were received by the server.

DHCPDECLINE The number of DHCPDECLINE messages that were received by the server.

DHCPRELEASE The number of DHCPRELEASE messages that were received by the server.

DHCPINFORM The number of DHCPINFORM messages that were received by the server.

Message Sent

DHCPOFFER The number of DHCPOFFER messages that were sent by the server.

DHCPACK The number of DHCPACK messages that were sent by the server.

DHCPNACK The number of DHCPNACK messages that were sent by the server.

show ip dhcp conflict

This command displays address conflicts logged by the DHCP Server. If no IP address is specified, all the conflicting addresses are displayed.

Format `show ip dhcp conflict [ip-address]`

Modes Privileged EXEC
User EXEC

IP address The IP address of the host as recorded on the DHCP server.

Detection Method The manner in which the IP address of the hosts were found on the DHCP Server

Detection time The time when the conflict was found.

clear ip dhcp binding

This command deletes an automatic address binding from the DHCP server database. If "*" is specified, the bindings corresponding to all the addresses are deleted. <address> is a valid IP address made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	clear ip dhcp binding {address *}
Mode	Privileged EXEC

clear ip dhcp server statistics

This command clears DHCP server statistics counters.

Format	clear ip dhcp server statistics
Mode	Privileged EXEC

clear ip dhcp conflict

The command is used to clear an address conflict from the DHCP Server database. The server detects conflicts using a ping. DHCP server clears all conflicts If the asterisk (*) character is used as the address parameter.

Default	none
Format	clear ip dhcp conflict {<address> *}
Mode	Privileged EXEC

Provisioning (IEEE 802.1p) Commands

This chapter provides a detailed explanation of the Provisioning commands. The commands are divided into two functional groups:

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

classofservice dot1pmapping

This command maps an 802.1p priority to an internal traffic class for a device when in 'Global Config' mode. The number of available traffic classes may vary with the platform. Userpriority and trafficclass can both be the range from 0-7. The command is only available on platforms that support priority to traffic class mapping on a 'per-port' basis, and the number of available traffic classes may vary with the platform.

Format	<code>classofservice dot1pmapping <userpriority> <traffic-class></code>
Mode	Global Config or Interface Config

show classofservice dot1pmapping

This command displays the current 802.1p priority mapping to internal traffic classes for a specific interface. The slot/port parameter is required on platforms that support priority to traffic class mapping on a 'per-port' basis.

Platforms that support priority to traffic class mapping on a per-port basis:

Format	<code>show classofservice dot1pmapping <slot/port></code>
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Platforms that do not support priority to traffic class mapping on a per-port basis:

Format	<code>Show classofservice dot1pmapping</code>
Mode	Privileged EXEC and User EXEC

vlan port priority all

This command configures the port priority assigned for untagged packets for all ports presently plugged into the device. The range for the priority is 0-7. Any subsequent per port configuration will override this configuration setting.

Format	<code>vlan port priority all <priority></code>
Mode	Global Config

vlan priority

This command configures the default 802.1p port priority assigned for untagged packets for a specific interface. The range for the priority is 0-7

Default	0
Format	<code>vlan priority <priority></code>
Mode	Interface Config

GARP Commands

This chapter provides a detailed explanation of the GARP commands. The commands are divided into two functional groups:

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

set garp timer join

This command sets the GVRP join time per port and per GARP. Join time is the interval between the transmission of GARP Protocol Data Units (PDUs) registering (or re-registering) membership for a VLAN or multicast group.

This command has an effect only when GVRP is enabled. The time is from 10 to 100 (centiseconds). the value 20 centiseconds is 0.2 seconds.

Default	20
Format	<code>set garp timer join <10-100></code>
Mode	Interface Config

no set garp timer join

This command sets the GVRP join time per port and per GARP to 20 centiseconds (0.2 seconds). This command has an effect only when GVRP is enabled.

Format	<code>no set garp timer join</code>
Mode	Interface Config

set garp timer join all

This command sets the GVRP join time for all ports and per GARP. Join time is the interval between the transmission of GARP Protocol Data Units (PDUs) registering (or re-registering) membership for a VLAN or multicast group.

This command has an effect only when GVRP is enabled. The time is from 10 to 100 (centiseconds). The value 20 centiseconds is 0.2 seconds.

Default	20
Format	<code>set garp timer join all <10-100></code>
Mode	Global Config

no set garp timer join all

This command sets the GVRP join time for all ports and per GARP to 20 centiseconds (0.2 seconds). This command has an effect only when GVRP is enabled.

Format	<code>no set garp timer join all</code>
Mode	Global Config

set garp timer leave

This command sets the GVRP leave time per port. Leave time is the time to wait after receiving an unregister request for a VLAN or a multicast group before deleting the VLAN entry. This can be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service.time is 20 to 600 (centiseconds). The value 60 centiseconds is 0.6 seconds.

Note: *This command has an effect only when GVRP is enabled.*

Default	60
Format	<code>set garp timer leave <20-600></code>
Mode	Interface Config

no set garp timer leave

This command sets the GVRP leave time per port to 60 centiseconds (0.6 seconds).

Note: *This command has an effect only when GVRP is enabled.*

Format	<code>no set garp timer leave</code>
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Mode**Interface Config**

set garp timer leave all

This command sets the GVRP leave time for all ports. Leave time is the time to wait after receiving an unregister request for a VLAN or a multicast group before deleting the VLAN entry. This can be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. time is 20 to 600 (centiseconds). The value 60 centiseconds is 0.6 seconds.

Note: *This command has an effect only when GVRP is enabled.*

Default	60
Format	<code>set garp timer leave all <20-600></code>
Mode	Global Config

no set garp timer leave all

This command sets the GVRP leave time for all ports to the default 60 centiseconds (0.6 seconds).

Note: *This command has an effect only when GVRP is enabled.*

Format	<code>no set garp timer leave all</code>
Mode	Global Config

set garp timer leaveall

This command sets how frequently *Leave All PDUs* are generated per port. A *Leave All PDU* indicates that all registrations will be unregistered. Participants would need to rejoin in order to maintain registration. The value applies per port and per GARP participation. The time may range from 200 to 6000 (centiseconds). The value 1000 centiseconds is 10 seconds.

Note: *This command has an effect only when GVRP is enabled.*

Default	1000
Format	<code>set garp timer leaveall <200-6000></code>
Mode	Interface Config

no set garp timer leaveall

This command sets how frequently *Leave All PDUs* are generated per port to 1000 centiseconds (10 seconds). .

Note: *This command has an effect only when GVRP is enabled.*

Format	<code>no set garp timer leaveall</code>
Mode	Interface Config

set garp timer leaveall all

This command sets how frequently *Leave All PDUs* are generated for all ports. A *Leave All PDU* indicates that all registrations will be unregistered. Participants would need to rejoin in order to maintain registration. The value applies per port and per GARP participation. The time may range from 200 to 6000 (centiseconds). The value 1000 centiseconds is 10 seconds.

Note: *This command has an effect only when GVRP is enabled.*

Default	1000
Format	<code>set garp timer leaveall all <200-6000></code>
Mode	Global Config

no set garp timer leaveall all

This command sets how frequently *Leave All PDUs* are generated for all ports to 1000 centiseconds (10 seconds). .

Note: *This command has an effect only when GVRP is enabled.*

Format	<code>no set garp timer leaveall all</code>
Mode	Global Config

show garp

This command displays Generic Attributes Registration Protocol (GARP) information.

Format	<code>show garp</code>
Mode	Privileged EXEC and User EXEC
GMRP Admin Mode	This displays the administrative mode of GARP Multicast Registration Protocol (GMRP) for the system.
GVRP Admin Mode	This displays the administrative mode of GARP VLAN Registration Protocol (GVRP) for the system

GARP VLAN Registration Protocol (GVRP) Commands

This chapter provides a detailed explanation of the GVRP commands. The commands are divided into two functional groups:

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

set gvrp adminmode

This command enables GVRP.

Default	disabled
Format	<code>set gvrp adminmode</code>
Mode	Privileged EXEC

no set gvrp adminmode

This command disables GVRP.

Format	<code>no set gvrp adminmode</code>
Mode	Privileged EXEC

set gvrp interfacemode

This command enables GVRP (GARP VLAN Registration Protocol) for a specific port.

Default	disabled
Format	<code>set gvrp interfacemode</code>
Mode	Interface Config

no set gvrp interfacemode

This command disables GVRP (GARP VLAN Registration Protocol) for a specific port. If GVRP is disabled, Join Time, Leave Time and Leave All Time have no effect.

Format	<code>no set gvrp interfacemode</code>
Mode	Interface Config

set gvrp interfacemode all

This command enables GVRP (GARP VLAN Registration Protocol) for all ports.

Default	disabled
Format	<code>set gvrp interfacemode all</code>
Mode	Global Config

no set gvrp interfacemode all

This command disables GVRP (GARP VLAN Registration Protocol) for all ports. If GVRP is disabled, Join Time, Leave Time and Leave All Time have no effect.

Format	<code>no set gvrp interfacemode all</code>
Mode	Global Config

show gvrp configuration

This command displays Generic Attributes Registration Protocol (GARP) information for one or all interfaces.

Format	<code>show gvrp configuration {<slot/port> / all}</code>
Mode	Privileged EXEC and User EXEC
Interface	Valid slot and port number separated by forward slashes.
Join Timer	Specifies the interval between the transmission of GARP PDUs registering (or re-registering) membership for an attribute. Current attributes are a VLAN or multicast group. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 10 to 100 centiseconds (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
Leave Timer	Specifies the period of time to wait after receiving an unregister request for an attribute before deleting the attribute. Current attributes are a VLAN or multicast group. This may be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 20 to 600 centiseconds (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
LeaveAll Timer	This Leave All Time controls how frequently LeaveAll PDUs are generated. A LeaveAll PDU indicates that all registrations will shortly be deregistered. Participants will need to rejoin in order to maintain registration. There is an

instance of this timer on a per-Port, per-GARP participant basis. The Leave All Period Timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. Permissible values are 200 to 6000 centiseconds (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).

Port GMRP Mode

Indicates the GMRP administrative mode for the port. It may be enabled or disabled. If this parameter is disabled, Join Time, Leave Time and Leave All Time have no effect. The factory default is disabled.

GARP Multicast Registration Protocol (GMRP) Commands

This chapter provides a detailed explanation of the GMRP commands. The commands are divided into two functional groups:

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

set gmrp adminmode

This command enables GARP Multicast Registration Protocol (GMRP) on the system. The default value is disable.

Format	<code>set gmrp adminmode</code>
Mode	Privileged EXEC

no set gmrp adminmode

This command disables GARP Multicast Registration Protocol (GMRP) on the system.

Format	<code>no set gmrp adminmode</code>
Mode	Privileged EXEC

set gmrp interfacemode

This command enables GARP Multicast Registration Protocol on a selected interface. If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality will be disabled on that interface. GARP functionality will subsequently be re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Default	disabled
Format	<code>set gmrp interfacemode</code>
Mode	Interface Config

no set gmrp interfacemode

This command disables GARP Multicast Registration Protocol on a selected interface. If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality will be disabled on that interface. GARP functionality will subsequently be re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Format	<code>no set gmrp interfacemode</code>
Mode	Interface Config

set gmrp interfacemode all

This command enables GARP Multicast Registration Protocol on all interfaces. If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality will be disabled on that interface. GARP functionality will subsequently be re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Default	disabled
Format	<code>set gmrp interfacemode all</code>
Mode	Global Config

no set gmrp interfacemode all

This command disables GARP Multicast Registration Protocol on a selected interface.

Format	<code>no set gmrp interfacemode all</code>
---------------	--

Mode Global Config

show gmrp configuration

This command displays Generic Attributes Registration Protocol (GARP) information for one or all interfaces.

Format	<code>show gmrp configuration {<slot/port> all}</code>
Mode	Privileged EXEC and User EXEC
Interface	This displays the slot/port of the interface that this row in the table describes.
Join Timer	Specifies the interval between the transmission of GARP PDUs registering (or re-registering) membership for an attribute. Current attributes are a VLAN or multicast group. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 10 to 100 centiseconds (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
Leave Timer	Specifies the period of time to wait after receiving an unregister request for an attribute before deleting the attribute. Current attributes are a VLAN or multicast group. This may be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 20 to 600 centiseconds (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
LeaveAll Timer	This Leave All Time controls how frequently LeaveAll PDUs are generated. A LeaveAll PDU indicates that all registrations will shortly be deregistered. Participants will need to rejoin in order to maintain registration. There is an instance of this timer on a per-Port, per-GARP participant basis. The Leave All Period Timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. Permissible values are 200 to 6000 centiseconds (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
Port GMRP Mode	Indicates the GMRP administrative mode for the port. It may be enabled or disabled. If this parameter is disabled, Join Time, Leave Time and Leave All Time have no effect. The factory default is disabled.

show mac-address-table gmrp

This command displays the GARP Multicast Registration Protocol (GMRP) entries in the Multicast Forwarding Database (MFDB) table.

Format `show mac-address-table gmrp`

Mode	Privileged EXEC
Mac Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 or 8 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as 8 bytes.
Type	This displays the type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

Internet Group Management Protocol (IGMP) Commands

This chapter provides a detailed explanation of the IGMP commands. The commands are divided into two functional groups:

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

set igmp

This command enables IGMP Snooping on the system. The default value is disable.

Note: *The IGMP application supports the following:*

- Global configuration or per interface configuration. Per VLAN configuration is unsupported in the IGMP snooping application.
- Validation of the IP header checksum (as well as the IGMP header checksum) and discarding of the frame upon checksum error.
- Maintenance of the forwarding table entries based on the MAC address versus the IP address.
- Flooding of unregistered multicast data packets to all ports in the VLAN.

Format	<code>set igmp</code>
Mode	Global Config

no set igmp

This command disables IGMP Snooping on the system.

Format	<code>no set igmp</code>
Mode	<code>Global Config</code>

set igmp

This command enables IGMP Snooping on a selected interface. If an interface which has IGMP Snooping enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), IGMP Snooping functionality will be disabled on that interface. IGMP Snooping functionality will subsequently be re-enabled if routing is disabled or port-channel (LAG) membership is removed from an interface that has IGMP Snooping enabled.

Default	<code>disabled</code>
Format	<code>set igmp</code>
Mode	<code>Interface Config</code>

no set igmp

This command disables IGMP Snooping on a selected interface.

Format	<code>no set igmp</code>
Mode	<code>Interface Config</code>

set igmp groupmembership-interval

This command sets the IGMP Group Membership Interval time on the system. The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the IGMP Maximum Response time value. The range is 2 to 3600 seconds.

Default	<code>260</code>
Format	<code>set igmp groupmembership-interval <2-3600></code>
Mode	<code>Global Config</code>

no set igmp groupmembership-interval

This command sets the IGMP Group Membership Interval time on the system to 260 seconds.

Format `no set igmp groupmembership-interval`
Mode `Global Config`

set igmp interfacemode all

This command enables IGMP Snooping on all interfaces. If an interface which has IGMP Snooping enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), IGMP Snooping functionality will be disabled on that interface. IGMP Snooping functionality will subsequently be re-enabled if routing is disabled or port-channel (LAG) membership is removed from an interface that has IGMP Snooping enabled.

Default `disabled`
Format `set igmp interfacemode all`
Mode `Global Config`

no set igmp interfacemode all

This command disables IGMP Snooping on all interfaces.

Format `no set igmp interfacemode all`
Mode `Global Config`

set igmp maxresponse

This command sets the IGMP Maximum Response time on the system. The Maximum Response time is the amount of time in seconds that a switch will wait after sending a query on an interface because it did not receive a report for a particular group in that interface. This value must be less than the IGMP Query Interval time value. The range is 1 to 3599 seconds.

Default `10`
Format `set igmp maxresponse <1-3599>`
Mode `Global Config`

no set igmp maxresponse

This command sets the IGMP Maximum Response time on the system to 10 seconds.

Format `no set igmp maxresponse`
Mode `Global Config`

set igmp mcrtrexpiretime

This command sets the Multicast Router Present Expiration time on the system. This is the amount of time in seconds that a switch will wait for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 0 to 3600 seconds. A value of 0 indicates an infinite timeout, i.e. no expiration.

Default	0
Format	<code>set igmp mcrtrexpiretime <0-3600></code>
Mode	Global Config

no set igmp mcrtrexpiretime

This command sets the Multicast Router Present Expiration time on the system to 0. A value of 0 indicates an infinite timeout, i.e. no expiration.

Format	<code>no set igmp mcrtrexpiretime</code>
Mode	Global Config

show igmpsnooping

This command displays IGMP Snooping information. Configured information is displayed whether or not IGMP Snooping is enabled. Status information is only displayed when IGMP Snooping is enabled.

Format	<code>show igmpsnooping</code>
Mode	Privileged EXEC

Admin Mode This indicates whether or not IGMP Snooping is active on the switch.

Group Membership Interval This displays the IGMP Query Interval Time. This is the amount of time a switch will wait for a report for a particular group on a particular interface before it sends a query on that interface. This value may be configured

Max Response Time This displays the amount of time the switch will wait after sending a query on an interface because it did not receive a report for a particular group on that interface. This value may be configured.

Multicast Router Present Expiration Time If a query is not received on an interface within this amount of time, the interface is removed from the list of interfaces with multicast routers attached. This value may be configured.

Interfaces Enabled for IGMP Snooping This is the list of interfaces on which IGMP Snooping is enabled.

Multicast Control Frame Count This displays the number of multicast control frames that are processed by the CPU.

show mac-address-table igmpsnooping

This command displays the IGMP Snooping entries in the Multicast Forwarding Database (MFDB) table.

Format	<code>show mac-address-table igmpsnooping</code>
Mode	Privileged EXEC
Mac Address	A multicast MAC address for which the switch has forwarding and or filtering information. The format is two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as a MAC address and VLAN ID combination of 8 bytes.
Type	This displays the type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

IGMP Snooping per VLAN

This section provides a detailed explanation of the IGMP Snooping per VLAN commands. The commands are divided into two functional groups:

- Show commands display spanning tree settings, statistics, and other information.
- Configuration Commands configure features and options of the switch. For every configuration

set igmp

This command enables IGMP snooping on a particular VLAN, and in turn enabling IGMP snooping on all interfaces participating in this VLAN.

Default	<code>disable</code>
Format	<code>set igmp <vlanId></code>

Mode	Vlan Mode
-------------	------------------

no set igmp

This command disables IGMP snooping on a particular VLAN, and in turn disabling IGMP snooping on all interfaces participating in this VLAN.

Format	no set igmp <vlanId>
---------------	-----------------------------------

Mode	Vlan Mode
-------------	------------------

set igmp groupmembershipinterval

This command sets the IGMP Group Membership Interval on a particular VLAN. The Group Membership Interval time is the amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry. This value must be greater than IGMP Maximum Response time value. The range is 2 to 3600 seconds.

Default	260 seconds
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Format	set igmp groupmembershipinterval <vlanId> <2-3600>
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Mode	Vlan Mode
-------------	------------------

no set igmp groupmembershipinterval

This command sets the IGMP Group Membership Interval time on a particular VLAN to the default value.

Format	no set igmp groupmembershipinterval <vlanId>
---------------	---

Mode	Vlan Mode
-------------	------------------

set igmp maxresponse

This command sets the IGMP Maximum Response time on a particular VLAN. The Maximum Response time is the amount of time in seconds that a switch will wait after sending a query on an interface, which is participating in the VLAN, because it did not receive a report for a particular group in that interface. This value must be less than the IGMP Query Interval time value. The range is 1 to 3599 seconds.

Default	10 seconds
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Format `set igmp maxresponse <vlanId> <1-3599>`
Mode `Vlan Mode`

no set igmp maxresponse

This command sets the IGMP Maximum Response time on the VLAN to the default value.

Format `no set igmp maxresponse <vlanId>`
Mode `Vlan Mode`

set igmp mcrtexpiretime

This command sets the Multicast Router Present Expiration time on a particular VLAN. This is the amount of time in seconds that a switch will wait for a query to be received on an interface, which is participating in the VLAN, before the interface is removed from the list of interfaces with multicast routers attached. The range is 0 to 3600 seconds. A value of 0 indicates an infinite time-out, i.e. no expiration.

Default `0`
Format `set igmp mcrtexpiretime <vlanId> <0-3600>`
Mode `Vlan Mode`

no set igmp mcrtexpiretime

This command sets the Multicast Router Present Expiration time on the VLAN to 0. A value of 0 indicates an infinite time-out, i.e. no expiration.

Format `no set igmp mcrtexpiretime <vlanId>`
Mode `Vlan Mode`

set igmp fast-leave

This command enables or disables IGMP Snooping fast-leave admin mode on a selected VLAN. Enabling fast-leave allows the switch to immediately remove the layer 2 LAN interface, participating in the VLAN, from its forwarding table entry upon receiving an IGMP leave message for that multicast group without first sending out MAC-based general queries to the interface.

Fast-leave admin mode should be enabled only on VLANs where only one host is connected to each layer 2 LAN port, to prevent the inadvertent dropping of the other hosts that were connected to the same layer 2 LAN port but were still interested in receiving multicast traffic directed to that group. Also, fast-leave processing is supported only with IGMP version 2 hosts.

Default	<code>disable</code>
Format	<code>set igmp fast-leave <vlanId></code>
Mode	<code>Vlan Mode</code>

no set igmp fast-leave

This command disables IGMP Snooping fast-leave admin mode on a selected VLAN.

Format	<code>no set igmp fast-leave <vlanId></code>
Mode	<code>Vlan Mode</code>

show igmpsnooping

This command displays IGMP Snooping information. Configured information is displayed whether or not IGMP Snooping is enabled.

Format	<code>show igmpsnooping <vlanId></code>
Mode	<code>Privileged EXEC</code>

This display parameters when the optional argument '`<vlanId>`' is not used are as follows:

Admin Mode	This indicates whether or not IGMP Snooping is active on the switch.
Interfaces Enabled for IGMP Snooping	This is the list of interfaces on which IGMP Snooping is enabled.
Multicast Control Frame Count	This displays the number of multicast control frames that are processed by the CPU.
Data Frames Forwarded by the CPU	This displays the number of data frames that are forwarded by the CPU.
VLANs Enabled for IGMP Snooping	This is the list of VLANs on which IGMP Snooping is enabled.

The display parameters when the argument is '`<vlanId>`' are as follows:

VLAN Admin Mode	This indicates whether or not IGMP Snooping is active on the VLAN.
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- Fast Leave Mode** This indicates whether or not IGMP Snooping Fast-leave is active on the VLAN.
- Group Membership Interval Time** The Group Membership Interval time is the amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry. This value may be configured
- Max Response Time** This displays the amount of time the switch will wait after sending a query on an interface, participating in the VLAN, because it did not receive a report for a particular group on that interface. This value may be configured.
- Multicast Router Present Expiration Time** If a query is not received on an interface, participating in the VLAN, within this amount of time, the interface is removed from the list of interfaces with multicast routers attached. This value may be configured.

Link Aggregation (LAG)/Port-Channel (802.3AD) Commands

This section provides a detailed explanation of the LAG commands. The LAG feature initially load balances traffic based upon the source and destination MAC address. If an ARP entry is learned on the LAG then the LAG is converted to load balance based upon source/destination IP address.

The commands are divided into two functional groups:

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

port-channel staticcapability

This command enables the support of port-channels (static link aggregations - LAGs) on the device. By default, the static capability for all port-channels is disabled.

Default	disabled
Format	<code>port-channel staticcapability</code>
Mode	Global Config

no port-channel staticcapability

This command disables the support of static port-channels (link aggregations - LAGs) on the device.

Format	<code>no port-channel staticcapability</code>
Mode	Global Config

port lacpmode

This command enables Link Aggregation Control Protocol (LACP) on a port.

Default	disabled
Format	<code>port lacpmode</code>
Mode	Interface Config

no port lacpmode

This command disables Link Aggregation Control Protocol (LACP) on a port.

Format	<code>no port lacpmode</code>
Mode	Interface Config

port lacpmode all

This command enables Link Aggregation Control Protocol (LACP) on all ports.

Format	<code>port lacpmode all</code>
Mode	Global Config

no port lacpmode all

This command disables Link Aggregation Control Protocol (LACP) on all ports.

Format	<code>no port lacpmode all</code>
Mode	Global Config

port-channel

This command configures a new port-channel (LAG) and generates a logical slot/port number for the port-channel. The <name> field is a character string which allows the dash '-' character as well as alphanumeric characters. Display this number using the “show port-channel”.

Note: Before including a port in a port-channel, set the port physical mode. See ‘speed’ command.

Format	<code>port-channel <name></code>
Mode	Global Config

no port-channel

This command deletes a port-channel (LAG).

Format	<code>no port-channel <name></code>
Mode	Global Config

port-channel adminmode all

This command enables a port-channel (LAG). The interface is a logical slot/port for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting.

Format	<code>port-channel adminmode all</code>
Mode	Global Config

no port-channel adminmode

This command disables a port-channel (LAG). The interface is a logical slot/port for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting.

Format	<code>no port-channel adminmode all</code>
Mode	Global Config

port-channel linktrap

This command enables link trap notifications for the port-channel (LAG). The interface is a logical slot/port for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting.

Default	enabled
Format	<code>port-channel linktrap {<logical slot/port> / all}</code>
Mode	Global Config

no port-channel linktrap

This command disables link trap notifications for the port-channel (LAG). The interface is a logical unit, slot and port slot and port for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting.

Format	<code>no port-channel linktrap {<logical slot/port> / all}</code>
Mode	GlobalConfig

port-channel name

This command defines a name for the port-channel (LAG). The interface is a logical slot/port for a configured port-channel, and name is an alphanumeric string up to 15 characters. This command is used to modify the name that was associated with the port-channel when it was created.

Format	<code>port-channel name {<logical slot/port> / all / <name>}</code>
Mode	Global Config

show port-channel brief

This command displays the static capability of all port-channels (LAGs) on the device as well as a summary of individual port-channels.

Format	<code>show port-channel brief</code>
Mode	Privileged EXEC and User EXEC
Static Capability	This field displays whether or not the device has static capability enabled.

For each port-channel the following information is displayed:

Name	This field displays the name of the port-channel.
Link State	This field indicates whether the link is up or down.
Mbr Ports	This field lists the ports that are members of this port-channel, in <slot/port> notation.

Active Ports This field lists the ports that are actively participating in this port-channel.

show port-channel

This command displays an overview of all port-channels (LAGs) on the switch.

Format	<code>show port-channel {<logical slot/port> / all}</code>
Mode	Privileged EXEC
Logical slot/port	Valid slot and port number separated by forward slashes.
Name	The name of this port-channel (LAG). You may enter any string of up to 15 alphanumeric characters.
Link State	Indicates whether the Link is up or down.
Admin Mode	May be enabled or disabled. The factory default is enabled.
Link Trap Mode	This object determines whether or not to send a trap when link status changes. The factory default is enabled.
STP Mode	The Spanning Tree Protocol Administrative Mode associated with the port or port-channel (LAG). The possible values are: Disable - Spanning tree is disabled for this port. Enable - Spanning tree is enabled for this port.
Mbr Ports	A listing of the ports that are members of this port-channel (LAG), in slot/port notation. There can be a maximum of eight ports assigned to a given port-channel (LAG).
Port Speed	Speed of the port-channel port.
Type	This field displays the status designating whether a particular port-channel (LAG) is statically or dynamically maintained. The possible values of this field are Static, indicating that the port-channel is statically maintained; and Dynamic, indicating that the port-channel is dynamically maintained.
Active Ports	This field lists the ports that are actively participating in the port-channel (LAG).

Spanning Tree (STP) Commands

This chapter provides a detailed explanation of the Spanning Tree commands. The commands are divided into two functional groups:

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

Note: The software platform STP default mode is IEEE 802.1s, but the legacy IEEE 802.1D mode is available. To change to the legacy IEEE 802.1D mode, set the STP operational mode to disabled, then enable the IEEE 802.1D mode from the source code. Recompile the software to operationally enable the IEEE 802.1D mode. With the IEEE 802.1D mode operationally enabled, the rapid configuration and multiple instances features are not available. If the rapid configuration and multiple instances capabilities are required, use the IEEE 802.1s mode which is compatible with the legacy IEEE 802.1D standard.

spanning-tree max-hops

This command sets the MSTP Max Hops parameter to a new value for the common and internal spanning tree. The max-hops value is in a range of 1 to 127.

Default	20
Format	<code>spanning-tree max-hops <1-127></code>
Mode	Global Config

no spanning-tree max-hops

This command sets the Bridge Max Hops parameter for the common and internal spanning tree to the default value.

Format	<code>no spanning-tree max-hops</code>
Mode	Global Config

spanning-tree

This command sets the spanning-tree operational mode to enabled.

Default	disabled
Format	spanning-tree
Mode	Global Config

no spanning-tree

This command sets the spanning-tree operational mode to disabled. While disabled, the spanning-tree configuration is retained and can be changed, but is not activated.

Format	no spanning-tree
Mode	Global Config

spanning-tree configuration name

This command sets the Configuration Identifier Name for use in identifying the configuration that this switch is currently using. The <name> is a string of at most 32 characters.

Default	The base MAC address displayed using hexadecimal notation as specified in IEEE 802 standard.
Format	spanning-tree configuration name <name>
Mode	Global Config

no spanning-tree configuration name

This command resets the Configuration Identifier Name to its default.

Format	no spanning-tree configuration name
Mode	Global Config

spanning-tree configuration revision

This command sets the Configuration Identifier Revision Level for use in identifying the configuration that this switch is currently using. The Configuration Identifier Revision Level is a number in the range of 0 to 65535.

Default	0
Format	spanning-tree configuration revision <0-65535>
Mode	Global Config

no spanning-tree configuration revision

This command sets the Configuration Identifier Revision Level for use in identifying the configuration that this switch is currently using to the default value, i.e. 0.

Format	no spanning-tree configuration revision
Mode	Global Config

spanning-tree edgeport

This command specifies that this port is an Edge Port within the common and internal spanning tree. This will allow this port to transition to Forwarding State without delay.

Format	spanning-tree edgeport
Mode	Interface Config

no spanning-tree edgeport

This command specifies that this port is not an Edge Port within the common and internal spanning tree.

Format	no spanning-tree edgeport
Mode	Interface Config

spanning-tree forceversion

This command sets the Force Protocol Version parameter to a new value. The Force Protocol Version can be one of the following:

- 802.1d - ST BPDUs are transmitted rather than MST BPDUs (IEEE 802.1d functionality supported)
- 802.1w - RST BPDUs are transmitted rather than MST BPDUs (IEEE 802.1w functionality supported)
- 802.1s - MST BPDUs are transmitted (IEEE 802.1s functionality supported)

Default	802.1s
Format	spanning-tree forceversion <802.1d 802.1w 802.1s>
Mode	Global Config

no spanning-tree forceversion

This command sets the Force Protocol Version parameter to the default value, i.e. 802.1s.

Format	no spanning-tree forceversion
Mode	Global Config

spanning-tree forward-time

This command sets the Bridge Forward Delay parameter to a new value for the common and internal spanning tree. The forward-time value is in seconds within a range of 4 to 30, with the value being greater than or equal to $(\text{Bridge Max Age} / 2) + 1$.

Default	15
Format	spanning-tree forward-time <4-30>
Mode	Global Config

no spanning-tree forward-time

This command sets the Bridge Forward Delay parameter for the common and internal spanning tree to the default value, i.e. 15.

Format	no spanning-tree forward-time
Mode	Global Config

spanning-tree hello-time

This command sets the Admin Hello Time parameter to a new value for the common and internal spanning tree. The hellotime <value> is in whole seconds within a range of 1 to 10 with the value being less than or equal to $(\text{Bridge Max Age} / 2) - 1$.

Default	2
Format	spanning-tree hello-time <1-10>
Mode	Interface Config

no spanning-tree hello-time

This command sets the admin Hello Time parameter for the common and internal spanning tree to the default value.

Format	<code>no spanning-tree hello-time</code>
Mode	Interface Config

spanning-tree max-age

This command sets the Bridge Max Age parameter to a new value for the common and internal spanning tree. The max-age value is in seconds within a range of 6 to 40, with the value being less than or equal to "2 times (Bridge Forward Delay - 1)".

Default	20
Format	<code>spanning-tree max-age <6-40></code>
Mode	Global Config

no spanning-tree max-age

This command sets the Bridge Max Age parameter for the common and internal spanning tree to the default value, i.e. 20.

Format	<code>no spanning-tree max-age</code>
Mode	Global Config

spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance or in the common and internal spanning tree. If the <mstid> parameter corresponds to an existing multiple spanning tree instance, then the configurations are done for that multiple spanning tree instance. If however 0 (defined as the default CIST ID) is passed as the <mstid>, then the configurations are performed for the common and internal spanning tree instance.

If the 'cost' token is specified, this command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter. The pathcost can be specified as a number in the range of 1 to 200000000 or auto. If "auto" is specified, the pathcost value will be set based on Link Speed.

If the 'external-cost' token is specified, this command sets the external-path cost for MST instance '0' i.e. CIST instance. The external pathcost can be specified as a number in the range of 1 to 200000000 or auto. If "auto" is specified, the external pathcost value will be set based on Link Speed.

If the 'port-priority' token is specified, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter. The port-priority value is a number in the range of 0 to 240 in increments of 16.

Default	cost : auto; external-cost : auto; port-priority : 128
Format	spanning-tree mst <mstid> {{cost <1-200000000> auto } {external-cost <1-200000000> auto } port-priority <0-240>}
Mode	Interface Config

no spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance or in the common and internal spanning tree to the respective default values. If the <mstid> parameter corresponds to an existing multiple spanning tree instance, then the configurations are done for that multiple spanning tree instance. If however 0 (defined as the default CIST ID) is passed as the <mstid>, then the configurations are performed for the common and internal spanning tree instance.

If the 'cost' token is specified, this command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter, to the default value, i.e. a pathcost value based on the Link Speed.

If the 'external-cost' token is specified, this command sets the external path cost for this port for mst '0' instance, to the default value, i.e. a pathcost value based on the Link Speed.

If the 'port-priority' token is specified, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter, to the default value, i.e. 128.

Format	no spanning-tree mst <mstid> <cost external-cost port-priority>
Mode	Interface Config

spanning-tree mst instance

This command adds a multiple spanning tree instance to the switch. The instance <mstid> is a number within a range of 1 to 4094, that corresponds to the new instance ID to be added. The maximum number of multiple instances supported by the software is 4.

Format	<code>spanning-tree mst instance <mstid></code>
Mode	Global Config

no spanning-tree mst instance

This command removes a multiple spanning tree instance from the switch and reallocates all VLANs allocated to the deleted instance to the common and internal spanning tree. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance to be removed.

Format	<code>no spanning-tree mst instance <mstid></code>
Mode	Global Config

spanning-tree mst priority

This command sets the bridge priority for a specific multiple spanning tree instance. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance. The priority value is a number within a range of 0 to 61440 in increments of 4096.

If 0 (defined as the default CIST ID) is passed as the <mstid>, then this command sets the Bridge Priority parameter to a new value for the common and internal spanning tree. The bridge priority value again is a number within a range of 0 to 61440. The twelve least significant bits will be masked according to the 802.1s specification. This will cause the priority to be rounded down to the next lower valid priority.

Default	32768
Format	<code>spanning-tree mst priority <mstid> <0-61440></code>
Mode	Global Config

no spanning-tree mst priority

This command sets the bridge priority for a specific multiple spanning tree instance to the default value, i.e. 32768. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance.

If 0 (defined as the default CIST ID) is passed as the <mstid>, then this command sets the Bridge Priority parameter for the common and internal spanning tree to the default value, i.e. 32768.

Format `spanning-tree mst priority <mstid>`
Mode **Global Config**

spanning-tree mst vlan

This command adds an association between a multiple spanning tree instance and a VLAN. The VLAN will no longer be associated with the common and internal spanning tree. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance. The <vlanid> corresponds to an existing VLAN ID.

Format `spanning-tree mst vlan <mstid> <vlanid>`
Mode **Global Config**

no spanning-tree mst vlan

This command removes an association between a multiple spanning tree instance and a VLAN. The VLAN will again be associated with the common and internal spanning tree. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance. The <vlanid> corresponds to an existing VLAN ID.

Format `no spanning-tree mst vlan <mstid> <vlanid>`
Mode **Global Config**

spanning-tree port mode

This command sets the Administrative Switch Port State for this port to enabled.

Default disabled
Format `spanning-tree port mode`
Mode **Interface Config**

no spanning-tree port mode

This command sets the Administrative Switch Port State for this port to disabled.

Format `no spanning-tree port mode`
Mode **Interface Config**

spanning-tree port mode all

This command sets the Administrative Switch Port State for all ports to enabled.

Default	disabled
Format	spanning-tree port mode all
Mode	Global Config

no spanning-tree port mode all

This command sets the Administrative Switch Port State for all ports to disabled.

Format	no spanning-tree port mode all
Mode	Global Config

spanning-tree

This command sets the STP mode for a specific port-channel (LAG). This is the value specified for STP Mode on the Port Configuration Menu. 802.1D mode is the default. The interface is a logical slot/port for a configured port-channel. The **all** option sets all configured port-channels (LAGs) with the same option.

Format	<code>spanning-tree {<logical slot/port> all <off 802.1d fast>}</code>
Mode	Global Config

The mode is one of the following:

802.1d	IEEE 802.1D-compliant STP mode is used
fast	Fast STP mode is used
off	STP is turned off

spanning-tree bpdumigrationcheck

This command enables BPDU migration check on a given interface. The **all** option enables BPDU migration check on all interfaces.

Format	<code>spanning-tree bpdumigrationcheck {<slot/port> all}</code>
Mode	Global Config

no spanning-tree bpdumigrationcheck

This command disables BPDU migration check on a given interface. The **all** option disables BPDU migration check on all interfaces.

Format	<code>no spanning-tree bpdumigrationcheck {<slot/port> / all}</code>
Mode	Global Config

show spanning-tree

This command displays spanning tree settings for the common and internal spanning tree, when the optional parameter “brief” is not included in the command. The following details are displayed.

Format	<code>show spanning-tree <brief></code>
Modes	Privileged EXEC User EXEC
Bridge Priority	Specifies the bridge priority for the spanning tree.
Bridge Identifier	The bridge identifier for the selected instance.
Time Since Topology Change	The time in seconds since the topology last changed.
Topology Change Count	Number of times the topology has changed.
Topology Change in progress	Boolean value of the Topology Change parameter for the switch indicating if a topology change is in progress on any port assigned to the common and internal spanning tree.
Designated Root	The bridge identifier of the root bridge. It is derived from the bridge priority and the base MAC address of the bridge.
Root Path Cost	Value of the Root Path Cost parameter for the common and internal spanning tree.
Root Port Identifier	Port to access the Designated Root.
Bridge Max Age	Specifies the bridge maximum age for the spanning tree.
Bridge Forwarding Delay	Specifies the time spent in “Listening and Learning” mode before forwarding packets. Bridge Forwarding Delay must be greater or equal to “(Bridge Max Age/2) + 1”. The time range is from 4 seconds to 30 seconds. The default value is 15.
Hello Time	Configured value of the parameter for common spanning tree.
Bridge Hold Time	Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs)

CST Regional Root Bridge Identifier of the common spanning tree regional root. It is derived using the bridge priority and the base MAC address of the bridge.

Regional Root Path Cost Path cost to the common spanning tree Regional Root.

Associated FIDs List of forwarding database identifiers currently associated with this instance.

Associated VLANs List of VLAN IDs currently associated with this instance.

When the “brief” optional parameter is included, this command displays spanning tree settings for the bridge. In this case, the following details are displayed.

Bridge Priority Specifies the bridge priority for the spanning tree.

Bridge Identifier The bridge identifier for the selected instance.

Bridge Max Age Specifies the bridge maximum age for the spanning tree.

Hello Time Configured value of the parameter for the common spanning tree.

Bridge Forwarding Delay Specifies the time spent in “Listening and Learning” mode before forwarding packets. Bridge Forwarding Delay must be greater or equal to “(Bridge Max Age/2) + 1”. The time range is from 4 seconds to 30 seconds. The default value is 15.

Bridge Hold Time Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs).

show spanning-tree interface

This command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The <slot/port> is the desired switch port. The following details are displayed on execution of the command.

Format `show spanning-tree interface <slot/port>`

Modes
Privileged EXEC
User EXEC

Port mode Enabled or disabled.

Port Up Time Since Counters Last Cleared Time since port was reset, displayed in days, hours, minutes, and seconds.

STP BPDUs Transmitted Spanning Tree Protocol Bridge Protocol Data Units sent

STP BPDUs Received Spanning Tree Protocol Bridge Protocol Data Units received.

RST BPDUs Transmitted Rapid Spanning Tree Protocol Bridge Protocol Data Units sent

RST BPDUs Received Rapid Spanning Tree Protocol Bridge Protocol Data Units received.

MSTP BPDUs Transmitted Multiple Spanning Tree Protocol Bridge Protocol Data Units sent

MSTP BPDUs Received Multiple Spanning Tree Protocol Bridge Protocol Data Units received.

show spanning-tree mst detailed

This command displays settings and parameters for the specified multiple spanning tree instance. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance ID. The following details are displayed.

Format	show spanning-tree mst detailed <mstid>
Modes	Privileged EXEC User EXEC
MST Instance ID	The ID of the MST being created.
MST Bridge Priority	The bridge priority for the MST instance selected.
Time Since Topology Change	The time in seconds since the topology changed.
Topology Change Count	Number of times the topology has changed for this multiple spanning tree instance.
Topology Change in Progress	Value of the Topology Change parameter for the multiple spanning tree instance.
Designated Root	Identifier of the Regional Root for this multiple spanning tree instance.
Root Path Cost	Path Cost to the Designated Root for this multiple spanning tree instance.
Root Port Identifier	Port to access the Designated Root for this multiple spanning tree instance.
Associated FIDs	List of forwarding database identifiers associated with this instance.
Associated VLANs	List of VLAN IDs associated with this instance.

show spanning-tree mst port detailed

This command displays the detailed settings and parameters for a specific switch port within a particular multiple spanning tree instance. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance. The <slot/port> is the desired switch port.

Format	show spanning-tree mst port detailed <mstid> <slot/port>
Mode	Privileged EXEC and User EXEC
MST Instance ID	The ID of the MST instance.
Port Identifier	The port identifier for the specified port within the spanning tree.

Port Priority	The priority for a particular port within the selected MST instance.
Port Forwarding State	Current spanning tree state of this port
Port Role	Each MST Bridge Port that is enabled is assigned a Port Role for each spanning tree.
Port Path Cost	Configured value of the Internal Port Path Cost parameter
Designated Root	The Identifier of the designated root for this port.
Designated Port Cost	Path Cost offered to the LAN by the Designated Port
Designated Bridge	Bridge Identifier of the bridge with the Designated Port.
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN.

If 0 (defined as the default CIST ID) is passed as the <mstid>, then this command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The <slot/port> is the desired switch port. In this case, the following are displayed.

Port Identifier	The port identifier for this port within the CST.
Port Priority	The priority of the port within the CST.
Port Forwarding State	The forwarding state of the port within the CST.
Port Role	The role of the specified interface within the CST.
Port Path Cost	The configured path cost for the specified interface.
Designated Root	Identifier of the designated root for this port within the CST.
Designated Port Cost	Path Cost offered to the LAN by the Designated Port.
Designated Bridge	The bridge containing the designated port
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN
Topology Change Acknowledgement	Value of flag in next Configuration Bridge Protocol Data Unit (BPDU) transmission indicating if a topology change is in progress for this port.
Hello Time	The hello time in use for this port.
Edge Port	The configured value indicating if this port is an edge port.
Edge Port Status	The derived value of the edge port status. True if operating as an edge port; false otherwise.

Point To Point MAC Status	Derived value indicating if this port is part of a point to point link.
CST Regional Root	The regional root identifier in use for this port.
CST Port Cost	The configured path cost for this port.

show spanning-tree mst port summary

This command displays the settings of one or all ports within the specified multiple spanning tree instance. The parameter <mstid> indicates a particular MST instance. The parameter {<slot/port> | all} indicates the desired switch port or all ports.

If 0 (defined as the default CIST ID) is passed as the <mstid>, then the status summary is displayed for one or all ports within the common and internal spanning tree.

Format	<code>show spanning-tree mst port summary <mstid> {<slot/port> all}</code>
Mode	Privileged EXEC and User EXEC
MST Instance ID	The MST instance associated with this port.
Slot/Port	Valid slot and port number separated by forward slashes.
Type	Currently not used.
STP State	The forwarding state of the port in the specified spanning tree instance
Port Role	The role of the specified port within the spanning tree.
Link Status	The operational status of the link. Possible values are “Up” or “Down”.
Link Trap	The link trap configuration for the specified interface.

show spanning-tree mst summary

This command displays summary information about all multiple spanning tree instances in the switch. On execution, the following details are displayed.

Format	<code>show spanning-tree mst summary</code>
Mode	Privileged EXEC and User EXEC
MST Instance ID List	List of multiple spanning trees IDs currently configured.
For each MSTID:	

Associated FIDs	List of forwarding database identifiers associated with this instance.
Associated VLANs	List of VLAN IDs associated with this instance.

show spanning-tree summary

This command displays spanning tree settings and parameters for the switch. The following details are displayed on execution of the command.

Format	show spanning-tree summary
Mode	Privileged EXEC and User EXEC
Spanning Tree Adminmode	Enabled or disabled.
Spanning Tree Version	Version of 802.1 currently supported (IEEE 802.1s, IEEE 802.1w, or IEEE 802.1d) based upon the Force Protocol Version parameter
Configuration Name	Identifier used to identify the configuration currently being used.
Configuration Revision Level	Identifier used to identify the configuration currently being used.
Configuration Digest Key	Identifier used to identify the configuration currently being used.
MST Instances	List of all multiple spanning tree instances configured on the switch

show spanning-tree vlan

This command displays the association between a VLAN and a multiple spanning tree instance. The <vlanid> corresponds to an existing VLAN ID.

Format	show spanning-tree vlan <vlanid>
Mode	Privileged EXEC and User EXEC
VLAN Identifier	
Associated Instance	Identifier for the associated multiple spanning tree instance or "CST" if associated with the common and internal spanning tree

spanning-tree max-hops

This command sets the MSTP Max Hops parameter to a new value for the common and internal spanning tree. The max-hops value is a range from 1 to 127.

Default	20
Format	<code>spanning-tree max-hops <1-127></code>
Mode	Global Config

no spanning-tree max-hops

This command sets the Bridge Max Hops parameter for the common and internal spanning tree to the default value.

Format	<code>no spanning-tree max-hops</code>
Mode	Global Config

spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance or in the common and internal spanning tree. If the <mstid> parameter corresponds to an existing multiple spanning tree instance, then the configurations are done for that multiple spanning tree instance. If however 0 (defined as the default CIST ID) is passed as the <mstid>, then the configurations are performed for the common and internal spanning tree instance.

If the 'cost' token is specified, this command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter. The pathcost can be specified as a number in the range of 1 to 200000000 or auto. If "auto" is specified, the pathcost value will be set based on Link Speed.

If the 'external-cost' token is specified, this command sets the external-path cost for MST instance '0' i.e. CIST instance. The external pathcost can be specified as a number in the range of 1 to 200000000 or auto. If "auto" is specified, the external pathcost value will be set based on Link Speed.

If the 'port-priority' token is specified, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter. The port-priority value is a number in the range of 0 to 240 in increments of 16.

Default *cost : auto*
external-cost : auto
port-priority : 128

Format `spanning-tree mst <mstid> {{cost <1-200000000> | auto } |
{external-cost <1-200000000> | auto }| port-priority
<0-240>}`

Mode **Interface Config**

no spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance or in the common and internal spanning tree to the respective default values. If the <mstid> parameter corresponds to an existing multiple spanning tree instance, then the configurations are done for that multiple spanning tree instance. If however 0 (defined as the default CIST ID) is passed as the <mstid>, then the configurations are performed for the common and internal spanning tree instance.

If the 'cost' token is specified, this command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter, to the default value, i.e. a pathcost value based on the Link Speed.

If the 'external-cost' token is specified, this command sets the external path cost for this port for mst '0' instance, to the default value, i.e. a pathcost value based on the Link Speed.

If the 'port-priority' token is specified, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the <mstid> parameter, to the default value, i.e. 128.

Format *no spanning-tree mst <mstid> <cost | external-cost |
port-priority>*

Mode **Interface Config**

spanning-tree hello-time

This command sets the Admin Hello Time parameter to a new value for the common and internal spanning tree. The `hellotime <value>` is in whole seconds within a range of 1 to 10 with the value being less than or equal to $(\text{Bridge Max Age} / 2) - 1$.

Default	2
Format	<i>spanning-tree hello-time <1-10></i>
Mode	<i>Interface Config</i>

no spanning-tree hello-time

This command sets the admin Hello Time parameter for the common and internal spanning tree to the default value, i.e. 2.

Format	<i>no spanning-tree hello-time</i>
Mode	<i>Interface Config</i>

show spanning-tree

This command displays spanning tree settings for the common and internal spanning tree, when the optional parameter “brief” is not included in the command. The following details are displayed.

Format	<code>show spanning-tree <brief></code>
Mode	Privileged EXEC and User EXEC
Bridge Priority	Configured value.
Bridge Identifier	
Time Since Topology Change	Time in seconds.
Topology Change Count	Number of times changed.
Topology Change	Boolean value of the Topology Change parameter for the switch indicating if a topology change is in progress on any port assigned to the common and internal spanning tree.
Designated Root	
Root Path Cost	Value of the Root Path Cost parameter for the common and internal spanning tree.
Root Port Identifier	
Root Port Max Age	Derived value

Root Port Bridge Forward Delay Derived value

Hello Time Configured value

Bridge Hold Time Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs)

Bridge Max Hops *Bridge max-hops count for the device.*

CST Regional Root

Regional Root Path Cost

Associated FIDs List of forwarding database identifiers currently associated with this instance.

Associated VLANs List of VLAN IDs currently associated with this instance.

When the “brief” optional parameter is included, this command displays spanning tree settings for the bridge. In this case, the following details are displayed.

Bridge Priority Configured value.

Bridge Identifier

Bridge Max Age Configured value.

Bridge Max Hops *Bridge max-hops count for the device.*

Bridge Hello Time Configured value.

Bridge Forward Delay Configured value.

Bridge Hold Time Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs)

show spanning-tree interface

This command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The <slot/port> is the desired switch port. The following details are displayed on execution of the command.

Format **show spanning-tree interface <slot/port>**

Mode **Privileged EXEC and User EXEC**

Hello Time *Admin hello time for this port*

Port mode Enabled or disabled.

Port Up Time Since Counters Last Cleared Time since port was reset, displayed in days, hours, minutes, and seconds.

- STP BPDUs Transmitted** Spanning Tree Protocol Bridge Protocol Data Units sent
- STP BPDUs Received** Spanning Tree Protocol Bridge Protocol Data Units received.
- RST BPDUs Transmitted** Rapid Spanning Tree Protocol Bridge Protocol Data Units sent
- RST BPDUs Received** Rapid Spanning Tree Protocol Bridge Protocol Data Units received.
- MSTP BPDUs Transmitted** Multiple Spanning Tree Protocol Bridge Protocol Data Units sent
- MSTP BPDUs Received** Multiple Spanning Tree Protocol Bridge Protocol Data Units received.

show spanning-tree mst port detailed

This command displays the detailed settings and parameters for a specific switch port within a particular multiple spanning tree instance. The instance <mstid> is a number that corresponds to the desired existing multiple spanning tree instance. The <slot/port> is the desired switch port.

Format `show spanning-tree mst port detailed <mstid> <slot/port>`

Mode **Privileged EXEC and User EXEC**

MST Instance ID

Port Identifier

Port Priority

Port Forwarding State Current spanning tree state of this port

Port Role

Auto-Calculate Port Path Cost *This indicates whether auto calculation for port path cost is enabled or not.*

Port Path Cost *Configured value of the Internal Port Path Cost parameter*

Auto-Calculate External Port Path Cost *This indicates whether auto calculation for external port path cost is enabled or not.*

External Port Path Cost *Configured value of the external Port Path Cost parameter*

Designated Root The Identifier of the designated root for this port.

Designated Port Cost Path Cost offered to the LAN by the Designated Port

Designated Bridge Bridge Identifier of the bridge with the Designated Port.

Designated Port Identifier Port on the Designated Bridge that offers the lowest cost to the LAN

If 0 (defined as the default CIST ID) is passed as the <mstid>, then this command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The <slot/port> is the desired switch port. In this case, the following are displayed.

Port Identifier	The port identifier for this port within the CST.
Port Priority	The priority of the port within the CST.
Port Forwarding State	The forwarding state of the port within the CST.
Port Role	The role of the specified interface within the CST.
Port Path Cost	The configured path cost for the specified interface.
Designated Root	Identifier of the designated root for this port within the CST.
Designated Port Cost	Path Cost offered to the LAN by the Designated Port.
Designated Bridge	The bridge containing the designated port
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN
Topology Change Acknowledgement	Value of flag in next Configuration Bridge Protocol Data Unit (BPDU) transmission indicating if a topology change is in progress for this port.
Hello Time	The hello time in use for this port.
Edge Port	The configured value indicating if this port is an edge port.
Edge Port Status	The derived value of the edge port status. True if operating as an edge port; false otherwise.
Point To Point MAC Status	Derived value indicating if this port is part of a point to point link.
CST Regional Root	The regional root identifier in use for this port.
CST Port Cost	The configured path cost for this port.

Chapter 9

Security Commands

This section provides a detailed explanation of the Security commands. The commands are divided into the following groups:

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

Port Security

This section provides a detailed explanation of the Port Security commands. The commands are divided into the following groups:

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

port-security

This command enables port locking at the system level (Global Config) or port level (Interface Config)

Default	Disabled
Format	<code>port-security</code>
Modes	Global Config Interface Config

no port-security

This command disables port locking at the system level (Global Config) or port level (Interface Config).

Format	<code>no port-security</code>
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Modes	<code>Global Config</code> <code>Interface Config</code>
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port-security max-dynamic

This command sets the maximum of dynamically locked MAC addresses allowed on a specific port.

Default	<code>600</code>
Format	<code>port-security max-dynamic <maxvalue></code>
Mode	<code>Interface Config</code>

no port-security max-dynamic

This command resets the maximum of dynamically locked MAC addresses allowed on a specific port to its default value.

Format	<code>no port-security max-dynamic</code>
Mode	<code>Interface Config</code>

port-security max-static

This command sets the maximum number of statically locked MAC addresses allowed on a specific port.

Default	<code>20</code>
Format	<code>port-security max-static <maxvalue></code>
Mode	<code>Interface Config</code>

no port-security max-static

This command resets the maximum of statically locked MAC addresses allowed on a specific port to its default value.

Format	<code>no port-security max-static</code>
Mode	<code>Interface Config</code>

port-security mac-address

This command adds a MAC address to the list of statically locked MAC addresses.

Format	<code>port-security mac-address <vid> <mac-address></code>
Mode	Interface Config

no port-security mac-address

This command removes a MAC address to the list of statically locked MAC addresses.

Format	<code>no port-security mac-address <vid> <mac-address></code>
Mode	Interface Config

port-security mac-address move

This command converts dynamically locked MAC addresses to statically locked addresses.

Format	<code>port-security mac-address move</code>
Mode	Interface Config

snmp-server enable traps violation

This command enables the sending of new violation traps designating when a packet with a disallowed MAC address is received on a locked port.

Default	Disabled
Format	<code>snmp-server enable traps violation</code>
Mode	Interface Config

no snmp-server enable traps violation

This command disables the sending of new violation traps.

Format	<code>no snmp-server enable traps violation</code>
Mode	Interface Config

show port-security

This command displays the port-security settings for the entire system.

Format	<code>show port-security</code>
Mode	Privileged EXEC
Admin Mode	Port Locking mode for the entire system

show port-security

This command displays the port-security settings for a particular interface or all interfaces.

Format	<code>show port-security <interface all></code>
Mode	Privileged EXEC
Interface Admin Mode	Port Locking mode for the Interface.
Dynamic Limit	Maximum dynamically allocated MAC Addresses.
Static Limit	Maximum statically allocated MAC Addresses.
Violation Trap Mode	Whether violation traps are enabled.

show port-security dynamic

This command displays the dynamically locked MAC addresses for port.

Format	<code>show port-security dynamic <interface></code>
Mode	Privileged EXEC
MAC Address	MAC Address of dynamically locked MAC.

show port-security static

This command displays the statically locked MAC addresses for port.

Format	<code>show port-security static <interface></code>
Mode	Privileged EXEC
MAC Address	MAC Address of statically locked MAC.

show port-security violation

This command displays the source MAC address of the last packet that was discarded on a locked port.

Format	<code>show port-security violation <interface></code>
Mode	Privileged EXEC
MAC Address	MAC Address of discarded packet on locked port.

Port Based Network Access Control (IEEE 802.1X) Commands

This section provides a detailed explanation of the 802.1x commands. The commands are divided into the following groups:

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

authentication login

This command creates an authentication login list. The `<listname>` is any character string and is not case sensitive. Up to 10 authentication login lists can be configured on the switch. When a list is created, the authentication method “local” is set as the first method.

When the optional parameters “Option1”, “Option2” and/or “Option3” are used, an ordered list of methods are set in the authentication login list. If the authentication login list does not exist, a new authentication login list is first created and then the authentication methods are set in the authentication login list. The maximum number of authentication login methods is three. The possible method values are `local`, `radius` and `reject`.

The value of `local` indicates that the user’s locally stored ID and password are used for authentication. The value of `radius` indicates that the user’s ID and password will be authenticated using the RADIUS server. The value of `reject` indicates the user is never authenticated.

To authenticate a user, the authentication methods in the user’s login will be attempted in order until an authentication attempt succeeds or fails.

Note: *The default login list included with the default configuration can not be changed.*

Format `authentication login <listname> [method1 [method2 [method3]]]`

Mode `Global Config`

no authentication login

This command deletes the specified authentication login list. The attempt to delete will fail if any of the following conditions are true:

- The login list name is invalid or does not match an existing authentication login list
- The specified authentication login list is assigned to any user or to the non configured user for any component
- The login list is the default login list included with the default configuration and was not created using 'authentication login'. The default login list cannot be deleted.

Format `no authentication login <listname>`

Mode `Global Config`

clear dot1x statistics

This command resets the 802.1x statistics for the specified port or for all ports.

Format `clear dot1x statistics { <slot/port> / all }`

Mode `Privileged EXEC`

clear radius statistics

This command is used to clear all RADIUS statistics.

Format `clear radius statistics`

Mode `Privileged EXEC`

dot1x defaultlogin

This command assigns the authentication login list to use for non-configured users for 802.1x port security. This setting is over-ridden by the authentication login list assigned to a specific user if the user is configured locally. If this value is not configured, users will be authenticated using local authentication only.

Format `dot1x defaultlogin <listname>`

Mode **Global Config**

dot1x initialize

This command begins the initialization sequence on the specified port. This command is only valid if the control mode for the specified port is 'auto'. If the control mode is not 'auto' an error will be returned.

Format `dot1x initialize <slot/port>`

Mode **Privileged EXEC**

dot1x login

This command assigns the specified authentication login list to the specified user for 802.1x port security. The <user> parameter must be a configured user and the <listname> parameter must be a configured authentication login list.

Format `dot1x login <user> <listname>`

Mode **Global Config**

dot1x max-req

This command sets the maximum number of times the authenticator state machine on this port will transmit an EAPOL EAP Request/Identity frame before timing out the supplicant. The <count> value must be in the range 1 - 10.

Default 2

Format `dot1x max-req <count>`

Mode **Interface Config**

no dot1x max-req

This command sets the maximum number of times the authenticator state machine on this port will transmit an EAPOL EAP Request/Identity frame before timing out the supplicant.

Format `no dot1x max-req`

Mode **Interface Config**

dot1x port-control

This command sets the authentication mode to be used on the specified port. . The control mode may be one of the following.

force-unauthorized: The authenticator PAE unconditionally sets the controlled port to unauthorized.

force-authorized: The authenticator PAE unconditionally sets the controlled port to authorized.

auto: The authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator and the authentication server.

Default	auto
Format	<code>dot1x port-control {force-unauthorized force-authorized auto}</code>
Mode	Interface Config

no dot1x port-control

This command sets the authentication mode to be used on the specified port to 'auto'.

Format	no dot1x port-control
Mode	Interface Config

dot1x port-control All

This command sets the authentication mode to be used on all ports. The control mode may be one of the following.

force-unauthorized: The authenticator PAE unconditionally sets the controlled port to unauthorized.

force-authorized: The authenticator PAE unconditionally sets the controlled port to authorized.

auto: The authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator and the authentication server.

Default	auto
Format	<code>dot1x port-control all {force-unauthorized force-authorized auto}</code>

Mode **Global Config**

no dot1x port-control All

This command sets the authentication mode to be used on all ports to 'auto'.

Format **no dot1x port-control all**
Mode **Global Config**

dot1x re-authenticate

This command begins the re-authentication sequence on the specified port. This command is only valid if the control mode for the specified port is 'auto'. If the control mode is not 'auto' an error will be returned.

Format **dot1x re-authenticate <slot/port>**
Mode **Privileged EXEC**

dot1x re-authentication

This command enables re-authentication of the supplicant for the specified port.

Default disabled
Format **dot1x re-authentication**
Mode **Interface Config**

no dot1x re-authentication

This command disables re-authentication of the supplicant for the specified port.

Format **no dot1x re-authentication**
Mode **Interface Config**

dot1x system-auth-control

This command is used to enable the dot1x authentication support on the switch. By default, the authentication support is disabled. While disabled, the dot1x configuration is retained and can be changed, but is not activated.

Default disabled

Format `dot1x system-auth-control`

Mode `Global Config`

no dot1x system-auth-control

This command is used to disable the dot1x authentication support on the switch.

Format `no dot1x system-auth-control`

Mode `Global Config`

dot1x timeout

This command sets the value, in seconds, of the timer used by the authenticator state machine on this port. Depending on the token used and the value (in seconds) passed, various timeout configurable parameters are set. The following tokens are supported.

reauth-period: Sets the value, in seconds, of the timer used by the authenticator state machine on this port to determine when re-authentication of the supplicant takes place. The reauth-period must be a value in the range 1 - 65535.

quiet-period: Sets the value, in seconds, of the timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. The quiet-period must be a value in the range 0 - 65535.

tx-period: Sets the value, in seconds, of the timer used by the authenticator state machine on this port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant. The quiet-period must be a value in the range 1 - 65535.

supp-timeout: Sets the value, in seconds, of the timer used by the authenticator state machine on this port to timeout the supplicant. The supp-timeout must be a value in the range 1 - 65535.

server-timeout: Sets the value, in seconds, of the timer used by the authenticator state machine on this port to timeout the authentication server. The supp-timeout must be a value in the range 1 - 65535.

Default

reauth-period: 3600 seconds

quiet-period: 60 seconds

tx-period: 30 seconds

supp-timeout: 30 seconds

server-timeout: 30 seconds

Format `dot1x timeout {{reauth-period <seconds>} | {quiet-period <seconds>} | {tx-period <seconds>} | {supp-timeout <seconds>} | {server-timeout <seconds>}}`

Mode `Interface Config`

no dot1x timeout

This command sets the value, in seconds, of the timer used by the authenticator state machine on this port to the default values. Depending on the token used, the corresponding default values are set.

Format `no dot1x timeout {reauth-period | quiet-period | tx-period | supp-timeout | server-timeout}`

Mode `Interface Config`

dot1x user

This command adds the specified user to the list of users with access to the specified port or all ports. The <user> parameter must be a configured user.

Format `dot1x user <user> {<slot/port> / all}`

Mode `Global Config`

no dot1x user

This command removes the user from the list of users with access to the specified port or all ports.

Format `no dot1x user <user> {<slot/port> / all}`

Mode `Global Config`

show radius accounting

This command is used to display the configured RADIUS accounting mode, accounting server and the statistics for the configured accounting server.

Format `show radius accounting [statistics <ipaddr>]`

Mode `Privileged EXEC`

If the optional token 'statistics <ipaddr>' is not included, then only the accounting mode and the RADIUS accounting server details are displayed.

Mode `Enabled or disabled`

IP Address	The configured IP address of the RADIUS accounting server
Port	The port in use by the RADIUS accounting server
Secret Configured	Yes or No

If the optional token 'statistics <ipaddr>' is included, the statistics for the configured RADIUS accounting server are displayed. The IP address parameter must match that of a previously configured RADIUS accounting server. The following information regarding the statistics of the RADIUS accounting server is displayed.

Accounting Server IP Address	IP Address of the configured RADIUS accounting server
Round Trip Time	The time interval, in hundredths of a second, between the most recent Accounting-Response and the Accounting-Request that matched it from the RADIUS accounting server.
Requests	The number of RADIUS Accounting-Request packets sent to this accounting server. This number does not include retransmissions.
Retransmission	The number of RADIUS Accounting-Request packets retransmitted to this RADIUS accounting server.
Responses	The number of RADIUS packets received on the accounting port from this server.
Malformed Responses	The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators and unknown types are not included as malformed accounting responses.
Bad Authenticators	The number of RADIUS Accounting-Response packets containing invalid authenticators received from this accounting server.
Pending Requests	The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response.
Timeouts	The number of accounting timeouts to this server.
Unknown Types	The number of RADIUS packets of unknown types, which were received from this server on the accounting port.
Packets Dropped	The number of RADIUS packets received from this server on the accounting port and dropped for some other reason.

show authentication

This command displays the ordered authentication methods for all authentication login lists.

Format	<code>show authentication</code>
Mode	Privileged EXEC
Authentication Login List	This displays the authentication login listname.
Method 1	This displays the first method in the specified authentication login list, if any.
Method 2	This displays the second method in the specified authentication login list, if any.
Method 3	This displays the third method in the specified authentication login list, if any.

show authentication users

This command displays information about the users assigned to the specified authentication login list. If the login is assigned to non-configured users, the user “default” will appear in the user column.

Format	<code>show authentication users <listname></code>
Mode	Privileged EXEC
User	This field displays the user assigned to the specified authentication login list.
Component	This field displays the component (User or 802.1x) for which the authentication login list is assigned.

show dot1x

This command is used to show a summary of the global dot1x configuration, summary information of the dot1x configuration for a specified port or all ports, the detailed dot1x configuration for a specified port and the dot1x statistics for a specified port - depending on the tokens used.

Format	<code>show dot1x [{summary <slot/port> all} {detail <slot/port>} {statistics <slot/port>}]</code>
Mode	Privileged EXEC

If none of the optional parameters are used, the global dot1x configuration summary is displayed.

Administrative mode Indicates whether authentication control on the switch is enabled or disabled.

If the optional parameter 'summary {<slot/port> | all}' is used, the dot1x configuration for the specified port or all ports are displayed.

Port The interface whose configuration is displayed.

Control Mode The configured control mode for this port. Possible values are force-unauthorized | force-authorized | auto

Operating Control Mode The control mode under which this port is operating. Possible values are authorized | unauthorized

Reauthentication Enabled Indicates whether re-authentication is enabled on this port

Key Transmission Enabled Indicates if the key is transmitted to the supplicant for the specified port

If the optional parameter 'detail <slot/port>' is used, the detailed dot1x configuration for the specified port are displayed.

Port The interface whose configuration is displayed

Protocol Version The protocol version associated with this port. The only possible value is 1, corresponding to the first version of the dot1x specification.

PAE Capabilities The port access entity (PAE) functionality of this port. Possible values are Authenticator or Supplicant.

Authenticator PAE State Current state of the authenticator PAE state machine. Possible values are Initialize, Disconnected, Connecting, Authenticating, Authenticated, Aborting, Held, ForceAuthorized, and ForceUnauthorized.

Backend Authentication State Current state of the backend authentication state machine. Possible values are Request, Response, Success, Fail, Timeout, Idle, and Initialize.

Quiet Period The timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. The value is expressed in seconds and will be in the range 0 and 65535.

Transmit Period The timer used by the authenticator state machine on the specified port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.

Supplicant Timeout The timer used by the authenticator state machine on this port to timeout the supplicant. . The value is expressed in seconds and will be in the range of 1 and 65535.

Server Timeout The timer used by the authenticator on this port to timeout the authentication server. The value is expressed in seconds and will be in the range of 1 and 65535.

Maximum Requests The maximum number of times the authenticator state machine on this port will retransmit an EAPOL EAP Request/Identity before timing out the supplicant. The value will be in the range of 1 and 10.

Reauthentication Period The timer used by the authenticator state machine on this port to determine when reauthentication of the supplicant takes place. The value is expressed in seconds and will be in the range of 1 and 65535.

Reauthentication Enabled Indicates if reauthentication is enabled on this port. Possible values are "True" or "False".

Key Transmission Enabled Indicates if the key is transmitted to the supplicant for the specified port. Possible values are True or False.

Control Direction Indicates the control direction for the specified port or ports. Possible values are both or in.

If the optional parameter 'statistics <slot/port>' is used, the dot1x statistics for the specified port are displayed.

Port The interface whose statistics are displayed.

EAPOL Frames Received The number of valid EAPOL frames of any type that have been received by this authenticator.

EAPOL Frames Transmitted The number of EAPOL frames of any type that have been transmitted by this authenticator.

EAPOL Start Frames Received The number of EAPOL start frames that have been received by this authenticator.

EAPOL Logoff Frames Received The number of EAPOL logoff frames that have been received by this authenticator.

Last EAPOL Frame Version The protocol version number carried in the most recently received EAPOL frame.

Last EAPOL Frame Source The source MAC address carried in the most recently received EAPOL frame.

EAP Response/Id Frames Received The number of EAP response/identity frames that have been received by this authenticator.

EAP Response Frames Received The number of valid EAP response frames (other than resp/id frames) that have been received by this authenticator.

EAP Request/Id Frames Transmitted The number of EAP request/identity frames that have been transmitted by this authenticator.

EAP Request Frames Transmitted The number of EAP request frames (other than request/identity frames) that have been transmitted by this authenticator.

Invalid EAPOL Frames Received The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized.

EAP Length Error Frames Received The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized.

show dot1x users

This command displays 802.1x port security user information for locally configured users.

Format	show dot1x users <slot/port>
Mode	Privileged EXEC
User	Users configured locally to have access to the specified port.

show users authentication

This command displays all user and all authentication login information. It also displays the authentication login list assigned to the default user.

Format	show users authentication
Mode	Privileged EXEC
User	This field lists every user that has an authentication login list assigned.
System Login	This field displays the authentication login list assigned to the user for system login.
802.1x Port Security	This field displays the authentication login list assigned to the user for 802.1x port security.

users defaultlogin

This command assigns the authentication login list to use for non-configured users when attempting to log in to the system. This setting is overridden by the authentication login list assigned to a specific user if the user is configured locally. If this value is not configured, users will be authenticated using local authentication only.

Format	users defaultlogin <listname>
Mode	Global Config

users login

This command assigns the specified authentication login list to the specified user for system login. The <user> must be a configured <user> and the <listname> must be a configured login list.

If the user is assigned a login list that requires remote authentication, all access to the interface from all CLI, web, and telnet sessions will be blocked until the authentication is complete.

Note that the login list associated with the 'admin' user can not be changed to prevent accidental lockout from the switch.

Format	<code>users login <user> <listname></code>
Mode	Global Config

Remote Authentication Dial In User Service (RADIUS) Commands

This section provides a detailed explanation of the RADIUS commands. The commands are divided into the following groups:

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

radius accounting mode

This command is used to enable the RADIUS accounting function.

Default	disabled
Format	radius accounting mode
Mode	Global Config

no radius accounting mode

This command is used to set the RADIUS accounting function to the default value - i.e. the RADIUS accounting function is disabled.

Format	no radius accounting mode
Mode	Global Config

radius server host

This command is used to configure the RADIUS authentication and accounting server.

If the 'auth' token is used, the command configures the IP address to use to connect to a RADIUS authentication server. Up to 3 servers can be configured per RADIUS client. If the maximum number of configured servers is reached, the command will fail until one of the servers is removed by executing the no form of the command. If the optional <port> parameter is used, the command will configure the UDP port number to use to connect to the configured RADIUS server. In order to configure the UDP port number, the IP address must match that of a previously configured RADIUS authentication server. The port number must lie between 1 - 65535, with 1812 being the default value.

If the 'acct' token is used, the command configures the IP address to use for the RADIUS accounting server. Only a single accounting server can be configured. If an accounting server is currently configured, it must be removed from the configuration using the no form of the command before this command succeeds. If the optional <port> parameter is used, the command will configure the UDP port to use to connect to the RADIUS accounting server. The IP address specified must match that of a previously configured accounting server. If a port is already configured for the accounting server then the new port will replace the previously configured value. The port must be a value in the range 1 - 65535, with 1813 being the default value.

Format `radius server host {auth | acct} <ipaddr> [<port>]`
Mode **Global Config**

no radius server host

This command is used to remove the configured RADIUS authentication server or the RADIUS accounting server. If the 'auth' token is used, the previously configured RADIUS authentication server is removed from the configuration. Similarly, if the 'acct' token is used, the previously configured RADIUS accounting server is removed from the configuration. The <ipaddr> parameter must match the IP address of the previously configured RADIUS authentication / accounting server.

Format `no radius server host {auth | acct} <ipaddress>`
Mode **Global Config**

radius server key

This command is used to configure the shared secret between the RADIUS client and the RADIUS accounting / authentication server. Depending on whether the 'auth' or 'acct' token is used, the shared secret will be configured for the RADIUS authentication or RADIUS accounting server. The IP address provided must match a previously configured server. When this command is executed, the secret will be prompted. The secret must be an alphanumeric value not exceeding 20 characters.

Format	<code>radius server key {auth acct} <ipaddr></code>
Mode	Global Config

radius server msgauth

This command enables the message authenticator attribute for a specified server.

Default	<code>radius server msgauth <ipaddr></code>
Mode	Global Config

radius server primary

This command is used to configure the primary RADIUS authentication server for this RADIUS client. The primary server is the one that is used by default for handling RADIUS requests. The remaining configured servers are only used if the primary server cannot be reached. A maximum of three servers can be configured on each client. Only one of these servers can be configured as the primary. If a primary server is already configured prior to this command being executed, the server specified by the IP address specified used in this command will become the new primary server. The IP address must match that of a previously configured RADIUS authentication server.

Format	<code>radius server primary <ipaddr></code>
Mode	Global Config

radius server retransmit

This command sets the maximum number of times a request packet is re-transmitted when no response is received from the RADIUS server. The retries value is an integer in the range of 1 to 15.

Default	10
----------------	----

Format `radius server retransmit <retries>`
Mode `Global Config`

no radius server retransmit

This command sets the maximum number of times a request packet is re-transmitted, when no response is received from the RADIUS server, to the default value, i.e. 10.

Format `no radius server retransmit`
Mode `Global Config`

radius server timeout

This command sets the timeout value (in seconds) after which a request must be retransmitted to the RADIUS server if no response is received. The timeout value is an integer in the range of 1 to 30.

Default `6`
Format `radius server timeout <seconds>`
Mode `Global Config`

no radius server timeout

This command sets the timeout value (in seconds) after which a request must be retransmitted to the RADIUS server if no response is received, to the default value, i.e. 6.

Format `no radius server timeout`
Mode `Global Config`

show radius

This command is used to display the various RADIUS configuration items for the switch as well as the configured RADIUS servers. If the optional token 'servers' is not included, the following RADIUS configuration items will be displayed.

Format `show radius [servers]`
Mode `Privileged EXEC`

Primary Server IP Address Indicates the configured server currently in use for authentication

Number of configured servers	The configured IP address of the authentication server
Max number of retransmits	The configured value of the maximum number of times a request packet is retransmitted
Timeout Duration	The configured timeout value, in seconds, for request re-transmissions
Accounting Mode	Yes or No

If the optional token 'servers' is included, the following information regarding the configured RADIUS servers is displayed.

IP Address	IP Address of the configured RADIUS server
Port	The port in use by this server
Type	Primary or secondary
Secret Configured	Yes / No
Message Authenticator	Enables or disables. the message authenticator attribute for the selected server

show radius statistics

This command is used to display the statistics for RADIUS or configured server . To show the configured RADIUS server statistic, the IP Address specified must match that of a previously configured RADIUS server. On execution, the following fields are displayed.

Format	show radius statistics [ipaddr]
Mode	Privileged EXEC

If ip address is not specified than only Invalid Server Address field is displayed. Otherwise other listed fields are displayed.

Invalid Server Addresses The number of RADIUS Access-Response packets received from unknown addresses.

Server IP Address	IP Address of the Server.
Round Trip Time	The time interval, in hundredths of a second, between the most recent Access-Reply Access-Challenge and the Access-Request that matched it from the RADIUS authentication server.
Access Requests	The number of RADIUS Access-Request packets sent to this server. This number does not include retransmissions.

Access Retransmission The number of RADIUS Access-Request packets retransmitted to this RADIUS authentication server.

Access Accepts The number of RADIUS Access-Accept packets, including both valid and invalid packets, which were received from this server.

Access Rejects The number of RADIUS Access-Reject packets, including both valid and invalid packets, which were received from this server.

Access Challenges The number of RADIUS Access-Challenge packets, including both valid and invalid packets, which were received from this server.

Malformed Access Responses The number of malformed RADIUS Access-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed access responses.

Bad Authenticators The number of RADIUS Access-Response packets containing invalid authenticators or signature attributes received from this server.

Pending Requests The number of RADIUS Access-Request packets destined for this server that have not yet timed out or received a response.

Timeouts The number of authentication timeouts to this server.

Unknown Types The number of RADIUS packets of unknown types, which were received from this server on the authentication port.

Packets Dropped The number of RADIUS packets received from this server on the authentication port and dropped for some other reason.

Secure Shell (SSH) Commands

This section provides a detailed explanation of the SSH commands. The commands are divided into the following groups:

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

ip ssh

This command is used to enable SSH.

Default	disabled
Format	<code>ip ssh</code>

Mode Privileged EXEC

no ip ssh

This command is used to disable SSH.

Format no ip ssh

Mode Privileged EXEC

ip ssh protocol

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

Default 1 and 2

Format ip ssh protocol [1] [2]

Mode Privileged EXEC

show ip ssh

This command displays the ssh settings.

Format show ip ssh

Mode Privileged EXEC

Administrative Mode This field indicates whether the administrative mode of SSH is enabled or disabled.

Protocol Level The protocol level may have the values of version 1, version 2 or both versions 1 and version 2.

Connections This field specifies the current ssh connections.

Hypertext Transfer Protocol (HTTP) Commands

This section provides a detailed explanation of the HTTP commands. The commands are divided into the following groups:

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

ip http secure-port

This command is used to set the sslt port where port can be 1-65535 and the default is port 443.

Default	443
Format	<code>ip http secure-port <portid></code>
Mode	Privileged EXEC

no ip http secure-port

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

Format	<code>no ip http secure-port</code>
Mode	Privileged EXEC

ip http secure-protocol

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

Default	SSL3 and TLS1
Format	<code>ip http secure-protocol [SSL3] [TLS1]</code>
Mode	Privileged EXEC

ip http secure-server

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

Default	disabled
Format	<code>ip http secure-server</code>
Mode	Privileged EXEC

no ip http secure-server

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

Format	<code>ip http secure-server</code>
Mode	Privileged EXEC

ip http server

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

Disabling the Web interface takes effect immediately. All interfaces are effected.

Default	enabled
Format	<code>ip http server</code>
Mode	Privileged EXEC

no ip http server

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

Format	<code>no ip http server</code>
Mode	Privileged EXEC

show ip http

This command displays the http settings for the switch.

Format	<code>show ip http</code>
Mode	Privileged EXEC

Secure-Server Administrative Mode This field indicates whether the administrative mode of secure HTTP is enabled or disabled.

Secure Protocol Level The protocol level may have the values of SSL3, TSL1, or both SSL3 and TSL1.

Secure Port This field specifies the port configured for SSLT.

HTTP Mode This field indicates whether the HTTP mode is enabled or disabled.

Chapter 10

Routing Commands

This chapter provides a detailed explanation of the Routing commands.

Address Resolution Protocol (ARP) Commands

This chapter provides a detailed explanation of the ARP commands. The commands are divided by functionality into the following different groups:

- Show commands are used to display switch settings, statistics and other information.
- Configuration Commands are used to configure features and options of the switch. For every configuration command there is a show command that will display the configuration setting.
- Copy commands are used to transfer configuration and informational files to and from the switch.

arp

This command creates an ARP entry. The value for <ipaddress> is the IP address of a device on a subnet attached to an existing routing interface. <macaddr> is a unicast MAC address for that device.

The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 00:06:29:32:81:40.

Format	<code>arp <ipaddress> <macaddr></code>
Mode	<code>Global Config</code>

no arp

This command deletes an ARP entry. The value for <arprentry> is the IP address of the interface. The value for <ipaddress> is the IP address of a device on a subnet attached to an existing routing interface. <macaddr> is a unicast MAC address for that device.

Format	<code>no arp <ipaddress> <macaddr></code>
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Mode **Global Config**

ip proxy-arp

This command enables proxy ARP on a router interface.

Without proxy ARP, a device only responds to an ARP request if the target IP address is an address configured on the interface where the ARP request arrived. With proxy ARP, the device may also respond if the target IP address is reachable. The device only responds if all next hops in its route to the destination are through interfaces other than the interface that received the ARP request.

Default **enabled**
Format **ip proxy-arp**
Mode **Interface Config**

no ip proxy-arp

This command disables proxy ARP on a router interface.

Format **no ip proxy-arp**
Mode **Interface Config**

arp cachesize

This command configures the ARP cache size. The value for <cachesize> is a platform specific integer value.

Format **arp cachesize <Platform specific integer value>**
Mode **Global Config**

no arp cachesize

This command configures the default ARP cache size.

Format **no arp cachesize**
Mode **Global Config**

arp dynamicrenew

This command enables ARP component to automatically renew ARP entries of type dynamic when they age out.

Format	<code>arp dynamicrenew</code>
Mode	<code>Privileged Exec</code>

no arp dynamicrenew

This command disables ARP component from automatically renewing ARP entries of type dynamic when they age out.

Format	<code>no arp dynamicrenew</code>
Mode	<code>Privileged Exec</code>

arp purge

This command causes the specified IP address to be removed from the ARP cache. Only entries of type dynamic or gateway are affected by this command.

Format	<code>arp purge <ipaddr></code>
Mode	<code>Privileged EXEC</code>

arp resptime

This command configures the ARP request response timeout.

The value for <seconds> is a valid positive integer, which represents the IP ARP entry response timeout time in seconds. The range for <seconds> is between 1-10 seconds.

Default	<code>1</code>
Format	<code>arp resptime <1-10></code>
Mode	<code>Global Config</code>

no arp resptime

This command configures the default ARP request response timeout.

Format	<code>no arp resptime</code>
Mode	<code>Global Config</code>

arp retries

This command configures the ARP count of maximum request for retries.

The value for <retries> is an integer, which represents the maximum number of request for retries. The range for <retries> is an integer between 0-10 retries.

Default	4
Format	<code>arp retries <0-10></code>
Mode	Global Config

no arp retries

This command configures the default ARP count of maximum request for retries.

Format	<code>no arp retries</code>
Mode	Global Config

arp timeout

This command configures the ARP entry ageout time.

The value for <seconds> is a valid positive integer, which represents the IP ARP entry ageout time in seconds. The range for <seconds> is between 15-21600 seconds.

Default	1200
Format	<code>arp timeout <15-21600></code>
Mode	Global Config

no arp timeout

This command configures the default ARP entry ageout time.

Format	<code>no arp timeout</code>
Mode	Global Config

clear arp-cache

This command causes all ARP entries of type dynamic to be removed from the ARP cache. If the *gateway* parameter is specified, the dynamic entries of type gateway are purged as well.

Format `clear arp-cache [gateway]`
Mode `Privileged Exec`

show arp

This command displays the Address Resolution Protocol (ARP) cache. The displayed results are not the total ARP entries. To view the total ARP entries, the operator should view the `show arp` results in conjunction with the `show arp switch` results.

Format `show arp`
Mode `Privileged EXEC`
Age Time (seconds) Is the time it takes for an ARP entry to age out. This value was configured into the unit. Age time is measured in seconds.
Response Time (seconds) Is the time it takes for an ARP request timeout. This value was configured into the unit. Response time is measured in seconds.
Retries Is the maximum number of times an ARP request is retried. This value was configured into the unit.
Cache Size Is the maximum number of entries in the ARP table. This value was configured into the unit.
Dynamic Renew Mode Displays whether the ARP component automatically attempts to renew dynamic ARP entries when they age out.
Total Entry Count Current / Peak Field listing the total entries in the ARP table and the peak entry count in the ARP table.
Static Entry Count Current / Max Field listing the static entry count in the ARP table and maximum static entry count in the ARP table.

The following are displayed for each ARP entry.

IP Address Is the IP address of a device on a subnet attached to an existing routing interface.
MAC Address Is the hardware MAC address of that device.
Interface Is the routing slot/port associated with the device ARP entry.
Type Is the type that was configured into the unit. The possible values are Local, Gateway, Dynamic and Static.
Age This field displays the current age of the ARP entry since last refresh (in hh:mm:ss format)

show arp brief

This command displays the brief Address Resolution Protocol (ARP) table information.

Format	<code>show arp brief</code>
Mode	Privileged EXEC
Age Time (seconds)	Is the time it takes for an ARP entry to age out. This value was configured into the unit. Age time is measured in seconds.
Response Time (seconds)	Is the time it takes for an ARP request timeout. This value was configured into the unit. Response time is measured in seconds.
Retries	Is the maximum number of times an ARP request is retried. This value was configured into the unit.
Cache Size	Is the maximum number of entries in the ARP table. This value was configured into the unit.
Dynamic Renew Mode	Displays whether the ARP component automatically attempts to renew dynamic ARP entries when they age out.
Total Entry Count Current / Peak	Field listing the total entries in the ARP table and the peak entry count in the ARP table.
Static Entry Count Current / Max	Field listing the static entry count in the ARP table and maximum static entry count in the ARP table.

IP Routing

This chapter provides a detailed explanation of the IP Routing commands. The commands are divided by functionality into the following different groups:

- Show commands are used to display switch settings, statistics and other information.
- Configuration Commands are used to configure features and options of the switch. For every configuration command there is a show command that will display the configuration setting.
- Copy commands are used to transfer configuration and informational files to and from the switch.

routing

This command enables routing for an interface.

The current value for this function is displayed under "show ip interface" labeled as "Routing Mode".

Default	disabled
Format	routing
Mode	Interface Config

no routing

This command disables routing for an interface.

The current value for this function is displayed under "show ip interface" labeled as "Routing Mode".

Format	no routing
Mode	Interface Config

ip routing

This command enables the IP Router Admin Mode for the master switch.

Format	ip routing
Mode	Global Config

no ip routing

This command disables the IP Router Admin Mode for the master switch.

Format	no ip routing
Mode	Global Config

ip address

This command configures an IP address on an interface. The IP address may be a secondary IP address.

The value for <ipaddr> is the IP Address of the interface.

The value for <subnetmask> is a 4-digit dotted-decimal number which represents the Subnet Mask of the interface. This changes the label "IP address" in "show ip interface."

Format	ip address <ipaddr> <subnetmask> [<i>secondary</i>]
---------------	---

Format `ip route default <nextHopRtr> [<preference>]`
Mode `Global Config`

no ip route default

This command deletes all configured default routes. If the optional <nextHopRtr> parameter is designated, the specific next hop is deleted from the configured default route and if the optional preference value is designated, the preference of the configured default route is reset to its default.

Format `no ip route default [{<nextHopRtr> | <preference>}]`
Mode `Global Config`

ip route distance

This command sets the default distance for static routes. Lower route preference values are preferred when determining the best route. The "ip route" and "ip route default" commands allow you to optionally set the distance of an individual static route. The default distance is used when no distance is specified in these commands. Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance will only be applied to static routes created after invoking the "ip route distance" command.

Default `1`
Format `ip route distance <1-255>`
Mode `Global Config`

no ip route distance

This command sets the default static route preference value in the router. Lower route preference values are preferred when determining the best route.

Format `no ip route distance`
Mode `Global Config`

ip forwarding

This command enables forwarding of IP frames.

Default `enabled`

Format	<code>ip forwarding</code>
Mode	Global Config

no ip forwarding

This command disables forwarding of IP frames.

Format	<code>no ip forwarding</code>
Mode	Global Config

ip netdirbcast

This command enables the forwarding of network-directed broadcasts. When enabled, network directed broadcasts are forwarded. When disabled they are dropped.

Default	disabled
Format	<code>ip netdirbcast</code>
Mode	Interface Config

no ip netdirbcast

This command disables the forwarding of network-directed broadcasts. When disabled, network directed broadcasts are dropped.

Format	<code>no ip netdirbcast</code>
Mode	Interface Config

ip mtu

This command sets the maximum transmission unit (MTU) size of IP packets sent on a specific routing interface.

Default	1500 bytes
Format	<code>ip mtu <68 - 9194></code>
Mode	Interface Config

no ip mtu

This command sets the maximum transmission unit (MTU) size to the default value.

Format	<code>no ip mtu</code>
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Mode Interface Config

show ip brief

This command displays all the summary information of the IP. This command takes no options.

Format	<code>show ip brief</code>
Mode	Privileged EXEC and User EXEC
Default Time to Live	The computed TTL (Time to Live) of forwarding a packet from the local router to the final destination.
Router ID	Is a 32 bit integer in dotted decimal format identifying the router, about which information is displayed. This is a configured value.
Routing Mode	Shows whether the routing mode is enabled or disabled.
IP Forwarding Mode	Shows whether forwarding of IP frames is enabled or disabled. This is a configured value.

show ip interface

This command displays all pertinent information about the IP interface.

Format	<code>show ip interface <slot/port></code>
Mode	Privileged EXEC and User EXEC
IP Address	Is an IP address representing the subnet configuration of the router interface. This value was configured into the unit.
Subnet Mask	Is a mask of the network and host portion of the IP address for the router interface. This value was configured into the unit.
Routing Mode	Is the administrative mode of router interface participation. The possible values are enable or disable. This value was configured into the unit.
Administrative Mode	Is the administrative mode of the specified interface. The possible values of this field are enable or disable. This value was configured into the unit.
Forward Net Directed Broadcasts	Displays whether forwarding of network-directed broadcasts is enabled or disabled. This value was configured into the unit.
Active State	Displays whether the interface is active or inactive. An interface is considered active if its link is up and it is in forwarding state.

Link Speed Data Rate	Is an integer representing the physical link data rate of the specified interface. This is measured in Megabits per second (Mbps).
MAC Address	Is the burned in physical address of the specified interface. The format is 6 two-digit hexadecimal numbers that are separated by colons.
Encapsulation Type	Is the encapsulation type for the specified interface. The types are: Ethernet or SNAP.

show ip interface brief

This command displays summary information about IP configuration settings for all ports in the router. This command takes no options.

Format	<code>show ip interface brief</code>
Mode	Privileged EXEC and User EXEC
Slot/Port	Valid slot and port number separated by forward slashes.
IP Address	The IP address of the routing interface in 32-bit dotted decimal format.
IP Mask	The IP mask of the routing interface in 32-bit dotted decimal format.
Netdir Bcast	Indicates if IP forwards net-directed broadcasts on this interface. Possible values are Enable or Disable.
MultiCast Fwd	Indicates the multicast forwarding administrative mode on the interface. Possible values are Enable or Disable.
In Access Mode	Indicates the inbound access list checking administrative mode on this interface. Possible values are Enable or Disable.
Out Access Mode	Indicates the outbound access list checking administrative mode on this interface. Possible values are Enable or Disable.

show ip route

This command displays the entire route table. This command takes no options.

Format	<code>show ip route</code>
Mode	Privileged EXEC
Network Address	Is an IP address identifying the network on the specified interface.

Subnet Mask	Is a mask of the network and host portion of the IP address for the router interface.
Protocol	Tells which protocol added the specified route. The possibilities are: local, static, or RIP.
Total Number of Routes	The total number of routes.
<i>For each Next Hop</i>	
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next destination.
Next Hop IP Address	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination.

show ip route bestroutes

This command causes the entire route table to be displayed. This commands takes no options.

Format	<code>show ip route bestroutes</code>
Mode	Privileged EXEC
Network Address	Is an IP route prefix for the destination.
Subnet Mask	Is a mask of the network and host portion of the IP address for the specified interface.
Protocol	Tells which protocol added the specified route. The possibilities are: local, static, or RIP.
Total Number of Routes	The total number of routes in the route table.
<i>For each Next Hop</i>	
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next destination.
Next Hop IP Address	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination. The next router will always be one of the adjacent neighbors or the IP address of the local interface for a directly attached network.

show ip route entry

This command displays the entire route table.

Format	<code>show ip route entry</code>
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Mode	Privileged EXEC
Network Address	Is a valid network address identifying the network on the specified interface.
Subnet Mask	Is a mask of the network and host portion of the IP address for the attached network.
Protocol	Tells which protocol added the specified route. The possibilities are: local, static, or RIP.
<i>For each Next Hop</i>	
Next Hop Interface	The outgoing router interface to use when forwarding traffic to the next destination.
Next Hop IP Address	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination.
Preference Metric	The metric value that is used for this route entry.

show ip route preferences

This command displays detailed information about the route preferences. Route preferences are used in determining the best route. Lower router preference values are preferred over higher router preference values.

Format	<code>show ip route preferences</code>
Mode	Privileged EXEC and User EXEC
Local	This field displays the local route preference value.
Static	This field displays the static route preference value.
RIP	This field displays the RIP route preference value.

show ip stats

This command displays IP statistical information. Refer to RFC 1213 for more information about the fields that are displayed. This command takes no options.

Format	<code>show ip stats</code>
Mode	Privileged EXEC and User EXEC

encapsulation

This command configures the link layer encapsulation type for the packet. Acceptable values for <encapstype> are Ethernet and SNAP. The default is Ethernet.

Format	<code>encapsulation {ethernet snap}</code>
Mode	Interface Config
Restrictions	Routed frames are always Ethernet encapsulated when a frame is routed to a VLAN.

Bootp/DHCP Relay Commands

This chapter provides a detailed explanation of the BootP/DHCP Relay commands. The commands are divided by functionality into the following different groups:

- Show commands are used to display switch settings, statistics and other information.
- Configuration Commands are used to configure features and options of the switch. For every configuration command there is a show command that will display the configuration setting.
- Copy commands are used to transfer configuration and informational files to and from the switch.

bootpdhcprelay cidoptmode

This command enables the circuit ID option mode for BootP/DHCP Relay on the system.

Default	disabled
Format	<code>bootpdhcprelay cidoptmode</code>
Mode	Global Config

no bootpdhcprelay cidoptmode

This command disables the circuit ID option mode for BootP/DHCP Relay on the system.

Format	<code>no bootpdhcprelay cidoptmode</code>
Mode	Global Config

bootpdhcprelay enable

This command enables the forwarding of relay requests for BootP/DHCP Relay on the system.

Default	disabled
Format	<code>bootpdhcprelay enable</code>
Mode	Global Config

no bootpdhcprelay enable

This command disables the forwarding of relay requests for BootP/DHCP Relay on the system.

Format	<code>no bootpdhcprelay enable</code>
Mode	Global Config

bootpdhcprelay maxhopcount

This command configures the maximum allowable relay agent hops for BootP/DHCP Relay on the system. The <hops> parameter has a range of 1 to 16.

Default	4
Format	<code>bootpdhcprelay maxhopcount <1-16></code>
Mode	Global Config

no bootpdhcprelay maxhopcount

This command configures the default maximum allowable relay agent hops for BootP/DHCP Relay on the system.

Format	<code>no bootpdhcprelay maxhopcount</code>
Mode	Global Config

bootpdhcprelay minwaittime

This command configures the minimum wait time in seconds for BootP/DHCP Relay on the system. When the BOOTP relay agent receives a BOOTREQUEST message, it MAY use the seconds-since-client-began-booting field of the request as a factor in deciding whether to relay the request or not. The parameter has a range of 0 to 100 seconds.

Default	0
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Format `bootpdhcprelay minwaittime <0-100>`
Mode `Global Config`

no bootpdhcprelay minwaittime

This command configures the default minimum wait time in seconds for BootP/DHCP Relay on the system.

Format `no bootpdhcprelay minwaittime`
Mode `Global Config`

bootpdhcprelay serverip

This command configures the server IP Address for BootP/DHCP Relay on the system. The <ipaddr> parameter is an IP address in a 4-digit dotted decimal format.

Default `0.0.0.0`
Format `bootpdhcprelay serverip <ipaddr>`
Mode `Global Config`

no bootpdhcprelay serverip

This command configures the default server IP Address for BootP/DHCP Relay on the system.

Format `no bootpdhcprelay serverip`
Mode `Global Config`

show bootpdhcprelay

This command displays the BootP/DHCP Relay information.

Format `show bootpdhcprelay`
Mode `Privileged EXEC and User EXEC`
Maximum Hop Count Is the maximum allowable relay agent hops.
Minimum Wait Time (Seconds) Is the minimum wait time.
Admin Mode Represents whether relaying of requests is enabled or disabled.
Server IP Address Is the IP Address for the BootP/DHCP Relay server.
Circuit Id Option Mode Is the DHCP circuit Id option which may be enabled or disabled.

Requests Received	Is the number of requests received.
Requests Relayed	Is the number of requests relayed.
Packets Discarded	Is the number of packets discarded.

Router Discovery Protocol Commands

This chapter provides a detailed explanation of the Router Discovery commands. The commands are divided by functionality into the following different groups:

- Show commands are used to display switch settings, statistics and other information.
- Configuration Commands are used to configure features and options of the switch. For every configuration command there is a show command that will display the configuration setting.
- Copy commands are used to transfer configuration and informational files to and from the switch.

ip irdp

This command enables Router Discovery on an interface.

Default	enabled
Format	<code>ip irdp</code>
Mode	Interface Config

no ip irdp

This command disables Router Discovery on an interface.

Format	<code>no ip irdp</code>
Mode	Interface Config

ip irdp address

This command configures the address to be used to advertise the router for the interface. The valid values for ipaddr are 224.0.0.1 and 255.255.255.255.

Default	224.0.0.1
Format	<code>ip irdp address <ipaddr></code>

Mode **Interface Config**

no ip irdp address

This command configures the default address to be used to advertise the router for the interface.

Format **no ip irdp address**

Mode **Interface Config**

ip irdp holdtime

This command configures the value, in seconds, of the holdtime field of the router advertisement sent from this interface. The range is the maxadvertinterval to 9000 seconds.

Default **3 * maxinterval**

Format **ip irdp holdtime <maxadvertinterval-9000>**

Mode **Interface Config**

no ip irdp holdtime

This command configures the default value, in seconds, of the holdtime field of the router advertisement sent from this interface.

Format **no ip irdp holdtime**

Mode **Interface Config**

ip irdp maxadvertinterval

This command configures the maximum time, in seconds, allowed between sending router advertisements from the interface. The range for maxadvertinterval is 4 to 1800 seconds.

Default **600**

Format **ip irdp maxadvertinterval <4-1800>**

Mode **Interface Config**

no ip irdp maxadvertinterval

This command configures the default maximum time, in seconds.

Format **no ip irdp maxadvertinterval**

Mode **Interface Config**

ip irdp minadvertinterval

This command configures the minimum time, in seconds, allowed between sending router advertisements from the interface. The range for minadvertinterval is 3 to the value of maxadvertinterval.

Default	0.75 * maxadvertinterval
Format	ip irdp minadvertinterval <3-maxadvertinterval>
Mode	Interface Config

no ip irdp minadvertinterval

This command configures the default minimum time, in seconds.

Format	no ip irdp minadvertinterval
Mode	Interface Config

ip irdp preference

This command configures the preferability of the address as a default router address, relative to other router addresses on the same subnet. The range is -2147483648 to -1 to 0 to 1 to 2147483647.

Default	0
Format	ip irdp preference <-2147483648-2147483647>
Mode	Interface Config

no ip irdp preference

This command configures the default preferability of the address as a default router address, relative to other router addresses on the same subnet.

Format	no ip irdp preference
Mode	Interface Config

show ip irdp

This command displays the router discovery information for all interfaces, or a specified interface.

Format	show ip irdp {<slot/port> / all}
---------------	----------------------------------

Mode	Privileged EXEC and User EXEC
Ad Mode	Displays the advertise mode which indicates whether router discovery is enabled or disabled on this interface.
Max Int	Displays the maximum advertise interval which is the maximum time allowed between sending router advertisements from the interface in seconds.
Min Int	Displays the minimum advertise interval which is the minimum time allowed between sending router advertisements from the interface in seconds.
Adv Life	Displays advertise lifetime which is the value of the lifetime field of the router advertisement sent from the interface in seconds.
Preferences	Displays the preference of the address as a default router address, relative to other router addresses on the same subnet.

Virtual LAN Routing Commands

This chapter provides a detailed explanation of the Virtual LAN Routing commands. The commands are divided by functionality into the following different groups:

- Show commands are used to display switch settings, statistics and other information.
- Configuration Commands are used to configure features and options of the switch. For every configuration command there is a show command that will display the configuration setting.
- Copy commands are used to transfer configuration and informational files to and from the switch.

vlan routing

This command creates routing on a VLAN. The <vlanid> value has a range from 1 to 4094.

Format	<code>vlan routing <vlanid></code>
Mode	VLAN Database

no vlan routing

This command deletes routing on a VLAN. The <vlanid> value has a range from 1 to 4094.

Format	<code>no vlan routing <vlanid></code>
---------------	---

Mode **VLAN Database**

show ip vlan

This command displays the VLAN routing information for all VLANs with routing enabled in the system.

Format `show ip vlan`

Mode `Privileged EXEC and User EXEC`

MAC Address used by Routing VLANs Is the MAC Address associated with the internal bridge-router interface (IBRI). The same MAC Address is used by all VLAN routing interfaces. It will be displayed above the per-VLAN information.

VLAN ID Is the identifier of the VLAN.

Logical Interface Indicates the logical slot/port associated with the VLAN routing interface.

IP Address Displays the IP Address associated with this VLAN.

Subnet Mask Indicates the subnet mask that is associated with this VLAN.

Routing Information Protocol (RIP) Commands

This chapter provides a detailed explanation of the RIP commands. The commands are divided by functionality into the following different groups:

- Show commands are used to display switch settings, statistics and other information.
- Configuration Commands are used to configure features and options of the switch. For every configuration command there is a show command that will display the configuration setting.
- Copy commands are used to transfer configuration and informational files to and from the switch.

enable (RIP)

This command resets the default administrative mode of RIP in the router (active).

Default `enabled`

Format `enable`

Mode `Router RIP Config`

no enable (RIP)

This command sets the administrative mode of RIP in the router to inactive.

Format	<code>no enable</code>
Mode	<code>Router RIP Config</code>

ip rip

This command enables RIP on a router interface.

Default	<code>disabled</code>
Format	<code>ip rip</code>
Mode	<code>Interface Config</code>

no ip rip

This command disables RIP on a router interface.

Format	<code>no ip rip</code>
Mode	<code>Interface Config</code>

auto-summary

This command enables the RIP auto-summarization mode.

Default	<code>enabled</code>
Format	<code>auto-summary</code>
Mode	<code>Router RIP Config</code>

no auto-summary

This command disables the RIP auto-summarization mode.

Format	<code>no auto-summary</code>
Mode	<code>Router RIP Config</code>

default-information originate (RIP)

This command is used to control the advertisement of default routes.

Format	<code>default-information originate</code>
Mode	<code>Router RIP Config</code>

no default-information originate (RIP)

This command is used to control the advertisement of default routes.

Format	<code>no default-information originate</code>
Mode	<code>Router RIP Config</code>

default-metric (RIP)

This command is used to set a default for the metric of distributed routes.

Format	<code>default-metric <0-15></code>
Mode	<code>Router RIP Config</code>

no default-metric (RIP)

This command is used to reset the default metric of distributed routes to its default value.

Format	<code>no default-metric</code>
Mode	<code>Router RIP Config</code>

distance rip

This command sets the route preference value of RIP in the router. Lower route preference values are preferred when determining the best route.

Default	15
Format	<code>distance rip <0-255></code>
Mode	<code>Router RIP Config</code>

no distance rip

This command sets the default route preference value of RIP in the router.

Format	<code>no distance rip</code>
Mode	<code>Router RIP Config</code>

istribute-list out

This command is used to specify the access list to filter routes received from the source protocol.

Default	0
Format	<code>istribute-list <1-199> out {bgp static connected}</code>
Mode	Router RIP Config

no istribute-list out

This command is used to specify the access list to filter routes received from the source protocol.

Format	<code>no istribute-list <1-199> out {bgp static connected}</code>
Mode	Router RIP Config

no default-information originate

This command is used to control the advertisement of default routes.

Format	<code>no default-information originate</code>
Mode	Router RIP Config

ip rip authentication

This command sets the RIP Version 2 Authentication Type and Key for the specified interface. The value of <type> is either none, simple, or encrypt.

The value for authentication key [key] must be 16 bytes or less. The [key] is composed of standard displayable, non-control keystrokes from a Standard 101/102-key keyboard. If the value of <type> is encrypt, a keyid in the range of 0 and 255 must be specified.

Default	The default authentication type is none.
Default	The default password key is an empty string. Unauthenticated interfaces do not need an authentication key.
Default	The default key id is not defined. Unauthenticated interfaces do not need an authentication key id.
Format	<code>ip rip authentication {none {simple <key>} {encrypt <key> <keyid>}}</code>
Mode	Interface Config

no ip rip authentication

This command sets the default RIP Version 2 Authentication Type.

Format	<code>no ip rip authentication</code>
Mode	<code>Interface Config</code>

ip rip receive version

This command configures the interface to allow RIP control packets of the specified version(s) to be received.

The value for <mode> is one of: rip1 to receive only RIP version 1 formatted packets, rip2 for RIP version 2, both to receive packets from either format, or none to not allow any RIP control packets to be received.

Default	<code>both</code>
Format	<code>ip rip receive version {rip1 rip2 both none}</code>
Mode	<code>Interface Config</code>

no ip rip receive version

This command configures the interface to allow RIP control packets of the default version(s) to be received.

Format	<code>no ip rip receive version</code>
Mode	<code>Interface Config</code>

ip rip send version

This command configures the interface to allow RIP control packets of the specified version to be sent.

The value for <mode> is one of: rip1 to broadcast RIP version 1 formatted packets, rip1c (RIP version 1 compatibility mode) which sends RIP version 2 formatted packets via broadcast, rip2 for sending RIP version 2 using multicast, or none to not allow any RIP control packets to be sent.

Default	<code>rip2</code>
Format	<code>ip rip send version {rip1 rip1c rip2 none}</code>
Mode	<code>Interface Config</code>

no ip rip send version

This command configures the interface to allow RIP control packets of the default version to be sent.

Format	<code>no ip rip send version</code>
Mode	<code>Interface Config</code>

hostroutesaccept

This command enables the RIP hostroutesaccept mode.

Default	<code>enabled</code>
Format	<code>hostroutesaccept</code>
Mode	<code>Router RIP Config</code>

no hostroutesaccept

This command disables the RIP hostroutesaccept mode.

Format	<code>no hostroutesaccept</code>
Mode	<code>Router RIP Config</code>

split-horizon

This command sets the RIP split horizon mode.

Default	<code>simple</code>
Format	<code>split-horizon {none / simple / poison}</code>
Mode	<code>Router RIP Config</code>

no split-horizon

This command sets the default RIP split horizon mode.

Format	<code>no split-horizon</code>
Mode	<code>Router RIP Config</code>

redistribute

This command configures RIP protocol to redistribute routes from the specified source protocol/routers. There are five possible match options. When you submit the command redistribute match <match-type> the match-type or types specified are added to any match types presently being redistributed. Internal routes are redistributed by default.

Default metric -- not-configured; match -- internal

Format for other source protocol

```
redistribute {bgp | static | connected} [metric <0-15>]
```

Mode Router RIP Config

no redistribute

This command de-configures RIP protocol to redistribute routes from the specified source protocol/routers.

Format no redistribute {bgp | static | connected} [metric] [match [internal]]

Mode Router RIP Config

show ip rip

This command displays information relevant to the RIP router.

Format show ip rip

Mode Privileged EXEC and User EXEC

RIP Admin Mode Select enable or disable from the pulldown menu. If you select enable RIP will be enabled for the switch. The default is disable.

Split Horizon Mode Select none, simple or poison reverse from the pulldown menu. Split horizon is a technique for avoiding problems caused by including routes in updates sent to the router from which the route was originally learned. The options are: None - no special processing for this case. Simple - a route will not be included in updates sent to the router from which it was learned. Poisoned reverse - a route will be included in updates sent to the router from which it was learned, but the metric will be set to infinity. The default is simple

Auto Summary Mode	Select enable or disable from the pulldown menu. If you select enable groups of adjacent routes will be summarized into single entries, in order to reduce the total number of entries The default is enable.
Host Routes Accept Mode	Select enable or disable from the pulldown menu. If you select enable the router will be accept host routes. The default is enable.
Global Route Changes	The number of route changes made to the IP Route Database by RIP. This does not include the refresh of a route's age.
Global queries -	The number of responses sent to RIP queries from other systems.Default Metric
Default Metric	Sets a default for the metric of redistributed routes.This field displays the default metric if one has already been set or blank if not configured earlier. The valid values are (1 to 15)
Default Route Advertise	The default route.

show ip rip interface brief

This command displays general information for each RIP interface. For this command to display successful results routing must be enabled per interface (i.e. ip rip).

Format	<code>show ip rip interface brief</code>
Mode	Privileged EXEC and User EXEC
Slot/Port	Valid slot and port number separated by forward slashes.
IP Address	The IP source address used by the specified RIP interface.
Send Version	The RIP version(s) used when sending updates on the specified interface. The types are none, RIP-1, RIP-1c, RIP-2.
Receive Version	The RIP version(s) allowed when receiving updates from the specified interface. The types are none, RIP-1, RIP-2, Both
RIP Mode	RIP administrative mode of router RIP operation; enable activates, disable de-activates it.
Link State	The mode of the interface (up or down).

show ip rip interface

This command displays information related to a particular RIP interface.

Format	<code>show ip rip interface <slot/port></code>
Mode	Privileged EXEC and User EXEC
Interface	Valid slot and port number separated by forward slashes. This is a configured value.
IP Address	The IP source address used by the specified RIP interface. This is a configured value.
Send version	The RIP version(s) used when sending updates on the specified interface. The types are none, RIP-1, RIP-1c, RIP-2. This is a configured value.
Receive version	The RIP version(s) allowed when receiving updates from the specified interface. The types are none, RIP-1, RIP-2, Both. This is a configured value.
Both RIP Admin Mode	RIP administrative mode of router RIP operation; enable activates, disable de-activates it. This is a configured value.
Link State	Indicates whether the RIP interface is up or down. This is a configured value.
Authentication Type	The RIP Authentication Type for the specified interface. The types are none, simple, and encrypt. This is a configured value.
Default Metric	A number which represents the metric used for default routes in RIP updates originated on the specified interface. This is a configured value.

The following information will be invalid if the link state is down.

Bad Packets Received	The number of RIP response packets received by the RIP process which were subsequently discarded for any reason.
Bad Routes Received	The number of routes contained in valid RIP packets that were ignored for any reason.
Updates Sent	The number of triggered RIP updates actually sent on this interface.

Chapter 11

Quality of Service (QoS) Commands

This chapter provides a detailed explanation of the Quality of Service (QoS) commands. The following QoS commands are available in the software QoS module.

The commands are divided into these different groups:

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

Access Control List (ACL) Commands

Access Control Lists (ACLs) ensure that only authorized users have access to specific resources while blocking off any unwarranted attempts to reach network resources.

Note:

- ◆ ACL configuration for IP packet fragments is not supported.
- ◆ The maximum number of rules per ACL translates into the number of hardware classifier entries used when an ACL is attached to an interface. Increasing these values in the software increases the RAM and NVSTORE usage.
- ◆ ACLs are configured separately for Layer 2 and Layer 3/Layer 4. Some types of hardware do not allow both types of ACLs to be applied to the same interface.

mac access-list extended <name>

This command creates a MAC Access Control List (ACL) identified by <name>, consisting of classification fields defined for the Layer 2 header of an Ethernet frame. The <name> parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the MAC access list.

If a MAC ACL by this name already exists, this command enters Mac-Access-List config mode to allow updating the existing ACL.

Note: The CLI mode is changed to Mac-Access-List Config when this command is successfully executed.

Format	<code>mac access-list extended <name></code>
Mode	Global Config

no mac access-list extended <name>

This command deletes a MAC ACL identified by <name> from the system.

Format	<code>no mac access-list extended <name></code>
Mode	Global Config

mac access-list extended rename <name> <newname>

This command changes the name of a MAC Access Control List (ACL). The <name> parameter is the name of an existing MAC ACL. The <newname> parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the MAC access list.

This command fails if a MAC ACL by the name <newname> already exists.

Format	<code>mac access-list extended rename <name> <newname></code>
Mode	Global Config

{deny|permit} <srcmac> <srcmacmask> <dstmac> <dstmacmask>

This command creates a new rule for the current MAC access list. Each rule is appended to the list of configured rules for the list. Note that an implicit 'deny all' MAC rule always terminates the access list.

Note: The 'no' form of this command is not supported, as the rules within an ACL cannot be deleted individually. Rather, the entire ACL must be deleted and re-specified.

A rule may either deny or permit traffic according to the specified classification fields. At a minimum, the source and destination MAC value and mask pairs must be specified, each of which may be substituted using the keyword any to indicate a match on any value in that field. The bpdud keyword may be specified for the destination MAC value/mask pair indicating a well-known BPDUD MAC value of 01-80-c2-xx-xx-xx (hex), where 'xx' indicates a don't care. The remaining command parameters are all optional.

The Ethertype may be specified as either a keyword or a four-digit hexadecimal value from 0x0600-0xFFFF. The currently supported <ethertypekey> values are: appletalk, arp, ibmsna, ipv4, ipv6, ipx, mplsicast, mplsucast, netbios, novell, pppoe, rarp. Each of these translates into its equivalent Ethertype value(s).

The assign-queue parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed <queue-id> value is 0-(n-1), where n is the number of user configurable queues available for the hardware platform. The redirect parameter allows the traffic matching this rule to be forwarded to the specified <slot/port>. The assign-queue and redirect parameters are only valid for a 'permit' rule.

Format `{deny|permit} {{<srcmac> <srcmacmask> | any} {{<dstmac> <dstmacmask>} | any | bpdu} [<ethertypekey> | <0x0600-0xFFFF>] [vlan {{eq <0-4095>} | {range <0-4095> <0-4095>}}] [cos <0-7>] [secondary-vlan {{eq <0-4095>} | {range <0-4095> <0-4095>}}] [secondary-cos <0-7>] [assign-queue <queue-id>] [redirect <slot/port>]`

Note that the special command form {deny|permit} any any is used to match all Ethernet layer 2 packets, and is the equivalent of the IP access list "match every" rule.

Mode `Mac-Access-List Config`

mac access-group <name> {in|out} [sequence <1-4294967295>]

This command attaches a specific MAC Access Control List (ACL) identified by <name> to an interface in a given direction. The <name> parameter must be the name of an existing MAC ACL.

An optional sequence number may be specified to indicate the order of this access list relative to other access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction will be used.

This command specified in 'Interface Config' mode only affects a single interface, whereas the 'Global Config' mode setting is applied to all interfaces. The 'Interface Config' mode command is only available on platforms that support independent per-port class of service queue configuration.

Format `mac access-group <name> {in|out} [sequence <1-4294967295>]`

Mode `Global Config or Interface Config`

no mac access-group <name> {in|out}

This command removes a MAC ACL identified by <name> from the interface in a given direction.

Format	<code>no mac access-list <name> {in out}</code>
Mode	Global Config or Interface Config

show mac access-list <name>

This command displays a MAC access list and all of the rules that are defined for the ACL. The <name> parameter is used to identify a specific MAC ACL to display.

Format	<code>show mac access-list <name></code>
Mode	Privileged EXEC
Rule Number	The ordered rule number identifier defined within the ACL.
Action	Displays the action associated with each rule. The possible values are Permit or Deny.
Source MAC Address	Displays the source MAC address for this rule.
Source MAC Mask	Displays the source MAC mask for this rule.
Destination MAC Address	Displays the destination MAC address for this rule.
Destination MAC Mask	Displays the destination MAC mask for this rule.
Ethertype	Displays the Ethertype keyword or custom value for this rule.
VLAN ID	Displays the VLAN identifier value or range for this rule.
COS	Displays the COS (802.1p) value for this rule.
Secondary VLAN ID	Displays the Secondary VLAN identifier value or range for this rule.
Secondary COS	Displays the Secondary COS (802.1p) value for this rule.
Assign Queue	Displays the queue identifier to which packets matching this rule are assigned.
Redirect Interface	Displays the slot/port to which packets matching this rule are forwarded.

show mac access-lists

This command displays a summary of all defined MAC access lists in the system.

Format	<code>show mac access-lists</code>
Mode	Privileged EXEC
Name	The name of the MAC access list.
Number of Rules	The number of user-configured rules defined for this ACL.

Note: This does not include the implicit 'deny all' rule defined at the end of every MAC ACL.

Interfaces	Displays the list of interfaces (slot/port) to which this MAC ACL is attached in a given direction.
Direction	Denotes the direction in which this MAC ACL is attached to the set of interfaces listed. The possible values are Inbound or Outbound.

access-list

This command creates an Access Control List (ACL) that is identified by the parameter `<accesslistnumber>`. The ACL number is an integer from 1 to 199. The range 1 to 99 is for normal ACL List and 100 to 199 is extended ACL List. The ACL rule is created with the option of *permit* or *deny*. The protocol to filter for an ACL rule is specified by giving the protocol to be used like *cmp, igmp, ip, tcp, udp*. The command specifies a source ipaddress and source mask for match condition of the ACL rule specified by the *srcip* and *srcmask* parameters. The source layer 4 port match condition for the ACL rule are specified by the *port value* parameter. The `<startport>` and `<endport>` parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between will be part of the destination port range. The `<portvalue>` parameter uses a single keyword notation and currently has the values of *domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, and www*. Each of these values translates into its equivalent port number, which is used as both the start and end of a port range. The command specifies a destination ipaddress and destination mask for match condition of the ACL rule specified by the *dstip* and *dstmask* parameters. The command specifies the TOS for an ACL rule depending on a match of precedence or DSCP values using the parameters *tos, tosmask, dscp*.

Default	none
Format	<pre>access-list {(<1-99> {deny permit} <srcip> <src-mask>) ((<100-199> {deny permit} {evry {{icmp igmp ip tcp udp <number>} <srcip> <srcmask> [{eq {<portkey> <portvalue>}] range <startport> <endport>}] <dstip> <dstmask> [{eq {<portkey> <portvalue>} range <startport> <endport>}]} [precedence <precedence> tos <tos> <tosmask> dscp <dscp>] [assign-queue <queue-id>] [redirect <slot/port>])}}}</pre>
Mode	Global Config

no access-list

This command deletes an ACL that is identified by the parameter `<accesslistnumber>` from the system.

Format	<code>no access-list <accesslistnumber></code>
Mode	Global Config

ip access-group

This command attach a specified access-control list to an interface.

Default	none
Format	<code>ip access-group <accesslistnumber> <in / out></code>
Mode	Interface Config

ip access-group all

This command attach a specified access-control list to all interfaces.

Default	none
Format	<code>ip access-group all <accesslistnumber> <in / out></code>
Mode	Global Config

show ip access-lists

This command displays an Access Control List (ACL) and all of the rules that are defined for the ACL. The `<accesslistnumber>` is the number used to identify the ACL.

Format	<code>show ip access-lists <accesslistnumber></code>
Mode	Privileged EXEC and User EXEC
Rule Number	This displays the number identifier for each rule that is defined for the ACL.
Action	This displays the action associated with each rule. The possible values are Permit or Deny.
Protocol	This displays the protocol to filter for this rule.
Source IP Address	This displays the source IP address for this rule.

Source IP Mask	This field displays the source IP Mask for this rule.
Source Ports	This field displays the source port range for this rule.
Destination IP Address	This displays the destination IP address for this rule.
Destination IP Mask	This field displays the destination IP Mask for this rule.
Destination Ports	This field displays the destination port range for this rule.
Service Type Field Match	This field indicates whether an IP DSCP, IP Precedence, or IP TOS match condition is specified for this rule.
Service Type Field Value	This field indicates the value specified for the Service Type Field Match (IP DSCP, IP Precedence, or IP TOS).

Differentiated Services (DiffServ) Commands

This chapter contains the CLI commands used for the QOS Differentiated Services (DiffServ) package.

The user configures DiffServ in several stages by specifying:

1. Class
 - ◆ creating and deleting classes
 - ◆ defining match criteria for a class. Note: The only way to remove an individual match criterion from an existing class definition is to delete the class and re-create it.
2. Policy
 - ◆ creating and deleting policies
 - ◆ associating classes with a policy
 - ◆ defining policy statements for a policy/class combination
3. Service
 - ◆ adding and removing a policy to/from a directional (i.e., inbound, outbound) interface

Packets are filtered and processed based on defined criteria. The filtering criteria is defined by a class. The processing is defined by a policy's attributes. Policy attributes may be defined on a per-class instance basis, and it is these attributes that are applied when a match occurs.

Packet processing begins by testing the match criteria for a packet. A policy is applied to a packet when a class match within that policy is found.

Note that the type of class - all, any, or acl - has a bearing on the validity of match criteria specified when defining the class. A class type of 'any' processes its match rules in an ordered sequence; additional rules specified for such a class simply extend this list. A class type of 'acl' obtains its rule list by interpreting each ACL rule definition at the time the DiffServ class is created.

Differences arise when specifying match criteria for a class type 'all', since only one value for each non-excluded match field is allowed within a class definition. If a field is already specified for a class, all subsequent attempts to specify the same field fail, including the cases where a field can be specified multiple ways through alternative formats. The exception to this is when the 'exclude' option is specified, in which case this restriction does not apply to the excluded fields.

The following class restrictions are imposed by the DiffServ design:

- nested class support limited to:
 - ◆ 'any' within 'any'
 - ◆ 'all' within 'all'
 - ◆ no nested 'not' conditions
 - ◆ no nested 'acl' class types
 - ◆ each class contains at most one referenced class
- hierarchical service policies not supported in a class definition
- access list matched by reference only, and must be sole criterion in a class
 - ◆ i.e., ACL rules copied as class match criteria at time of class creation, with class type 'any'
 - ◆ implicit ACL 'deny all' rule also copied
 - ◆ no nesting of class type 'acl'

Regarding nested classes, referred to here as class references, a given class definition can contain at most one reference to another class, which can be combined with other match criteria. The referenced class is truly a reference and not a copy, since additions to a referenced class affect all classes that reference it. Changes to any class definition currently referenced by any other class must result in valid class definitions for all derived classes otherwise the change is rejected. A class reference may be removed from a class definition.

The user can display summary and detailed information for classes, policies and services. All configuration information is accessible via the CLI, Web, and SNMP user interfaces.

diffserv

This command sets the DiffServ operational mode to active. While disabled, the DiffServ configuration is retained and can be changed, but it is not activated. When enabled, DiffServ services are activated.

Format	<code>diffserv</code>
Mode	Global Config

no diffserv

This command sets the DiffServ operational mode to inactive. While disabled, the DiffServ configuration is retained and can be changed, but it is not activated. When enabled, Diffserv services are activated.

Format	<code>no diffserv</code>
Mode	Global Config

Class Commands

The 'class' command set is used in DiffServ to define:

Traffic Classification	Specify Behavior Aggregate (BA), based on DSCP, and Multi-Field (MF) classes of traffic (name, match criteria)
Service Levels	Specify the BA forwarding classes / service levels. Conceptually, DiffServ is a two-level hierarchy of classes: 1. Service/PHB, 2. Traffic Class

This set of commands consists of class creation/deletion and matching, with the class match commands specifying layer 3, layer 2, and general match criteria. The class match criteria are also known as class rules, with a class definition consisting of one or more rules to identify the traffic belonging to the class. Note that once a class match criterion is created for a class, it cannot be changed or deleted - the entire class must be deleted and re-created.

The CLI command root is `class-map`.

class-map

This command defines a new DiffServ class of type match-all, match-any or match-access-group. The `<classname>` parameter is a case sensitive alphanumeric string from 1 to 31 characters uniquely identifying the class (Note: the class name 'default' is reserved and must not be used here).

When used without any match condition, this command enters the class-map mode. The `<classname>` is the name of an existing DiffServ class (note: the class name 'default' is reserved and is not allowed here)

The class type of **match-all** indicates all of the individual match conditions must be true for a packet to be considered a member of the class.

The class type of **match-any** indicates only one of the match criteria must be true for a packet to belong to the class; multiple matching criteria are evaluated in a sequential order, with the highest precedence awarded to the first criterion defined for the class.

The class type of **match-access-group** indicates the individual class match criteria are evaluated based on an access list (ACL). The **<aclid>** parameter is an integer specifying an existing ACL number (refer to the appropriate ACL documentation for the valid ACL number range). A **match-access-group** class type copies its set of match criteria from the current rule definition of the specified ACL number. All elements of a single ACL Rule are treated by DiffServ as a grouped set, similar to class type all. For any class, at least one class match condition must be specified for the class to be considered valid.

Note: The class match conditions are obtained from the referenced access list **at the time of class creation**. Thus, any subsequent changes to the referenced ACL definition do not affect the DiffServ class. To pick up the latest ACL definition, the DiffServ class must be deleted and re-created.

This command may be used without specifying a class type to enter the Class-Map Config mode for an existing DiffServ class.

Note: The CLI mode is changed to Class-Map Config when this command is successfully executed.

Format	<code>class-map {<match-all match-any match-access-group> <aclid>} <classmapname></code>
Mode	Global Config

no class-map

This command eliminates an existing DiffServ class. The **<classname>** is the name of an existing DiffServ class (note: the class name 'default' is reserved and is not allowed here). This command may be issued at any time; if the class is currently referenced by one or more policies or by any other class, this deletion attempt shall fail.

Format	<code>no class-map <classname></code>
Mode	Global Config

class-map rename

This command changes the name of a DiffServ class. The `<classname>` is the name of an existing DiffServ class. The `<newclassname>` parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the class (Note: the class name 'default' is reserved and must not be used here).

Default	none
Format	<code>class-map rename <classname> <newclassname></code>
Mode	Global Config

match ethertype

This command adds to the specified class definition a match condition based on the value of the ethertype. The `<ethertype>` value is specified as one of the following keywords: **appletalk**, **arp**, **ibmsna**, **ipv4**, **ipv6**, **ipx**, **mplsmcast**, **mplsucast**, **netbios**, **novell**, **pppoe**, **rarp** or as a custom ethertype value in the range of 0x0600-0xFFFF.

Format	<code>match [not] ethertype {<keyword> custom <0x0600-0xFFFF>}</code>
Mode	Class-Map Config

match secondary-cos

This command adds to the specified class definition a match condition for the secondary Class of Service value (the inner 802.1Q tag of a double VLAN tagged packet). The value may be from 0 to 7.

Format	<code>match [not] secondary-cos <0-7></code>
Mode	Class-Map Config

match secondary-vlan

This command adds to the specified class definition a match condition for the secondary VLAN identifier value (the inner 802.1Q tag of a double VLAN tagged packet). The range from `vlanmin` and `vlanmax` are integers from 1 to 4094 with `vlanmax` being optional.

Format	<code>match [not] secondary-vlan <vlanmin> [<vlanmax>]</code>
Mode	Class-Map Config

match any

This command adds to the specified class definition a match condition whereby all packets are considered to belong to the class. The optional [not] parameter has the effect of negating this match condition for the class (i.e., none of the packets are considered to belong to the class).

Default	none
Format	match [not] any
Mode	Class-Map Config

match class-map

This command adds to the specified class definition the set of match conditions defined for another class. The <refclassname> is the name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

Note: there is no [not] option for this match command.

Default	none
Format	match class-map <refclassname>
Mode	Class-Map Config
Restrictions	<p>The class types of both <classname> and <refclassname> must be identical (i.e., any vs. any, or all vs. all). A class type of acl is not supported by this command.</p> <p>Cannot specify <refclassname> the same as <classname> (i.e., self-referencing of class name not allowed).</p> <p>At most one other class may be referenced by a class.</p> <p>Any attempt to delete the <refclassname> class while still referenced by any <classname> shall fail.</p> <p>The combined match criteria of <classname> and <refclassname> must be an allowed combination based on the class type. Any subsequent changes to the <refclassname> class match criteria must maintain this validity, or the change attempt shall fail.</p> <p>The total number of class rules formed by the complete reference class chain (includes both predecessor and successor classes) must not exceed a platform-specific maximum.</p> <p>In some cases, each removal of a refclass rule reduces the maximum number of available rules in the class definition by one.</p>

no match class-map

This command removes from the specified class definition the set of match conditions defined for another class. The <refclassname> is the name of an existing DiffServ class whose match conditions are being referenced by the specified class definition. Note: there is no [not] option for this match command.

Format	<code>no match class-map <refclassname></code>
Mode	Class-Map Config

match cos

This command adds to the specified class definition a match condition for the Class of Service value (the only tag in a single tagged packet or the first or outer 802.1Q tag of a double VLAN tagged packet). The value may be from 0 to 7. The optional [not] parameter has the effect of negating this match condition for the class (i.e., match all class of service values except for what is specified here).

Default	none
Format	<code>match [not] cos <0-7></code>
Mode	Class-Map Config

match destination-address mac

This command adds to the specified class definition a match condition based on the destination MAC address of a packet. The <macaddr> parameter is any layer 2 MAC address formatted as six, two-digit hexadecimal numbers separated by colons (e.g., 00:11:22:dd:ee:ff). The <macmask> parameter is a layer 2 MAC address bit mask, which need not be contiguous, and is formatted as six, two-digit hexadecimal numbers separated by colons (e.g., ff:07:23:ff:fe:dc). The optional [not] parameter has the effect of negating this match condition for the class (i.e., match all destination MAC addresses except for what is specified here).

Default	none
Format	<code>match [not] destination-address mac <macaddr> <mac-mask></code>
Mode	Class-Map Config

match dstip

This command adds to the specified class definition a match condition based on the destination IP address of a packet. The <ipaddr> parameter specifies an IP address. The <ipmask> parameter specifies an IP address bit mask; note that although similar to a standard subnet mask, this bit mask need not be contiguous. The optional [not] parameter has the effect of negating this match condition for the class (i.e., match all destination IP addresses except for what is specified here).

Default	none
Format	<code>match [not] dstip <ipaddr> <ipmask></code>
Mode	Class-Map Config

match dstl4port

This command adds to the specified class definition a match condition based on the destination layer 4 port of a packet using a single keyword or numeric notation or a numeric range notation.

To specify the match condition as a single keyword, the value for <portkey> is one of the supported port name keywords. The currently supported <portkey> values are: **domain**, **echo**, **ftp**, **ftpdata**, **http**, **smtp**, **snmp**, **telnet**, **ftp**, **www**. Each of these translates into its equivalent port number, which is used as both the start and end of a port range.

To specify the match condition using a numeric notation, one layer 4 port number is required. The port number is an integer from 0 to 65535.

To specify the match condition using a numeric range notation, two layer 4 port numbers are required and together they specify a contiguous port range. Each port number is an integer from 0 to 65535, but with the added requirement that the second number be equal to or greater than the first.

The optional [not] parameter has the effect of negating this match condition for the class (i.e., match all destination layer 4 port numbers except for the one specified here).

Default	none
Format	<code>match [not] dstl4port {portkey <0-65535>} [0-65535]</code>
Mode	Class-Map Config

match ip dscp

This command adds to the specified class definition a match condition based on the value of the IP DiffServ Code Point (DSCP) field in a packet, which is defined as the high-order six bits of the Service Type octet in the IP header (the low-order two bits are not checked). The optional **[not]** parameter has the effect of negating this match condition for the class (i.e., match all IP DSCP values except for what is specified here). The **<dscpval>** value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: **af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef**.

Note: The **ip dscp**, **ip precedence**, and **ip tos** match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Note: To specify a match on all DSCP values, use the **match [not] ip tos <tosbits> <tosmask>** command with **<tosbits>** set to 0 and **<tosmask>** set to 03 (hex).

Default	none
Format	match [not] ip dscp <dscpval>
Mode	Class-Map Config

match ip precedence

This command adds to the specified class definition a match condition based on the value of the IP Precedence field in a packet, which is defined as the high-order three bits of the Service Type octet in the IP header (the low-order five bits are not checked). The precedence value is an integer from 0 to 7. The optional **[not]** parameter has the effect of negating this match condition for the class (i.e., match all IP Precedence values except for what is specified here).

Note: The **ip dscp**, **ip precedence**, and **ip tos** match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Note: To specify a match on all Precedence values, use the **match [not] ip tos <tosbits> <tosmask>** command with **<tosbits>** set to 0 and **<tosmask>** set to 1F (hex).

Default	none
Format	match [not] ip precedence <0-7>
Mode	Class-Map Config

match ip tos

This command adds to the specified class definition a match condition based on the value of the IP TOS field in a packet, which is defined as all eight bits of the Service Type octet in the IP header. The value of `<tosbits>` is a two-digit hexadecimal number from 00 to ff. The value of `<tosmask>` is a two-digit hexadecimal number from 00 to ff. The optional `[not]` parameter has the effect of negating this match condition for the class (i.e., match all IP Precedence values except for what is specified here). The `<tosmask>` denotes the bit positions in `<tosbits>` that are used for comparison against the IP TOS field in a packet. For example, to check for an IP TOS value having bits 7 and 5 set and bit 1 clear, where bit 7 is most significant, use a `<tosbits>` value of a0 (hex) and a `<tosmask>` of a2 (hex).

Note: The `ip dscp`, `ip precedence`, and `ip tos` match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Note: In essence, this the “free form” version of the IP DSCP/Precedence/TOS match specification in that the user has complete control of specifying which bits of the IP Service Type field are checked.

Default	none
Format	<code>match [not] ip tos <tosbits> <tosmask></code>
Mode	Class-Map Config

match protocol

This command adds to the specified class definition a match condition based on the value of the IP Protocol field in a packet using a single keyword notation or a numeric value notation.

To specify the match condition using a single keyword notation, the value for `<protocol-name>` is one of the supported protocol name keywords. The currently supported values are: `icmp`, `igmp`, `ip`, `tcp`, `udp`. Note that a value of `ip` is interpreted to match all protocol number values.

To specify the match condition using a numeric value notation, the protocol number is a standard value assigned by IANA and is interpreted as an integer from 0 to 255. Note: This command does not validate the protocol number value against the current list defined by IANA.

The optional `[not]` parameter has the effect of negating this match condition for the class (i.e., match all IP Protocol numbers except for the one specified here).

Default	none
Format	<code>match [not] protocol {protocol-name <0-255>}</code>

Mode	Class-Map Config
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match source-address mac

This command adds to the specified class definition a match condition based on the source MAC address of a packet. The <address> parameter is any layer 2 MAC address formatted as six, two-digit hexadecimal numbers separated by colons (e.g., 00:11:22:dd:ee:ff). The <macmask> parameter is a layer 2 MAC address bit mask, which need not be contiguous, and is formatted as six, two-digit hexadecimal numbers separated by colons (e.g., ff:07:23:ff:fe:dc). The optional [not] parameter has the effect of negating this match condition for the class (i.e., match all source MAC addresses except for what is specified here).

Default	none
Format	match [not] source-address mac <address> <macmask>
Mode	Class-Map Config

match srcip

This command adds to the specified class definition a match condition based on the source IP address of a packet. The <ipaddr> parameter specifies an IP address. The <ipmask> parameter specifies an IP address bit mask; note that although it resembles a standard subnet mask, this bit mask need not be contiguous. The optional [not] parameter has the effect of negating this match condition for the class (i.e., match all source IP addresses except for what is specified here).

Default	none
Format	match [not] srcip <ipaddr> <ipmask>
Mode	Class-Map Config

match srcl4port

This command adds to the specified class definition a match condition based on the source layer 4 port of a packet using a single keyword or numeric notation or a numeric range notation.

To specify the match condition as a single keyword notation, the value for <portkey> is one of the supported port name keywords (listed below).

The currently supported <portkey> values are: **domain**, **echo**, **ftp**, **ftpdata**, **http**, **smtp**, **snmp**, **telnet**, **tftp**, **www**. Each of these translates into its equivalent port number, which is used as both the start and end of a port range.

To specify the match condition as a numeric value, one layer 4 port number is required. The port number is an integer from 0 to 65535.

To specify the match condition as a range, two layer 4 port numbers are required and together they specify a contiguous port range. Each port number is an integer from 0 to 65535, but with the added requirement that the second number be equal to or greater than the first. The optional **[not]** parameter has the effect of negating this match condition for the class (i.e., match all source layer 4 ports except for those within the range specified here).

The optional **[not]** parameter has the effect of negating this match condition for the class (i.e., match all source layer 4 port numbers except for the one specified here).

Default	None
Format	<code>match [not] src14port {portkey <0-65535>} [0-65535]</code>
Mode	Class-Map Config

match vlan

This command adds to the specified class definition a match condition based on the value of the layer 2 VLAN Identifier field (the only tag in a single tagged packet or the first or outer tag of a double VLAN tagged packet). The VLAN ID is an integer from 1 to 4094. The optional **[not]** parameter has the effect of negating this match condition for the class (i.e., match all VLAN Identifier values except for what is specified here).

Default	None
Format	<code>match [not] vlan <1-4094></code>
Mode	Class-Map Config

Policy Commands

The 'policy' command set is used in DiffServ to define:

Traffic Conditioning	Specify traffic conditioning actions (policing, marking, shaping) to apply to traffic classes
Service Provisioning	Specify bandwidth and queue depth management requirements of service levels (EF, AF, etc.)

The policy commands are used to associate a traffic class, which was defined by the class command set, with one or more QoS policy attributes. This association is then assigned to an interface to form a service. The user specifies the policy name when the policy is created.

The DiffServ CLI does not necessarily require that users associate only one traffic class to one policy. In fact, multiple traffic classes can be associated with a single policy, each defining a particular treatment for packets that match the class definition. When a packet satisfies the conditions of more than one class, preference is based on the order in which the classes were added to the policy, with the foremost class taking highest precedence.

This set of commands consists of policy creation/deletion, class addition/removal, and individual policy attributes. Note that the only way to remove an individual policy attribute from a class instance within a policy is to remove the class instance and re-add it to the policy. The values associated with an existing policy attribute can be changed without removing the class instance.

The CLI command root is `policy-map`.

assign-queue

This command modifies the queue id to which the associated traffic stream is assigned. The queueid is an integer from 0 to n-1, where n is the number of egress queues supported by the device.

Format	<code>assign-queue <queueid></code>
Mode	<code>Policy-Class-Map Config</code>

drop

This command specifies that all packets for the associated traffic stream are to be dropped at ingress.

Format	<code>drop</code>
Mode	<code>Policy-Class-Map Config</code>

mark secondary-cos

This command marks all packets for the associated traffic stream with the specified secondary class of service value (the inner 802.1Q tag of a double VLAN tagged packet) in the priority field of the 802.1p header. If the packet does not already contain this header, one is inserted. The CoS value is an integer from 0 to 7.

Format	<code>mark secondary-cos <0-7></code>
Mode	<code>Policy-Class-Map Config</code>

redirect

This command specifies that all incoming packets for the associated traffic stream are redirected to a specific egress interface (physical port or port-channel).

Format redirect <slot/port>
Mode Policy-Class-Map Config

conform-color

This command is used to enable color-aware traffic policing and define the conform-color and exceed-color class maps used. Used in conjunction with the police command where the fields for the conform level (for simple, single-rate, and two-rate policing) and optionally the exceed level (for single-rate and two-rate policing) are specified. The <class-map-name> parameter is the name of an existing Diffserv class map, where different ones must be used for the conform and exceed colors.

Format conform-color <class-map-name> [exceed-color <class-map-name>]
Mode Policy-Class-Map Config

bandwidth kbps

This command identifies a minimum amount of bandwidth to be reserved for the specified class instance within the named policy using an absolute rate notation. The committed information rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295.

Note: The actual bandwidth allocation does not occur until the policy is attached to an interface in a particular direction.

Note: The bandwidth kbps and percent commands are alternative ways to specify the same bandwidth policy attribute.

Format bandwidth kbps <1-4294967295>
Mode Policy-classmap Config

Restrictions The sum of the committed information rate values for all bandwidth and expedite commands defined within a policy must not exceed the available link bandwidth of the interface to which that policy is assigned. Violation of this requirement shall prevent successful attachment of a policy to the interface, or shall cause this command to fail if the policy is already in service on one or more interfaces.

Policy Type Out

Incompatibilities Expedite (all forms)

bandwidth percent

This command identifies a minimum amount of bandwidth to be reserved for the specified class instance within the named policy using a relative rate notation. The committed information rate is specified as a percentage of total link capacity and is an integer from 1 to 100.

Note: The actual bandwidth allocation does not occur until the policy is attached to an interface in a particular direction.

Note: The bandwidth kbps and percent commands are alternative ways to specify the same bandwidth policy attribute.

Format `bandwidth percent <1-100>`

Mode `Policy-classmap Config`

Restrictions The sum of the committed information rate values for all bandwidth and expedite commands defined within a policy must not exceed the available link bandwidth of the interface to which that policy is assigned. Violation of this requirement shall prevent successful attachment of a policy to the interface, or shall cause this command to fail if the policy is already in service on one or more interfaces.

Policy Type Out

Incompatibilities Expedite (all forms)

class

This command creates an instance of a class definition within the specified policy for the purpose of defining treatment of the traffic class through subsequent policy attribute statements. The `<classname>` is the name of an existing DiffServ class. Note that this command causes the specified policy to create a reference to the class definition.

Note: The CLI mode is changed to Policy-classmap Config when this command is successfully executed.

Format `class <classname>`

Mode `Policy-Map Config`

no class

This command deletes the instance of a particular class and its defined treatment from the specified policy. <classname> is the names of an existing DiffServ class. Note that this command removes the reference to the class definition for the specified policy.

Format `no class <classname>`

Mode `Policy-Map Config`

expedite kbps

This command identifies the maximum guaranteed amount of bandwidth to be reserved for the specified class instance within the named policy using an absolute rate notation. The committed information rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295. The optional committed burst size is specified in kilobytes (KB) as an integer from 1 to 128, with a default of 4.

Note: The actual bandwidth allocation does not occur until the policy is attached to an interface in a particular direction.

Note: The expedite kbps and percent commands are alternative ways to specify the same expedite policy attribute.

Format `expedite kbps <1-4294967295> [1-128]`

Mode `Policy-classmap Config`

Restrictions The sum of the committed information rate values for all bandwidth and expedite commands defined within a policy must not exceed the available link bandwidth of the interface to which that policy is assigned. Violation of this requirement shall prevent successful attachment of a policy to the interface, or shall cause this command to fail if the policy is already in service on one or more interfaces.

Policy Type `Out`

Incompatibilities `Bandwidth (all forms), Shape Peak`

expedite percent

This command identifies the maximum guaranteed amount of bandwidth to be reserved for the specified class instance within the named policy using a relative rate notation. The committed information rate is specified as a percentage of total link capacity and is an integer from 1 to 100. The optional committed burst size is specified in kilobytes (KB) as an integer from 1 to 128, with a default of 4.

Note: The actual bandwidth allocation does not occur until the policy is attached to an interface in a particular direction.

Note: The expedite kbps and percent commands are alternative ways to specify the same expedite policy attribute.

Format	<code>expedite percent <1-100> [1-128]</code>
Mode	<code>Policy-classmap Config</code>
Restrictions	The sum of the committed information rate values for all bandwidth and expedite commands defined within a policy must not exceed the available link bandwidth of the interface to which that policy is assigned. Violation of this requirement shall prevent successful attachment of a policy to the interface, or shall cause this command to fail if the policy is already in service on one or more interfaces.
Policy Type	Out
Incompatibilities	Bandwidth (all forms), Shape Peak

mark cos

This command marks all packets for the associated traffic stream with the specified class of service value in the priority field of the 802.1p header. If the packet does not already contain this header, one is inserted. The CoS value is an integer from 0 to 7.

Default	1
Format	<code>mark-cos <0-7></code>
Mode	<code>Policy-classmap Config</code>
Policy Type	In

mark ip-dscp

This command marks all packets for the associated traffic stream with the specified IP DSCP value.

The <dscpval> value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: *af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.*

Format	<code>mark ip-dscp <dscpval></code>
Mode	<code>Policy-classmap Config</code>

Policy Type	In
Incompatibilities	Mark IP Precedence, Police (all forms)

mark ip-precedence

This command marks all packets for the associated traffic stream with the specified IP Precedence value. The IP Precedence value is an integer from 0 to 7.

Format	<code>mark ip-precedence <0-7></code>
Mode	<code>Policy-classmap Config</code>
Policy Type	In
Incompatibilities	Mark IP DSCP, Police (all forms)

police-simple

This command is used to establish the traffic policing style for the specified class. The simple form of the police command uses a single data rate and burst size, resulting in two outcomes: conform and nonconform. The conforming data rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295. The conforming burst size is specified in kilobytes (KB) and is an integer from 1 to 128.

For each outcome, the only possible actions are drop, **set-cos-transmit**,| **set-sec-cos-transmit**, set-dscp-transmit, set-prec-transmit, or transmit. In this simple form of the police command, the conform action defaults to transmit and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

For set-dscp-transmit, a `<dscpval>` value is required and is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: **af11**, **af12**, **af13**, **af21**, **af22**, **af23**, **af31**, **af32**, **af33**, **af41**, **af42**, **af43**, **be**, **cs0**, **cs1**, **cs2**, **cs3**, **cs4**, **cs5**, **cs6**, **cs7**, **ef**.

For set-prec-transmit, an IP Precedence value is required and is specified as an integer from 0-7.

Format	<code>police-simple {<1-4294967295> <1-128> conform-action {drop set-cos-transmit <0-7> set-sec-cos-transmit <0-7> set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} [violate-action {drop set-cos-transmit <0-7> set-sec-cos-transmit <0-7> set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit}]}</code>
Mode	<code>Policy-classmap Config</code>

Restrictions	Only one style of police command (simple, singlerate, tworate) is allowed for a given class instance in a particular policy.
Policy Type	In
Incompatibilities	Mark IP DSCP, Mark IP Precedence

police-single-rate

This command is used to establish the traffic policing style for the specified class. The single-rate form of the police command uses a single data rate and two burst sizes, resulting in three outcomes: conform, exceed and violate. The conforming data rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295. The conforming burst size is specified in kilobytes (KB) as an integer from 1 to 128. The exceeding burst size is specified in kilobytes (KB) as an integer from 1 to 128. Note that the exceeding burst size must be equal to or greater than the conforming burst size.

For each outcome, the only possible actions are drop, **set-cos-transmit**, **set-sec-cos-transmit**, **set-dscp-transmit**, **set-prec-transmit**, or **transmit**. In this singlerate form of the police command, the conform action defaults to send, the exceed action defaults to drop, and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

For **set-dscp-transmit**, a `<dscpval>` value is required and is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: **af11**, **af12**, **af13**, **af21**, **af22**, **af23**, **af31**, **af32**, **af33**, **af41**, **af42**, **af43**, **be**, **cs0**, **cs1**, **cs2**, **cs3**, **cs4**, **cs5**, **cs6**, **cs7**, **ef**.

For **set-prec-transmit**, an IP Precedence value is required and is specified as an integer from 0-7.

Format	<pre>police-single-rate {<1-4294967295> <1-128> <1-128> conform-action {drop set-cos-transmit <0-7> set- sec-cos-transmit <0-7> set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} exceed-action {drop set-cos-transmit <0-7> set-sec-cos-transmit <0-7> set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} [violate-action {drop set-cos- transmit <0-7> set-sec-cos-transmit <0-7> set- prec-transmit <0-7> set-dscp-transmit <0-63> transmit}]}</pre>
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Mode	Policy-classmap Config
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Restrictions	Only one style of police command (simple, singlerate, tworate) is allowed for a given class instance in a particular policy.
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Policy Type	In
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Incompatibilities	Mark IP DSCP, Mark IP Precedence
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police-two-rate

This command is used to establish the traffic policing style for the specified class. The two-rate form of the police command uses two data rates and two burst sizes, resulting in three outcomes: conform, exceed and violate. The first two data parameters are the conforming data rate and burst size. The conforming data rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295, while the conforming burst size is specified in kilobytes (KB) as an integer from 1 to 128. The next two data parameters are the peak data rate and burst size. The peak data rate is specified in kilobits-per-second (Kbps) as an integer from 1 to 4294967295, while the peak burst size is specified in kilobytes (KB) as an integer from 1 to 128. Note that the peak data rate must be equal to or greater than the conforming data rate.

For each outcome, the only possible actions are drop, **set-cos-transmit**, **set-sec-cos-transmit**, **set-dscp-transmit**, **set-prec-transmit**, or transmit. In this two-rate form of the police command, the conform action defaults to send, the exceed action defaults to drop, and the violate action defaults to drop. These actions can be set with this command

For **set-dscp-transmit**, a **<dscpval>** value is required and is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: **af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef**.

For **set-prec-transmit**, an IP Precedence value is required and is specified as an integer from 0-7.

Format

```
police-two-rate {<1-4294967295> <1-4294967295> <1-128> <1-128> conform-action {drop | set-cos-transmit <0-7> | set-sec-cos-transmit <0-7> | set-prec-transmit <0-7> | set-dscp-transmit <0-63> | transmit} exceed-action {drop | set-cos-transmit <0-7> | set-sec-cos-transmit <0-7> | set-prec-transmit <0-7> | set-dscp-transmit <0-63> | transmit} [violate-action {drop | set-cos-transmit <0-7> | set-sec-cos-transmit <0-7> | set-prec-transmit <0-7> | set-dscp-transmit <0-63> | transmit}]}
```

Mode

Policy-classmap Config

Restrictions

Only one style of police command (simple, singlerate, tworate) is allowed for a given class instance in a particular policy.

Policy Type

In

Incompatibilities

Mark IP DSCP, Mark IP Precedence

policy-map

This command establishes a new DiffServ policy. The `<polycyname>` parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the policy. The type of policy is specific to either the inbound or outbound traffic direction as indicated by the `{in | out}` parameter.

Note: The policy type dictates which of the individual policy attribute commands are valid within the policy definition.

Note: The CLI mode is changed to Policy-Map Config when this command is successfully executed.

Format	<code>policy-map <polycyname> <in out></code>
Mode	Global Config

no policy-map

This command eliminates an existing DiffServ policy. The `<polycyname>` parameter is the name of an existing DiffServ policy. This command may be issued at any time; if the policy is currently referenced by one or more interface service attachments, this deletion attempt shall fail.

Format	<code>no policy-map <polycyname></code>
Mode	Global Config

policy-map rename

This command changes the name of a DiffServ policy. The `<polycyname>` is the name of an existing DiffServ class. The `<newpolycyname>` parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the policy.

Format	<code>policy-map rename <polycyname> <newpolycyname></code>
Mode	Global Config

randomdrop

This command changes the active queue depth management scheme from the default tail drop to RED. The first two data parameters are the average queue depth minimum and maximum threshold values specified in bytes. The minimum threshold is an integer from 1 to 250000. The maximum threshold is an integer from 1 to 500000, but it must be equal to or greater than the minimum threshold. The third data parameter is the maximum drop probability and is an integer from 0 to 100. It indicates the percentage likelihood that a packet will be dropped when the average queue depth reaches the maximum threshold value.

The remaining parameters are all optional. The fourth data parameter is the sampling rate, indicating the period at which the queue is sampled for computing the average depth. Expressed in microseconds, the sampling rate is an integer from 0 to 1000000, with a default of 0 (meaning per-packet sampling). The last parameter is the decay exponent, which determines how quickly the average queue length calculation decays over time, with a higher number producing a faster rate of decay. This value is an integer from 0 to 16, with a default of 9.

Note: The last two parameters, namely sampling rate and decay exponent, are hierarchically specified in this command. That is, in order to provide a value for the decay exponent `<0-16>`, the user is required to also specify a sampling rate `<0-1000000>` for proper command interpretation.

Format	<code>randomdrop <1-250000> <1-500000> <0-100> [<0-1000000> <0-16>]</code>
Mode	<code>Policy-classmap Config</code>
Policy Type	Out

shape average

This command is used to establish average rate traffic shaping for the specified class, which limits transmissions for the class to the committed information rate, with excess traffic delayed via queueing. The committed information rate is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295.

Note: Queue depth management defaults to tail drop, but the `randomdrop` command can be used to change to a RED scheme.

Format	<code>shape average <1-4294967295></code>
Mode	<code>Policy-classmap Config</code>
Restrictions	This shaping rate must not exceed the maximum link data rate of the interface to which the policy is applied.
Policy Type	Out

shape peak

This command is used to establish peak rate traffic shaping for the specified class, which allows transmissions for the class to exceed the committed information rate by sending excess traffic with the understanding that it could be dropped by a downstream network element. Two rate parameters are used, a committed information rate and a peak information rate. Each of these rates is specified in kilobits-per-second (Kbps) and is an integer from 1 to 4294967295. The peak rate must be specified as equal to or greater than the committed rate.

Note: Queue depth management defaults to tail drop, but the `randomdrop` command can be used to change to a RED scheme.

Format	<code>shape peak <1-4294967295> <1-4294967295></code>
Mode	<code>Policy-classmap Config</code>
Restrictions	Neither of the shaping rate parameters is allowed to exceed the maximum link data rate of the interface to which the policy is applied.
Policy Type	Out
Incompatibilities	Expedite (all forms)

Service Commands

The 'service' command set is used in DiffServ to define:

Traffic Conditioning	Assign a DiffServ traffic conditioning policy (as specified by the policy commands) to an interface in the incoming direction
Service Provisioning	Assign a DiffServ service provisioning policy (as specified by the policy commands) to an interface in the outgoing direction

The service commands attach a defined policy to a directional interface. Only one policy may be assigned at any one time to an interface in a particular direction. The policy type (in, out) must match the interface direction to which it is attached.

This set of commands consists of service addition/removal.

The CLI command root is *service-policy*

service-policy

This command attaches a policy to an interface in a particular direction. The command can be used in the **Interface Config** mode to attach a policy to a specific interface. Alternatively, the command can be used in the **Global Config** mode to attach this policy to all system interfaces. The direction value is either in or out. The `<policyname>` parameter is the name of an existing DiffServ policy, whose type must match the interface direction. Note that this command causes a service to create a reference to the policy.

Note: This command effectively enables DiffServ on an interface (in a particular direction). There is no separate interface administrative 'mode' command for DiffServ.

Note: This command shall fail if any attributes within the policy definition exceed the capabilities of the interface. Once a policy is successfully attached to an interface, any attempt to change the policy definition such that it would result in a violation of said interface capabilities shall cause the policy change attempt to fail.

Format	<code>service-policy <in out> <polycymapname></code>
Modes	Global Config (for all system interfaces) Interface Config (for a specific interface)
Restrictions	Only a single policy may be attached to a particular interface in a particular direction at any one time.

no service-policy

This command detaches a policy from an interface in a particular direction. The command can be used in the Interface Config mode to detach a policy from a specific interface. Alternatively, the command can be used in the Global Config mode to detach this policy from all system interfaces to which it is currently attached. The direction value is either in or out. The `<polycymapname>` parameter is the name of an existing DiffServ policy. Note that this command causes a service to remove its reference to the policy.

Note: This command effectively disables DiffServ on an interface (in a particular direction). There is no separate interface administrative 'mode' command for DiffServ.

Format	<code>no service-policy <in out> <polycymapname></code>
Modes	Global Config (for all system interfaces) Interface Config (for a specific interface)

Show Commands

The 'show' command set is used in DiffServ to display configuration and status information for:

- Classes
- Policies
- Services

This information can be displayed in either summary or detailed formats. The status information is only shown when the DiffServ administrative mode is enabled; it is suppressed otherwise.

There is also a 'show' command for general DiffServ information that is available at any time.

show class-map

This command displays all configuration information for the specified class. The `<classname>` is the name of an existing DiffServ class.

Format	<code>show class-map <classname></code>
Mode	Privileged EXEC and User EXEC

If the Class Name is specified the following fields are displayed:

Class Name	The name of this class.
Class Type	The class type (all, any, or acl) indicating how the match criteria are evaluated for this class. A class type of all means every match criterion defined for the class is evaluated simultaneously they must all be true to indicate a class match. For a type of any each match criterion is evaluated sequentially and only one need be true to indicate a class match. Class type acl rules are evaluated in a hybrid manner, with those derived from each ACL Rule grouped and evaluated simultaneously, while each such grouping is evaluated sequentially.
Match Criteria	The Match Criteria fields will only be displayed if they have been configured. They will be displayed in the order entered by the user. These are evaluated in accordance with the class type. The possible Match Criteria fields are: Class of Service, Destination IP Address, Destination Layer 4 Port, Destination MAC Address, Every, IP DSCP, IP Precedence, IP TOS, Protocol Keyword, Reference Class, Source IP Address, Source Layer 4 Port, Source MAC Address, COS, Secondary COS , and VLAN, Secondary VLAN, and Ethertype .
Values	This field displays the values of the Match Criteria.
Excluded	This field indicates whether or not this Match Criteria is excluded.

If the Class Name is not specified, this command displays a list of all defined DiffServ classes. The following fields are displayed:

Class Name	The name of this class. (Note that the order in which classes are displayed is not necessarily the same order in which they were created.)
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- Class Type** The class type (all, any, or acl) indicating how the match criteria are evaluated for this class. A class type of all means every match criterion defined for the class is evaluated simultaneously they must all be true to indicate a class match. For a type of any each match criterion is evaluated sequentially and only one need be true to indicate a class match. Class type acl rules are evaluated in a hybrid manner, with those derived from each ACL Rule grouped and evaluated simultaneously, while each such grouping is evaluated sequentially.
- ACL Number** The ACL number used to define the class match conditions at the time the class was created. This field is only meaningful if the class type is acl. (Note that the contents of the ACL may have changed since this class was created.)
- Ref Class Name** The name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

show diffserv

This command displays the DiffServ General Status Group information, which includes the current administrative mode setting as well as the current and maximum number of rows in each of the main DiffServ private MIB tables. This command takes no options.

Format	<code>show diffserv</code>
Mode	Privileged EXEC
DiffServ Admin mode	The current value of the DiffServ administrative mode.
Class Table Size	The current number of entries (rows) in the Class Table.
Class Table Max	The maximum allowed entries (rows) for the Class Table.
Class Rule Table Size	The current number of entries (rows) in the Class Rule Table.
Class Rule Table Max	The maximum allowed entries (rows) for the Class Rule Table.
Policy Table Size	The current number of entries (rows) in the Policy Table.
Policy Table Max	The maximum allowed entries (rows) for the Policy Table.
Policy Instance Table Size	The current number of entries (rows) in the Policy Instance Table.
Policy Instance Table Max	The maximum allowed entries (rows) for the Policy Instance Table.

Policy Attribute Table Size The current number of entries (rows) in the Policy Attribute Table.

Policy Attribute Table Max The maximum allowed entries (rows) for the Policy Attribute Table.

Service Table Size The current number of entries (rows) in the Service Table.

Service Table Max The maximum allowed entries (rows) for the Service Table.

show policy-map

This command displays all configuration information for the specified policy. The <policyname> is the name of an existing DiffServ policy.

Format `show policy-map [policyname]`

Mode `Policy-classmap Config`

Mark Secondary COS Denotes the secondary class of service value that is set in the 802.1p header of outbound packets. This is not displayed if the mark secondary-cos was not specified.

Conform COS The action to be taken on conforming packets per the policing metrics.

Conform Secondary COS The action to be taken on packets conforming with the secondary class of service value per the policing metrics.

Exceed COS The action to be taken on excess packets per the policing metrics.

Exceed Secondary COS The action to be taken on excess packets conforming with the secondary class of service value per the policing metrics.

Non-Conform COS The action to be taken on violating packets per the policing metric.

Non-Conform Secondary COS The action to be taken on violating packets conforming with the secondary class of service per the policing metric.

Assign Queue Directs traffic stream to the specified QoS queue. This allows a traffic classifier to specify which one of the supported hardware queues are used for handling packets belonging to the class.

Drop Drop a packet upon arrival. This is useful for emulating access control list operation using DiffServ, especially when DiffServ and ACL cannot co-exist on the same interface.

Redirect Forces a classified traffic stream to a specified egress port (physical or LAG). This can occur in addition to any marking or polic-

ing action. It may also be specified along with a QoS queue assignment.

If the Policy Name is specified the following fields are displayed:

Policy Name	The name of this policy.
Type	The policy type, namely whether it is an inbound or outbound policy definition.

The following information is repeated for each class associated with this policy (only those policy attributes actually configured are displayed):

Class Name	The name of this class.
Mark CoS	Denotes the class of service value that is set in the 802.1p header of outbound packets. This is not displayed if the mark cos was not specified.
Mark IP DSCP	Denotes the mark/re-mark value used as the DSCP for traffic matching this class. This is not displayed if mark ip description is not specified using the police-two-rate command, or if policing is in use for the class under this policy.
Mark IP Precedence	Denotes the mark/re-mark value used as the IP Precedence for traffic matching this class. This is not displayed if precedence is not specified using police-two-rate command, or if either mark DSCP or policing is in use for the class under this policy.
Policing Style	This field denotes the style of policing, if any, used (simple, single rate, or two rate).
Committed Rate (Kbps)	This field displays the committed rate, used in simple policing, single-rate policing, and two-rate policing.
Committed Burst Size (KB)	This field displays the committed burst size, used in simple policing, single-rate policing, and two-rate policing.
Excess Burst Size (KB)	This field displays the excess burst size, used in single-rate policing.
Peak Rate (Kbps)	This field displays the peak rate, used in two-rate policing.
Peak Burst Size (KB)	This field displays the peak burst size, used in two-rate policing.
Conform Action	The current setting for the action taken on a packet considered to conform to the policing parameters. This is not displayed if policing is not in use for the class under this policy.

- Conform DSCP Value** This field shows the DSCP mark value if the conform action is markdscp.
- Conform IP Precedence Value** This field shows the IP Precedence mark value if the conform action is markprec.
- Exceed Action** The current setting for the action taken on a packet considered to exceed to the policing parameters. This is not displayed if policing not in use for the class under this policy.
- Exceed DSCP Value** This field shows the DSCP mark value if this action is markdscp.
- Exceed IP Precedence Value** This field shows the IP Precedence mark value if this action is markprec.
- Non-Conform Action** The current setting for the action taken on a packet considered to not conform to the policing parameters. This is not displayed if policing not in use for the class under this policy.
- Non-Conform DSCP Value** This field displays the DSCP mark value if this action is markdscp.
- Non-Conform IP Precedence Value** This field displays the IP Precedence mark value if this action is markprec.
- Bandwidth** This field displays the minimum amount of bandwidth reserved in either percent or kilobits-per-second.
- Expedite Burst Size (KBytes)** This field displays the maximum guaranteed amount of bandwidth reserved in either percent or kilobits-per-second format.
- Shaping Average** This field is displayed if average shaping is in use. Indicates whether average or peak rate shaping is in use, along with the parameters used to form the traffic shaping criteria, such as CIR and PIR. This is not displayed if shaping is not configured for the class under this policy.
- Shape Committed Rate (Kbps)** This field is displayed if average or peak rate shaping is in use. It displays the shaping committed rate in kilobits-per-second.
- Shape Peak Rate (Kbps)** This field is displayed if peak rate shaping is in use. It displays the shaping peak rate in kilobits-per-second.
- Random Drop Minimum Threshold** This field displays the RED minimum threshold. This is not displayed if the queue depth management scheme is not RED.

Random Drop Maximum Threshold This field displays the RED maximum threshold. This is not displayed if the queue depth management scheme is not RED.

Random Drop Maximum Drop Probability This field displays the RED maximum drop probability. This is not displayed if the queue depth management scheme is not RED.

Random Drop Sampling Rate This field displays the RED sampling rate. This is not displayed if the queue depth management scheme is not RED.

Random Drop Decay Exponent This field displays the RED decay exponent. This is not displayed if the queue depth management scheme is not RED.

If the Policy Name is not specified this command displays a list of all defined DiffServ policies. The following fields are displayed:

Policy Name The name of this policy. (Note that the order in which the policies are displayed is not necessarily the same order in which they were created.)

Policy Type The policy type, namely whether it is an inbound or outbound policy definition.

Class Members List of all class names associated with this policy.

show diffserv service

This command displays policy service information for the specified interface and direction. The <slot/port> parameter specifies a valid slot/port number for the system. The direction parameter indicates the interface direction of interest.

Format `show diffserv service <slot/port> <in | out>`

Mode `Privileged EXEC`

DiffServ Admin Mode The current setting of the DiffServ administrative mode. An attached policy is only in effect on an interface while DiffServ is in an enabled mode.

Interface Valid slot and port number separated by forward slashes.

Direction The traffic direction of this interface service, either in or out

Operational Status The current operational status of this DiffServ service interface.

Policy Name The name of the policy attached to the interface in the indicated direction.

Policy Details

Attached policy details, whose content is identical to that described for the `show policy-map <polycymapname>` command (content not repeated here for brevity).

show diffserv service brief

This command displays all interfaces in the system to which a DiffServ policy has been attached. The direction parameter is optional; if specified, only services in the indicated direction are shown, otherwise service information is shown for both directions, where applicable.

Format `show diffserv service brief [in | out]`

Mode `Privileged EXEC`

DiffServ Mode The current setting of the DiffServ administrative mode. An attached policy is only active on an interface while DiffServ is in an enabled mode.

The following information is repeated for interface and direction (only those interfaces configured with an attached policy are shown):

Interface Valid slot and port number separated by forward slashes.

Direction The traffic direction of this interface service, either in or out

OperStatus The current operational status of this DiffServ service interface.

Policy Name The name of the policy attached to the interface in the indicated direction.

show policy-map interface

This command displays policy-oriented statistics information for the specified interface and direction. The `<slot/port>` parameter specifies a valid interface for the system. The direction parameter indicates the interface direction of interest.

Note: This command is only allowed while the DiffServ administrative mode is enabled.

Format `show policy-map interface <slot/port> <in | out>`

Interface Valid slot and port number separated by forward slashes.

Direction The traffic direction of this interface service, either in or out.

Operational Status The current operational status of this DiffServ service interface.

Policy Name The name of the policy attached to the interface in the indicated direction.

Interface Offered Octets/Packets A cumulative count of the octets/packets offered to this service interface in the specified direction before the defined DiffServ treatment is applied.

Interface Discarded Octets/Packets A cumulative count of the octets/packets discarded by this service interface in the specified direction for any reason due to DiffServ treatment.

Interface Sent Octets/Packets A cumulative count of the octets/packets forwarded by this service interface in the specified direction after the defined DiffServ treatment was applied. In this case, forwarding means the traffic stream was passed to the next functional element in the data path, such as the switching or routing function or an out-bound link transmission element.

The following information is repeated for each class instance within this policy:

Class Name	The name of this class instance.
-------------------	----------------------------------

In Offered Octets/Packets A count of the octets/packets offered to this class instance before the defined DiffServ treatment is applied. Only displayed for the 'in' direction.

In Discarded Octets/Packets A count of the octets/packets discarded for this class instance for any reason due to DiffServ treatment of the traffic class. Only displayed for the 'in' direction.

Tail Dropped Octets/Packets A count of the octets/packets discarded due to tail dropping from a transmission queue, typically due to the effects of traffic shaping. These counts may not be supported on all platforms. Only displayed for the 'out' direction.

Random Dropped Octets/Packets A count of the octets/packets discarded due to WRED active queue depth management, typically due to the effects of traffic shaping. These counts are only applicable for a class instance whose policy attributes includes random dropping, and may not be supported on all platforms. Only displayed for the 'out' direction.

Shape Delayed Octets/Packets A count of the octets/packets that were delayed due to traffic shaping. These counts are only applicable for a class instance whose policy attributes includes shaping, and may not be supported on all platforms. Only displayed for the 'out' direction.

Sent Octets/Packets

A count of the octets/packets forwarded for this class instance after the defined DiffServ treatment was applied. In this case, forwarding means the traffic stream was passed to the next functional element in the data path, such as the switching or routing function or an outbound link transmission element. Only displayed for the 'out' direction.

Note:

None of the counters listed here are guaranteed to be supported on all platforms. Only supported counters are shown in the display output.

show service-policy

This command displays a summary of policy-oriented statistics information for all interfaces in the specified direction. The direction parameter indicates the interface direction of interest.

This command enables or disables the route reflector client. A route reflector client relies on a route reflector to re-advertise its routes to the entire AS. The possible values for this field are *enable* and *disable*.

Format	<code>show service-policy <in out></code>
Mode	Privileged EXEC

The following information is repeated for each interface and direction (only those interfaces configured with an attached policy are shown):

Interface	Valid slot and port number separated by forward slashes.
Dir	The traffic direction of this interface service, either in or out.
Operational Status	The current operational status of this DiffServ service interface.
Offered Packets	A count of the total number of packets offered to all class instances in this service before their defined DiffServ treatment is applied. These are overall per-interface per-direction counts.
Discarded Packets	A count of the total number of packets discarded for all class instances in this service for any reason due to DiffServ treatment. These are overall per-interface per-direction counts.
Sent Packets	A count of the total number of packets forwarded for all class instances in this service after their defined DiffServ treatments were applied. In this case, forwarding means the traffic stream was passed to the next functional element in the data path, such as the switching or routing function or an outbound link transmission element. These are overall per-interface per-direction counts.

Policy Name The name of the policy attached to the interface.

Note: None of the counters listed here are guaranteed to be supported on all platforms. Only supported counters are shown in the display output.

Class of Service (CoS) Commands

This chapter provides a detailed explanation of the software QoS CoS commands. The following commands are available in the software QOS module.

The commands are divided into these different groups:

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

Note: The 'Interface Config' mode only affects a single interface, whereas the 'Global Config' mode is applied to all interfaces.

classofservice dot1p-mapping

This command maps an 802.1p priority to an internal traffic class. The userpriority and trafficclass can both range from 0-7, although the actual number of available traffic classes depends on the platform. The 'no' form of this command is not supported.

Format	<code>classofservice dot1p-mapping <userpriority> <traffic-class></code>
Modes	Global Config Interface Config

classofservice ip-dscp-mapping

This command maps an IP DSCP value to an internal traffic class. The ipdscp range is from 0-63 and the trafficclass range is from 0-7, although the actual number of available traffic classes depends on the platform. The 'no' form of this command is not supported.

Format	<code>classofservice ip-dscp-mapping <ipdscp> <traffic-class></code>
---------------	--

Modes
Global Config
Interface Config

classofservice ip-precedence-mapping

This command maps an IP precedence value to an internal traffic class. The `ipprecedence` and `trafficclass` can both range from 0-7, although the actual number of available traffic classes depends on the platform. The 'no' form of this command is not supported.

Format `classofservice ip-precedence-mapping <ipprecedence>`
 `<trafficclass>`
Modes Global Config
 Interface Config

classofservice trust

This command sets the class of service trust mode of an interface. The mode can be set to trust one of the Dot1p (802.1p), IP Precedence, or IP DSCP packet markings.

Format `classofservice trust <dot1p/ip-precedence/ip-dscp>`
Mode Global Config
 Interface Config

no classofservice trust

This command sets the interface mode to untrusted.

Format `no classofservice trust`
Modes Global Config
 Interface Config

cos-queue max-bandwidth

This command specifies the maximum transmission bandwidth limit for each interface queue. Also known as rate shaping, this has the effect of smoothing temporary traffic bursts over time so that the transmitted traffic rate is bounded. The total number of queues supported per interface is platform specific.

Format `cos-queue max-bandwidth <bw-0> <bw-1> ... <bw-n>`
Modes Global Config
 Interface Config

no cos-queue max-bandwidth

This command restores the default for each queue's maximum bandwidth value.

Format	<code>no cos-queue max-bandwidth</code>
Mode	Global Config Interface Config

cos-queue min-bandwidth

This command specifies the minimum transmission bandwidth guarantee for each interface queue. The total number of queues supported per interface is platform specific.

Format	<code>cos-queue min-bandwidth <bw-0> <bw-1> ... <bw-n></code>
Modes	Global Config Interface Config

no cos-queue min-bandwidth

This command restores the default for each queue's minimum bandwidth value.

Format	<code>no cos-queue min-bandwidth</code>
Modes	Global Config Interface Config

cos-queue random-detect

This command activates weighted random early discard (WRED) for each specified queue on the interface. Specific WRED parameters are configured using the 'random-detect queue-parms' and the 'random-detect exponential-weighting-constant' commands.

Format	<code>cos-queue random-detect <queue-id-1> [<queue-id-2> ... <queue-id-n>]</code>
Modes	Global Config Interface Config

no cos-queue random-detect

This command disables WRED, thereby restoring the default tail drop operation for the specified queues on the interface.

Format	<code>no cos-queue random-detect <queue-id-1> [<queue-id-2> ... <queue-id-n>]</code>
---------------	--

Modes	Global Config Interface Config
--------------	---

cos-queue strict

This command activates the strict priority scheduler mode for each specified queue.

Format	<code>cos-queue strict <queue-id-1> [<queue-id-2> ... <queue-id-n>]</code>
Modes	Global Config Interface Config

no cos-queue strict

This command restores the default weighted scheduler mode for each specified queue.

Format	<code>no cos-queue strict <queue-id-1> [<queue-id-2> ... <queue-id-n>]</code>
Modes	Global Config Interface Config

random-detect

This command is used to enable WRED for the interface as a whole, and is only available when per-queue WRED activation control is not supported by the device. Specific WRED parameters are configured using the 'random-detect queue-parms' and the 'random-detect exponential-weighting-constant' commands.

Format	<code>random-detect</code>
Modes	Global Config Interface Config

no random-detect

This command disables WRED, thereby restoring the default tail drop operation for all queues on the interface.

Format	<code>no random-detect</code>
Modes	Global Config Interface Config

random-detect exponential-weighting-constant

This command sets the decay exponent used by the WRED average queue depth calculation for the interface.

Format	<code>random-detect exponential-weighting-constant <1-15></code>
Modes	Global Config Interface Config

no random-detect exponential-weighting-constant

This command restores the default value.

Format	<code>no random-detect exponential-weighting-constant</code>
Modes	Global Config Interface Config

random-detect queue-parms

This command sets the WRED parameters for each drop precedence level supported by a queue. The actual number of queue drop precedence levels is platform-specific. Use the 'no' form of this command to restore the default values for the queue WRED parameters.

Format	<code>random-detect queue-parms <queue-id-1> [<queue-id-2> ... <queue-id-n>] min-thresh <0-16> <0-16> max- thresh <min-16> <min-16> <min-16> drop-prob-scale <1- 15> <1-15> <1-15></code>
Modes	Global Config Interface Config

no random-detect queue-parms

Format	<code>no random-detect queue-parms <queue-id-1> [<queue-id- 2> ... <queue-id-n>]</code>
Modes	Global Config Interface Config

tail-drop queue-parms

This command sets the tail drop threshold parameter for each drop precedence level supported by a queue. The total number of queue drop precedence levels is platform-specific. Use the 'no' form of this command to restore the default values for the queue tail drop threshold parameters.

tail-drop queue-parms <queue-id-1> [<queue-id-2> ... <queue-id-n>] threshold <0-16> <0-16>
<0-16>

no tail-drop queue-parms <queue-id-1> [<queue-id-2> ... <queue-id-n>]

Modes	Global Config
	Interface Config

traffic-shape

This command specifies the maximum transmission bandwidth limit for the interface as a whole. Also known as rate shaping, this has the effect of smoothing temporary traffic bursts over time so that the transmitted traffic rate is bounded. Use the 'no' form of this command to restore the default interface shaping rate value.

traffic-shape <bw>

no traffic-shape

Modes	Global Config
	Interface Config

show classofservice dot1p-mapping

This command displays the current Dot1p (802.1p) priority mapping to internal traffic classes for a specific interface. The slot/port parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the 802.1p mapping table of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	show classofservice dot1p-mapping [slot/port]
Mode	Privileged EXEC

The following information is repeated for each user priority.

User Priority	The 802.1p user priority value.
Traffic Class	The traffic class internal queue identifier to which the user priority value is mapped.

show classofservice ip-precedence-mapping

This command displays the current IP Precedence mapping to internal traffic classes for a specific interface. The slot/port parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the IP Precedence mapping table of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	<code>show classofservice ip-precedence-mapping [slot/port]</code>
Mode	Privileged EXEC

The following information is repeated for each user priority.

IP Precedence	The IP Precedence value.
Traffic Class	The traffic class internal queue identifier to which the IP Precedence value is mapped.

show classofservice trust

This command displays the current trust mode setting for a specific interface. The slot/port parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the port trust mode of the interface is displayed. If omitted, the port trust mode of each interface in the system is shown. If the platform does not support independent per-port class of service mappings, the output represents the system-wide port trust mode used for all interfaces.

Format	<code>show classofservice trust [slot/port]</code>
Mode	Privileged EXEC
Non-IP Traffic	ClassThe traffic class used for non-IP traffic. This is only displayed when the COS trust mode is set to either 'trust ip-dscp' or 'trust ip-precedence'.
Untrusted Traffic Class	The traffic class used for all untrusted traffic. This is only displayed when the COS trust mode is set to 'untrusted'.

show interfaces cos-queue

This command displays the class-of-service queue configuration for the specified interface. The slot/port parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the class-of-service queue configuration of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	<code>show interfaces cos-queue [slot/port]</code>
Mode	Privileged EXEC

Interface	This displays the slot/port of the interface. If displaying the global configuration, this output line is replaced with a Global Config indication.
Intf Shaping Rate	The maximum transmission bandwidth limit for the interface as a whole. It is independent of any per-queue maximum bandwidth value(s) in effect for the interface. This is a configured value.
Queue Mgmt Type	The queue depth management technique used for all queues on this interface, either tail drop or weighted random early discard (WRED). This is a configured value.
WRED Decay Exponent	The weighted random early discard (WRED) average queue length calculation decay exponent. This is a configured value.

The following information is repeated for each queue on the interface.

Queue Id	Queue identification number An interface supports n queues numbered 0 to (n-1). The specific n value is platform dependent.
Minimum Bandwidth	The minimum transmission bandwidth guarantee for the queue, expressed as a percentage. A value of 0 means bandwidth is not guaranteed and the queue operates using best-effort. This is a configured value.
Maximum Bandwidth	The maximum transmission bandwidth limit for the queue, expressed as a percentage. A value of 0 means no upper limit is enforced, so the queue may use any or all of the available bandwidth of the interface. This is a configured value.
Scheduler Type	Indicates whether this queue is scheduled for transmission using a strict priority or a weighted scheme. This is a configured value.
Queue Mgmt Type	The queue depth management technique used for this queue, either tail drop or weighted random early discard (WRED). This is a configured value.

show interfaces random-detect

This command displays the weighted random early discard (WRED) configuration for each supported drop precedence level of each queue for the specified interface. The slot/port parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the class-of-service WRED configuration of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	<code>show interfaces random-detect [slot/port]</code>
Mode	Privileged EXEC

Interface This displays the slot/port of the interface. If displaying the global configuration, this output line is replaced with a Global Config indication.

The following information is repeated for each queue on the interface.

Queue Id **Queue identification number** An interface supports *n* queues numbered 0 to (*n*-1). The number *n* is platform dependent and corresponds to the number of supported queues (traffic classes).

The following information is repeated for each drop precedence level defined for the preceding Queue Id.

Drop Precedence Level The drop precedence level for this queue, from 1 to *p*. The specific *p* value is platform dependent.

WRED Minimum Threshold The WRED minimum threshold value for this drop precedence level, expressed in sixteenths of the overall device queue size (e.g., 0/16, 1/16, 2/16..., 16/16). This is a configured value.

WRED Maximum Threshold The WRED maximum threshold value for this drop precedence level, expressed in sixteenths of the overall device queue size (e.g., 0/16, 1/16, 2/16..., 16/16). This is a configured value.

WRED Drop Probability Scale The WRED drop probability scale factor expressed as an integer. This value, *S*, specifies that one out of every ($2^{**}S$) packets are dropped by WRED when the average queue length reaches its maximum threshold value. This is a configured value.

show interfaces tail-drop-threshold

This command displays the tail drop threshold configuration for each supported drop precedence level of each queue for the specified interface. The slot/port parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the class-of-service tail drop configuration of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format `show interfaces tail-drop-threshold [slot/port]`

Mode Privileged EXEC

Interface This displays the slot/port of the interface. If displaying the global configuration, this output line is replaced with a Global Config indication.

The following information is repeated for each queue on the interface.

Queue Id **Queue identification number** An interface supports n queues numbered 0 to (n-1). The number n is platform dependent and corresponds to the number of supported queues (traffic classes).

The following information is repeated for each drop precedence level defined for the preceding Queue Id.

Drop Precedence Level	The drop precedence level for this queue, from 1 to p. The specific p value is platform dependent.
Tail Drop Threshold	The tail drop queue threshold value for this drop precedence level, expressed in sixteenths of the overall device queue size (e.g., 0/16, 1/16, 2/16..., 16/16). This is a configured value.

Chapter 12

Managing Switch Stacks

This chapter describes the concepts and recommended operating procedures to manage FSM7328S or FSM7352S switches running Release 4.0.0 and includes the following sections:

- Initial installation and power-up of a stack
- Removing a unit from the stack
- Adding a unit to an operating stack
- Replacing a stack member with a new unit
- Renumbering stack members
- Moving the master to a different unit in the stack
- Removing a master unit from an operating stack
- Merging two operational stacks
- Pre configuration
- Upgrading firmware
- Migration of configuration with a firmware upgrade

Understanding Switch Stacks

A *switch stack* is a set of up to eight Ethernet switches connected through their stacking ports. One of the switches controls the operation of the stack and is called the *stack master*. The *stack master* and the other switches in the stack are *stack members*. The stack members use stacking technology to behave and work together as a unified system. Layer 2 and Layer 3 protocols present the entire switch stack as a single entity to the network.

The stack master is the single point of stack-wide management. From the stack master, you configure:

- System-level (global) features that apply to all stack members
- Interface-level features for all interfaces on any stack member

A switch stack is identified in the network by its network IP address. The network IP address is assigned according to the MAC address of the stack master. Every stack member is uniquely identified by its own *stack member number*.

All stack members are eligible stack masters. If the stack master becomes unavailable, the remaining stack members participate in electing a new stack master from among themselves. A set of factors determine which switch is elected the stack master. These factors are:

1. The switch who is master always has priority to retain the role of master
2. Assigned priority
3. MAC address

If the master cannot be selected by (1), then (2) is used. If (2) does not resolve which stack member becomes stack master, then (3) is used.

The stack master contains the saved and running configuration files for the switch stack. The configuration files include the system-level settings for the switch stack and the interface-level settings for all stack members. Each stack member retains a copy of the saved file for backup purposes.

If the master is removed from the stack, another member will be elected master, and will then run from that saved configuration.

You can use these methods to manage switch stacks:

- Stack web interface
- Command line interface (CLI) over a serial connection to the console port of the master
- A network management application through the Simple Network Management Protocol (SNMP)

Switch Stack Membership

A switch stack has up to eight stack members connected through their stacking ports. A switch stack always has one stack master.

A standalone switch is a switch stack with one stack member that also operates as the stack master. You can connect one standalone switch to another to create a switch stack containing two stack members, with one of them being the stack master. You can connect standalone switches to an existing switch stack to increase the stack membership.

If you replace a stack member with an identical model, the new switch functions with exactly the same configuration as the replaced switch, assuming that the new switch is using the same member number as the replaced switch. For information about the benefits of preconfiguring a switch stack, see [“Preconfiguration” on page 12-15](#).

The operation of the switch stack continues uninterrupted during membership changes unless you remove the stack master or you add powered-on standalone switches or switch stacks.

- Adding powered-on switches (merging) causes the stack masters of the merging switch stacks to elect a stack master from among themselves. The re-elected stack master retains its role and configuration and so do its stack members. All remaining switches, including the former stack masters, reload and join the switch stack as stack members. They change their stack member numbers to the lowest available numbers and use the stack configuration of the re-elected stack master. Therefore, when you merge two powered stacks, you cannot control which unit becomes stack master and which configuration is used. For these reasons, it is recommended that powered switches be powered down before adding to an existing operating stack.
- Removing powered-on stack members can cause the switch stack to divide (partition) into two or more switch stacks, each with the same configuration. However, if cabled properly, the switch stack should not divide.
 - If the switch stack divides, and you want the switch stacks to remain separate, change the IP address or addresses of the newly created switch stacks.
 - If you did not intend to partition the switch stack:
 - Power off the newly created switch stacks
 - Reconnect them to the original switch stack through their stacking ports
 - Power on the switches

Switch Stack Cabling

Figure 12-1 and Figure 12-2 illustrate how individual switches are interconnected to form a stack. You can use the regular Category 5 Ethernet 8 wire cable.

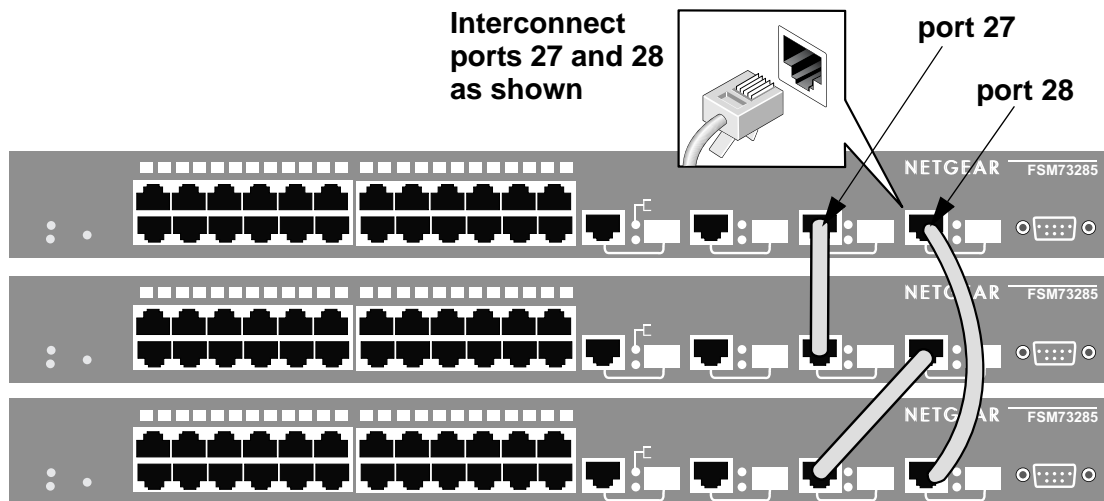


Figure 12-1: Interconnecting individual FSM7328S switches to form a stack

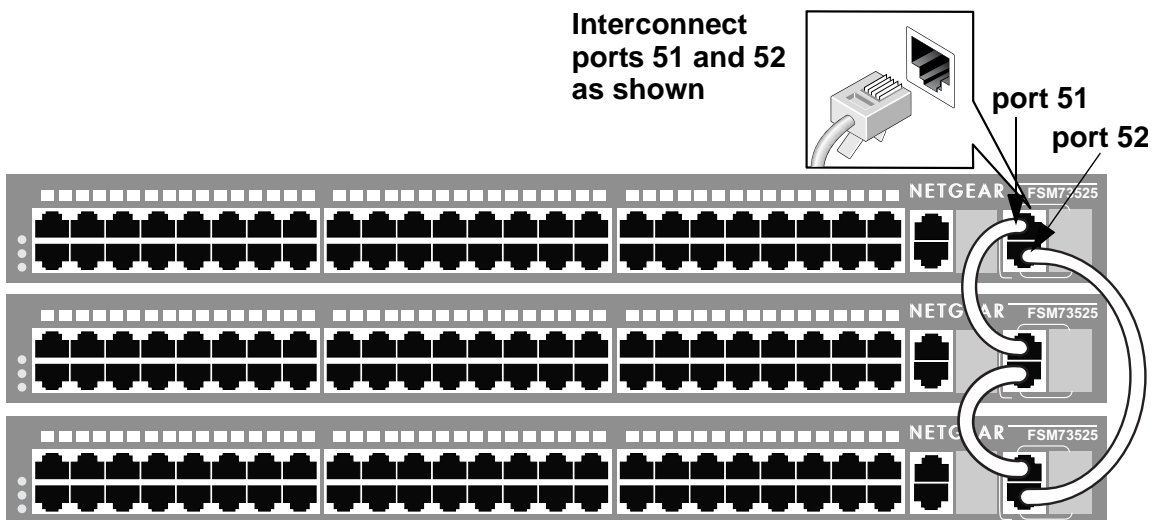


Figure 12-2: Interconnecting individual FSM7352S switches to form a stack

Stack Master Election and Re-Election

The stack master is elected or re-elected based on one of these factors and in the order listed:

1. The switch that is currently the stack master
2. The switch with the highest stack member priority value

Note: Netgear recommends assigning the highest priority value to the switch that you prefer to be the stack master. This ensures that the switch is re-elected as stack master if a re-election occurs.

3. The switch with the higher MAC address

A stack master retains its role unless one of these events occurs:

- The stack master is removed from the switch stack
- The stack master is reset or powered off
- The stack master has failed
- The switch stack membership is increased by adding powered-on standalone switches or switch stacks

In the case of a master re-election, the new stack master becomes available after a few seconds. In the meantime, the switch stack uses the forwarding tables in memory to minimize network disruption. The physical interfaces on the other available stack members are not affected while a new stack master is elected.

If a new stack master is elected and the previous stack master becomes available, the previous stack master does not resume its role as stack master.

Stack Member Numbers

A stack member number (1 to 8) identifies each member in the switch stack. The member number also determines the interface-level configuration that a stack member uses. You can display the stack member number by using the **show switch** user EXEC command.

A new, out-of-the-box switch (one that has not joined a switch stack or has not been manually assigned a stack member number) ships with a default stack member number of 1. When it joins a switch stack, its default stack member number changes to the lowest available member number in the stack.

Stack members in the same switch stack cannot have the same stack member number. Every stack member, including a standalone switch, retains its member number until you manually change the number or unless the number is already being used by another member in the stack.

See [“Renumbering Stack Members” on page 12-13](#) and [“Merging Two Operational Stacks” on page 12-14](#).

Stack Member Priority Values

A stack member priority can be changed if the user would like change who is the master of the stack. Use the following command to change stack member's priority (this command is in the global config mode):

```
switch unit priority value
```

Switch Stack Offline Configuration

You can use the offline configuration feature to preconfigure (supply a configuration to) a new switch before it joins the switch stack. You can configure in advance the stack member number, the switch type, and the interfaces associated with a switch that is not currently part of the stack.

See [“Preconfiguration” on page 12-15](#).

Effects of Adding a Preconfigured Switch to a Switched Stack

When you add a preconfigured switch to the switch stack, the stack applies either the preconfigured configuration or the default configuration. [Table 12-1](#) lists the events that occur when the switch stack compares the preconfigured configuration with the new switch:

Table 12-1. Results of comparing the preconfiguration with the new switch

Scenario	Result
<p>The stack member numbers and the switch types match.</p> <ul style="list-style-type: none"> • If the stack member number of the preconfigured switch matches the stack member number in the configuration on the stack, and • If the switch type of the preconfigured switch matches the switch type in the configuration on the stack. 	<p>The switch stack applies the configuration to the preconfigured new switch and adds it to the stack.</p>
<p>The stack member numbers match but the switch types do not match.</p> <ul style="list-style-type: none"> • If the stack member number of the preconfigured switch matches the stack member number in the configuration on the stack, but • The switch type of the preconfigured switch does not match the switch type in the configuration on the stack. 	<ul style="list-style-type: none"> • The switch stack applies the default configuration to the preconfigured switch and adds it to the stack. • The configuration in the preconfigured switch is changed to reflect the new information.
<p>The stack member number is not found in the configuration.</p>	<ul style="list-style-type: none"> • The switch stack applies the default configuration to the new switch and adds it to the stack. • The preconfigured information is changed to reflect the new information.
<p>The stack member number of the preconfigured switch is not found in the configuration.</p>	<p>The switch stack applies the default configuration to the preconfigured switch and adds it to the stack.</p>

Effects of Replacing a Preconfigured Switch in a Switch Stack

When a preconfigured switch in a switch stack fails, is removed from the stack, and is replaced with another switch, the stack applies either the preconfiguration or the default configuration to it. The events that occur when the switch stack compares the configuration with the preconfigured switch are the same as those described in [“Effects of Adding a Preconfigured Switch to a Switched Stack”](#) on page 12-6.

Effects of Removing a Preconfigured Switch from a Switch Stack

If you remove a preconfigured switch from the switch stack, the configuration associated with the removed stack member remains in the running configuration as configured information. To completely remove the configuration, use the **no member *unit_number*** (this is in the stacking configuration mode).

Switch Stack Software Compatibility Recommendations

All stack members must run the same software version to ensure compatibility between stack members. The software versions on all stack members, including the stack master, must be the same. This helps ensure full compatibility in the stack protocol version among the stack members.

If a stack member is running a software version that is not the same as the stack master, then the stack member is not allowed to join the stack. Use the **show switch** command to list the stack members and software versions. See [“Code Mismatch” on page 12-16](#).

Incompatible Software and Stack Member Image Upgrades

You can upgrade a switch that has an incompatible software image by using the **archive download-sw** `xmodem | ymodem | zmodem | tftp://ip/filepath/filename` command (this is in the stacking configuration mode). It copies the software image from an existing stack member to the one with incompatible software. That switch automatically reloads and joins the stack as a fully functioning member.

Switch Stack Configuration Files

The configuration files record settings for all global and interface specific settings that define the operation of the stack and individual members. Once a **save config** command is issued, all stack members store a copy of the configuration settings. If a stack master becomes unavailable, any stack member assuming the role of stack master will operate from the saved configuration files.

When a new, out-of-box switch joins a switch stack, it uses the system-level settings of that switch stack. However, if you want it to store this system level configuration, you must issue a **save config** command.

You back up and restore the stack configuration in the same way as you would for standalone switch configuration by using the copy command.

Switch Stack Management Connectivity

You manage the switch stack and the stack member interfaces through the stack master. You can use the web interface, the CLI, and SNMP. You cannot manage stack members on an individual switch basis.

Connectivity to the Switch Stack Through Console Ports

You can connect to the stack master through the console port of the stack master only.

Connectivity to the Switch Stack Through Telnet

You can connect to the stack master using telnet by telnetting to the ip address of the stack.

Switch Stack Configuration Scenarios

[Table 12-2](#) provides switch stack configuration scenarios. Most of the scenarios assume at least two switches are connected through their stacking ports.

Table 12-2. Switch stack configuration scenarios

Scenario	Result
Stack master election specifically determined by existing stack masters Note: This is not recommended. <ul style="list-style-type: none"> Connect two powered-on switch stacks through the stacking ports. 	Only one of the two stack masters becomes the new stack master. None of the other stack members become the stack master.
Stack master election specifically determined by the stack member priority value <ul style="list-style-type: none"> Connect two switches through their stacking ports. Use the switch stack-member-number priority new-priority-number global configuration command to set one stack member to a higher member priority value. Restart both stack members at the same time. 	The stack member with the higher priority value is elected stack master.

Table 12-2. Switch stack configuration scenarios (continued)

<p>Stack master election specifically determined by the MAC address</p> <ul style="list-style-type: none"> • Assuming that both stack members have the same priority value and software image, restart both stack members at the same time. 	<p>The stack member with the higher MAC address is elected stack master.</p>
<p>Add a stack member</p> <ul style="list-style-type: none"> • Power off the new switch • Through their stacking ports, connect the new switch to a powered-on switch stack. • Power on the new switch. 	<p>The stack master is retained. The new switch is added to the switch stack.</p>
<p>Stack master failure</p> <ul style="list-style-type: none"> • Remove (or power off) the stack master. 	<p>Based on "Stack Master Election and Re-Election" on page 5, one of the remaining stack members becomes the new stack master. All other stack members in the stack remain as stack members and do not reboot.</p>

Stacking Recommendations

The purpose of this section is to collect notes on recommended procedures and expected behavior of stacked FSM7328S/FSM7352S. Procedures addressed initially are listed below.

- Initial installation and power-up of a stack.
- Removing a unit from the stack
- Adding a unit to an operating stack
- Replacing a stack member with a new unit
- Renumbering stack members
- Moving the master to a different unit in the stack
- Removing a master unit from an operating stack
- Merging two operational stacks
- Preconfiguration
- Upgrading firmware
- Migration of configuration with a firmware upgrade

General Practices

- When issuing a command (such as move management, or renumber), it is recommended that the command has fully completed before issuing the next command. For example, if a reset is issued to a stack member, use the “show port” command to verify that the unit has remerged with the stack, and all ports are joined before issuing the next command.
- When physically removing or relocating a unit, always power down the unit before disconnecting stack cables.
- When reconnecting stack cables, connect them before powering up the unit, if possible, and insure a good connection by tightening all connector screws (where applicable).

Initial installation and Power-up of a Stack

1. Install units in rack.
2. Install all stacking cables. Fully connect, including the redundant stack link. It is highly recommended that a redundant link be installed.
3. Identify the unit to be the master. Power this unit up first.
4. Monitor the console port. Allow this unit to come up to the login prompt. If unit has the default configuration, it should come up as unit #1, and will automatically become a master unit. If not, renumber as desired.
5. If desired, preconfigure other units to be added to the stack. Preconfiguration is described in Section Preconfiguration.
6. Power on a second unit, making sure it is adjacent (next physical unit in the stack) to the unit already powered up. This will insure the second unit comes up as a member of the stack, and not a “Master” of a separate stack.
7. Monitor the master unit to see that the second unit joins the stack. Use the “show switch” command to determine when the unit joins the stack. It will be assigned a unit number (unit #2, if it has the default configuration).
8. Renumber this stack unit, if desired. See section Renumbering Stack Members on recommendations for renumbering stack members.
9. Repeat steps 6 through 8 to add additional members to the stack. Always power on a unit adjacent to the units already in the stack.

Removing a Unit from the Stack

1. Make sure the redundant stack connection is in place and functional. All stack members should be connected in a logical ring.
2. Power down the unit to be removed.
3. Disconnect stack cables.
4. If unit is not to be replaced, reconnect the stack cable from the stack member above to the stack member below the unit being removed.
5. Remove unit from the rack.
6. If desired, remove the unit from the configuration by issuing the command:
no member <unit-id>

Adding a Unit to an Operating Stack

1. Make sure the redundant stack connection is in place and functional. All stack members should be connected in a logical ring.
2. Preconfigure the new unit, if desired.
3. Install new unit in the rack. (Assumes installation below the bottom-most unit, or above the top-most unit).
4. Disconnect the redundant stack cable that connects the last unit in the stack back up to the first unit in the stack at the position in the ring where the new unit is to be inserted.
5. Connect this cable to the new unit, following the established order of “stack up” to “stack down” connections
6. Power up the new unit. Verify, by monitoring the master unit console port, that the new unit successfully joins the stack by issuing the **show switch** command. The new unit should always join as a “member” (never as master; the existing master of the stack should not change).
7. If the code version of the newly added member is not the same as the existing stack, update the code as described in section Upgrading Firmware.

Replacing a Stack Member with a New Unit

There are two possible situations here. First, if you replace a stack member of a certain model number with another unit of the same model, follow the process below:

- Follow the process in section Removing a Unit from the Stack to remove the desired stack member.
- Follow the process in section Adding a Unit to an Operating Stack to add a new member to the stack with the following exceptions:
 - Insert the new member in the same position in the stack as the one removed.
 - Preconfiguration described in step Preconfigure the new unit, if desired. of that procedure is not required.

Second, if you replace a stack member with another unit of a different model number, use the following process:

- Follow the process in section Removing a Unit from the Stack to remove the desired stack member.
- Remove the now-absent stack member from the configuration by issuing the command **no member** command.
- Add the new stack unit to the stack using the process described in section Adding a Unit to an Operating Stack. The unit can be inserted into the same position as the unit just removed, or the unit can be inserted at the bottom of the stack. In either case, make sure all stack cables are connected with the exception of the cable at the position where the new unit is to be inserted to insure that the stack does not get divided into two separate stacks, causing the election of a new master.

Renumbering Stack Members

1. If particular numbering is required, it is recommended that stack members be assigned specific numbers when they are first installed and configured in the stack, if possible.
2. If the desired stack unit number for a particular unit is unused, a unit can be renumbered simply by using the **switch** <oldunit-id> **renumber** <newunit-id> CLI command. This command is found in global config mode.
3. If the newunit-id has been preconfigured, you may need to remove the newunit-id from the configuration before renumbering the unit.
4. If reassignment of multiple existing stack unit numbers is necessary, there are a number of implications in terms of mismatching of configuration. In this case, it is recommended that all units except the master be powered down and added back one at a time using the procedure in Section Adding a Unit to an Operating Stack.

Moving a Master to a Different Unit in the Stack

1. Using the “movemanagement” command, move the master to the desired unit number. The operation may take between 30 seconds and 3 minutes depending on the stack size and configuration. The command is **movemanagement** <fromunit-id> <tounit-id>
2. Make sure that you can log in on the console attached to the new master. Use the **show switch** command to verify that all units rejoined the stack.
3. It is recommended that the stack be reset with the **reload** command after moving the master.

Removing a Master Unit from an Operating Stack

1. First, move the designated master to a different unit in the stack using [“Moving a Master to a Different Unit in the Stack” on page 12-14](#).
2. Second, using [“Removing a Unit from the Stack” on page 12-12](#), remove the unit from the stack.

Merging Two Operational Stacks

1. It is strongly recommended that two functioning stacks (each having an independent master) not be merged simply by the reconnection of stack cables. That process may result in a number of unpredictable results and should be avoided.
2. Always power off all units in one stack before connecting into another stack.
3. Add the units as a group by unplugging one stacking cable in the operational stack and physically connecting all unpowered units at that point.
4. Completely cable the stacking connections, making sure the redundant link is also in place.
5. Then, power up each unit, one at a time, by following [“Adding a Unit to an Operating Stack” on page 12-12](#).

Preconfiguration

1. General Information: All configuration on the stack except unit numbers is stored on the management unit. This means that a stack unit may be replaced with another device of the same type without having to reconfigure the switch. Unit numbers are stored independently on each switch, so that after power cycling the stack the units always come back with the same unit numbers. The unit type associated with each unit number may be learned by the management unit automatically as the units are connected or preconfigured by the administrator.
2. Issue the **member** <unit-id> <switchindex> command to preconfigure a unit. Supported unit types are shown by the **show supported switchtype** command.
3. Next, configure the unit you just defined with configuration commands, just as if the unit were physically present.
4. Ports for the preconfigured unit come up in “detached” state and can be seen with the **show port all** command. The detached ports may now be configured for VLAN membership and any other port-specific configuration.
5. After a unit type is preconfigured for a specific unit number, attaching a unit with different unit type for this unit number causes the switch to report an error. The **show switch** command indicates “config mismatch” for the new unit and the ports on that unit don’t come up. To resolve this situation the customer may change the unit number of the mismatched unit or delete the preconfigured unit type using the **no member** <unit-id> command.

Upgrading Firmware

1. New code is downloaded via TFTP or xmodem to the management unit using the **copy** command. Once code is successfully loaded on the management unit, it automatically propagates the code to the other units in the stack. If some error occurs during code propagation to stack units then the **archive** command (in stack configuration mode) may be issued to make another attempt to copy the software to the unit(s) that did not get updated. Errors during code propagation to stack members could be caused by stack cable movement or unit reconfiguration during the propagation phase. An error could also occur in the presence of excessive network traffic (such as a broadcast event).

2. All units in the stack must run the same code version. Ports on stack units that don't match the management unit code version don't come up and **the show switch** command shows a "code mismatch" error. To resolve this situation the administrator may issue **archive** command. This command copies management unit's software to the other units with mismatched code version. Before issuing this command, be sure the code running on the management unit is the desired code revision for all units in the stack. Once code is loaded to all members of the stack, the units must be reset in order for the new code to start running.

Migration of Configuration With a Firmware Upgrade

In some cases, a configuration may not be carried forward in a code update. For updates where this issue is to be expected, the following procedure should be followed:

1. Save the current configuration by uploading it from the stack, using the copy command from the CLI.
2. Load new code into the stack manager. Reboot the stack.
3. Upon reboot, go into the boot menu and erase the configuration ("restore to factory defaults")
4. Continue with boot of operational code.
5. Once the stack is up, download the saved configuration back to the master. This configuration should then be automatically propagated to all members of the stack

Code Mismatch

If a unit is added to a stack and it does not have the same version of code as that of the master, the following should happen:

- "New" unit will boot up and become a "member" of the stack
- Ports on the added unit should remain in the "detached" state
- A message should appear on the CLI indicating a code mismatch with the newly added unit.
- To have the newly added unit to merge normally with the stack, code should be loaded to the newly added unit from the master using the copy command. The newly added member should then be reset, and should reboot normally and join the stack.

Appendix A

IS CLI Mapping

This chapter illustrates the mapping between CLI commands and the previous 7300S Series L3 Switch commands. The Package column indicates the 7300S Series L3 Switch package in which the command is located.

Table 12-3. IS CLI Mapping

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	show acl detailed <aclid>	Privileged EXEC	show ip access-lists [<1-199>]
QOS	show acl summary	Privileged EXEC and User EXEC	
QOS	config acl create <aclid>	Global Config	access-list {{(<1-99> {deny permit} <srcip> <srcmask>) ({<100-199> {deny permit} {every {{icmp igmp ip tcp udp <number>} <srcip> <srcmask> [[eq {<0-65535> <portkey>} range <startport> <endport>]} <dstip> <dstmask> [[eq {<0-65535> <portkey>} range <startport> <endport>]} [[precedence <precedence>] [tos <tos> <tosmask>] [dscp <dscp>]]}}}}}}
QOS	config acl delete <aclid>	Global Config	no access-list {<1-99> <100-199>}
QOS	config acl rule create <aclid> <rulenum>		
QOS	config acl rule delete <aclid> <rulenum>		

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	config acl rule action <aclid> <rulenum> <permit/deny>		
QOS	config acl rule match dstip <aclid> <rulenum> <ipaddr> <ipmask>		
QOS	config acl rule match dstl4port keyword <aclid> <rulenum> <portkey>		
QOS	config acl rule match dstl4port range <aclid> <rulenum> <startport> <endport>		
QOS	config acl rule match every <aclid> <rulenum> <true/false>		
QOS	config acl rule match ipdscp <aclid> <rulenum> <dscpval>		
QOS	config acl rule match ipprecedence <aclid> <rulenum> <precedenceval>		
QOS	config acl rule match iptos <aclid> <rulenum> <tosbits> <tosmask>		
QOS	config acl rule match protocol keyword <aclid> <rulenum> <protocolkey>		
QOS	config acl rule match protocol number <aclid> <rulenum> <protocolnum>		
QOS	config acl rule match srcip <aclid> <rulenum> <ipaddr> <ipmask>		
QOS	config acl rule match srcl4port keyword <aclid> <rulenum> <portkey>		

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	config acl rule match srl4port range <aclid> <rulenum> <startport> <endport>		
QOS	config acl interface add <slot/port> <direction> <aclid>	Interface Config	ip access-group <1-199> {in out}
QOS	config acl interface remove <slot/port> <direction> <aclid>	Interface Config	no ip access-group <1-199> {in out}
QOS	config acl rule match dstl4port number <aclid> <rulenum> <portnumber>	Interface Config	ip access-group <1-199> {in out}
QOS	config acl rule match srl4port number <aclid> <rulenum> <portnumber>	Interface Config	
QOS	config diffserv adminmode <enable/disable>	Global Config	diffserv
		Global Config	no diffserv
QOS	show diffserv info	Privileged EXEC	show diffserv
QOS	show diffserv service info detailed <slot/port> <in/out>	Privileged EXEC	show diffserv service <slot/port> {in out}
QOS	show diffserv service info summary [in/out]	Privileged EXEC	show diffserv service brief [in out]
QOS	show diffserv policy detailed <policyname>	Privileged EXEC	show policy-map <polycyname>
QOS	show diffserv policy summary	Privileged EXEC	show policy-map
QOS	show diffserv service stats detailed <slot/port> [in/out]	Privileged EXEC	show policy-map interface <slot/port> {in out}
QOS	config diffserv policy create <policyname> <in/out>	Global Config	policy-map <policyname> {in out}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	config diffserv policy delete <policyname>	Global Config	no policy-map <policyname>
QOS	config diffserv policy rename <policyname> <newpolicyname>	Global Config	policy-map rename <policyname> <newpolicyname>
QOS	config diffservpolicy class add <policyname> <classname>	Policy-Map Config	class <classname>
QOS	config diffserv policy class remove <policyname> <classname>	Policy-Map Config	no class <classname>
QOS	config diffserv policy bandwidth kbps <policyname> <classname> <1-4294967295>	Policy-Class-Map Config	bandwidth {kbps <1-4294967295> percent <1-100>}
QOS	config diffserv policy bandwidth percent <policyname> <classname> <1-100>	Policy-Class-Map Config	
QOS	config diffserv policy expedite kbps <policyname> <classname> <1-4294967295> [1-128]	Policy-Class-Map Config	expedite kbps <1-4294967295> [1-128]
QOS	config diffserv policy expedite percent <policyname> <classname> <1-100> [1-128]	Policy-Class-Map Config	expedite percent <1-100> [1-128]
QOS	config diffserv policy shape average <policyname> <classname> <1-4294967295>	Policy-Class-Map Config	shape {bps-average <1-4294967295> bps-peak <1-4294967295> <1-4294967295>}
QOS	config diffserv policy shape peak <policyname> <classname> <1-4294967295> <1-4294967295>	Policy-Class-Map Config	
QOS	config diffserv policy randomdrop <policyname> <classname> <1-250000> <1-500000> <0-100> [<0-1000000> [0-16]]	Policy-Class-Map Config	randomdrop <1-250000> <1-500000> <1-100> [<1-1000000> [<0-16>]]
QOS	config diffserv policy mark cos <policyname> <classname> <0-7>	Policy-Class-Map Config	mark {cos <0-7> ip-dscp <0-63> ip-precedence <0-7>}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	config diffserv policy police style simple <polycyname> <classname> <1-4294967295> <1-128>	Policy-Class-Map Config	police-simple {<1-4294967295> <1-128> conform-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} [violate-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit}]}
QOS	config diffserv policy police style singlerate <polycyname> <classname> <1-4294967295> <1-128> <1-128>	Policy-Class-Map Config	police-single-rate {<1-4294967295> <1-128> <1-128> conform-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} exceed-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} [violate-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit}]}
QOS	config diffserv policy police style tworate <polycyname> <classname> <1-4294967295> <1-128> <1-4294967295> <1-128>	Policy-Class-Map Config	police-two-rate {<1-4294967295> <1-128> <1-4294967295> <1-128> conform-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} exceed-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit} [violate-action {drop set-prec-transmit <0-7> set-dscp-transmit <0-63> transmit}]}
QOS	config diffserv policy mark ipdscp <polycyname> <class-name> <0-63>	Policy-Class-Map Config	
QOS	config diffserv policy mark ipprecedence <polycyname> <classname> <0-7>	Policy-Class-Map Config	
QOS	config diffserv policy police action conform markdscp <polycyname> <classname> <dscpval>	Policy-Class-Map Config	

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	config diffserv policy police action conform markprec <policyname> <classname> <0-7>	Policy-Class-Map Config	
QOS	config diffserv policy police action conform send <policyname> <classname>	Policy-Class-Map Config	
QOS	config diffserv policy police action exceed drop <policyname> <classname>	Policy-Class-Map Config	
QOS	config diffserv policy police action exceed markdscp <policyname> <classname> <dscpval>	Policy-Class-Map Config	
QOS	config diffserv policy police action exceed markprec <policyname> <classname>	Policy-Class-Map Config	
QOS	config diffserv policy police action exceed send <policyname> <classname>	Policy-Class-Map Config	
QOS	config diffserv policy police action nonconform drop <policyname> <classname>	Policy-Class-Map Config	
QOS	config diffserv policy police action nonconform markdscp <policyname> <classname> <dscpval>	Policy-Class-Map Config	
QOS	config diffserv policy police action nonconform markprec <policyname> <classname> <0-7>	Policy-Class-Map Config	
QOS	config diffserv policy police action nonconform send <policyname> <classname>	Policy-Class-Map Config	
QOS	config diffserv policy police action conform drop <policyname> <classname>	Policy-Class-Map Config	

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	show diffserv service stats summary [in/out]	Privileged EXEC	show service-policy [in out]
QOS	config diffserv service add <in/out> <slot/port/all> <policyname>	Interface Config	service-policy {in out} <policyname>
QOS	config diffserv service remove <in/out> <slot/port/all> <policyname>	Interface Config	no service-policy {in out} <policyname>
QOS	config diffserv service add <in/out> <slot/port/all> <policyname>	Global Config	service-policy {in out} <policyname>
QOS	config diffserv service remove <in/out> <slot/port/all> <policyname>	Global Config	no service-policy {in out} <policyname>
QOS	show diffserv class detailed <classname>	Privileged EXEC and User EXEC	show class-map [<classname>]
QOS	show diffserv class summary	Privileged EXEC and User EXEC	
QOS	config diffserv class create any <classname>	Global Config	class-map {{match-all match-any} <classmapname>} {match-access-group <classmapname> <aclid>}
QOS	config diffserv class create all <classname>	Global Config	class-map {{match-all match-any} <classmapname>} {match-access-group <classmapname> <aclid>}
QOS	config diffserv class delete <classname>	Global Config	no class-map <classmapname>
QOS	config diffserv class rename <classname> <newclassname>	Global Config	class-map rename <classmapname> <newclassmapname>
QOS	config diffserv class match cos <classname> <0-7> [exclude]	Class-Map Config	match cos <0-7>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Class-Map Config	match not cos <0-7>
QOS	config diffserv class match dstip <classname> <ipaddr> <ipmask> [exclude]	Class-Map Config	match dstip <ipaddr> <ipmask>
		Class-Map Config	match not dstip <ipaddr> <ipmask>
QOS	config diffserv class match dstl4port keyword <classname> <port-key> [exclude]	Class-Map Config	match dstl4port {<portkey> <0-65535> [<0-65535>]}
QOS	config diffserv class match dstl4port number <classname> <0-65535> [exclude]	Class-Map Config	match not dstl4port {<portkey> <0-65535> [<0-65535>]}
QOS	config diffserv class match dstl4port range <classname> <0-65535> <0-65535> [exclude]		
QOS	config diffserv class match dstmac <classname> <macaddr> <mac-mask> [exclude]	Class-Map Config	match destination-address mac <address> <macmask>
		Class-Map Config	match not destination-address mac <address> <macmask>
QOS	config diffserv class match every <classname> [exclude]	Class-Map Config	match any
		Class-Map Config	match not any
QOS	config diffserv class match ipdscp <classname> <dscpval> [exclude]	Class-Map Config	match ip dscp <value>
		Class-Map Config	match not ip dscp <value>
QOS	config diffserv class match ipprecedence <classname> <0-7> [exclude]	Class-Map Config	match ip precedence <0-7>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Class-Map Config	match not ip precedence <0-7>
QOS	config diffserv class match iptos <classname> <tosbits> <tosmask> [exclude]	Class-Map Config	match ip tos <tosbits> <tosmask>
		Class-Map Config	match not ip tos <tosbits> <tosmask>
QOS	config diffserv class match protocol keyword <classname> <protocolkey> [exclude]	Class-Map Config	match protocol {<protocol-name> <0-255>}
QOS	config diffserv class match protocol number <classname> <0-255> [exclude]	Class-Map Config	match not protocol {<protocol-name> <0-255>}
QOS	config diffserv class match refclass <add/remove> <classname> <refclassname>	Class-Map Config	match class-map <refclassname>
		Class-Map Config	no match class-map <refclassname>
QOS	config diffserv class match srcip <classname> <ipaddr> <ipmask> [exclude]	Class-Map Config	match srcip <ipaddr> <ipmask>
		Class-Map Config	match not srcip <ipaddr> <ipmask>
QOS	config diffserv class match srcl4port keyword <classname> <portkey> [exclude]	Class-Map Config	match srcl4port {<portkey> <0-65535> [<0-65535>]}
QOS	config diffserv class match srcl4port number <classname> <0-65535> [exclude]	Class-Map Config	match not srcl4port {<portkey> <0-65535> [<0-65535>]}
QOS	config diffserv class match srcl4port range <classname> <0-65535> <0-65535> [exclude]		

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
QOS	config diffserv class match srcmac <classname> <macaddr> <macmask> [exclude]	Class-Ma p Config	match source-address mac <address> <macmask>
		Class-Ma p Config	match not source-address mac <address> <macmask>
QOS	config diffserv class match vlan <classname> <1-4094> [exclude]	Class-Ma p Config	match vlan <1-4094>
		Class-Ma p Config	match not vlan <1-4094>
Routing	show arp table	Privileged EXEC	show arp
Routing	show arp switch	Privileged EXEC	show arp switch
Routing	show ip interface <slot/port>	Privileged EXEC	show ip interface <slot/port>
Routing	show router ip interface summary	Privileged EXEC	show ip interface brief
Routing	show ip summary	Privileged EXEC	show ip brief
Routing	show ip stats	Privileged EXEC	show ip stats
Routing	show ip vlan	Privileged EXEC	show ip vlan
Routing	show router rip info	Privileged EXEC and User EXEC	show ip rip
Routing	show router rip interface detailed <slot/port>	Privileged EXEC and User EXEC	show ip rip interface <slot/port>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Routing	show router rip interface summary	Privileged EXEC and User EXEC	show ip rip interface brief
Routing	show router route table	Privileged EXEC and User EXEC	show ip route
Routing	show router route bestroutes	Privileged EXEC and User EXEC	show ip route bestroutes
Routing	show router route entry <networkaddr>	Privileged EXEC and User EXEC	show ip route entry <networkaddr>
Routing	show router route preferences	Privileged EXEC and User EXEC	show ip route preferences
Routing	show router vrrp info	Privileged EXEC and User EXEC	show ip vrrp
Routing	show router vrrp interface stats <slot/port> <VrID>	Privileged EXEC and User EXEC	show ip vrrp interface stats <slot/port> <VrID>
Routing	show router vrrp interface detailed <slot/port> <VrID>	Privileged EXEC and User EXEC	show ip vrrp interface <slot/port> <VrID>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Routing	show router vrrp interface summary	Privileged EXEC and User EXEC	show ip vrrp interface brief
Routing	show router rtrdiscovery <slot/port/all>	Privileged EXEC and User EXEC	show ip irdp {<slot/port> all}
Routing	show router bootpdhcprelay	Privileged EXEC and User EXEC	show bootpdhcprelay
Routing	config arp agetime <15-3600seconds>	Global Config	arp timeout <15-21600>
		Global Config	no arp timeout
Routing	config arp cachesize <10-128>	Global Config	arp cachesize <48-112>
		Global Config	no arp cachesize
Routing	config arp create <arpretry> <macaddr>	Global Config	arp <ipaddress> <macaddress>
Routing	config arp delete <arpretry> <macaddr>	Global Config	no arp <ipaddress> <macaddress>
Routing	config arp resptime <seconds>	Global Config	arp resptime <1-10>
		Global Config	no arp resptime
Routing	config arp retries	Global Config	arp retries <0-10>
		Global Config	no arp retries

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Routing	config interface encaps <slot/port> <ethernet/snap>	Interface Config	encapsulation {<ethernet> <snap>}
Routing	config interface routing <slot/port> <enable/disable>	Interface Config	routing
		Interface Config	no routing
Routing	config ip interface mtu <slot/port> <576-1500>	Interface Config	mtu <1522-9216>
Routing	config ip interface netdirbcst <slot/port> <enable/disable>	Interface Config	ip netdirbcst
		Interface Config	no ip netdirbcst
Routing	config ip interface create <slot/port> <ipaddr> <subnetmask>	Global Config	ip address <slot/port> <ipaddr> <subnetmask>
Routing	config ip forwarding <enable disable>	Global Config	ip forwarding
		Global Config	no ip forwarding
Routing	config routing <enable disable>	Global Config	ip routing
		Global Config	no ip routing
Routing	config ip vlan routing create <vlan>	VLAN database	vlan routing <vlanid>
Routing	config ip vlan routing delete <vlan>	VLAN database	no vlan routing <vlanid>
Routing	config router rip adminmode <enable disable>	Router RIP Config	enable

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Router RIP Config	no enable
Routing	config router rip preference <0-255>	Router RIP Config	distance rip <1-255>
Routing	config router rip interface authentication <slot/port> <none simple> [key]	Interface Config	ip rip authentication {none {simple <key>} {encrypt <key> <keyid>}}
		Interface Config	no ip rip authentication
Routing	config router rip interface defaultmetric <slot/port> <0-15>	Router RIP Config	default-information originate
Routing	config router rip interface mode <enable disable>	Interface Config	ip rip
		Interface Config	no ip rip
Routing	config router rip interface version receive <slot/port> <rip1 rip2 both none>	Interface Config	ip rip receive version {rip1 rip2 both none}
		Interface Config	no ip rip receive version
Routing	config router rip interface version send <slot/port> <rip1 rip1c rip2 none>	Interface Config	ip rip send version {rip1 rip1c rip2 none}
		Interface Config	no ip rip send version
Routing	config router route create <networkaddr> <subnetmask> <nexthop> [metric]	Global Config	ip route <networkaddr> <subnetmask> <nexthop> [0-255]

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Routing	config router route delete <networkaddr> <subnetmask> <nexthopip>	Global Config	no ip route <networkaddr> <subnetmask> <nexthopip>
Routing	config router route staticpreference <local/static> <0-255>	Global Config	ip route distance <1-255>
Routing	config config router route default create <nexthopip>	Global Config	ip route default <nexthopip>
Routing	config router route default delete	Global Config	no ip route default <nexthopip>
Routing	config router vrrp adminmode <enable/disable>	Global Config	ip vrrp
		Global Config	no ip vrrp
Routing	config router vrrp interface adminmode <slot/port> <VrID> <enable/disable>	Interface Config	ip vrrp <VrID> mode
		Interface Config	no ip vrrp <VrID> mode
Routing	config router vrrp interface priority <slot/port> <VrID> <1-254>	Interface Config	ip vrrp <VrID> priority <1-254>
		Interface Config	no ip vrrp <VrID> priority
Routing	config router vrrp interface ipaddress <slot/port> <vrID> <ipaddr>	Interface Config	ip vrrp <VrID> ip <ipaddress> <ipaddr>
Routing	config router vrrp interface preemptmode <slot/port> <vrID> <enable/disable>	Interface Config	ip vrrp <VrID> preempt
		Interface Config	no ip vrrp <VrID> preempt

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Routing	config router vrrp interface advinterval <slot/port> <vrid> <seconds>	Interface Config	ip vrrp <VrID> timers advertise <1-255>
		Interface Config	no ip vrrp <VrID> timers advertise
Routing	config router vrrp interface authdetails <slot/port> <vrid> <none simple> [key]	Interface Config	ip vrrp <VrID> authentication [<key>]
		Interface Config	no ip vrrp <VrID> authentication
Routing	config router vrrp removedetails <slot/port> <vrid>	Interface Config	ip vrrp removedetails <VrID>
Routing	config router rtrdiscovery adminmode <slot/port> <enable disable>	Interface Config	ip irdp [{holdtime <maxinterval-9000> maxadvertinterval <4-1800> minadvertinterval <3-maxinterval> preference <-2147483648 - 2147483647> address <address>}]
		Interface Config	no ip irdp
Routing	config router rtrdiscovery maxinterval <slot/port> <4-1800>		
Routing	config router rtrdiscovery mininterval <slot/port> <3-maxinterval>		
Routing	config router rtrdiscovery lifetime <slot/port> <max-interval-9000>		
Routing	config router rtrdiscovery address <slot/port> <ipaddr>		
Routing	config router rtrdiscovery preference <slot/port> <-2147483648 - 2147483647>		

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Routing	config router bootpdhcprelay cidoptmode <enable disable>	Global Config	bootpdhcprelay cidoptmode
		Global Config	no bootpdhcprelay cidoptmode
Routing	config router bootpdhcprelay adminmode <enable/disable>	Global Config	bootpdhcprelay disable
		Global Config	no bootpdhcprelay disable
Routing	config router bootpdhcprelay maxhopcount <1-16>	Global Config	bootpdhcprelay maxhopcount <1-16>
		Global Config	no bootpdhcprelay maxhopcount
Routing	config router bootpdhcprelay minwaittime <0-100>	Global Config	bootpdhcprelay minwaittime <0-100>
		Global Config	no bootpdhcprelay minwaittime
Routing	config router bootpdhcprelay serverip <ipaddr>	Global Config	bootpdhcprelay serverip <ipaddr>
Routing	config router ecmpmode <enable/disable>	Global Config	ip ecmpmode
		Global Config	no ip ecmpmode
Routing	config router rip autosummary <enable/disable>	Router RIP Config	auto-summary
		Router RIP Config	no auto-summary
Routing	config router rip splithorizon <none/simple/poison>	Router RIP Config	split-horizon {none simple poison}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Router RIP Config	no split-horizon
Routing	config router rip hostroutesaccept <enable/disable>	Router RIP Config	hostroutesaccept
		Router RIP Config	no hostroutesaccept
Switching	show serviceport	Privileged EXEC	show serviceport
Switching	show snmpcommunity	Privileged EXEC	show snmpcommunity
Switching	show snmptrap	Privileged EXEC	show snmptrap
Switching	show trapflags	Privileged EXEC	show trapflags
Switching	show telnet	Privileged EXEC and User EXEC	show remotecon
Switching	show forwardingdb agetime [fdbid all]	Privileged EXEC	show forwardingdb agetime {<fdbid all}
Switching	config network parms <ipaddr> <netmask> [gateway]	Privileged EXEC	network parms <ipaddr> <netmask> [-<gateway>]
Switching	config network protocol <none bootp dhcp>	Privileged EXEC	network protocol {none bootp dhcp}
Switching	config network webmode <enable disable>	Privileged EXEC	ip http server
		Privileged EXEC	no ip http server

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config network javamode <enable disable>	Privileged EXEC	network javamode
		Privileged EXEC	no network javamode
Switching	config prompt <system prompt>	Privileged EXEC	set prompt <promptstring>
Switching	config serial baudrate <speed>	Line Config	serial baudrate {1200 2400 4800 9600 19200 38400 57600 115200}
Switching	config serial timeout <0 - 160>	Line Config	serial timeout <0-160>
Switching	config serviceport parms <ipaddr> <netmask> [gateway]	Privileged EXEC	set serviceport ip <ipaddr> <netmask> [gateway]
Switching	config serviceport protocol <none bootp dhcp>	Privileged EXEC	set serviceport protocol {none bootp dhcp}
Switching	config snmpcommunity accessmode <ro rw> <name>	Global Config	snmp-server community ro <name>
		Global Config	snmp-server community rw <name>
Switching	config snmpcommunity create <name>	Global Config	snmp-server community <name>
Switching	config snmpcommunity delete <name>	Global Config	no snmp-server community <name>
Switching	config snmpcommunity ipaddr <ipaddr> <name>	Global Config	snmp-server community ipaddr <ipaddr> <name>
		Global Config	no snmp-server community ipaddr <name>
Switching	config snmpcommunity ipmask <ipmask> <name>	Global Config	snmp-server community ipmask <ipmask> <name>
		Global Config	no snmp-server community ipmask <name>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config snmpcommunity mode <enable disable> <name>	Global Config	snmp-server community mode <name>
		Global Config	no snmp-server community mode <name>
Switching	config snmptrap create <name> <ipaddr>	Global Config	snmptrap <name> <ipaddr>
Switching	config snmptrap delete <name> <ipaddr>	Global Config	no snmptrap <name> <ipaddr>
Switching	config snmptrap ipaddr <ipaddrold> <name> <ipaddrnew>	Global Config	snmptrap ipaddr <name> <ipaddrold> <ipaddrnew>
Switching	config snmptrap mode <enable disable> <name> <ipaddr>	Global Config	snmptrap mode <name> <ipaddr>
		Global Config	no snmptrap mode <name> <ipaddr>
Switching	config trapflags authentication <enable disable>	Global Config	snmp-server enable traps
		Global Config	no snmp-server enable traps
Switching	config trapflags bcaststorm <enable disable>	Global Config	snmp-server enable traps bcaststorm
		Global Config	no snmp-server enable traps bcaststorm
Switching	config trapflags linkmode <enable disable>	Global Config	snmp-server enable traps linkmode
		Global Config	no snmp-server enable traps linkmode
Switching	config trapflags multiusers <enable disable>	Global Config	snmp-server enable traps multiusers
		Global Config	no snmp-server enable traps multiusers

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config trapflags stpmode <enable disable>	Global Config	snmp-server enable traps stpmode
		Global Config	no snmp-server enable traps stpmode
Switching	config telnet maxsessions <0-5>	Privileged EXEC	remotecon maxsessions <0-5>
		Privileged EXEC	no remotecon maxsessions
Switching	config telnet mode <enable disable>	Privileged EXEC	telnet
		Privileged EXEC	no telnet
Switching	config telnet timeout <0-160>	Privileged EXEC	remnotecon timeout <0-160>
		Privileged EXEC	no remotecon timeout
Switching	config forwardingdb agetime <10-1,000,000> [fdbid/all]	Global Config	bridge aging-time <10-1000000> {<1-4094> all}
		Global Config	no bridge aging-time {<1-4094> all}
Switching	show spanningtree summary	Privileged EXEC and User EXEC	show spanning-tree summary
Switching	show spanningtree port <slot/port>	Privileged EXEC and User EXEC	show spanning-tree interface <slot/port>
Switching	show spanningtree cst detailed	Privileged EXEC and User EXEC	show spanning-tree

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	show spanningtree bridge	Privileged EXEC and User EXEC	show spanning-tree brief
Switching	show spanningtree mst summary	Privileged EXEC and User EXEC	show spanning-tree mst summary
Switching	show spanningtree mst detailed <mstid>	Privileged EXEC and User EXEC	show spanning-tree mst detailed <1-4094>
Switching	show spanningtree cst port summary <mstid> <slot/port/all>	Privileged EXEC and User EXEC	show spanning-tree mst port summary 0 {<slot/port> all}
Switching	show spanningtree cst port detailed <mstid> <slot/port>	Privileged EXEC and User EXEC	show spanning-tree mst port detailed 0 <slot/port>
Switching	show spanningtree vlan <vlan>	Privileged EXEC and User EXEC	show spanning-tree vlan <1-4094>
Switching	config spanningtree adminmode <enable/disable>	Global Config	spanning-tree
		Global Config	no spanning-tree
Switching	config spanningtree forceversion <802.lw/802.lw/802.ls>	Global Config	spanning-tree forceversion {802.1d 802.lw 802.ls}
		Global Config	no spanning-tree forceversion
Switching	config spanningtree configuration name <name>	Global Config	spanning-tree configuration name <name>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Global Config	no spanning-tree configuration name
Switching	config spanningtree configuration revision <0-65535>	Global Config	spanning-tree configuration revision <0-65535>
		Global Config	no spanning-tree configuration revision
Switching	config spanningtree port mode <slot/port/all> <enable/disable>	Interface Config	spanning-tree port mode all
		Interface Config	no spanning-tree port mode
Switching	config spanningtree port mode <slot/port/all> <enable/disable>	Global Config	spanning-tree port mode all
		Global Config	no spanning-tree port mode all
Switching	config spanningtree port migrationcheck <slot/port/all> <enable/disable>	Global Config	spanning-tree bpdumigrationcheck {<slot/port> all}
		Global Config	no spanning-tree bpdumigrationcheck {<slot/port> all}
Switching	config spanningtree bridge maxage <6-40>	Global Config	spanning-tree max-age <6-40>
		Global Config	no spanning-tree max-age
Switching	config spanningtree bridge hello-time <1-10>	Global Config	spanning-tree hello-time <1-10>
		Global Config	no spanning-tree hello-time
Switching	config spanningtree bridge forwarddelay <4-30>	Global Config	spanning-tree forward-time <4-30>
		Global Config	no spanning-tree forward-time

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config spanningtree bridge priority <0-61440>		Removed
Switching	config spanningtree cst port pathcost <slot/port> <1-200000000/auto>	Interface Config	spanning-tree mst 0 cost {<1-200000000> auto}
		Interface Config	no spanning-tree mst 0 cost
Switching	config spanningtree cst port priority <slot/port> <0-240>	Interface Config	spanning-tree mst 0 port-priority <0-240>
		Interface Config	no spanning-tree mst 0 port-priority
Switching	config spanningtree cst port edgeport <slot/port> <true/false>	Interface Config	spanning-tree edgeport
		Interface Config	no spanning-tree edgeport
Switching	config spanningtree mst create <mstid>	Global Config	spanning-tree mst instance <mstid>
Switching	config spanningtree mst delete <mstid>	Global Config	no spanning-tree mst instance <mstid>
Switching	config spanningtree mst vlan add <mstid> <vlan>	Global Config	spanning-tree mst vlan <mstid> <vlanid>
Switching	config spanningtree mst vlan remove <mstid> <vlan>	Global Config	no spanning-tree mst vlan <mstid> <vlanid>
Switching	config spanningtree mst priority <mstid> <0-61440>	Global Config	spanning-tree mst priority <mstid> <0-61440>
		Global Config	no spanning-tree mst priority <mstid>
Switching	config spanningtree mst port pathcost <mstid> <slot/port> <1-200000000/auto>	Interface Config	spanning-tree mst <mstid> cost {<1-200000000> auto}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Interface Config	no spanning-tree mst <mstid> cost
Switching	config spanningtree mst port priority <mstid> <slot/port> <0-240>	Interface Config	spanning-tree mst <mstid> port-priority <0-240>
		Interface Config	no spanning-tree mst <mstid> port-priority
Switching	show inventory	Privileged EXEC	show hardware
Switching	show sysinfo	Privileged EXEC	show sysinfo
Switching	show arp switch	Privileged EXEC	show arp switch
Switching	show forwardingdb table [macaddr/all]	Privileged EXEC	show mac-addr-table [{<macaddr> all}]
Switching	show stats port detailed <slot/port>	Privileged EXEC	show interface ethernet {<slot/port> switchport}
Switching	show stats switch detailed	Privileged EXEC	
Switching	show stats port summary <slot/port>	Privileged EXEC	show interface {<slot/port> switchport}
Switching	show stats switch summary	Privileged EXEC	
Switching	show eventlog	Privileged EXEC	show eventlog
Switching	show msglog	Privileged EXEC	show msglog
Switching	show traplog	Privileged EXEC	show logging
Switching	config sysname <name>	Global Config	snmp-server sysname <name>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config syslocation <location>	Global Config	snmp-server location <loc>
Switching	config syscontact <contact>	Global Config	snmp-server contact <con>
Switching	ping <ipaddr>	Privileged EXEC and User EXEC	ping <ipaddress>
Switching	reset system	Privileged EXEC	reload
Switching	transfer upload mode <xmodem tftp>	Privileged EXEC	copy { { nvram:errorlog nvram:msglog nvram:startup-config nvram:traplog } <url> } {<url> nvram:startup-config system:image nvram:sshkey-rsa1 nvram:sshkey-rsa2 nvram:sshkey-dsa nvram:sslpem-root nvram:sslpem-server nvram:sslpem-dhweak nvram:sslpem-strong } {system:running-config nvram:startup-config}
Switching	transfer upload serverip <ipaddr>		
Switching	transfer upload path <path>		
Switching	transfer upload filename <name>		
Switching	transfer upload datatype <config errorlog msglog traplog>		
Switching	transfer upload start		
Switching	transfer download mode <xmodem tftp>		
Switching	transfer download serverip <ipaddr>		

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	transfer download path <path>		
Switching	transfer download filename <name>		
Switching	transfer download datatype <code config>		
Switching	transfer download start		
Switching	clear transfer		
Switching	save config	Privileged EXEC	copy system:running-config nvram:startup-config
Switching	clear config	Privileged EXEC	clear config
Switching	clear pass	Privileged EXEC	clear pass
Switching	clear traplog	Privileged EXEC	clear traplog
Switching	clear vlan	Privileged EXEC	clear vlan
Switching	clear lag	Privileged EXEC	clear port-channel
Switching	clear stats port <slot/port>	Privileged EXEC	clear counters [<slot/port>]
Switching	clear stats switch	Privileged EXEC	
Switching	clear igmpsnooping	Privileged EXEC	clear igmpsnooping
Switching	logout	Privileged EXEC	logout
Switching	show users info	Privileged EXEC	show users

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	show loginsession	Privileged EXEC	show loginsession
Switching	config users add <name>	Global Config	users name <username>
Switching	config users delete <name>	Global Config	no users name <username>
Switching	config users passwd <user>	Global Config	users passwd <username>
Switching	config users snmpv3 authentication <user> <none/md5/sha>	Global Config	users snmpv3 authentication <username> {none md5 sha}
		Global Config	no users snmpv3 authentication <username>
Switching	config users snmpv3 encryption <user> <none/des [key]>	Global Config	users snmpv3 encryption <username> {none des [key]}
		Global Config	no users snmpv3 encryption <username>
Switching	config users snmpv3 accessmode <user> <readonly/readwrite>	Global Config	users snmpv3 accessmode <username> {readonly readwrite}
		Global Config	no users snmpv3 accessmode <username>
Switching	config loginsession close <sessionID/all>	Privileged EXEC	disconnect {<sessionID> all}
Switching	show switchconfig	Privileged EXEC	show storm-control
Switching	show port <slot/port all>	Privileged EXEC	show port {<slot/port> all}
Switching	show lag <logical slot/port all>	Privileged EXEC	show port-channel {<logical slot/port> all}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	show lags summary	Privileged EXEC and User EXEC	show port-channel brief
Switching	show vlan summary	Privileged EXEC and User EXEC	show vlan brief
Switching	show vlan detailed <vlan-id>	Privileged EXEC and User EXEC	show vlan <vlanid>
Switching	show vlan port <slot/port>	Privileged EXEC and User EXEC	show vlan port {<slot/port> all}
Switching	show protocol <groupid/all>	Privileged EXEC	show port protocol {<groupid> all}
Switching	show garp info	Privileged EXEC and User EXEC	show garp
Switching	show garp interface <slot/port/all>	Privileged EXEC and User EXEC	show gmrp configuration {<slot/port> all}
		Privileged EXEC and User EXEC	show gvrp configuration {<slot/port> all}
Switching	show igmpsnooping	Privileged EXEC	show igmpsnooping
Switching	show mfdb table [macaddr/all]	Privileged EXEC	show mac-address-table multicast [{<macaddr> all}]

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	show mfdb gmrp	Privileged EXEC	show mac-address-table gmrp
Switching	show mfdb igmpsnooping	Privileged EXEC	show mac-address-table igmpsnooping
Switching	show mfdb statisticfiltering	Privileged EXEC	show mac-address-table staticfiltering
Switching	show mfdb stats	Privileged EXEC	show mac-address-table stats
Switching	show mirroring	Privileged EXEC	show monitor
Switching	config switchconfig broadcast <enable/disable>	Global Config	storm-control broadcast
		Global Config	no storm-control broadcast
Switching	config switchconfig flowcontrol <enable/disable>	Global Config	storm-control flowcontrol
		Global Config	no storm-control flowcontrol
Switching	config port adminmode <slot/port all> <enable disable>	Interface Config	shutdown
		Interface Config	no shutdown
		Global Config	shutdown all
		Global Config	no shutdown all
Switching	config port linktrap <slot/port all> <enable disable>	Interface Config	snmp trap link- status
		Interface Config	no snmp trap link- status

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Global Config	snmp trap link- status all
		Global Config	no snmp trap link- status all
Switching	config port physicalmode <slot/port all> <100h 100f 10h 10f>	Interface Config	speed {{100 10} {half-duplex full-duplex} 1000 full-duplex}
		Global Config	speed all {{100 10} {half-duplex full-duplex} 1000 full-duplex}
Switching	config port lacpmode <slot/port/all> <enable/disable>	Interface Config	port lacpmode
		Interface Config	no port lacpmode
		Global Config	port lacpmode all
		Global Config	no port lacpmode all
Switching	config port autoneg <slot/port/all> <enable/disable>	Interface Config	auto-negotiate
		Interface Config	no auto-negotiate
		Global Config	auto-negotiate all
		Global Config	no auto-negotiate all
Switching	config lag create <name>	Global Config	port-channel <name>
Switching	config lag addport <logical slot/port> <slot/port>	Interface Config	addport <logical slot/port>
Switching	config lag deleteport <logical slot/port> <slot/port all>	Interface Config	deleteport <logical slot/port>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Global Config	deleteport <logical slot/port> all
Switching	config lag adminmode <logical slot/port all> <enable disable>	Global Config	port-channel adminmode {<logical slot/port> all}
		Global Config	no port-channel adminmode {<logical slot/port> all}
Switching	config lag linktrap <logical slot/port all> <enable disable>	Global Config	port-channel linktrap {<logical slot/port> all}
		Global Config	no port-channel linktrap {<logical slot/port> all}
Switching	config lag name <logical slot/port all> <name>	Global Config	port-channel name {<logical slot/port> all} <name>
Switching	config lag deletelag <logical slot/port all>	Interface Config	delete interface {<logical slot/port> all}
Switching	config lag stpmode <logical slot/port all> <off 802.1d fast>	Interface Config	spanning-tree {<logical slot/port> all} {off 802.1d fast}
Switching	config vlan create <2-4094>	VLAN database	vlan <1-4094>
		VLAN database	no vlan <1-4094>
Switching	config vlan name <name> <2-4094>	VLAN database	vlan name <1-4094> <newname>
Switching	config vlan delete <2-4094>	VLAN database	no vlan name <1-4094>
Switching	config vlan makestatic <2-4094>	VLAN database	vlan makestatic <1-4094>
Switching	config vlan participation <exclude include auto> <1-4094> <slot/port all>	Interface Config	vlan participation {exclude include auto} <1-4094>
		Global Config	vlan participation all {exclude include auto} <1-4094>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config vlan port tagging <enable disable> <1-4094> <slot/port all>	Interface Config	vlan tagging <1-4094>
		Interface Config	no vlan tagging <1-4094>
		Global Config	vlan port tagging all <1-4094>
		Global Config	no vlan port tagging all <1-4094>
Switching	config vlan port pvid <1-4094> <slot/port all>	Interface Config	vlan pvid <1-4094>
		Global Config	vlan port pvid all <1-4094>
Switching	config vlan port acceptframe <all vlan> <slot/port all>	Interface Config	vlan acceptframe {vlanonly all}
		Interface Config	no vlan acceptframe
		Global Config	vlan port acceptframe all {vlanonly all}
		Global Config	no vlan port acceptframe all
Switching	config vlan port ingressfilter <enable disable> <slot/port all>	Interface Config	vlan ingressfilter
		Interface Config	no vlan ingressfilter
		Global Config	vlan port ingressfilter all
		Global Config	no vlan port ingressfilter all
Switching	config protocol create <groupname>	Global Config	vlan protocol group <groupname>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config protocol delete <groupid>	Global Config	vlan protocol group remove <groupid>
Switching	config protocol protocol add <groupid> <protocol>	Global Config	vlan protocol group add protocol <groupid> {ip arp ipx}
Switching	config protocol protocol remove <groupid> <protocol>	Global Config	no vlan protocol group add protocol <groupid> {ip arp ipx}
Switching	config protocol vlan add <groupid> <vlan>	VLAN database	protocol group <groupid> <1-4094>
Switching	config protocol vlan remove <groupid> <vlan>	VLAN database	no protocol group <groupid> <1-4094>
Switching	config protocol interface add <groupid> <slot/port / all>	Interface Config	protocol vlan group <groupid>
Switching	config protocol interface remove <groupid> <slot/port/all>	Interface Config	no protocol vlan group <groupid>
Switching	config protocol interface remove <groupid> <slot/port/all>	Global Config	protocol vlan group all <groupid>
Switching	config protocol interface remove <groupid> <slot/port/all>	Global Config	no protocol vlan group all <groupid>
Switching	config garp gmrp adminmode <enable/disable>	Privileged EXEC	set gmrp adminmode
		Privileged EXEC	no set gmrp adminmode
Switching	config garp gmrp interfacemode <slot/port/all> <enable/disable>	Interface Config	set gmrp interfacemode
		Interface Config	no set gmrp interfacemode
		Global Config	set gmrp interfacemode all
		Global Config	no set gmrp interfacemode all

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config garp gvrp adminmode <enable disable>	Privileged EXEC	set gvrp adminmode
		Privileged EXEC	no set gvrp adminmode
Switching	config garp gvrp interfacemode <slot/port all> <enable disable>	Interface Config	set gvrp interfacemode
		Interface Config	no set gvrp interfacemode
		Global Config	set gvrp interfacemode all
		Global Config	no set gvrp interfacemode all
Switching	config garp jointimer <slot/port/all> <10-100>	Interface Config	set garp timer join <10-100>
		Interface Config	no set garp timer join
		Global Config	set garp timer join all <10-100>
		Global Config	no set garp timer join all
Switching	config garp leavetimer <slot/port/all> <20-600>	Interface Config	set garp timer leave <20-600>
		Interface Config	no set garp timer leave
		Global Config	set garp timer leave all <20-600>
		Global Config	no set garp timer leave all
Switching	config garp leavealltimer <slot/port/all> <200-600>	Interface Config	set garp timer leaveall <200-6000>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Interface Config	no set garp timer leaveall
		Global Config	set garp timer leaveall all <200-6000>
		Global Config	no set garp timer leaveall all
Switching	config igmpsnooping adminmode <enable/disable>	Global Config	set igmp
		Global Config	no set igmp
Switching	config igmpsnooping groupmembershipinterval <1-3600>	Global Config	set igmp groupmembershipinterval <2-3600>
		Global Config	no set igmp groupmembershipinterval
Switching	config igmpsnooping maxresponse <1-3600>	Global Config	set igmp maxresponse <1-3599>
		Global Config	no set igmp maxresponse
Switching	config igmpsnooping mcrtexpiretime <0-3600>	Global Config	set igmp mcrtexpiretime <0-3600>
		Global Config	no set igmp mcrtexpiretime
Switching	config igmpsnooping interfacemode <slot/port/all> <enable/disable>	Interface Config	set igmp
		Interface Config	no set igmp
		Global Config	set igmp interfacemode all

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Switching	config mirroring delete	Global Config	no set igmp interfacemode all
Switching	config mirroring create <slot/port> <slot/port>	Global Config	monitor session source <slot/port> destination <slot/port>
		Global Config	no monitor session
Switching	config mirroring mode <enable disable>	Global Config	monitor session mode
		Global Config	no monitor session mode
Security	config authentication login create <listname>	Global Config	authentication login <listname> [method1 [method2 [method3]]]
Security	config authentication login set <listname> <local/radius/reject> [local/radius/reject] [local/radius/reject]	Global Config	
Security	config authentication login delete <listname>	Global Config	no authentication login <listname>
Security	config users defaultlogin <listname>	Global Config	users defaultlogin <listname>
Security	config users login <user> <listname>	Global Config	users login <user> <listname>
Security	show authentication login info	Privileged EXEC	show authentication
Security	show authentication login users <listname>	Privileged EXEC	show authentication users <listname>
Security	show users authentication	Privileged EXEC	show users authentication
Security	config radius maxretransmit <1 - 15>	Global Config	radius server retransmit <1-15>

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Global Config	no radius server retransmit
Security	config radius timeout <1 - 30>	Global Config	radius server timeout <1-30>
		Global Config	no radius server timeout
Security	config radius accounting mode <enable/disable>	Global Config	radius accounting mode
		Global Config	no radius accounting mode
Security	config radius accounting server add <ipaddr>	Global Config	radius server host {auth acct} <ipaddr> [<0-65535>]
Security	config radius accounting server port <ipaddr> <0 - 65535>	Global Config	
Security	config radius accounting server remove <ipaddr>	Global Config	
Security	config radius server add <ipaddr>	Global Config	
Security	config radius server port <ipaddr> <0 - 65535>	Global Config	
Security	config radius server remove <ipaddr>	Global Config	no radius server host {auth acct} <ipaddr>
Security	config radius accounting server secret <ipaddr>	Global Config	radius server key {auth acct} <ipaddr>
Security	config radius server secret <ipaddr>	Global Config	
Security	config radius server primary <ipaddr>	Global Config	radius server primary <ipaddr>
Security	show radius summary	Privileged EXEC	show radius [servers]

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Security	show radius server summary	Privileged EXEC	
Security	show radius server stats <ipaddr>	Privileged EXEC	show radius statistics <ipaddr>
Security	show radius accounting summary	Privileged EXEC	show radius accounting [statistics <ipaddr>]
Security	show radius accounting stats <ipaddr>	Privileged EXEC	
Security	show radius stats	Privileged EXEC	show radius statistics
Security	clear radius stats	Privileged EXEC	clear radius statistics
Security	config dot1x adminmode <enable/disable>	Global Config	dot1x system-auth-control
		Global Config	no dot1x system-auth-control
Security	config dot1x port initialize <slot/port>	Privileged EXEC	dot1x initialize <slot/port>
Security	config dot1x port reauthenticate <slot/port>	Privileged EXEC	dot1x re-authenticate <slot/port>
Security	config dot1x port controldir <slot/port/all> <both/in>		Removed
Security	config dot1x port controlmode <slot/port/all> <forceunauthorized/forceauthorized/auto>	Global Config	dot1x port-control all {force-unauthorized force-authorized auto}
		Global Config	no dot1x port-control all
		Interface Config	dot1x port-control {force-unauthorized force-authorized auto}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
		Interface Config	no dot1x port-control
Security	config dot1x port quietperiod <slot/port> <0-65535>	Interface Config	dot1x timeout {{reauth-period <seconds>} {quiet-period <seconds>} {tx-period <seconds>} {supp-timeout <seconds>} {server-timeout <0-65535>}}
Security	config dot1x port transmitperiod <slot/port> <1-65535>	Interface Config	no dot1x timeout {reauth-period quiet-period tx-period supp-timeout server-timeout}
Security	config dot1x port supptimeout <slot/port> <1-65535>	Interface Config	
Security	config dot1x port servertimeout <slot/port> <1-65535>	Interface Config	
Security	config dot1x port reauthperiod <slot/port> <1-65535>	Interface Config	
Security	config dot1x port maxrequests <slot/port> <1-10>	Interface Config	dot1x max-req <1-10>
		Interface Config	no dot1x max-req
Security	config dot1x port reauthenabled <slot/port> <true/false>	Interface Config	dot1x re-authentication
		Interface Config	no dot1x re-authentication
Security	config dot1x defaultlogin <listname>	Global Config	dot1x defaultlogin <listname>
Security	config dot1x login <user> <listname>	Global Config	dot1x login <user> <listname>
Security	config dot1x port users add <user> <slot/port/all>	Global Config	dot1x user <user> {<slot/port> all}
Security	config dot1x port users remove <user> <slot/port/all>	Global Config	no dot1x user <user> {<slot/port> all}

Table 12-3. IS CLI Mapping (continued)

Package	7300S Series L3 Switch Command	CLI Command	
		Mode	Syntax
Security	show dot1x summary	Privileged EXEC	show dot1x [{summary {<slot/port> all}} {detail <slot/port>} {statistics <slot/port>} {users <slot/port>}]
Security	show dot1x port summary <slot/port/all>	Privileged EXEC	
Security	show dot1x port detailed <slot/port>	Privileged EXEC	
Security	show dot1x port stats <slot/port>	Privileged EXEC	
Security	show dot1x port users <slot/port>	Privileged EXEC	
Security	clear dot1x port stats <slot/port/all>	Privileged EXEC	clear dot1x statistics {<slot/port> all}

Appendix B

Cabling Guidelines

This appendix provides specifications for cables used with a NETGEAR NETGEAR 7300S Series Layer 3 Managed Switch.

Fast Ethernet Cable Guidelines

Fast Ethernet uses UTP cable, as specified in the IEEE 802.3u standard for 100BASE-TX. The specification requires Category 5 UTP cable consisting of either two-pair or four-pair twisted insulated copper conductors bound in a single plastic sheath. Category 5 cable is certified up to 100 MHz bandwidth. 100BASE-TX operation uses one pair of wires for transmission and the other pair for receiving and for collision detection.

When installing Category 5 UTP cabling, use the following guidelines to ensure that your cables perform to the following specifications:

Certification

Make sure that your Category 5 UTP cable has completed the Underwriters' Laboratories (UL) or Electronic Testing Laboratories (ETL) certification process.

Termination method

To minimize cross-talk noise, maintain the twist ratio of the cable up to the point of termination; untwist at any RJ-45 plug or patch panel should not exceed 0.5 inch (1.5 cm).

Category 5 Cable

Category 5 distributed cable that meets ANSI/EIA/TIA-568-A building wiring standards can be a maximum of 328 feet (ft.) or 100 meters (m) in length, divided as follows:

20 ft. (6 m) between the hub and the patch panel (if used)

295 ft. (90 m) from the wiring closet to the wall outlet

10 ft. (3 m) from the wall outlet to the desktop device

The patch panel and other connecting hardware must meet the requirements for 100 Mbps operation (Category 5). Only 0.5 inch (1.5 cm) of untwist in the wire pair is allowed at any termination point.

Category 5 Cable Specifications

Ensure that the fiber cable is crossed over to guarantee link.

The Table below lists the electrical requirements of Category 5 UTP cable.

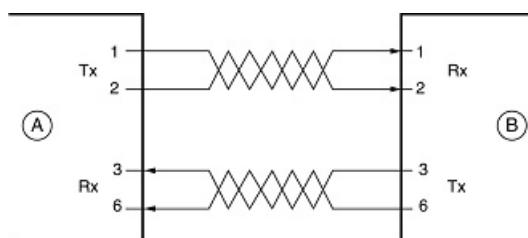
Table 12-4. Electrical Requirements of Category 5 Cable

SPECIFICATIONS	CATEGORY 5 CABLE REQUIREMENTS
Number of pairs	Four
Impedance	100 \pm 15%
Mutual capacitance at 1 KHz	5.6 nF per 100 m
Maximum attenuation (dB per 100 m, at 20° C)	at 4 MHz: 8.2 at 31 MHz: 11.7 at 100 MHz: 22.0
NEXT loss (dB minimum)	at 16 MHz: 44 at 31 MHz: 39 at 100 MHz: 32

Twisted Pair Cables

For two devices to communicate, the transmitter of each device must be connected to the receiver of the other device. The crossover function is usually implemented internally as part of the circuitry in the device. Computers and workstation adapter cards are usually media-dependent interface ports, called MDI or uplink ports. Most repeaters and switch ports are configured as media-dependent interfaces with built-in crossover ports, called MDI-X or normal ports. Auto Uplink technology automatically senses which connection, MDI or MDI-X, is needed and makes the right connection.

Figure 12-3 illustrates straight-through twisted pair cable.



Key:

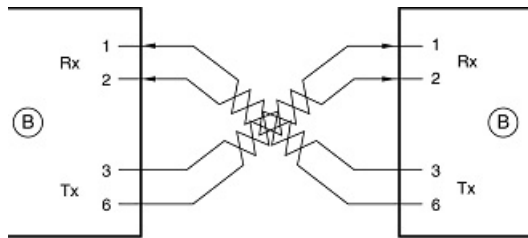
A = UPLINK OR MDI PORT (as on a PC)

B = Normal or MDI-X port (as on a hub or switch)

1, 2, 3, 6 = Pin numbers

Figure 12-3: Straight-Through Twisted-Pair Cable

Figure 12-4 illustrates crossover twisted pair cable.



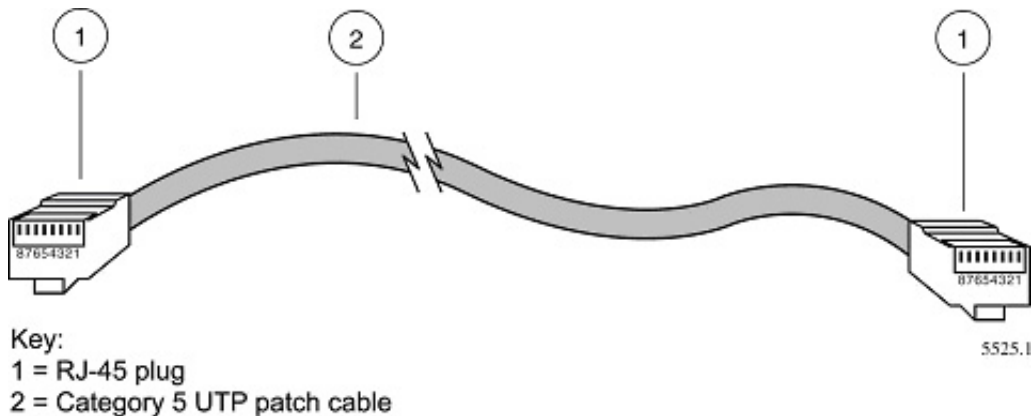
Key:
B = Normal or MDI-X port (as on a hub or switch)
1, 2, 3, 6 = Pin numbers

Figure 12-4: Crossover Twisted-Pair Cable

Patch Panels and Cables

If you are using patch panels, make sure that they meet the 100BASE-TX requirements. Use Category 5 UTP cable for all patch cables and work area cables to ensure that your UTP patch cable rating meets or exceeds the distribution cable rating.

To wire patch panels, you need two Category 5 UTP cables with an RJ-45 plug at each end, as shown here.



Key:
1 = RJ-45 plug
2 = Category 5 UTP patch cable

Figure 12-5: Category 5 UTP Cable with Male RJ-45 Plug at Each End

Note: Flat “silver satin” telephone cable may have the same RJ-45 plug. However, using telephone cable results in excessive collisions, causing the attached port to be partitioned or disconnected from the network.

Using 1000BASE-T Gigabit Ethernet over Category 5 Cable

When using the new 1000BASE-T standard, the limitations of cable installations and the steps necessary to ensure optimum performance must be considered. The most important components in your cabling system are patch panel connections, twists of the pairs at connector transition points, the jacket around the twisted-pair cable, bundling of multiple pairs on horizontal runs and punch down blocks. All of these factors affect the performance of 1000BASE-T technology if not correctly implemented. The following sections are designed to act as a guide to correct cabling for 1000BASE-T.

Cabling

The 1000BASE-T product is designed to operate over Category 5 cabling. To further enhance the operation, the cabling standards have been amended. The latest standard is Category 5e, which defines a higher level of link performance than is available with Category 5 cable.

If installing new cable, we recommend using Category 5e cable, since it costs about the same as Category 5 cable. If using the existing cable, be sure to have the cable plant tested by a professional who can verify that it meets or exceeds either ANSI/EIA/TIA-568-A:1995 or ISO/IEC 11801:1995 Category 5 specifications.

Length

The maximum distance limitation between two pieces of equipment is 100 m, as per the original Ethernet specification. The end-to-end link is called the “channel.”

TSB-67 defines the “Basic Link” which is the portion of the link that is part of the building infrastructure. This excludes patch and equipment cords. The maximum basic link length is 295 feet (90 m).

Return Loss

Return loss measures the amount of reflected signal energy resulting from impedance changes in the cabling link. The nature of 1000BASE-T renders this measurement very important; if too much energy is reflected back on to the receiver, the device does not perform optimally.

Unlike 10BASE-T and 100BASE-TX, which use only two of the four pairs of wires within the Category 5, 1000BASE-T uses all four pairs of the twisted pair. Make sure all wires are tested — this is important.

Factors that affect the return loss are:

The number of transition points, as there is a connection via an RJ-45 to another connector, a patch panel, or device at each transition point.

Removing the jacket that surrounds the four pairs of twisted cable. It is highly recommended that, when RJ-45 connections are made, this is minimized to 1-1/4 inch (32 mm).

Untwisting any pair of the twisted-pair cabling. It is important that any untwisting be minimized to 3/8 inch (10 mm) for RJ-45 connections.

Cabling or bundling of multiple Category 5 cables. This is regulated by ANSI/EIA/TIA-568A-3. If not correctly implemented, this can adversely affect all cabling parameters.

Near End Cross Talk (NEXT)

This is a measure of the signal coupling from one wire to another, within a cable assembly, or among cables within a bundle. NEXT measures the amount of cross-talk disturbance energy that is detected at the near end of the link — the end where the transmitter is located. NEXT measures the amount of energy that is “returned” to the sender end. The factors that affect NEXT and cross talk are exactly the same as outlined in the Return Loss section. The cross-talk performance is directly related to the quality of the cable installation.

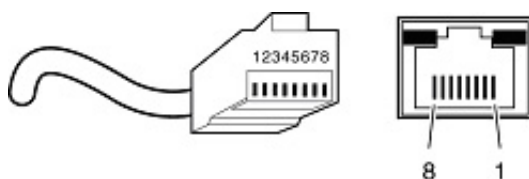
Patch Cables

When installing your equipment, replace old patch panel cables that do not meet Category 5e specifications. As pointed out in the NEXT section, this near end piece of cable is critical for successful operation.

RJ-45 Plug and RJ-45 Connectors

In a Fast Ethernet network, it is important that all 100BASE-T certified Category 5 cabling use RJ-45 plugs. The RJ-45 plug accepts 4-pair UTP or shielded twisted-pair (STP) 100-ohm cable and connects into the RJ-45 connector. The RJ-45 connector is used to connect stations, hubs, and switches through UTP cable; it supports 10 Mbps, 100 Mbps, or 1000 Mbps data transmission.

Figure 12-6 shows the RJ-45 plug and RJ-45 connector.



Key:
1 to 8 = pin numbers

Figure 12-6: RJ-45 Plug and RJ-45 Connector with Built-in LEDs

Table 12-1 lists the pin assignments for the 10/100 Mbps RJ-45 plug and the RJ-45 connector.

Table 12-1. 10/100 Mbps RJ-45 Plug and RJ-45 Connector Pin Assignments

PIN	NORMAL ASSIGNMENT ON PORTS 1 TO 8	UPLINK ASSIGNMENT ON PORT 8
1	Input Receive Data +	Output Transmit Data +
2	Input Receive Data –	Output Transmit Data –
3	Output Transmit Data +	Input Receive Data +
6	Output Transmit Data –	Input Receive Data –
4, 5, 7, 8	Internal termination, not used for data transmission	

Table E-2 lists the pin assignments for the 100/1000 Mbps RJ-45 plug and the RJ-45 connector.

Table 12-2. 100/1000 Mbps RJ-45 Plug and RJ-45 Connector Pin Assignments

PIN	CHANNEL	DESCRIPTION
1 2	A	Rx/Tx Data + Rx/Tx Data
3 6	B	Rx/Tx Data + Rx/Tx Data
4 5	C	Rx/Tx Data + Rx/Tx Data
7 8	D	Rx/Tx Data + Rx/Tx Data

Conclusion

For optimum performance of your 1000BASE-T product, it is important to fully qualify your cable installation and ensure it meets or exceeds ANSI/EIA/TIA-568-A:1995 or ISO/IEC 11801:1995 Category 5 specifications. Install Category 5e cable where possible, including patch panel cables. Minimize transition points, jacket removal, and untwist lengths. Bundling of cables must be properly installed to meet the requirements in ANSI/EIA/TIA-568A-3.

Appendix C

Glossary

Use the list below to find definitions for technical terms used in this manual.

Numeric

802.1D

The IEEE designator for Spanning Tree Protocol (STP). STP, a link management protocol, is part of the 802.1D standard for media access control bridges. Using the spanning tree algorithm, STP provides path redundancy while preventing endless loops in a network. An endless loop is created by multiple active paths between stations where there are alternate routes between hosts. To establish path redundancy, STP creates a logical tree that spans all of the switches in an extended network, forcing redundant paths into a standby, or blocked, state. STP allows only one active path at a time between any two network devices (this prevents the loops) but establishes the redundant links as a backup if the initial link should fail. If STP costs change, or if one network segment in the STP becomes unreachable, the spanning tree algorithm reconfigures the spanning tree topology and reestablishes the link by activating the standby path. Without spanning tree in place, it is possible that both connections may be simultaneously live, which could result in an endless loop of traffic on the LAN.

802.1P

The IEEE protocol designator for Local Area Network (LAN). This Layer 2 network standard improves support of time critical traffic, and limits the extent of high bandwidth multicast traffic within a bridged LAN. To do this, 802.1P defines a methodology for introducing traffic class priorities. The 802.1P standard allows priority to be defined in all 802 MAC protocols (Ethernet, Token Bus, Token Ring), as well as in FDDI. For protocols (such as Ethernet) that do not contain a priority field, 802.1P specifies a method for indicating frame priority based on the new fields defined in the 802.1Q (VLAN) standard.

802.1Q VLAN

The IEEE protocol designator for Virtual Local Area Network (VLAN). This standard provides VLAN identification and quality of service (QoS) levels. Four bytes are added to an Ethernet frame to allow eight priority levels (QoS) and to identify up to 4096 VLANs. See “VLAN” on page 21 for more information.

10BASE-T

The IEEE specification for 10 Mbps Ethernet over Category 3, 4, or 5 twisted-pair cable.

100BASE-FX

The IEEE specification for 100 Mbps Fast Ethernet over fiber-optic cable.

100BASE-TX

The IEEE specification for 100 Mbps Fast Ethernet over Category 5 twisted-pair cable.

1000BASE-SX

The IEEE specification for 1000 Mbps Gigabit Ethernet over fiber-optic cable.

1000BASE-T

The IEEE specification for 1000 Mbps Gigabit Ethernet over Category 5 twisted-pair cable. gain access.

A

ABR

See “Area Border Router” on page 2.

Access Control List

An ACL is a database that an Operating System uses to track each user’s access rights to system objects (such as file directories and/or files).

ACL

See “Access Control List” on page 2.

Address Resolution Protocol

An Internet Protocol that dynamically maps Internet addresses to physical (hardware) addresses on a LAN.

Advanced Network Device Layer/Software

Term for the Device Driver level.

Aging

When an entry for a node is added to the lookup table of a switch, it is given a timestamp. Each time a packet is received from a node, the timestamp is updated. The switch has a user-configurable timer that erases the entry after a certain length of time with no activity from that node.

Area Border Router

A router located on the border of one or more OSPF areas that connects those areas to the backbone network. ABRs are considered members of both the OSPF backbone and the attached areas. They therefore maintain routing tables describing both the backbone topology and the topology of the other areas. (Cisco Systems Inc.)

ARP

See “Address Resolution Protocol” on page 2.

ASBR

See “Autonomous System Boundary Router” on page 3.

Autonomous System Boundary Router

ABR located between an OSPF autonomous system and a non-OSPF network. ASBRs run both OSPF and another routing protocol, such as RIP. ASBRs must reside in a non-stub OSPF area. See also ABR, non-stub area, and OSPF. (Cisco Systems Inc.)

Auto-negotiation

A feature that allows twisted-pair ports to advertise their capabilities for speed, duplex and flow control. When connected to a port that also supports auto-negotiation, the link can automatically configure itself to the optimum setup.

Auto Uplink

Auto Uplink™ technology (also called MDI/MDIX) eliminates the need to worry about crossover vs. straight-through Ethernet cables. Auto Uplink™ will accommodate either type of cable to make the right connection.

AVL tree

Binary tree having the property that for any node in the tree, the difference in height between the left and right subtrees of that node is no more than 1.

B

BPDU

See “Bridge Protocol Data Unit” on page 4.

Backbone

The part of a network used as a primary path for transporting traffic between network segments.

Bandwidth

The information capacity, measured in bits per second, that a channel could transmit. Bandwidth examples include 10 Mbps for Ethernet, 100 Mbps for Fast Ethernet, and 1000 Mbps (1 Gbps) for Gigabit Ethernet.

Baud

The signaling rate of a line, that is, the number of transitions (voltage or frequency changes) made per second. Also known as line speed.

BootP

See “Bootstrap Protocol” on page 4.

Bootstrap Protocol

An Internet protocol that enables a diskless workstation to discover its own IP address, the IP address of a BootP server on the network, and a file to be loaded into memory to boot the machine. This enables the workstation to boot without requiring a hard or floppy disk drive.

Bridge Protocol Data Unit

BPDU is the IEEE 802.1D MAC Bridge Management protocol that is the standard implementation of STP (Spanning Tree Protocol). It uses the STP algorithm to insure that physical loops in the network topology do not result in logical looping of network traffic. Using one bridge configured as root for reference, the BPDU switches one of two bridges forming a network loop into standby mode, so that only one side of a potential loop passes traffic. By examining frequent 802.1d configuration updates, a bridge in the standby mode can switch automatically into the forward mode if the other bridge forming the loop fails.

Broadcast

A packet sent to all devices on a network.

Broadcast storm

Multiple simultaneous broadcasts that typically absorb all the available network bandwidth and can cause a network to fail. Broadcast storms can be due to faulty network devices or network loops.

C

Cat 5

Category 5 unshielded twisted pair (UTP) cabling. An Ethernet network operating at 10 Mbits/second (10BASE-T) will often tolerate low quality cables, but at 100 Mbits/second (10BASE-Tx) the cable must be rated as Category 5, or Cat 5 or Cat V, by the Electronic Industry Association (EIA).

This rating will be printed on the cable jacket. Cat 5 cable contains eight conductors, arranged in four twisted pairs, and terminated with an RJ45 type connector. In addition, there are restrictions on maximum cable length for both 10 and 100 Mbits/second networks.

Capacity planning

Determining whether current solutions can satisfy future demands. Capacity planning includes evaluating potential workload and infrastructure changes.

Checksum

A simple error-detection scheme in which each transmitted message is identified with a numerical value based on the number of set bits in the message. The receiving station then applies a formula to the message and checks to make sure the accompanying numerical value is the same. If not, the receiver can assume that the message has been corrupted.

Class of Service

A term to describe treating different types of traffic with different levels of service priority. Higher priority traffic gets faster treatment during times of switch congestion

CLI

See “Command Line Interface” on page 5.

Collision

A term used to describe two colliding packets in an Ethernet network. Collisions are a part of normal Ethernet operation, but a sudden prolonged increase in the number of collisions can indicate a problem with a device, particularly if it is not accompanied by a general increase in traffic.

Command Line Interface

CLI is a line-item interface for configuring systems. (It is one of the user interfaces for allowing programmers to configure their system).

Common Open Policy Service Protocol

A proposed standard protocol for exchanging network policy information between a Policy Decision Point (PDP) in a network and Policy Enforcement Points (PEPs) as part of overall Quality of Service (QoS) - the allocation of network traffic resources according to desired priorities of service. The policy decision point might be a network server controlled directly by the network administrator who enters policy statements about which kinds of traffic (voice, bulk data, video, teleconferencing, and so forth) should get the highest priority. The policy enforcement points might be router or layer 3 switches that implement the policy choices as traffic moves through the network. Currently, COPS is designed for use with the Resource Reservation Protocol (RSVP), which lets you allocate traffic priorities in advance for temporary high-bandwidth requirements (for example, video broadcasts or multicasts). It is possible that COPS will be extended to be a general policy communications protocol.

COPS

See “Common Open Policy Service Protocol” on page 5.

D

DHCP

See “Dynamic Host Configuration Protocol” on page 6.

Differentiated Services

Diffserv is a protocol for specifying and controlling network traffic by class so that certain types of traffic get precedence - for example, voice traffic, which requires a relatively uninterrupted flow of data, might get precedence over other kinds of traffic. Differentiated Services is the most advanced method for managing traffic in terms of what is called Class of Service (CoS). Unlike the earlier mechanisms of 802.1P tagging and Type of Service (ToS), Differentiated Services avoids simple priority tagging and depends on more

complex policy or rule statements to determine how to forward a given network packet. An analogy is made to travel services, in which a person can choose among different modes of travel - train, bus, airplane - degree of comfort, the number of stops on the route, standby status, the time of day or period of year for the trip, and so forth. For a given set of packet travel rules, a packet is given one of 64 possible forwarding behaviors - known as per hop behaviors (PHBs). A six-bit field, known as the Differentiated Services Code Point (DSCP), in the Internet Protocol (Internet Protocol) header specifies the per hop behavior for a given flow of packets. Differentiated Services and the Class of Service approach provide a way to control traffic that is both more flexible and more scalability than the Quality of Service approach.

Diffserv

See “Differentiated Services” on page 5.

DNS

Short for Domain Name System (or Service), an Internet service that translates domain names into IP addresses.

Because domain names are alphabetic, they're easier to remember. The Internet however, is really based on IP addresses. Every time you use a domain name, therefore, a DNS service must translate the name into the corresponding IP address. For example, the domain name `www.example.com` might translate to `198.105.232.4`. The DNS system is, in fact, its own network. If one DNS server doesn't know how to translate a particular domain name, it asks another one, and so on, until the correct IP address is returned.

Domain Name

A descriptive name for an address or group of addresses on the Internet. Domain names are of the form of a registered entity name plus one of a number of predefined top level suffixes such as `.com`, `.edu`, `.uk`, etc. For example, in the address `mail.NETGEAR.com`, `mail` is a server name and `NETGEAR.com` is the domain.

Dynamic Host Configuration Protocol

DHCP is a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. In some systems, the device's IP address can even change while it is still connected. DHCP also supports a mix of static and dynamic IP addresses. Dynamic addressing simplifies network administration because the software tracks IP addresses rather than requiring an administrator to manage the task. A new computer can be added to a network without the hassle of manually assigning it a unique IP address.

E

EAP

Extensible Authentication Protocol is a general protocol for authentication that supports multiple authentication methods.

EAP, an extension to PPP, supports such authentication methods as token cards, Kerberos, one-time passwords, certificates, public key authentication and smart cards. In wireless communications using EAP, a user requests connection to a WLAN through an AP, which then requests the identity of the user and

transmits that identity to an authentication server such as RADIUS. The server asks the AP for proof of identity, which the AP gets from the user and then sends back to the server to complete the authentication. EAP is defined by RFC 2284.

Endstation

A computer, printer, or server that is connected to a network.

Ethernet

A LAN specification developed jointly by Xerox, Intel and Digital Equipment Corporation. Ethernet networks transmit packets at a rate of 10 Mbps.

F

Fast Ethernet

An Ethernet system that is designed to operate at 100 Mbps.

Fault isolation

A technique for identifying and alerting administrators about connections (such as those associated with switch ports) that are experiencing congestion or failure, or exceeding an administrator-defined threshold.

Fast STP

A high-performance Spanning Tree Protocol. See “STP” on page 19 for more information.

Filtering

The process of screening a packet for certain characteristics, such as source address, destination address, or protocol. Filtering is used to determine whether traffic is to be forwarded, and can also prevent unauthorized access to a network or network devices.

Flow Control

The process of adjusting the flow of data from one network device to another to ensure that the receiving device can handle all of the incoming data. This is particularly important where the sending device is capable of sending data much faster than the receiving device can receive it. There are many flow control mechanisms. One of the most common flow control protocols for asynchronous communication is called xon-xoff. In this case, the receiving device sends an “xoff” message to the sending device when its buffer is full. The sending device then stops sending data. When the receiving device is ready to receive more data, it sends an “xon” signal.

Forwarding

When a frame is received on an input port on a switch, the address is checked against the lookup table. If the lookup table has recorded the destination address, the frame is automatically forwarded on an output port.

Full-duplex

A system that allows packets to be transmitted and received at the same time and, in effect, doubles the potential throughput of a link.

G

GARP

See “Generic Attribute Registration Protocol” on page 8.

GARP Information Propagation

GIP is the propagation of information between GARP participants for the same application in a bridge is carried out by a GIP component.

GARP Multicast Registration Protocol

GMRP provides a mechanism that allows Bridges and end stations to dynamically register (and subsequently, de-register) Group membership information with the MAC Bridges attached to the same LAN segment, and for that information to be disseminated across all Bridges in the Bridged LAN that support Extended Filtering Services. The operation of GMRP relies upon the services provided by the GARP.

GARP VLAN Registration Protocol

GVRP allows workstations to request admission to a particular VLAN for multicast purposes.

Gateway

A local device, usually a router, that connects hosts on a local network to other networks.

GE

See “Gigabit Ethernet” on page 8.

Generic Attribute Registration Protocol

GARP provides a generic attribute dissemination capability that is used by participants in GARP Applications (called GARP Participants) to register and de-register attribute values with other GARP Participants within a Bridged LAN. The definition of the attribute types, the values that they can carry, and the semantics that are associated with those values when registered are specific to the operation of the GARP Application concerned.

Gigabit Ethernet

An Ethernet system that is designed to operate at 1000 Mbps (1 Gbps).

GIP

See “GARP Information Propagation” on page 8.

GMRP

See “GARP Multicast Registration Protocol” on page 8.

GVD

GARP VLAN Database.

GVRP

See “GARP VLAN Registration Protocol” on page 8.

H

Half-duplex

A system that allows packets to be transmitted and received, but not at the same time. Contrast with full-duplex.

hop count

The number of routers that a data packet passes through on its way to its destination.

I

ICMP

See “Internet Control Message Protocol” on page 10.

IEEE

Institute of Electrical and Electronics Engineers. This American organization was founded in 1963 and sets standards for computers and communications.

IETF

Internet Engineering Task Force. An organization responsible for providing engineering solutions for TCP/IP networks. In the network management area, this group is responsible for the development of the SNMP protocol.

IGMP

See “Internet Group Management Protocol” on page 10.

IGMP Snooping

A series of operations performed by intermediate systems to add logic to the network to optimize the flow of multicast traffic; these intermediate systems (such as Layer 2 switches) listen for IGMP messages and build mapping tables and associated forwarding filters, in addition to reducing the IGMP protocol traffic. See “Internet Group Management Protocol” on page 10 for more information.

Internet Control Message Protocol

ICMP is an extension to the Internet Protocol (IP) that supports packets containing error, control, and informational messages. The PING command, for example, uses ICMP to test an Internet connection.

Internet Group Management Protocol

IGMP is the standard for IP Multicasting on the Internet. IGMP is used to establish host memberships in particular multicast groups on a single network. The mechanisms of the protocol allow a host to inform its local router, using Host Membership Reports, that it wants to receive messages addressed to a specific multicast group. All hosts conforming to Level 2 of the IP Multicasting specification require IGMP.

IP

See “Internet Protocol” on page 10.

IP Multicasting

Sending out data to distributed servers on the MBone (Multicast Backbone). For large amounts of data, IP Multicast is more efficient than normal Internet transmissions because the server can broadcast a message to many recipients simultaneously. Unlike traditional Internet traffic that requires separate connections for each source-destination pair, IP Multicasting allows many recipients to share the same source. This means that just one set of packets is transmitted for all the destinations.

Internet Protocol

The method or protocol by which data is sent from one computer to another on the Internet. Each computer (known as a host) on the Internet has at least one IP address that uniquely identifies it among all other computers on the Internet. When you send or receive data (for example, an e-mail note or a Web page), the message gets divided into little chunks called packets. Each of these packets contains both the sender's Internet address and the receiver's address. Any packet is sent first to a gateway computer that understands a small part of the Internet. The gateway computer reads the destination address and forwards the packet to an adjacent gateway that in turn reads the destination address and so forth across the Internet until one gateway recognizes the packet as belonging to a computer within its immediate neighborhood or domain. That gateway then forwards the packet directly to the computer whose address is specified.

Because a message is divided into a number of packets, each packet can, if necessary, be sent by a different route across the Internet. Packets can arrive in a different order than they were sent. The Internet Protocol just delivers them. It's up to another protocol, the Transmission Control Protocol (TCP) to put them back in the right order. IP is a connectionless protocol, which means that there is no continuing connection between the end points that are communicating. Each packet that travels through the Internet is treated as an independent unit of data without any relation to any other unit of data. (The reason the packets do get put in the right order is because of TCP, the connection-oriented protocol that keeps track of the packet sequence in a message.) In the Open Systems Interconnection (OSI) communication model, IP is in Layer 3, the Networking Layer. The most widely used version of IP today is IP version 4 (IPv4). However, IP version 6 (IPv6) is also beginning to be supported. IPv6 provides for much longer addresses and therefore for the possibility of many more Internet users. IPv6 includes the capabilities of IPv4 and any server that can support IPv6 packets can also support IPv4 packets.

L

LAN

See “Local Area Network” on page 11.

LDAP

See “Lightweight Directory Access Protocol” on page 11.

Lightweight Directory Access Protocol

A set of protocols for accessing information directories. LDAP is based on the standards contained within the X.500 standard, but is significantly simpler. Unlike X.500, LDAP supports TCP/IP, which is necessary for any type of Internet access. Although not yet widely implemented, LDAP should eventually make it possible for almost any application running on virtually any computer platform to obtain directory information, such as e-mail addresses and public keys. Because LDAP is an open protocol, applications need not worry about the type of server hosting the directory.

Learning

The bridge examines the Layer 2 source addresses of every frame on the attached networks (called listening) and then maintains a table, or cache, of which MAC addresses are attached to each of its ports.

Link-State

In routing protocols, the declared information about the available interfaces and available neighbors of a router or network. The protocol's topological database is formed from the collected link-state declarations.

Load balancing

The ability to distribute traffic across various ports of a device, such as a switch, to provide efficient, optimized traffic throughout the network.

Local Area Network

A communications network serving users within a limited area, such as one floor of a building. A LAN typically connects multiple personal computers and shared network devices such as storage and printers. Although many technologies exist to implement a LAN, Ethernet is the most common for connecting personal computers and is limited to a distance of 1,500 feet. LANs can be connected together, but if modems and telephones connect two or more LANs, the larger network constitutes what is called a WAN or Wide Area Network.

Loop

An event that occurs when two network devices are connected by more than one path, thereby causing packets to repeatedly cycle around the network and not reach their destination.

M

MAC

(1) Medium Access Control. In LANs, the sublayer of the data link control layer that supports medium-dependent functions and uses the services of the physical layer to provide services to the logical link control (LLC) sublayer. The MAC sublayer includes the method of determining when a device has access to the transmission medium. (2) Message Authentication Code. In computer security, a value that is a part of a message or accompanies a message and is used to determine that the contents, origin, author, or other attributes of all or part of the message are as they appear to be. (*IBM Glossary of Computing Terms*)

MAC address

The Media Access Control address is a unique 48-bit hardware address assigned to every network interface card. Usually written in the form 01:23:45:67:89:ab.

Management Information Base

When SNMP devices send SNMP messages to the management console (the device managing SNMP messages), it stores information in the MIB.

Mbps

Megabits per second.

MBONE

See “Multicast Backbone” on page 13.

MD5

MD5 creates digital signatures using a one-way hash function, meaning that it takes a message and converts it into a fixed string of digits, also called a message digest.

When using a one-way hash function, one can compare a calculated message digest against the message digest that is decrypted with a public key to verify that the message hasn't been tampered with. This comparison is called a "hashcheck."

MDI/MDIX

In cable wiring, the concept of transmit and receive are from the perspective of the PC, which is wired as a Media Dependant Interface (MDI). In MDI wiring, a PC transmits on pins 1 and 2. At the hub, switch, router, or access point, the perspective is reversed, and the hub receives on pins 1 and 2. This wiring is referred to as Media Dependant Interface - Crossover (MDI-X). See “Auto-negotiation” on page 3.

MIB

See “Management Information Base” on page 12.

MOSPF

See “Multicast OSPF” on page 13.

MPLS

See “Multi-Protocol Label Switching” on page 13.

Multicast Backbone

The MBONE is a virtual network. It is layered on top of portions of the physical Internet to support routing of IP multicast packets since that function has not yet been integrated into many production routers. The network is composed of islands that can directly support IP multicast, such as multicast LANs like Ethernet, linked by virtual point-to-point links called "tunnels". The tunnel endpoints are typically workstation-class machines having operating system support for IP multicast and running the "mrouted" multicast routing daemon.

Multicasting

To transmit a message to specific recipients across a network. A simple example of multicasting is sending an e-mail message to a mailing list. Teleconferencing and videoconferencing also use multicasting, but require more robust protocols and networks. Standards are being developed to support multicasting over a TCP/IP network such as the Internet. These standards, IP Multicast and Mbone, will allow users to easily join multicast groups. Note that multicasting refers to sending a message to a select group whereas broadcasting refers to sending a message to everyone connected to a network. The terms multicast and narrowcast are often used interchangeably, although narrowcast usually refers to the business model whereas multicast refers to the actual technology used to transmit the data.

Multicast OSPF

With a MOSPF specification, an IP Multicast packet is routed based both on the packet's source and its multicast destination (commonly referred to as source/destination routing). As it is routed, the multicast packet follows a shortest path to each multicast destination. During packet forwarding, any commonality of paths is exploited; when multiple hosts belong to a single multicast group, a multicast packet will be replicated only when the paths to the separate hosts diverge. See “OSPF” on page 15 for more information.

Multiplexing

A function within a layer that interleaves the information from multiple connections into one connection.

Multi-Protocol Label Switching

An initiative that integrates Layer 2 information about network links (bandwidth, latency, utilization) into Layer 3 (IP) within a particular autonomous system—or ISP—in order to simplify and improve IP-packet exchange. MPLS gives network operators a great deal of flexibility to divert and route traffic around link failures, congestion, and bottlenecks. From a QoS standpoint, ISPs will better be able to manage different kinds of data streams based on priority and service plan. For instance, those who subscribe to a premium service plan, or those who receive a lot of streaming media or high-bandwidth content can see minimal latency and packet loss. When packets enter into a MPLS-based network, Label Edge Routers (LERs) give them a label (identifier). These labels not only contain information based on the routing table entry (i.e., destination, bandwidth, delay, and other metrics), but also refer to the IP header field (source IP address), Layer 4 socket number information, and differentiated service. Once this classification is complete and mapped, different packets are assigned to corresponding Labeled Switch Paths (LSPs), where Label Switch

Routers (LSRs) place outgoing labels on the packets. With these LSPs, network operators can divert and route traffic based on data-stream type and Internet-access customer.

MUX

See “Multiplexing” on page 13.

N

NAT

See “Network Address Translation” on page 14.

netmask

Combined with the IP address, the IP Subnet Mask allows a device to know which other addresses are local to it, and which must be reached through a gateway or router.

A number that explains which part of an IP address comprises the network address and which part is the host address on that network. It can be expressed in dotted-decimal notation or as a number appended to the IP address. For example, a 28-bit mask starting from the MSB can be shown as 255.255.255.192 or as /28 appended to the IP address.

Network Address Translation

Sometimes referred to as Transparent Proxying, IP Address Overloading, or IP Masquerading. Involves use of a device called a Network Address Translator, which assigns a contrived, or logical, IP address and port number to each node on an organization's internal network and passes packets using these assigned addresses.

nm

Nanometer (1 x 10^{e9}) meters.

non-stub area

Resource-intensive OSPF area that carries a default route, static routes, intra-area routes, interarea routes, and external routes. Non-stub areas are the only OSPF areas that can have virtual links configured across them, and are the only areas that can contain an ASBR. Compare with stub area. See also ASAM and OSPF. (Cisco Systems Inc.)

O

Open Shortest Path First

A link-state (algorithm used by the router to determine the current topology of a network), Interior Gateway (distributes routing information between routers belonging to a single Autonomous System) routing

protocol. This protocol's algorithm determines the shortest path from its router to all the other routers in the network. This protocol is rapidly replacing RIP on the Internet.

Open Systems Interconnection

OSI is a seven (7) layer architecture model for communications systems developed by the ISO for the interconnection of data communications systems. Each layer uses and builds on the services provided by those below it.

OSI

See “Open Systems Interconnection” on page 15.

OSPF

See “Open Shortest Path First” on page 14.

P

packet

A block of information sent over a network. A packet typically contains a source and destination network address, some protocol and length information, a block of data, and a checksum.

PDU

See “Protocol Data Unit” on page 16.

PHY

The OSI Physical Layer: The physical layer provides for transmission of cells over a physical medium connecting two ATM devices. This physical layer is comprised of two sublayers: the Physical Medium Dependent (PMD) sublayer, and the Transmission Convergence (TC) sublayer.

PIM-DM

See “Protocol Independent Multicast – Dense Mode” on page 16.

PMC

Packet Mode Channel.

Point-to-Point Protocol

PPP. A protocol allowing a computer using TCP/IP to connect directly to the Internet.

Port Mirroring

Also known as a roving analysis port. This is a method of monitoring network traffic that forwards a copy of each incoming and outgoing packet from one port of a network switch to another port where the packet can be studied. A network administrator uses port mirroring as a diagnostic tool or debugging feature, especially when fending off an attack. It enables the administrator to keep close track of switch performance and alter it

if necessary. Port mirroring can be managed locally or remotely. An administrator configures port mirroring by assigning a port from which to copy all packets and another port where those packets will be sent. A packet bound for or heading away from the first port will be forwarded onto the second port as well. The administrator places a protocol analyzer on the port receiving the mirrored data to monitor each segment separately. The analyzer captures and evaluates the data without affecting the client on the original port. The monitor port may be a port on the same SwitchModule with an attached RMON probe, a port on a different SwitchModule in the same hub, or the SwitchModule processor. Port mirroring can consume significant CPU resources while active. Better choices for long-term monitoring may include a passive tap like an optical probe or an Ethernet repeater.

Port monitoring

The ability to monitor the traffic passing through a port on a device to analyze network characteristics and perform troubleshooting.

Port speed

The speed that a port on a device uses to communicate with another device or the network.

Port trunking

The ability to combine multiple ports on a device to create a single, high-bandwidth connection.

Protocol

A set of rules for communication between devices on a network.

Protocol Data Unit

PDU is a packet of data passed across a network. The term implies a specific layer of the OSI model and a specific protocol.

Protocol Independent Multicast – Dense Mode

Like DVMRP, PIM-DM uses a flood and prune protocol for building multicast trees. However, unlike DVMRP, PIM-DM uses existing unicast protocols for determining the route to the source.

Q

QoS

See “Quality of Service” on page 16.

Quality of Service

QoS is a networking term that specifies a guaranteed level of throughput. Throughput is the amount of data transferred from one device to another or processed in a specified amount of time - typically, throughputs are measured in bytes per second (Bps).

R

RADIUS

Short for Remote Authentication Dial-In User Service, RADIUS is an authentication system.

Using RADIUS, you must enter your user name and password before gaining access to a network. This information is passed to a RADIUS server, which checks that the information is correct, and then authorizes access. Though not an official standard, the RADIUS specification is maintained by a working group of the IETF.

Real-Time Operating System

RTOS is a component of the OSAPI module that abstracts operating systems with which other systems can interface.

Resource Reservation Setup Protocol

RSVP is a new Internet protocol being developed to enable the Internet to support specified Qualities-of-Service (QoS). Using RSVP, an application will be able to reserve resources along a route from source to destination. RSVP-enabled routers will then schedule and prioritize packets to meet the prioritization assigned by QoS. RSVP is a chief component of a new type of Internet being developed, known broadly as an integrated services Internet. The general idea is to enhance the Internet to support transmission of real-time data.

RIP

See “Routing Information Protocol” on page 17.

router

A device that forwards data between networks. An IP router forwards data based on IP source and destination addresses.

Routing Information Protocol

RIP is the routing protocol used by the routed process on Berkeley-derived UNIX systems. Many networks use RIP; it works well for small, isolated, and topologically simple networks.

RIPng

Routing Information Protocol, new generation.

RMON

Short for remote monitoring, a network management protocol that allows network information to be gathered at a single workstation. Whereas SNMP gathers network data from a single type of Management Information Base (MIB), RMON 1 defines nine additional MIBs that provide a much richer set of data about network usage. For RMON to work, network devices, such as hubs and switches, must be designed to support it. The newest version of RMON, RMON 2, provides data about traffic at the network layer in addition to the physical layer. This allows administrators to analyze traffic by protocol.

RSVP

See “Resource Reservation Setup Protocol” on page 17.

RTOS

See “Real-Time Operating System” on page 17.

S

Simple Network Management Protocol

SNMP is the protocol governing network management and the monitoring of network devices and their functions. It is not necessarily limited to TCP/IP networks. The versions have the following differences:

SNMPv1 (full): Security is based on community strings.

SNMPsec (historic): Security is based on parties. Few, if any, vendors implemented this version of the protocol, which is now largely forgotten.

SNMPv2p (historic): For this version, much work was done to update the SNMPv1 protocol and the SMIV1, and not just security. The result was updated protocol operations, new protocol operations and data types, and party-based security from SNMPsec.

SNMPv2c (experimental): This version of the protocol is called community string-based SNMPv2. It is an update of the protocol operations and data types of SNMPv2p, and uses community-based security from SNMPv1.

SNMPv2u (experimental): This version of the protocol uses the protocol operations and data types of SNMPv2c and security based on users.

*SNMPv2** (experimental): This version combined the best features of SNMPv2p and SNMPv2u. (It is also called SNMPv2star.) The documents defining this version were never published as RFCs.

SNMPv3 (proposed): This version of the protocol is a combination of user-based security and the protocol operations and data types from SNMPv2p and support for proxies. The security is based on that found in SNMPv2u and SNMPv2*, and updated after much review. The documents defining this protocol will soon be published as RFCs.

SimpleX signaling

SX is one of IEEE 802.3's designations for media. For example, 1000SX indicates 1000 gigabit Ethernet over "short haul" or "short wavelength" optical fiber.

SMII

Serial Media Independent Interface.

SNMP

See “Simple Network Management Protocol” on page 18.

Spanning Tree

A technique that detects loops in a network and logically blocks the redundant paths, ensuring that only one route exists between any two LANs.

Spanning Tree Protocol (STP)

A protocol that finds the most efficient path between segments of a multi-looped, bridged network. STP allows redundant switches and bridges to be used for network resilience, without the broadcast storms associated with looping. If a switch or bridge falls, a new path to a redundant switch or bridge is opened.

SRAM

Static Random Access Memory.

STP

Spanning Tree Protocol. See “802.1D” on page 1 for more information.

stub area

OSPF area that carries a default route, intra-area routes, and interarea routes, but does not carry external routes. Virtual links cannot be configured across a stub area, and they cannot contain an ASBR. Compare with non-stub area. See also OSPF. (Cisco Systems Inc.)

Subnet Mask

Combined with the IP address, the IP Subnet Mask allows a device to know which other addresses are local to it, and which must be reached through a gateway or router.

Switch

A device that interconnects several LANs to form a single logical LAN that comprises of several LAN segments. Switches are similar to bridges, in that they connect LANs of a different type; however they connect more LANs than a bridge and are generally more sophisticated.

SX

See “SimpleX signaling” on page 18.

T

Telnet

A character-based UNIX application that enables users with a Telnet server account to log on to a UNIX computer and utilize its resources.

TFTP

See “TLS” on page 20.

TLS

Short for Transport Layer Security, TLS is a protocol that guarantees privacy and data integrity between client/server applications communicating over the Internet.

The TLS protocol is made up of two layers. The TLS Record Protocol ensures that a connection is private by using symmetric data encryption and ensures that the connection is reliable. The second TLS layer is the TLS Handshake Protocol, which allows authentication between the server and client and the negotiation of an encryption algorithm and cryptographic keys before data is transmitted or received. Based on Netscape’s SSL 3.0, TLS supercedes and is an extension of SSL. TLS and SSL are not interoperable.

Telnet

A TCP/IP application protocol that provides a virtual terminal service, allowing a user to log into another computer system and access a device as if the user were connected directly to the device.

Traffic prioritization

Giving time-critical data traffic a higher quality of service over other, non-critical data traffic.

Trivial File Transfer Protocol

TFTP is a simple form of the File Transfer Protocol (FTP). TFTP uses the User Datagram Protocol (UDP, a direct protocol used to communicate datagrams over a network with little error recovery) and provides no security features. It is often used by servers to boot diskless workstations, X-terminals, and routers.

Trunking

The process of combing a set of trunks that are traffic-engineered as a unit for the establishment of connections between switching systems in which all of the communications paths are interchangeable.

U

UTP

Unshielded twisted pair is the cable used by 10BASE-T and 100BASE-Tx Ethernet networks.

V

Virtual Local Area Network

Operating at the Data Link Layer (Layer 2 of the OSI model), the VLAN is a means of parsing a single network into logical user groups or organizations, as if they physically resided on a dedicated LAN segment of their own. In reality, this virtually defined community may have individual members peppered across a large, extended LAN. The VLAN identifier is part of the 802.1Q tag, which is added to an Ethernet frame by

an 802.1Q-compliant switch or router. Devices recognizing 802.1Q-tagged frames maintain appropriate tables to track VLANs. The first three bits of the 802.1Q tag are used by 802.1P to establish priority for the packet.

Virtual Router Redundancy Protocol

VRRP specifies an election protocol that dynamically assigns responsibility for a virtual router to one of the VRRP routers on a LAN. The VRRP router controlling the IP address(es) associated with a virtual router is called the Master, and forwards packets sent to these IP addresses. The election process provides dynamic fail-over in the forwarding responsibility should the Master become unavailable. This allows any of the virtual router IP addresses on the LAN to be used as the default first hop router by end-hosts. The advantage gained from using VRRP is a higher availability default path without requiring configuration of dynamic routing or router discovery protocols on every end-host.

VLAN

See “Virtual Local Area Network” on page 20.

VRRP

See “Virtual Router Redundancy Protocol” on page 21.

W

WAN

See “Wide Area Network” on page 21.

Web

Also known as World-Wide Web (WWW) or W3. An Internet client-server system to distribute information, based upon the hypertext transfer protocol (HTTP).

Wide Area Network

A WAN is a computer network that spans a relatively large geographical area. Typically, a WAN consists of two or more local-area networks (LANs).

Windows Internet Naming Service

WINS. Windows Internet Naming Service is a server process for resolving Windows-based computer names to IP addresses.

If a remote network contains a WINS server, your Windows PCs can gather information from that WINS server about its local hosts. This allows your PCs to browse that remote network using the Windows Network Neighborhood feature.

WINS

WINS. Windows Internet Naming Service is a server process for resolving Windows-based computer names to IP addresses.

X

XModem

One of the most popular file transfer protocols (FTPs). Xmodem is fairly effective at detecting errors. It sends blocks of data together with a checksum and then waits for acknowledgment of the block's receipt. The waiting slows down the rate of data transmission considerably, but it ensures accurate transmission. Xmodem can be implemented either in software or in hardware. Many modems, and almost all communications software packages, support Xmodem. However, it is useful only at relatively slow data transmission speeds (less than 4,800 bps). Enhanced versions of Xmodem that work at higher transmission speeds are known as Ymodem and Zmodem.

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