<CHAPTER> **1**

Configuring System Message Logging and Smart Logging

This chapter describes how to configure system message logging on the Catalyst 3750-X or 3560-X switch. The switch also supports Smart Logging to capture packet flows based on configured triggers.

Note For complete syntax and usage information for the commands used in this chapter, see the *Cisco IOS Configuration Fundamentals Command Reference, Release 12.4* and the command reference for this release.

Caution Logging messages to the console at a high rate can cause high CPU utilization and adversely affect how the switch operates.

Understanding System Message Logging

By default, a switch sends the output from system messages and **debug** privileged EXEC commands to a logging process. Stack members can trigger system messages. A stack member that generates a system message appends its hostname in the form of *hostname-n*, where *n* is a switch number from 1 to 9, and redirects the output to the logging process on the stack master. Though the stack master is a stack member, it does *not* append its hostname to system messages. The logging process controls the distribution of logging messages to various destinations, such as the logging buffer, terminal lines, or a UNIX syslog server, depending on your configuration. The process also sends messages to the console.

Note The syslog format is compatible with 4.3 BSD UNIX.

When the logging process is disabled, messages are sent only to the console. The messages are sent as they are generated, so message and debug output are interspersed with prompts or output from other commands. On Catalyst 3750-X switches, messages appear on the active consoles after the process that generated them has finished. On Catalyst 3560-X switches, messages appear on the console after the process that generated them has finished.

You can set the severity level of the messages to control the type of messages displayed on the consoles and each of the destinations. You can time-stamp log messages or set the syslog source address to enhance real-time debugging and management. For information on possible messages, see the system message guide for this release.

You can access logged system messages by using the switch command-line interface (CLI) or by saving them to a properly configured syslog server. The switch software saves syslog messages in an internal buffer on a standalone switch, and in the case of a switch stack, on the stack master. If a standalone switch or the stack master fails, the log is lost unless you had saved it to flash memory.

You can remotely monitor system messages by viewing the logs on a syslog server or by accessing the switch through Telnet, through the console port, or through the Ethernet management port. In a switch stack, all stack member consoles provide the same console output.

Configuring System Message Logging

System Log Message Format

System log messages can contain up to 80 characters and a percent sign (%), which follows the optional sequence number or time-stamp information, if configured. Messages appear in this format:

For Catalyst 3750-X switches, *seq no:timestamp: %facility-severity-MNEMONIC:description (hostname-n)*

For Catalyst 3560-X switches, *seq no:timestamp: %facility-severity-MNEMONIC:description*

The part of the message preceding the percent sign depends on the setting of the **service sequence-numbers**, **service timestamps log datetime**, **service timestamps log datetime** [**localtime**] [**msec**] [**show-timezone**], or **service timestamps log uptime** global configuration command.

Table 1-1   ***System Log Message Elements***

Element	Description
seq no:	Stamps log messages with a sequence number only if the **service sequence-numbers** global configuration command is configured. For more information, see the "Enabling and Disabling Sequence Numbers in Log Messages" section on page 1-8.
timestamp formats: *mm/dd hh:mm:ss* or *hh:mm:ss* (short uptime) or *d h* (long uptime)	Date and time of the message or event. This information appears only if the **service timestamps log** [**datetime** | **log**] global configuration command is configured. For more information, see the "Enabling and Disabling Time Stamps on Log Messages" section on page 1-8.
facility	The facility to which the message refers (for example, SNMP, SYS, and so forth). For a list of supported facilities, see Table 1-4 on page 1-14.
severity	Single-digit code from 0 to 7 that is the severity of the message. For a description of the severity levels, see Table 1-3 on page 1-10.
MNEMONIC	Text string that uniquely describes the message.
description	Text string containing detailed information about the event being reported.
hostname-n	Hostname of a stack member and its switch number in the stack. Though the stack master is a stack member, it does *not* append its hostname to system messages.

This example shows a partial switch system message for a stack master and a stack member (hostname *Switch-2*):

```
00:00:46: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up
00:00:47: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/1, changed state to up
00:00:47: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/2, changed state to up
00:00:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
00:00:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed
state to down 2
*Mar  1 18:46:11: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)
18:47:02: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)
*Mar  1 18:48:50.483 UTC: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)

00:00:46: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up (Switch-2)
00:00:47: %LINK-3-UPDOWN: Interface GigabitEthernet2/0/1, changed state to up (Switch-2)
00:00:47: %LINK-3-UPDOWN: Interface GigabitEthernet2/0/2, changed state to up (Switch-2)
00:00:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
(Switch-2)
00:00:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet2/0/1, changed
state to down 2 (Switch-2)
```

This example shows a partial switch system message on a Catalyst 3560-X switch:

```
00:00:46: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up
00:00:47: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to up
00:00:47: %LINK-3-UPDOWN: Interface GigabitEthernet0/2, changed state to up
00:00:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down
00:00:48: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed
state to down 2
*Mar  1 18:46:11: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)
18:47:02: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)
*Mar  1 18:48:50.483 UTC: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)
```

Default System Message Logging Configuration

Table 1-2   Default System Message Logging Configuration

Feature	Default Setting
System message logging to the console	Enabled.
Console severity	Debugging (and numerically lower levels; see Table 1-3 on page 1-10).
Logging file configuration	No filename specified.
Logging buffer size	4096 bytes.
Logging history size	1 message.
Time stamps	Disabled.
Synchronous logging	Disabled.
Logging server	Disabled.
Syslog server IP address	None configured.
Server facility	Local7 (see Table 1-4 on page 1-14).
Server severity	Informational (and numerically lower levels; see Table 1-3 on page 1-10).

Disabling Message Logging

Message logging is enabled by default. It must be enabled to send messages to any destination other than the console. When enabled, log messages are sent to a logging process, which logs messages to designated locations asynchronously to the processes that generated the messages.

Beginning in privileged EXEC mode, follow these steps to disable message logging. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**no logging console**	Disable message logging.
Step 3	**end**	Return to privileged EXEC mode.

	Command	Purpose
Step 4	**show running-config** or **show logging**	Verify your entries.
Step 5	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Disabling the logging process can slow down the switch because a process must wait until the messages are written to the console before continuing. When the logging process is disabled, messages appear on the console as soon as they are produced, often appearing in the middle of command output.

The **logging synchronous** global configuration command also affects the display of messages to the console. When this command is enabled, messages appear only after you press Return. For more information, see the "Synchronizing Log Messages" section on page 1-6.

To re-enable message logging after it has been disabled, use the **logging on** global configuration command.

Setting the Message Display Destination Device

If message logging is enabled, you can send messages to specific locations in addition to the console. Beginning in privileged EXEC mode, use one or more of the following commands to specify the locations that receive messages. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**logging buffered** [*size*]	Log messages to an internal buffer on the switch or on a standalone switch or, in the case of a switch stack, on the stack master. The range is 4096 to 2147483647 bytes. The default buffer size is 4096 bytes. If a standalone switch or the stack master fails, the log file is lost unless you previously saved it to flash memory. See Step 4. **Note** Do not make the buffer size too large because the switch could run out of memory for other tasks. Use the **show memory** privileged EXEC command to view the free processor memory on the switch. However, this value is the maximum available, and the buffer size should *not* be set to this amount.
Step 3	**logging** *host*	Log messages to a UNIX syslog server host. For *host*, specify the name or IP address of the host to be used as the syslog server. To build a list of syslog servers that receive logging messages, enter this command more than once. For complete syslog server configuration steps, see the "Configuring UNIX Syslog Servers" section on page 1-12.

	Command	Purpose
Step 4	**logging file flash:***filename* [*max-file-size* [*min-file-size*]] [*severity-level-number	type*]	Store log messages in a file in flash memory on a standalone switch or, in the case of a switch stack, on the stack master. • For *filename*, enter the log message filename. • (Optional) For *max-file-size, s*pecify the maximum logging file size. The range is 4096 to 2147483647. The default is 4096 bytes. • (Optional) For *min-file-size, s*pecify the minimum logging file size. The range is 1024 to 2147483647. The default is 2048 bytes. • (Optional) For *severity-level-number	type,* specify either the logging severity level or the logging type. The severity range is 0 to 7. For a list of logging type keywords, see Table 1-3 on page 1-10. By default, the log file receives debugging messages and numerically lower levels.
Step 5	**end**	Return to privileged EXEC mode.
Step 6	**terminal monitor**	Log messages to a nonconsole terminal during the current session. Terminal parameter-setting commands are set locally and do not remain in effect after the session has ended. You must perform this step for each session to see the debugging messages.
Step 7	**show running-config**	Verify your entries.
Step 8	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

The **logging buffered** global configuration command copies logging messages to an internal buffer. The buffer is circular, so newer messages overwrite older messages after the buffer is full. To display the messages that are logged in the buffer, use the **show logging** privileged EXEC command. The first message displayed is the oldest message in the buffer. To clear the contents of the buffer, use the **clear logging** privileged EXEC command.

Use the **logging event power-inline-status** interface configuration command to enable and to disable logging of Power over Ethernet (PoE) events on specific PoE-capable ports. Logging on these ports is enabled by default.

To disable logging to the console, use the **no logging console** global configuration command. To disable logging to a file, use the **no logging file** [*severity-level-number | type*] global configuration command.

Synchronizing Log Messages

You can synchronize unsolicited messages and **debug** privileged EXEC command output with solicited device output and prompts for a specific console port line or virtual terminal line. You can identify the types of messages to be output asynchronously based on the level of severity. You can also configure the maximum number of buffers for storing asynchronous messages for the terminal after which messages are dropped.

When synchronous logging of unsolicited messages and **debug** command output is enabled, unsolicited device output appears on the console or printed after solicited device output appears or is printed. Unsolicited messages and **debug** command output appears on the console after the prompt for user input is returned. Therefore, unsolicited messages and **debug** command output are not interspersed with solicited device output and prompts. After the unsolicited messages appear, the console again displays the user prompt.

Beginning in privileged EXEC mode, follow these steps to configure synchronous logging. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**line** [**console**	**vty**] *line-number* [*ending-line-number*]	Specify the line to be configured for synchronous logging of messages.
		• Use the **console** keyword for configurations that occur through the switch console port or the Ethernet management port.
		• Use the **line vty** *line-number* command to specify which vty lines are to have synchronous logging enabled. You use a vty connection for configurations that occur through a Telnet session. The range of line numbers is from 0 to 15.
		You can change the setting of all 16 vty lines at once by entering:
		line vty 0 15
		Or you can change the setting of the single vty line being used for your current connection. For example, to change the setting for vty line 2, enter:
		line vty 2
		When you enter this command, the mode changes to line configuration.
Step 3	**logging synchronous** [**level** [*severity-level*	**all**]	**limit** *number-of-buffers*]	Enable synchronous logging of messages.
		• (Optional) For **level** *severity-level*, specify the message severity level. Messages with a severity level equal to or higher than this value are printed asynchronously. Low numbers mean greater severity and high numbers mean lesser severity. The default is 2.
		• (Optional) Specifying **level all** means that all messages are printed asynchronously regardless of the severity level.
		• (Optional) For **limit** *number-of-buffers*, specify the number of buffers to be queued for the terminal after which new messages are dropped. The range is 0 to 2147483647. The default is 20.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show running-config**	Verify your entries.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable synchronization of unsolicited messages and debug output, use the **no logging synchronous** [**level** *severity-level* | **all**] [**limit** *number-of-buffers*] line configuration command.

Enabling and Disabling Time Stamps on Log Messages

By default, log messages are not time-stamped.

Beginning in privileged EXEC mode, follow these steps to enable time-stamping of log messages. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**service timestamps log uptime** or **service timestamps log datetime** [**msec**] [**localtime**] [**show-timezone**]	Enable log time stamps. The first command enables time stamps on log messages, showing the time since the system was rebooted. The second command enables time stamps on log messages. Depending on the options selected, the time stamp can include the date, time in milliseconds relative to the local time-zone, and the time zone name.
Step 3	**end**	Return to privileged EXEC mode.
Step 4	**show running-config**	Verify your entries.
Step 5	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable time stamps for both debug and log messages, use the **no service timestamps** global configuration command.

This example shows part of a logging display with the **service timestamps log datetime** global configuration command enabled:

```
*Mar  1 18:46:11: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36)
(Switch-2)
```

This example shows part of a logging display with the s**ervice timestamps log uptime** global configuration command enabled:

```
00:00:46: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up (Switch-2)
```

Enabling and Disabling Sequence Numbers in Log Messages

Because there is a chance that more than one log message can have the same time stamp, you can display messages with sequence numbers so that you can unambiguously see a single message. By default, sequence numbers in log messages are not displayed.

Beginning in privileged EXEC mode, follow these steps to enable sequence numbers in log messages. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**service sequence-numbers**	Enable sequence numbers.
Step 3	**end**	Return to privileged EXEC mode.

	Command	Purpose
Step 4	**show running-config**	Verify your entries.
Step 5	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable sequence numbers, use the **no service sequence-numbers** global configuration command.

This example shows part of a logging display with sequence numbers enabled:

```
000019: %SYS-5-CONFIG_I: Configured from console by vty2 (10.34.195.36) (Switch-2)
```

Defining the Message Severity Level

You can limit messages displayed to the selected device by specifying the severity level of the message, which are described in Table 1-3.

Beginning in privileged EXEC mode, follow these steps to define the message severity level. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**logging console** *level*	Limit messages logged to the console.
		By default, the console receives debugging messages and numerically lower levels (see Table 1-3 on page 1-10).
Step 3	**logging monitor** *level*	Limit messages logged to the terminal lines.
		By default, the terminal receives debugging messages and numerically lower levels (see Table 1-3 on page 1-10).
Step 4	**logging trap** *level*	Limit messages logged to the syslog servers.
		By default, syslog servers receive informational messages and numerically lower levels (see Table 1-3 on page 1-10).
		For complete syslog server configuration steps, see the "Configuring UNIX Syslog Servers" section on page 1-12.
Step 5	**end**	Return to privileged EXEC mode.
Step 6	**show running-config**	Verify your entries.
	or	
	show logging	
Step 7	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Note   Specifying a *level* causes messages at that level and numerically lower levels to appear at the destination.

To disable logging to the console, use the **no logging console** global configuration command. To disable logging to a terminal other than the console, use the **no logging monitor** global configuration command. To disable logging to syslog servers, use the **no logging trap** global configuration command.

Table 1-3 describes the *level* keywords. It also lists the corresponding UNIX syslog definitions from the most severe level to the least severe level.

Table 1-3   Message Logging Level Keywords

Level Keyword	Level	Description	Syslog Definition
emergencies	0	System unstable	LOG_EMERG
alerts	1	Immediate action needed	LOG_ALERT
critical	2	Critical conditions	LOG_CRIT
errors	3	Error conditions	LOG_ERR
warnings	4	Warning conditions	LOG_WARNING
notifications	5	Normal but significant condition	LOG_NOTICE
informational	6	Informational messages only	LOG_INFO
debugging	7	Debugging messages	LOG_DEBUG

The software generates four other categories of messages:

- Error messages about software or hardware malfunctions, displayed at levels **warnings** through **emergencies**. These types of messages mean that the functionality of the switch is affected. For information on how to recover from these malfunctions, see the system message guide for this release.

- Output from the **debug** commands, displayed at the **debugging** level. Debug commands are typically used only by the Technical Assistance Center.

- Interface up or down transitions and system restart messages, displayed at the **notifications** level. This message is only for information; switch functionality is not affected.

- Reload requests and low-process stack messages, displayed at the **informational** level. This message is only for information; switch functionality is not affected.

Limiting Syslog Messages Sent to the History Table and to SNMP

If you enabled syslog message traps to be sent to an SNMP network management station by using the **snmp-server enable trap** global configuration command, you can change the level of messages sent and stored in the switch history table. You also can change the number of messages that are stored in the history table.

Messages are stored in the history table because SNMP traps are not guaranteed to reach their destination. By default, one message of the level **warning** and numerically lower levels (see Table 1-3 on page 1-10) are stored in the history table even if syslog traps are not enabled.

Beginning in privileged EXEC mode, follow these steps to change the level and history table size defaults. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**logging history** *level*[1]	Change the default level of syslog messages stored in the history file and sent to the SNMP server.
		See Table 1-3 on page 1-10 for a list of *level* keywords.
		By default, **warnings**, **errors**, **critical**, **alerts**, and **emergencies** messages are sent.
Step 3	**logging history size** *number*	Specify the number of syslog messages that can be stored in the history table.
		The default is to store one message. The range is 0 to 500 messages.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show running-config**	Verify your entries.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

1. Table 1-3 lists the level keywords and severity level. For SNMP usage, the severity level values increase by 1. For example, *emergencies* equal 1, not 0, and *critical* equals 3, not 2.

When the history table is full (it contains the maximum number of message entries specified with the **logging history size** global configuration command), the oldest message entry is deleted from the table to allow the new message entry to be stored.

To return the logging of syslog messages to the default level, use the **no logging history** global configuration command. To return the number of messages in the history table to the default value, use the **no logging history size** global configuration command.

Enabling the Configuration-Change Logger

You can enable a configuration logger to keep track of configuration changes made with the command-line interface (CLI). When you enter the **logging enable** configuration-change logger configuration command, the log records the session, the user, and the command that was entered to change the configuration. You can configure the size of the configuration log from 1 to 1000 entries (the default is 100). You can clear the log at any time by entering the **no logging enable** command followed by the **logging enable** command to disable and re-enable logging.

Use the **show archive log config** {**all** | *number* [*end-number*] | **user** *username* [**session** *number*] *number* [*end-number*] | **statistics**} [**provisioning**] privileged EXEC command to display the complete configuration log or the log for specified parameters.

The default is that configuration logging is disabled.

For information about the commands, see the *Cisco IOS Configuration Fundamentals and Network Management Command Reference, Release 12.3 T.*

Beginning in privileged EXEC mode, follow these steps to enable configuration logging:

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	archive	Enter archive configuration mode.
Step 3	log config	Enter configuration-change logger configuration mode.
Step 4	logging enable	Enable configuration change logging.
Step 5	logging size *entries*	(Optional) Configure the number of entries retained in the configuration log. The range is from 1 to 1000. The default is 100. **Note** When the configuration log is full, the oldest log entry is removed each time a new entry is entered.
Step 6	end	Return to privileged EXEC mode.
Step 7	show archive log config	Verify your entries by viewing the configuration log.

This example shows how to enable the configuration-change logger and to set the number of entries in the log to 500.

```
Switch(config)# archive
Switch(config-archive)# log config
Switch(config-archive-log-cfg)# logging enable
Switch(config-archive-log-cfg)# logging size 500
Switch(config-archive-log-cfg)# end
```

This is an example of output for the configuration log:

```
Switch# show archive log config all
 idx   sess          user@line      Logged command
   38    11   unknown user@vty3   |no aaa authorization config-commands
   39    12   unknown user@vty3   |no aaa authorization network default group radius
   40    12   unknown user@vty3   |no aaa accounting dot1x default start-stop group
radius
   41    13   unknown user@vty3   |no aaa accounting system default
   42    14           temi@vty4   |interface GigabitEthernet4/0/1
   43    14           temi@vty4   | switchport mode trunk
   44    14           temi@vty4   | exit
   45    16           temi@vty5   |interface GigabitEthernet5/0/1
   46    16           temi@vty5   | switchport mode trunk
   47    16           temi@vty5   | exit
```

Configuring UNIX Syslog Servers

The next sections describe how to configure the UNIX server syslog daemon and how to define the UNIX system logging facility.

Logging Messages to a UNIX Syslog Daemon

Before you can send system log messages to a UNIX syslog server, you must configure the syslog daemon on a UNIX server. This procedure is optional.

Log in as root, and perform these steps:

> **Note**   Some recent versions of UNIX syslog daemons no longer accept by default syslog packets from the network. If this is the case with your system, use the UNIX **man syslogd** command to decide what options must be added to or removed from the syslog command line to enable logging of remote syslog messages.

Step 1   Add a line such as the following to the file /etc/syslog.conf:

```
local7.debug /usr/adm/logs/cisco.log
```

The **local7** keyword specifies the logging facility to be used; see Table 1-4 on page 1-14 for information on the facilities. The **debug** keyword specifies the syslog level; see Table 1-3 on page 1-10 for information on the severity levels. The syslog daemon sends messages at this level or at a more severe level to the file specified in the next field. The file must already exist, and the syslog daemon must have permission to write to it.

Step 2   Create the log file by entering these commands at the UNIX shell prompt:

```
$ touch /var/log/cisco.log
$ chmod 666 /var/log/cisco.log
```

Step 3   Make sure the syslog daemon reads the new changes:

```
$ kill -HUP `cat /etc/syslog.pid`
```

For more information, see the **man syslog.conf** and **man syslogd** commands on your UNIX system.

Configuring the UNIX System Logging Facility

When sending system log messages to an external device, you can cause the switch to identify its messages as originating from any of the UNIX syslog facilities.

Beginning in privileged EXEC mode, follow these steps to configure UNIX system facility message logging. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**logging** *host*	Log messages to a UNIX syslog server host by entering its IP address.
		To build a list of syslog servers that receive logging messages, enter this command more than once.
Step 3	**logging trap** *level*	Limit messages logged to the syslog servers.
		Be default, syslog servers receive informational messages and lower. See Table 1-3 on page 1-10 for *level* keywords.
Step 4	**logging facility** *facility-type*	Configure the syslog facility. See Table 1-4 on page 1-14 for *facility-type* keywords.
		The default is **local7**.
Step 5	**end**	Return to privileged EXEC mode.

	Command	Purpose
Step 6	show running-config	Verify your entries.
Step 7	copy running-config startup-config	(Optional) Save your entries in the configuration file.

To remove a syslog server, use the **no logging** *host* global configuration command, and specify the syslog server IP address. To disable logging to syslog servers, enter the **no logging trap** global configuration command.

Table 1-4 lists the UNIX system facilities supported by the software. For more information about these facilities, consult the operator's manual for your UNIX operating system.

Table 1-4   Logging Facility-Type Keywords

Facility Type Keyword	Description
auth	Authorization system
cron	Cron facility
daemon	System daemon
kern	Kernel
local0-7	Locally defined messages
lpr	Line printer system
mail	Mail system
news	USENET news
sys9-14	System use
syslog	System log
user	User process
uucp	UNIX-to-UNIX copy system

Configuring Smart Logging

Smart logging provides a mechanism to capture and export packet flows based on predefined or user-configured triggers. Beginning with Cisco IOS Release 12.2(58)SE, the switch supports smart logging for these events:

- DHCP snooping violations
- Dynamic ARP inspection violations
- IP source guard denied traffic
- ACL permitted or denied traffic

To use smart logging, you must first configure a NetFlow exporter that you identify when you enable smart logging. For information on configuring Cisco Flexible NetFlow, see the *Cisco IOS Flexible NetFlow Configuration Guide, Release 12.4T*:
http://www.cisco.com.do/en/US/docs/ios/fnetflow/configuration/guide/12_4t/fnf_12_4t_book.html

Smart logging processing creates a NetFlow packet for the configured event and sends the packet to the external NetFlow collector. Smart logging counters reflect the number of packets that are logged. This number is the same as the number of packets sent to the collector if no packets are dropped between the switch and the NetFlow collector.

You enable smart logging globally on the switch, and you can then configure specific events to be smart logged.

Enabling Smart Logging

Beginning in privileged EXEC mode, follow these steps to globally enable smart logging:

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	logging smartlog	Turn on the smart logging feature.
Step 3	logging smartlog exporter *exporter_name*	Identify the smart log exporter. You must have already configured the exporter by using the flexible NetFlow CLI. If the exporter name does not exist, you receive an error message. By default, the switch sends data to the collector every 60 seconds.
Step 4	logging packet capture size *packet_size*	(Optional) Configure the size of the packet to be sent to the exporter. The range is from 64 to 1024 bytes in 4-byte increments. The default size is 64 bytes. **Note** Increasing the packet capture size reduces the number of flow records per packet.
Step 5	end	Return to privileged EXEC mode.
Step 6	show logging smartlog	Verify your entries.
Step 7	copy running-config startup-config	(Optional) Save your entries in the configuration file.

Enabling Smart Logging for DHCP Snooping Violations

DHCP snooping intercepts and inspects DHCP packets entering untrusted ports and either forwards or drops the packets. You can enable DHCP snooping smart logging to send the contents of dropped packets to the NetFlow collector. Beginning in privileged EXEC mode, follow these steps to enable DHCP snooping smart logging:

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	ip dhcp snooping vlan *vlan-range* smartlog	Specify a VLAN ID or a range of VLANs on which to enable DHCP snooping smart logging.
Step 3	end	Return to privileged EXEC mode.
Step 4	show ip dhcp snooping	Verify the configuration.
Step 5	copy running-config startup-config	(Optional) Save your entries in the configuration file.

Enabling Smart Logging for Dynamic ARP Inspection Violations

Dynamic ARP inspection intercepts ARP packets on untrusted ports and validates them before forwarding. The functionality is similar to DHCP snooping but for ARP packets. You can configure dynamic ARP inspection logging by using the **ip arp inspection log-buffer** global configuration command. By default, all dropped packets are logged. You can also configure the switch to apply smart logging to the same packets that are being logged, sending the packet contents packet to the NetFlow collector.

Beginning in privileged EXEC mode, follow these steps to enable dynamic ARP inspection smart logging:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**ip arp inspection smartlog**	Specify that whatever packets are currently being logged (the default is all dropped packets) are also smart-logged.
Step 3	**end**	Return to privileged EXEC mode.
Step 4	**show ip arp inspection**	Verify the configuration.
Step 5	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Enabling Smart Logging for IP Source Guard Violations

IP source guard is a security feature related to DHCP snooping. You can use IP source guard to filter traffic based on the IP source address or the MAC address. All IP packets with a source address other than the specified address or addresses learned through DHCP snooping are denied. You can enable IP source guard smart logging to send the contents of the denied packets to the NetFlow collector.

Beginning in privileged EXEC mode, follow these steps to enable IP source guard smart logging:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify an interface and enter interface configuration mode.
Step 3	**ip verify source smartlog**	Enable IP source guard smart logging for all packets that are denied by IP source guard.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show ip verify source**	Verify your entries. The output shows whether or not smart logging is enabled on the interface.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Enabling Smart Logging for Port ACL Deny or Permit Actions

The switch supports port ACLs, router ACLs, and VLAN ACLs.

- Port ACLs are IP or MAC ACLs applied to a Layer 2 port. Logging is not supported on port ACLs, but smart logging is supported on IP ACLs applied to Layer 2 ports.

- Router ACLs are ACLs applied to Layer 3 ports. Router ACLs support logging but not smart logging.

- VLAN ACLs or VLAN maps are ACLs applied to VLANs. You can configure logging on VLAN maps, but not smart logging.

When you configure any permit or deny ACL, you can configure logging or smart logging as part of the access list, to take place on all traffic that the ACL permits or denies. The type of port that you attach the ACL to determines the type of logging. If you attach an ACL with smart log configured to a router or a VLAN, the ACL is attached, but smart logging does not take affect. If you configure logging on an ACL attached to a Layer 2 port, the logging keyword is ignored.

You add the smart log configuration option when you create the permit and deny conditions for an ACL. This example enables smart logging on a numbered access list:

```
Switch(config)# access-list 199 permit ip any any smartlog
```

This example enables smart logging on a named access list:

```
Switch(config)# ip access-list extended test1
Switch(config-ext-nacl)# deny ip host 10.1.1.3 any smartlog
```

Displaying the Logging Configuration

To display the logging configuration and the contents of the log buffer, use the **show logging** privileged EXEC command. For information about the fields in this display, see the *Cisco IOS Configuration Fundamentals Command Reference, Release 12.4* on Cisco.com.

To display smart logging information, use the **show logging smartlog** command. For information about this command, see the command reference for this release.