



## Configuring System Message Logging

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This chapter describes how to configure system message logging on your bridge.



**Note**

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For complete syntax and usage information for the commands used in this chapter, refer to the *Cisco IOS Configuration Fundamentals Command Reference for Release 12.2*.

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This chapter consists of these sections:

- [Understanding System Message Logging, page 18-2](#)
- [Configuring System Message Logging, page 18-2](#)
- [Displaying the Logging Configuration, page 18-12](#)

# Understanding System Message Logging

By default, bridges send the output from system messages and **debug** privileged EXEC commands to a logging process. 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. Messages are displayed 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 console and each of the destinations. You can timestamp log messages or set the syslog source address to enhance real-time debugging and management.

You can access logged system messages by using the bridge command-line interface (CLI) or by saving them to a properly configured syslog server. The bridge software saves syslog messages in an internal buffer. You can remotely monitor system messages by accessing the bridge through Telnet or by viewing the logs on a syslog server.

## Configuring System Message Logging

This section describes how to configure system message logging. It contains this configuration information:

- [System Log Message Format, page 18-2](#)
- [Default System Message Logging Configuration, page 18-3](#)
- [Disabling and Enabling Message Logging, page 18-4](#)
- [Setting the Message Display Destination Device, page 18-5](#)
- [Enabling and Disabling Timestamps on Log Messages, page 18-6](#)
- [Enabling and Disabling Sequence Numbers in Log Messages, page 18-6](#)
- [Defining the Message Severity Level, page 18-7](#)
- [Limiting Syslog Messages Sent to the History Table and to SNMP, page 18-8](#)
- [Setting a Logging Rate Limit, page 18-9](#)
- [Configuring UNIX Syslog Servers, page 18-10](#)

## System Log Message Format

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

*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 18-1 describes the elements of syslog messages.

**Table 18-1 System Log Message Elements**

Element	Description
<i>seq no:</i>	Stamps log messages with a sequence number only if the <b>service sequence-numbers</b> global configuration command is configured.  For more information, see the “ <a href="#">Enabling and Disabling Sequence Numbers in Log Messages</a> ” section on page 18-6.
<i>timestamp</i> formats: <i>mm/dd hh:mm:ss</i> or <i>hh:mm:ss</i> (short uptime) or <i>d h</i> (long uptime)	Date and time of the message or event. This information appears only if the <b>service timestamps log [datetime   log]</b> global configuration command is configured.  For more information, see the “ <a href="#">Enabling and Disabling Timestamps on Log Messages</a> ” section on page 18-6.
<i>facility</i>	The facility to which the message refers (for example, SNMP, SYS, and so forth). A facility can be a hardware device, a protocol, or a module of the system software. It denotes the source or the cause of the system message.
<i>severity</i>	Single-digit code from 0 to 7 that is the severity of the message. For a description of the severity levels, see <a href="#">Table 18-3 on page 18-8</a> .
<i>MNEMONIC</i>	Text string that uniquely describes the message.
<i>description</i>	Text string containing detailed information about the event being reported.

This example shows a partial bridge system message:

```
00:00:46: %LINK-3-UPDOWN: Interface Port-channell1, 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 18-2 shows the default system message logging configuration.

**Table 18-2 Default System Message Logging Configuration**

Feature	Default Setting
System message logging to the console	Enabled
Console severity	Debugging (and numerically lower levels; see <a href="#">Table 18-3 on page 18-8</a> )
Logging buffer size	4096 bytes
Logging history size	1 message

**Table 18-2 Default System Message Logging Configuration (continued)**

Feature	Default Setting
Timestamps	Disabled
Synchronous logging	Disabled
Logging server	Disabled
Syslog server IP address	None configured
Server facility	Local7 (see <a href="#">Table 18-4 on page 18-11</a> )
Server severity	Informational (and numerically lower levels; see <a href="#">Table 18-3 on page 18-8</a> )

## Disabling and Enabling 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:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>no logging on</b>	Disable message logging.
Step 3	<b>end</b>	Return to privileged EXEC mode.
Step 4	<b>show running-config</b> or <b>show logging</b>	Verify your entries.
Step 5	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.

Disabling the logging process can slow down the bridge because a process must wait until the messages are written to the console before continuing. When the logging process is disabled, messages are displayed 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 “[Enabling and Disabling Timestamps on Log Messages](#)” section on page 18-6.

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:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>logging buffered</b> [ <i>size</i> ] [ <i>level</i> ]	Log messages to an internal buffer. The default buffer size is 4096. The range is 4096 to 2147483647 bytes. Levels include emergencies 0, alerts 1, critical 2, errors 3, warnings 4, notifications 5, informational 6, and debugging 7.  <b>Note</b> Do not make the buffer size too large because the bridge could run out of memory for other tasks. Use the <b>show memory</b> privileged EXEC command to view the free processor memory on the bridge; however, this value is the maximum available, and you should <i>not</i> set the buffer size to this amount.
Step 3	<b>logging host</b>	Log messages to a UNIX syslog server host.  For <i>host</i> , 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 “ <a href="#">Configuring UNIX Syslog Servers</a> ” section on page 18-10.
Step 4	<b>end</b>	Return to privileged EXEC mode.
Step 5	<b>terminal monitor</b>	Log messages to a non-console 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 6	<b>show running-config</b>	Verify your entries.
Step 7	<b>copy running-config startup-config</b>	(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.

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.

## Enabling and Disabling Timestamps on Log Messages

By default, log messages are not timestamped.

Beginning in privileged EXEC mode, follow these steps to enable timestamping of log messages:

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

To disable timestamps 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)
```

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

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

## Enabling and Disabling Sequence Numbers in Log Messages

Because there is a chance that more than one log message can have the same timestamp, you can display messages with sequence numbers so that you can unambiguously refer to 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:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>service sequence-numbers</b>	Enable sequence numbers.
Step 3	<b>end</b>	Return to privileged EXEC mode.
Step 4	<b>show running-config</b>	Verify your entries.
Step 5	<b>copy running-config startup-config</b>	(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)
```

## 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 18-3](#).

Beginning in privileged EXEC mode, follow these steps to define the message severity level:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>logging console <i>level</i></b>	Limit messages logged to the console. By default, the console receives debugging messages and numerically lower levels (see <a href="#">Table 18-3 on page 18-8</a> ).
Step 3	<b>logging monitor <i>level</i></b>	Limit messages logged to the terminal lines. By default, the terminal receives debugging messages and numerically lower levels (see <a href="#">Table 18-3 on page 18-8</a> ).
Step 4	<b>logging trap <i>level</i></b>	Limit messages logged to the syslog servers. By default, syslog servers receive informational messages and numerically lower levels (see <a href="#">Table 18-3 on page 18-8</a> ). For complete syslog server configuration steps, see the “ <a href="#">Configuring UNIX Syslog Servers</a> ” section on page 18-10.
Step 5	<b>end</b>	Return to privileged EXEC mode.
Step 6	<b>show running-config</b> or <b>show logging</b>	Verify your entries.
Step 7	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.



### Note

Specifying a *level* causes messages at that level and numerically lower levels to be displayed 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 18-3 describes the *level* keywords. It also lists the corresponding UNIX syslog definitions from the most severe level to the least severe level.

**Table 18-3 Message Logging Level Keywords**

Level Keyword	Level	Description	Syslog Definition
<b>emergencies</b>	0	System unstable	LOG_EMERG
<b>alerts</b>	1	Immediate action needed	LOG_ALERT
<b>critical</b>	2	Critical conditions	LOG_CRIT
<b>errors</b>	3	Error conditions	LOG_ERR
<b>warnings</b>	4	Warning conditions	LOG_WARNING
<b>notifications</b>	5	Normal but significant condition	LOG_NOTICE
<b>informational</b>	6	Informational messages only	LOG_INFO
<b>debugging</b>	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 bridge is affected.
- Output from the **debug** commands, displayed at the **debugging** level. Debug commands are typically used only by the Technical Assistance Center (TAC).
- Interface up or down transitions and system restart messages, displayed at the **notifications** level. This message is only for information; bridge functionality is not affected.
- Reload requests and low-process stack messages, displayed at the **informational** level. This message is only for information; bridge functionality is not affected.

## Limiting Syslog Messages Sent to the History Table and to SNMP

If you have 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 bridge history table. You can also 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 18-3 on page 18-8) 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:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>logging history <i>level</i></b> <sup>1</sup>	Change the default level of syslog messages stored in the history file and sent to the SNMP server.  See <a href="#">Table 18-3 on page 18-8</a> for a list of <i>level</i> keywords.  By default, <b>warnings</b> , <b>errors</b> , <b>critical</b> , <b>alerts</b> , and <b>emergencies</b> messages are sent.
Step 3	<b>logging history size <i>number</i></b>	Specify the number of syslog messages that can be stored in the history table.  The default is to store one message. The range is 1 to 500 messages.
Step 4	<b>end</b>	Return to privileged EXEC mode.
Step 5	<b>show running-config</b>	Verify your entries.
Step 6	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.

1. [Table 18-3](#) 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.

## Setting a Logging Rate Limit

You can enable a limit on the number of messages that the bridge logs per second. You can enable the limit for all messages or for messages sent to the console, and you can specify that messages of a specific severity are exempt from the limit.

Beginning in privileged EXEC mode, follow these steps to enable a logging rate limit:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>logging rate-limit <i>seconds</i></b> <b>[all   console]</b> <b>[except <i>severity</i>]</b>	Enable a logging rate limit in seconds.  <ul style="list-style-type: none"> <li>• (Optional) Apply the limit to all logging or only to messages logged to the console.</li> <li>• (Optional) Exempt a specific severity from the limit.</li> </ul>
Step 3	<b>end</b>	Return to privileged EXEC mode.
Step 4	<b>copy running-config startup-config</b>	(Optional) Save your entries in the configuration file.

To disable the rate limit, use the **no logging rate-limit** global configuration command.

## Configuring UNIX Syslog Servers

The next sections describe how to configure the 4.3 BSD UNIX server syslog daemon and 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. 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 determine 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 18-4 on page 18-11](#) for information on the facilities. The **debug** keyword specifies the syslog level; see [Table 18-3 on page 18-8](#) 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 /usr/adm/log/cisco.log
$ chmod 666 /usr/adm/log/cisco.log
```

**Step 3** Make sure the syslog daemon reads the new changes by entering this command:

```
$ 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 bridge 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:

	Command	Purpose
Step 1	<b>configure terminal</b>	Enter global configuration mode.
Step 2	<b>logging host</b>	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.

	Command	Purpose
Step 3	<b>logging trap</b> <i>level</i>	Limit messages logged to the syslog servers. By default, syslog servers receive informational messages and lower. See <a href="#">Table 18-3 on page 18-8</a> for <i>level</i> keywords.
Step 4	<b>logging facility</b> <i>facility-type</i>	Configure the syslog facility. See <a href="#">Table 18-4 on page 18-11</a> for <i>facility-type</i> keywords. The default is <b>local7</b> .
Step 5	<b>end</b>	Return to privileged EXEC mode.
Step 6	<b>show running-config</b>	Verify your entries.
Step 7	<b>copy running-config startup-config</b>	(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 18-4](#) lists the 4.3 BSD UNIX system facilities supported by the Cisco IOS software. For more information about these facilities, consult the operator's manual for your UNIX operating system.

**Table 18-4 Logging Facility-Type Keywords**

Facility Type Keyword	Description
<b>auth</b>	Authorization system
<b>cron</b>	Cron facility
<b>daemon</b>	System daemon
<b>kern</b>	Kernel
<b>local0-7</b>	Locally defined messages
<b>lpr</b>	Line printer system
<b>mail</b>	Mail system
<b>news</b>	USENET news
<b>sys9</b>	System use
<b>sys10</b>	System use
<b>sys11</b>	System use
<b>sys12</b>	System use
<b>sys13</b>	System use
<b>sys14</b>	System use
<b>syslog</b>	System log
<b>user</b>	User process
<b>uucp</b>	UNIX-to-UNIX copy system

## Displaying the Logging Configuration

To display the current logging configuration and the contents of the log buffer, use the **show logging** privileged EXEC command. For information about the fields in this display, refer to the *Cisco IOS Configuration Fundamentals Command Reference for Release 12.2*.

To display the logging history file, use the **show logging history** privileged EXEC command.