Implementing System Logging

This module describes the tasks you need to implement logging services on the router.

The Cisco IOS XR Software provides basic logging services. Logging services provide a means to gather logging information for monitoring and troubleshooting, to select the type of logging information captured, and to specify the destinations of captured system logging (syslog) messages.

Feature History for Implementing System Logging

Release	Modification
Release 7.0.11	This feature was introduced.

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Implementing System Logging

System Logging (Syslog) is the standard application used for sending system log messages. Log messages indicates the health of the device and point to any encountered problems or simplify notification messages according to the severity level. The IOS XR router sends its syslog messages to a syslog process. By default, syslog messages will be sent to the console terminal. But, syslog messages can be send to destinations other than the console such as the logging buffer, syslog servers, and terminal lines.

Syslog Message Format

By default, the general format of syslog messages generated by the syslog process on the Cisco IOS XR software is as follows:

```
node-id : timestamp : process-name [pid] : % message category -group -severity -message
-code : message-text
```

The following table describes the general format of syslog messages on Cisco IOS XR software.

Table 1: Format of Syslog Messages

Field	Description
node-id	Node from which the syslog message originated.

Field	Description
timestamp	Time stamp in the month day HH:MM:SS format, indicating when the message was generated. **Note** The time-stamp format can be modified using the **service timestamps** command.
process-name	Process that generated the syslog message.
[pid]	Process ID (pid) of the process that generated the syslog message.
%*message -group -severity -message-code*	Message category, group name, severity, and message code associated with the syslog message.
message-text	Text string describing the syslog message.

Syslog Message Severity Levels

In the case of logging destinations such as console terminal, syslog servers and terminal lines, you can limit the number of messages sent to a logging destination by specifying the severity level of syslog messages. However, for the logging buffer destination, syslog messages of all severity will be sent to it irrespective of the specified severity level. In this case, the severity level only limits the syslog messages displayed in the output of the command **show logging**, at or below specified value. The following table lists the severity level keywords that can be supplied for the severity argument and the corresponding UNIX syslog definitions in order from the most severe level to the least severe level.

Note Utility word count lines are used to calculate the number of logs present in the IOS XR syslog buffer. When there is an increase in the inflow of logs from the routers, if you are executing the **show logging** command, the number of lines calculated by using the word count utility may exceed the value set for login buffer size. You can set the login buffer size by using the **logging buffer entries-count** command.

Table 2: Syslog Message Severity Levels

Severity Keyword	Level	Description
emergencies	0	System unusable
alert	1	Immediate action needed
critical	2	Critical conditions
errors	3	Error conditions
warnings	4	Warning conditions
notifications	5	Normal but significant condition
informational	6	Informational messages only

Severity Keyword	Level	Description
debugging	7	Debugging messages

Prerequisites for Configuring System Logging

These prerequisites are required to configure the logging of system messages in your network operating center (NOC):

- You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.
- You must have connectivity with syslog servers to configure syslog server hosts as the recipients for syslog messages.

Syslog Messages Sent to Syslog Servers

The Cisco IOS XR Software provides these features to help manage syslog messages sent to syslog servers:

UNIX System Logging Facilities

You can configure the syslog facility in which syslog messages are sent by using the **logging facility** command. Consult the operator manual for your UNIX operating system for more information about these UNIX system facilities. The syslog format is compatible with Berkeley Standard Distribution (BSD) UNIX version 4.3.

This table describes the facility type keywords that can be supplied for the *type* argument.

Table 3: Logging Facility Type Keywords

Facility Type Keyword	Description
auth	Indicates the authorization system.
cron	Indicates the cron facility.
daemon	Indicates the system daemon.
kern	Indicates the Kernel.
local0–7	Reserved for locally defined messages.
lpr	Indicates line printer system.
mail	Indicates mail system.
news	Indicates USENET news.
sys9	Indicates system use.
sys10	Indicates system use.
sys11	Indicates system use.

Facility Type Keyword	Description
sys12	Indicates system use.
sys13	Indicates system use.
sys14	Indicates system use.
syslog	Indicates the system log.
user	Indicates user process.
uucp	Indicates UNIX-to-UNIX copy system.

Hostname Prefix Logging

To help manage system logging messages sent to syslog servers, Cisco IOS XR Software supports hostname prefix logging. When enabled, hostname prefix logging appends a hostname prefix to syslog messages being sent from the router to syslog servers. You can use hostname prefixes to sort the messages being sent to a given syslog server from different networking devices.

To append a hostname prefix to syslog messages sent to syslog servers, use the **logging hostname** command in mode.

Configuration Example

This example shows how to add the hostname prefix host1 to messages sent to the syslog servers from the router.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging hostnameprefix host1
RP/0/RP0/CPU0:Router(config)# commit
```

Syslog Source Address Logging

By default, a syslog message contains the IP address (IPv4 and IPv6 are supported) of the interface it uses to leave the router when sent to syslog servers. To set all syslog messages to contain the same IP address, regardless of which interface the syslog message uses to exit the router, use the **logging source-interface** command in mode.

Configuration Example

This example shows how to specify that the IP address for HundredGigE interface 0/1/0/0 be set as the source IP address for all messages.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging source-interface HundredGigE interface 0/1/0/0
RP/0/RP0/CPU0:Router(config)# commit
```

Logging History Table

If you have enabled syslog messages traps to be sent to a Simple Network Management Protocol (SNMP) network management station (NMS) with the **snmp-server enable traps syslog** command, you can change

the level of messages sent and stored in a history table on the router. You can also change the number of messages that get 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 above (see Table 2: Syslog Message Severity Levels, on page 2) is stored in the history table even if syslog traps are not enabled.

Note Table 2: Syslog Message Severity Levels, on page 2 lists the level keywords and severity level. For SNMP usage, the severity level values use +1. For example, **emergency** equals 1 not 0 and **critical** equals 3 not 2.

Configuration Example

This example shows how to change the severity level and table size defaults of the logging history table.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging history severity
RP/0/RP0/CPU0:Router(config)# logging history size number
RP/0/RP0/CPU0:Router(config)# commit
```

Configuring System Logging

Perform the tasks in this section for configuring system logging as required.

Configuring Syslog Severity Level for Telemetry

The severity of syslog messages that are generated by the router varies from emergencies to simple notifications. You can specify a severity keyword corresponding to any one of the severity levels—from the highest severity level 0 (emergencies) through the lowest severity level 7 (debugging). Depending upon the severity level you have specified, the router streams data to the telemetry server, starting from the chosen severity level and higher. See Implementing System Logging for more information.

You can specify the severity level by using the **logging yang** *severity-level* command.

Tip You can programmatically monitor syslog messages by using the `openconfig-messages.yang` OpenConfig data model. To get started with using data models, see the *Programmability Configuration Guide for Cisco 8000 Series Routers*.

Configuration Example

This example sets **warnings** as the severity level. This results in the streaming of syslogs only for **warnings**, **errors**, **critical**, **alert**, and **emergencies**. Syslogs of lower severity are not streamed.

```
Router(config)#logging yang warnings
```

Telemetry Output

This example shows sample telemetry operational output when **logging yang warnings** command is configured.

```
--------
{"node_id_str":"ios","subscription_id_str":"app_TEST_200000001","encoding_path":
"openconfig-system:system","collection_id":"40","collection_start_time":"1664513125273",
```

```
"msg_timestamp":"1664513125273","data_json":[{"timestamp":"1664513125272","content":
{"messages":
{"state":{"severity":"EMERGENCY","message":
{"msg":"RP/0/0/CPU0:Sep 30 10:15:25.272 IST: logger[67820]: %OS-SYSLOG-0-LOG_EMERG :
TEST_EMERG ","priority":184,"app-name":"logger","procid":"67820","msgid":
"OS-SYSLOG-0-LOG_EMERG"}}}}}],"collection_end_time":"1664513125273"}
--------
 Sub_id 200000001, flag 4, len 534
--------
{"node_id_str":"ios","subscription_id_str":"app_TEST_200000001","encoding_path":
"openconfig-system:system","collection_id":"41","collection_start_time":"1664513137884",
"msg_timestamp":"1664513137884","data_json":[{"timestamp":"1664513137883","content":
{"messages":
{"state":{"severity":"WARNING","message":
{"msg":"RP/0/0/CPU0:Sep 30 10:15:37.882 IST: logger[67997]:
%OS-SYSLOG-4-LOG_WARNING : TEST_WARN
 ","priority":188,"app-name":"logger","procid":"67997","msgid":
"OS-SYSLOG-4-LOG_WARNING"}}}}}],"collection_end_time":"1664513137884"}
--------
 Sub_id 200000001, flag 4, len 529
--------
{"node_id_str":"ios","subscription_id_str":"app_TEST_200000001","encoding_path":
"openconfig-system:system","collection_id":"42","collection_start_time":
"1664513562626","msg_timestamp":"1664513562626","data_json":[{"timestamp":"1664513562624",
"content":{"messages":{"state":{"severity":"CRITICAL","message":
{"msg":"RP/0/0/CPU0:Sep 30 10:22:42.624 IST: logger[68957]: %OS-SYSLOG-2-LOG_CRIT :
 TEST_CRIT ","priority":186,"app-name":"logger","procid":"68957","msgid":
"OS-SYSLOG-2-LOG_CRIT"}}}}}],"collection_end_time":"1664513562626"}
--------
 Sub_id 200000001, flag 4, len 529
--------
{"node_id_str":"ios","subscription_id_str":"app_TEST_200000001","encoding_path":
"openconfig-system:system","collection_id":"43","collection_start_time":
"1664513570004","msg_timestamp":"1664513570004","data_json":[{"timestamp":"1664513570003",
"content":{"messages":{"state":{"severity":"ALERT","message":
{"msg":"RP/0/0/CPU0:Sep 30 10:22:50.002 IST: logger[69113]: %OS-SYSLOG-1-LOG_ALERT :
TEST_ALERT ","priority":185,"app-name":"logger","procid":"69113",
"msgid":"OS-SYSLOG-1-LOG_ALERT"}}}}}],"collection_end_time":"1664513570004"}
--------
 Sub_id 200000001, flag 4, len 525
--------
{"node_id_str":"ios","subscription_id_str":"app_TEST_200000001","encoding_path":
"openconfig-system:system","collection_id":"44","collection_start_time":
"1664513844428","msg_timestamp":"1664513844428","data_json":[{"timestamp":"1664513844427","content":
{"messages":{"state":{"severity":"ERROR","message":
{"msg":"RP/0/0/CPU0:Sep 30 10:27:24.426 IST: logger[69203]: %OS-SYSLOG-3-LOG_ERR :
TEST_ERROR ","priority":187,"app-name":"logger","procid":"69203","msgid":
"OS-SYSLOG-3-LOG_ERR"}}}}}],"collection_end_time":"1664513844428"}
--------
```


Configuring Logging to the Logging Buffer

Syslog messages can be sent to multiple destinations including an internal circular buffer known as logging buffer. You can send syslog messages to the logging buffer using the **logging buffered** command.

Configuration Example

This example shows the configuration for sending syslog messages to the logging buffer. The size of the logging buffer is configured as 3000000 bytes. The default value for the size of the logging buffer is 2097152 bytes.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging buffered 3000000
RP/0/RP0/CPU0:Router(config)# commit
```

System Logging Message Count

Table 4: Feature History Table

Feature Name	Release Information	Feature Description
System Logging Message Count	Release 7.11.1	Instead of calculating the bytes consumed by Syslog as you did previously, you can now easily and effectively manage the buffer size of the system log messages by specifying the number of entries the system log displays. The feature introduces these changes: **CLI:** • The **entries-count** keyword is added to the **logging buffered** command. **YANG Data Model:** • New Xpaths for Cisco-IOS-XR-infra-syslog-cfg • New Xpaths for Cisco-IOS-XR-um-logging-cfg

Earlier, you were only able to configure the buffer size of the system log messages in bytes using the **logging buffered** command.

Starting Cisco IOS XR Software Release 7.5.5, you can you can specify the number of entries to be present while displaying the system logs. Based on the number of entries, the system internally calculates the buffer size and reserves the same for system log buffer. The default value is 2545. The range for sytem logging message count entry is from 2545 to 151699. When you disable the command, the logging buffer size points back to the default value of 2545.

If both the **logging buffered** *bytes* and **logging buffered entries-count** commands are present, then the maximum configured value is taken to display the number of system log messages.

Configuration Example for System Logging Message Count

Use the **logging buffered entries-count** command to specify the number of entries to be present while displaying the system logs.

```
Router# configure
Router(config)# logging buffered entries-count 3000
Router(config)# commit
```

Running Configuration

```
Router#show running-config logging
.
.
.
logging console disable
logging buffered entries-count 3000
!
```

Verification

```
Router(config)#show logging last 3
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level warnings, 2 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 0 messages logged
    Buffer logging: level debugging, 63 messages logged

Log Buffer (3000 entries):
```

Configuring Logging to a Remote Server

Syslog messages can be sent to destinations other than the console, such as logging buffer, syslog servers, snmp server and terminal lines. You can send syslog messages to an external syslog server by specifying the ip address or hostname of the syslog server using the **logging** command. Also you can configure the syslog facility in which syslog messages are send by using the **logging facility** command.

The following table list the features supported by Cisco IOS XR Software to help managing syslog messages sent to syslog servers.

Table 5: Features for Managing Syslog Messages

Features	Description
UNIX system log facility	Facility is the identifier used by UNIX to describe the application or process that submitted the log message. You can configure the syslog facility in which syslog messages are sent by using the **logging facility** command.
Hostname prefix logging	Cisco IOS XR Software supports hostname prefix logging. When enabled, hostname prefix logging appends a hostname prefix to syslog messages being sent from the router to syslog servers. You can use hostname prefixes to sort the messages being sent to a given syslog server from different networking devices. Use the **logging hostname** command to append a hostname prefix to syslog messages sent to syslog servers

Features	Description
Syslog source address logging	By default, a syslog message sent to a syslog server contains the IP address of the interface it uses to leave the router. Use the **logging source-interface** command to set all syslog messages to contain the same IP address, regardless of which interface the syslog message uses to exit the router.

Configuration Example for Logging to Syslog Server

This example shows the configuration for sending syslog messages to an external syslog server. The ip address 209.165.201.1 is configured as the syslog server.

```
Router# configure
Router(config)# logging 209.165.201.1 vrf default
Router(config)# logging facility kern (optional)
Router(config)# logging hostnameprefix 203.0.113.1 (optional)
Router(config)# logging source-interface HundredGigE 0/0/0/0 (optional)
Router(config)# commit
```

Configuration Example for Logging to SNMP Server

This example shows the configuration for sending syslog messages to an SNMP server. The logging trap command is used to limit the logging of messages sent to the snmp servers based on severity.

```
Router# configure
Router(config)# snmp-server traps syslog
Router(config)# logging trap warnings
Router(config)# commit
```

For more information on SNMP server configurations, see the *Configuring Simple Network Management Protocol* chapter in the *System Management Configuration Guide for Cisco 8000 Series Routers*

Related Topics

- Configuring Logging to the Logging Buffer, on page 6

System Log Facility and Source-address per Remote Server

Table 6: Feature History Table

Feature Name	Release Information	Feature Description
System Log Facility and Source-address per Remote Server	Release 24.2.11	You can now assign a facility type per remote syslog server, which the router uses to calculate the priority value of the syslog messages sent. You can also configure the source address to choose the interface to send remote syslog packets per remote server. The feature introduces these changes: Modified Command: **CLI** • The keywords **facility** and **source-address** per remote syslog server are introduced in the **logging** command. **YANG Data Models:** • New XPaths for `openconfig-system-logging.yang` (see GitHub, YANG Data Models Navigator)

Configuration Example for Logging to Remote Syslog Server

The configurations for **facility** and **source-address** per remote syslog server takes priority over global configuration.

This example shows how to configure **facility** and **source-address** per remote syslog server:

```
Router#configure
Router(config)#
Router(config)#logging 209.165.201.1 source-address 209.165.201.2
Router(config)#logging 209.165.201.1 facility local2
Router(config)#commit
```

Configuring Logging to Terminal Lines

By default syslog messages will be sent to the console terminal. But, syslog messages can also be send to terminal lines other than the console. You can send syslog messages to the logging buffer using the **logging monitor** command.

Configuration Example

This example shows the configuration for sending syslog messages to terminal lines other than console. In this example, severity level is configured as critical. The terminal monitor command is configured to display syslog messages during a terminal session. The default severity level is debugging.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging monitor critical
RP/0/RP0/CPU0:Router(config)# commit
RP/0/RP0/CPU0:Router# terminal monitor
```

Enable Message Logs for Third-Party Software Containers

Table 7: Feature History Table

Feature Name	Release Information	Feature Description
Message Logs for Third-Party Software Containers	Release 7.3.15	This feature introduces the logging container all command to monitor messages from a third-party container logs, such as Docker.

Cisco IOS XR operating system can host third-party software containers, such as Docker. To monitor logs from such software containers, use the **logging container all** command.

Configuration Example

This example shows how to enable third-party software container logging and how to view the logs for the third-party software container named Docker:

```
Router# configure
Router(config)# logging container all
Router(config)# commit


Router# show running-config logging

logging container all

Router# show logging | inc DOCKER
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level warnings, 5 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 0 messages logged
    Buffer logging: level debugging, 148 messages logged

Log Buffer (2097152 bytes):

RP/0/RP0/CPU0:Mar  5 06:56:11.913 UTC: exec[66927]: %SECURITY-LOGIN-6-AUTHEN_SUCCESS :
Successfully authenticated user 'lab' from 'console' on 'con0_RP0_CPU0'
RP/0/RP0/CPU0:Mar  5 06:58:13.053 UTC: config[66985]: %MGBL-SYS-5-CONFIG_I : Configured
from console by lab
RP/0/RP0/CPU0:Mar  5 06:59:04.775 UTC: ubuntu-1[67232]: %OS-SYSLOG-6-DOCKER_APP :
^[]0;root@c382b2e7bed6: /^Groot@c382b2e7bed6:/# testlog
RP/0/RP0/CPU0:Mar  5 06:59:04.830 UTC: config[67139]: %MGBL-CONFIG-6-DB_COMMIT : Configuration
 committed by user 'lab'. Use 'show configuration commit changes 1000000012' to view the
changes.
RP/0/RP0/CPU0:Mar  5 06:59:45.028 UTC: config[67139]: %MGBL-SYS-5-CONFIG_I : Configured
from console by lab
RP/0/RP0/CPU0:Mar  5 06:59:48.552 UTC: run_cmd[67780]: %INFRA-INFRA_MSG-5-RUN_LOGIN : User
```

```
 lab logged into shell from con0/RP0/CPU0
RP/0/RP0/CPU0:Mar  5 06:59:56.073 UTC: ubuntu-1[67976]: %OS-SYSLOG-6-DOCKER_APP : testlog-123

RP/0/RP0/CPU0:Mar  5 07:00:12.471 UTC: ubuntu-1[68099]: %OS-SYSLOG-6-DOCKER_APP : testlog-new1

RP/0/RP0/CPU0:Mar  5 07:01:55.747 UTC: ubuntu-1[68245]: %OS-SYSLOG-6-DOCKER_APP : testlog-new1

RP/0/RP0/CPU0:Mar  5 07:02:02.869 UTC: run_cmd[67780]: %INFRA-INFRA_MSG-5-RUN_LOGOUT : User
 lab logged out of shell from con0/RP0/CPU0
```

Modifying Logging to Console Terminal

By default syslog messages will be sent to the console terminal. You can modify the logging of syslog messages to the console terminal

Configuration Example

This example shows how to modify the logging of syslog messages to the console terminal.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging console alerts
RP/0/RP0/CPU0:Router(config)# commit
```

Modifying Time Stamp Format

By default, time stamps are enabled for syslog messages. Time stamp is generated in the month day HH:MM:SS format indicating when the message was generated.

Configuration Example

This example shows how to modify the time-stamp for syslog and debugging messages.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# service timestamps log datetime localtime msec or service
timestamps log uptime
RP/0/RP0/CPU0:Router(config)# service timestamps debug datetime msec show-timezone or service
 timestamps debug uptime
RP/0/RP0/CPU0:Router(config)# commit
```

Suppressing Duplicate Syslog Messages

Suppressing duplicate messages, especially in a large network, can reduce message clutter and simplify the task of interpreting the log. The duplicate message suppression feature substantially reduces the number of duplicate event messages in both the logging history and the syslog file.

Configuration Example

This example shows how to suppress the consecutive logging of duplicate syslog messages.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging suppress duplicates
RP/0/RP0/CPU0:Router(config)# commit
```

Displaying System Logging Messages

You can display the syslog messages stored in the logging buffer by using the **show logging** command.

Configuration Example

This example shows how to display the syslog messages stored in the logging buffer.

```
RP/0/RP0/CPU0:Router# show logging
RP/0/RP0/CPU0:Router# show logging location 0/1/CPU0
RP/0/RP0/CPU0:Router# show logging process init
RP/0/RP0/CPU0:Router# show logging string install
RP/0/RP0/CPU0:Router# show logging start december 1 10:30:00
RP/0/RP0/CPU0:Router# show logging end december 2 22:16:00
```

Note The commands can be entered in any order.

```
RP/0/RP0/CPU0:Router# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level warnings, 0 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 0 messages logged
    Buffer logging: level debugging, 82 messages logged

Log Buffer (307200 bytes):

RP/0/0/CPU0:Feb  7 15:36:16.655 IST: init[68452]: %OS-INIT-7-MBI_STARTED : total time 0.215
 seconds
RP/0/0/CPU0:Feb  7 15:36:16.759 IST: sysmgr[55]: %OS-SYSMGR-5-NOTICE : Card is COLD started
RP/0/0/CPU0:Feb  7 15:36:16.893 IST: init[68452]: %OS-INIT-7-INSTALL_READY : total time
0.453 seconds
RP/0/0/CPU0:Feb  7 15:36:17.125 IST: sysmgr[278]: %OS-SYSMGR-6-INFO : Backup system manager
 is ready
RP/0/0/CPU0:Feb  7 15:36:17.149 IST: syslogd[405]: %SECURITY-XR_SSL-6-INFO : XR SSL info:
Setting fips register
RP/0/0/CPU0:Feb  7 15:36:17.177 IST: spp[52]: %L2-VTIO-6-NO_PORTS : Plug-in found no ports
 to manage
RP/0/0/CPU0:Feb  7 15:36:18.651 IST: dsc[210]: %PLATFORM-DSC-6-INFO_I_AM_DSC : Setting
myself as DSC
RP/0/0/CPU0:Feb  7 15:36:18.653 IST: sysmgr[55]: %OS-SYSMGR-7-DEBUG : node set to DSC
```

```
RP/0/RP0/CPU0:Router# show logging process smartlicserver
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level warnings, 0 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 0 messages logged
    Buffer logging: level debugging, 82 messages logged

Log Buffer (307200 bytes):

RP/0/0/CPU0:Feb  7 15:37:12.434 IST: smartlicserver[119]: %SMART_LIC-6-AGENT_ENABLED:Smart
 Agent for Licensing is enabled
RP/0/0/CPU0:Feb  7 15:37:23.029 IST: smartlicserver[119]: %SMART_LIC-6-REPORTING_REQUIRED:A
 Usage report acknowledgement will be required in 353 days.
RP/0/0/CPU0:Feb  7 15:37:24.030 IST: smartlicserver[119]: %SMART_LIC-5-IN_COMPLIANCE:All
entitlements and licenses in use on this device are authorized
RP/0/0/CPU0:Feb  7 15:37:29.474 IST: smartlicserver[119]: %SMART_LIC-5-SLR_IN_COMPLIANCE:The
 entitlement regid.2019-03.com.cisco.ENXR-TRK,1.0_2b015ca9-b01d-40eb-80b6-e6647f8fcf76 in
use on this device is authorized
RP/0/0/CPU0:Feb  7 15:37:38.045 IST: smartlicserver[119]:
%SMART_LIC-3-COMM_FAILED:Communications failure with the Cisco Smart License Utility (CSLU)
 : Unable to resolve server hostname/domain name
RP/0/0/CPU0:Feb  7 15:37:39.047 IST: smartlicserver[119]: %SMART_LIC-5-IN_COMPLIANCE:All
entitlements and licenses in use on this device are authorized
RP/0/0/CPU0:ios#
```

```
RP/0/RP0/CPU0:Router# show logging start february 7 15:37:24
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
    Console logging: level warnings, 0 messages logged
    Monitor logging: level debugging, 0 messages logged
    Trap logging: level informational, 0 messages logged
    Buffer logging: level debugging, 82 messages logged

Log Buffer (307200 bytes):

RP/0/0/CPU0:Feb  7 15:37:24.030 IST: smartlicserver[119]: %SMART_LIC-5-IN_COMPLIANCE:All
entitlements and licenses in use on this device are authorized
RP/0/0/CPU0:Feb  7 15:37:24.112 IST: iedged[462]: %SUBSCRIBER-SUB_UTIL-5-SESSION_THROTTLE
: Subscriber Infra is ready. Reason: [V6 Subscriber infra process(es) is available].
RP/0/0/CPU0:Feb  7 15:37:24.112 IST: subdb_svr[207]: %SUBSCRIBER-SUB_UTIL-5-SESSION_THROTTLE
 : Subscriber Infra is ready. Reason: [V6 Subscriber infra process(es) is available].
RP/0/0/CPU0:Feb  7 15:37:24.112 IST: pppoe_ma[216]: %SUBSCRIBER-SUB_UTIL-5-SESSION_THROTTLE
 : Subscriber Infra is ready. Reason: [V6 Subscriber infra process(es) is available].
RP/0/0/CPU0:Feb  7 15:37:29.474 IST: smartlicserver[119]: %SMART_LIC-5-SLR_IN_COMPLIANCE:The
 entitlement regid.2019-03.com.cisco.ENXR-TRK,1.0_2b015ca9-b01d-40eb-80b6-e6647f8fcf76 in
use on this device is authorized
RP/0/0/CPU0:Feb  7 15:37:38.045 IST: smartlicserver[119]:
%SMART_LIC-3-COMM_FAILED:Communications failure with the Cisco Smart License Utility (CSLU)
 : Unable to resolve server hostname/domain name
RP/0/0/CPU0:Feb  7 15:37:39.047 IST: smartlicserver[119]: %SMART_LIC-5-IN_COMPLIANCE:All
entitlements and licenses in use on this device are authorized
RP/0/0/CPU0:Feb  7 15:46:19.976 IST: /pkg/sbin/sysmgr_log[68415]: %OS-SYSMGR-7-CHECK_LOG :
 /pkg/bin/sysmgr_debug_script invoked for : (ltrace_data_export) sysmgr_level_ready_timeout:
 EOI required, but never received from ltrace_data_export,jid=293   Output is in
/disk0://sysmgr_debug/debug.node0_0_CPU0.174906
RP/0/0/CPU0:ios#
```

Archiving System Logging Messages to a Local Storage Device

Syslog messages can also be saved to an archive on a local storage device, such as the hard disk or a flash disk. Messages can be saved based on severity level, and you can specify attributes such as the size of the archive, how often messages are added (daily or weekly), and how many total weeks of messages the archive will hold.

You can create a logging archive and specify how the logging messages will be collected and stored by using the **logging archive** command.

The following table lists the commands used to specify the archive attributes once you are in the logging archive submode.

Table 8: Commands Used to Set Syslog Archive Attributes

Features	Description
archive-length weeks	Specifies the maximum number of weeks that the archive logs are maintained in the archive. Any logs older than this number are automatically removed from the archive.
archive-size size	Specifies the maximum total size of the syslog archives on a storage device. If the size is exceeded then the oldest file in the archive is deleted to make space for new logs.

Features	Description
device {disk0 | disk1 | harddisk}	Specifies the local storage device where syslogs are archived. By default, the logs are created under the directory <device>**/var/log**. If the device is not configured, then all other logging archive configurations are rejected. We recommend that syslogs be archived to the harddisk because it has more capacity than flash disks.
file-size size	Specifies the maximum file size (in megabytes) that a single log file in the archive can grow to. Once this limit is reached, a new file is automatically created with an increasing serial number.
frequency {daily | weekly}	Specifies if logs are collected on a daily or weekly basis.
severity severity	Specifies the minimum severity of log messages to archive. All syslog messages greater than or equal to this configured level are archived while those lesser than this are filtered out.
threshold	Specifics the threshold percentage for archive logs.

Configuration Example

This example shows how to save syslog messages to an archive on a local storage device.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# logging archive
RP/0/RP0/CPU0:Router(config-logging-arch)# device disk1
RP/0/RP0/CPU0:Router(config-logging-arch)# frequency weekly
RP/0/RP0/CPU0:Router(config-logging-arch)# severity warnings
RP/0/RP0/CPU0:Router(config-logging-arch)# archive-length 6
RP/0/RP0/CPU0:Router(config-logging-arch)# archive-size 50
RP/0/RP0/CPU0:Router(config-logging-arch)# file-size 10
RP/0/RP0/CPU0:Router(config)# commit
```

Platform Automated Monitoring

Platform Automated Monitoring (PAM) is a system monitoring tool integrated into Cisco IOS XR software image to monitor the following issues:

- process crashes
- memory leaks
- CPU hogs
- tracebacks
- disk usage

PAM is enabled by default. When the PAM tool detects any of these system issues, it collects the required data to troubleshoot the issue, and generates a syslog message stating the issue. The auto-collected troubleshooting information is then stored as a separate file in `harddisk:/cisco_support/` or in `/misc/disk1/cisco_support/ directory`.

Table 9: Feature History Table

Feature Name	Release	Description
Platform Automated Monitoring for Blocked Processes	Release 7.5.2	You can enable the Platform Automated Monitoring tool integrated into the Cisco IOS XR software image and receive alerts if any process is blocked. Several system failures can cause a blocked process, such as memory leak, network connection loss, and so on. The tool collects the required data to troubleshoot the issue and generates a system log message with the name of the process that is currently blocked. This feature introduces the following commands: • **enable-pam process-monitoring** • **disable-pam process-monitoring** • **show pam process-monitoring-status**

PAM Events

When PAM detects a process crash, traceback, potential memory leak, CPU hog, a full file system, or blocked process on any node, it automatically collects logs and saves these logs (along with the core file in applicable cases) as a *.tgz* file in harddisk:/cisco_support/ or in /misc/disk1/cisco_support/ directory. PAM also generates a syslog message with severity level as warning, mentioning the respective issue.

The format of the .tgz file is: *PAM-<platform>-<PAM event>-<node-name>-<PAM process>-<YYYYMMDD>-<checksum>.tgz*.For example, *PAM-cisco8000-crash-xr_0_RP0_CPU0-ipv4_rib-2016Aug16-210405.tgz* is the file collected when PAM detects a process crash.

Because PAM assumes that core files are saved to the default archive folder (harddisk:/ or /misc/disk1/), you must not modify the location of core archive (by configuring exception filepath) or remove the core files generated after PAM detects an event. Else, PAM does not detect the process crash. Also, once reported, the PAM does not report the same issue for the same process in the same node again.

For the list of commands used while collecting logs, refer Files Collected by PAM Tool, on page 20.

The Platform Automated Monitoring for blocked processes detects and alerts if any of the processes are blocked, except for the processes which are expected to be blocked by their design. These processes are listed in the table below:

Blocked process	Blocked on
lpts_fm	lpts_pa
isis	lspv_server
Ospf	lspv_server
l2vpn_mgr	lspv_server
mpls_ldp	lspv_server
bgp	lspv_server
te_control	lspv_server
xtc_agent	lspv_server

The sections below describe the main PAM events:

Crash Monitoring

The PAM monitors process crash for all nodes, in real time. This is a sample syslog generated when the PAM detects a process crash:

```
RP/0/RP0/CPU0:Aug 16 21:04:06.442 : logger[69324]: %OS-SYSLOG-4-LOG_WARNING : PAM detected
 crash for ipv4_rib on 0_RP0_CPU0.
All necessary files for debug have been collected and saved at
0/RP0/CPU0 :
harddisk:/cisco_support/PAM-cisco8000-crash-xr_0_RP0_CPU0-ipv4_rib-2016Aug16-210405.tgz
Please copy tgz file out of the router and send to Cisco support. This tgz file will be
removed after 14 days.)
```

Traceback Monitoring

The PAM monitors tracebacks for all nodes, in real time. This is a sample syslog generated when the PAM detects a traceback:

```
RP/0/RP0/CPU0:Aug 16 21:42:42.320 : logger[66139]: %OS-SYSLOG-4-LOG_WARNING : PAM detected
 traceback for ipv4_rib on 0_RP0_CPU0.
All necessary files for debug have been collected and saved at
0/RP0/CPU0 :
harddisk:/cisco_support/PAM-cisco8000-traceback-xr_0_RP0_CPU0-ipv4_rib-2016Aug16-214242.tgz

Please copy tgz file out of the router and send to Cisco support. This tgz file will be
removed after 14 days.)
```

Memory Usage Monitoring

The PAM monitors the process memory usage for all nodes. The PAM detects potential memory leaks by monitoring the memory usage trend and by applying a proprietary algorithm to the collected data. By default, it collects top output on all nodes periodically at an interval of 30 minutes.

This is a sample syslog generated when the PAM detects a potential memory leak:

```
RP/0/RP0/CPU0:Aug 17 05:13:32.684 : logger[67772]: %OS-SYSLOG-4-LOG_WARNING : PAM detected
 significant memory increase
(from 13.00MB at 2016/Aug/16/20:42:41 to 28.00MB at 2016/Aug/17/04:12:55) for
pam_memory_leaker on 0_RP0_CPU0.
All necessary files for debug have been collected and saved at
0/RP0/CPU0 :
harddisk:/cisco_support/PAM-cisco8000-memory_leak-xr_0_RP0_CPU0-pam_memory_leaker-2016Aug17-051332.tgz

(Please copy tgz file out of the router and send to Cisco support. This tgz file will be
removed after 14 days.)
```

CPU Monitoring

The PAM monitors CPU usage on all nodes periodically at an interval of 30 minutes. The PAM reports a CPU hog in either of these scenarios:

- When a process constantly consumes high CPU (that is, more than the threshold of 90 percentage)
- When high CPU usage lasts for more than 60 minutes

This is a sample syslog generated when the PAM detects a CPU hog:

```
RP/0/RP0/CPU0:Aug 16 00:56:00.819 : logger[68245]: %OS-SYSLOG-4-LOG_WARNING : PAM detected
 CPU hog for cpu_hogger on 0_RP0_CPU0.
All necessary files for debug have been collected and saved at 0/RP0/CPU0 :
harddisk:/cisco_support/PAM-cisco8000-cpu_hog-xr_0_RP0_CPU0-cpu_hogger-2016Aug16-005600.tgz

(Please copy tgz file out of the router and send to Cisco support. This tgz file will be
removed after 14 days.)
RP/0/RP0/CPU0:Jun 21 15:33:54.517 : logger[69042]: %OS-SYSLOG-1-LOG_ALERT : PAM detected
ifmgr is hogging CPU on 0_RP0_CPU0!
```

File System Monitoring

The PAM monitors disk usage on all nodes periodically at an interval of 30 minutes. This is a sample syslog generated when the PAM detects that a file system is full:

```
RP/0/RP0/CPU0:Jun 20 13:59:04.986 : logger[66125]: %OS-SYSLOG-4-LOG_WARNING : PAM detected
 /misc/config is full on 0_1_CPU0
(please clean up to avoid any fault caused by this). All necessary files for debug have
been collected and saved at
0/RP0/CPU0 : harddisk:/cisco_support/PAM-cisco8000-disk_usage-xr_0_1_CPU0-2016Jun20-135904.tgz

(Please copy tgz file out of the router and send to Cisco support. This tgz file will be
removed after 14 days.)
```

Disable and Re-enable PAM

The PAM tool consists of the following monitoring processes:

- monitor_cpu.pl
- monitor_crash.pl
- monitor_show_logging.pl
- monitor_process.pl

Note Monitor process.pl in PAM monitors all nodes and generates a system log message with the process name that is blocked if it detects any process is blocked for more than 30 minutes. It prevents multiple alarms for the same blocked process.

Before disabling or re-enabling the PAM, use these options to check if the PAM is installed in the router:

- From Cisco IOS XR Command Line Interface:

```
Router# show pam status
Tue Jun 14 17:58:42.791 UTC
PAM is enabled
```

- From router shell prompt:

```
Router# run ps auxw|egrep perl

root     12559  0.0  0.0  57836 17992 ?        S    Apr24   0:00 /usr/bin/perl
/pkg/opt/cisco/pam//pam_plugin.pl
```

Disable PAM

To disable PAM agent systemwide, execute the following command from the XR EXEC mode:

```
Router# disable-pam
```

Re-enable PAM

To re-enable PAM agent systemwide, execute the following command from XR EXEC mode:

```
Router# enable-pam
```

Data Archiving in PAM

At any given point of time, PAM does not occupy more than 200 MB of harddisk: space. If more than 200 MB is needed, then PAM archives old files and rotates the logs automatically.

The PAM collects CPU or memory usage (using **top -b -n1** command) periodically at an interval of 30 minutes. The files are saved under harddisk:/cisco_support/ directory with the filename as <node name>.log (for example, harddisk:/cisco_support/xr-0_RP0_CPU0.log). When the file size exceeds the limit of 15MB, the file is archived (compressed) into .tgz file, and then rotated for a maximum of two counts (that is, it retains only two .tgz files). The maximum rotation count of .tgz files is three. Also, the old file (ASCII data) is archived and rotated if a node is reloaded. For example, xr-0_RP0_CPU0.log is archived if RP0 is reloaded.

You must not manually delete the core file generated by the PAM. The core file is named as *<process name>_pid.by_user.<yyyymmdd>-<hhmmss>.<node>.<checksum>.core.gz*.

Files Collected by PAM Tool

The table below lists the various PAM events and the respective commands and files collected by the PAM for each event.

You can attach the respective*.tgz* file when you raise a service request (SR) with Cisco Technical Support.

Event Name	Commands and Files Collected by PAM
Process crash	• **show install active** • **show platform** • **show version** • core (gz) file • core.txt file
Process traceback	• **show dll** • **show install active** • **show logging** • **show platform** • **show version**
Memory leak	• **show install active** • **show platform** • **show version** • core (gz) file • dumpcore running • continuous memory usage snapshots
Show logging event	• **show install active** • **show logging** • **show platform** • **show version** • core (gz) file • core.txt file

Event Name	Commands and Files Collected by PAM
CPU hog	• **follow process** • **pstack** • **show dll** • **show install active** • **show platform** • **show version** • **top -H** • core (gz) file • CPU usage snapshots
Disk usage	• **show install active** • **show platform** • **show version** • console log • core (gz) file • Disk usage snapshots
Process Blockage	• **show version** • **show install active** • **show platform** • **show logging** • **show running-config** • **show process blocked location all** • core (gz) file