



Cisco Nexus 9000 Series NX-OS Troubleshooting Guide, Release 6.x

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Preface

This preface includes the following sections:

- [Audience, on page ix](#)
- [Document Conventions, on page ix](#)
- [Related Documentation for Cisco Nexus 9000 Series Switches, on page x](#)
- [Documentation Feedback, on page x](#)
- [Communications, Services, and Additional Information, on page x](#)

Audience

This publication is for network administrators who install, configure, and maintain Cisco Nexus switches.

Document Conventions

Command descriptions use the following conventions:

Convention	Description
bold	Bold text indicates the commands and keywords that you enter literally as shown.
<i>Italic</i>	Italic text indicates arguments for which you supply the values.
[x]	Square brackets enclose an optional element (keyword or argument).
[x y]	Square brackets enclosing keywords or arguments that are separated by a vertical bar indicate an optional choice.
{x y}	Braces enclosing keywords or arguments that are separated by a vertical bar indicate a required choice.
[x {y z}]	Nested set of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.

Convention	Description
<i>variable</i>	Indicates a variable for which you supply values, in context where italics cannot be used.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string includes the quotation marks.

Examples use the following conventions:

Convention	Description
<code>screen font</code>	Terminal sessions and information the switch displays are in screen font.
boldface screen font	Information that you must enter is in boldface screen font.
<i>italic screen font</i>	Arguments for which you supply values are in italic screen font.
<>	Nonprinting characters, such as passwords, are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Related Documentation for Cisco Nexus 9000 Series Switches

The entire Cisco Nexus 9000 Series switch documentation set is available at the following URL:

http://www.cisco.com/en/US/products/ps13386/tsd_products_support_series_home.html

Documentation Feedback

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Cisco Bug Search Tool

[Cisco Bug Search Tool](#) (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.



CHAPTER 1

New and Changed Information

This chapter provides release-specific information for each new and changed feature in the *Cisco Nexus 9000 Series NX-OS Troubleshooting Guide, Release 6.x*.

- [New and Changed Information, on page 1](#)

New and Changed Information

This table summarizes the new and changed features for the *Cisco Nexus 9000 Series NX-OS Troubleshooting Guide, Release 6.x* and tells you where they are documented.

Table 1: New and Changed Features for Cisco NX-OS Release 6.x

Feature	Description	Changed in Release	Where Documented
Private VLANs (PVLANS)	Introduced this feature.	6.1(2)I3(4)	Troubleshooting VLANs, on page 53
Traceroute	Added source interface support.	6.1(2)I3(3)	Troubleshooting Tools and Methodology, on page 95
Policy-based routing	Introduced this feature.	6.1(2)I3(1)	Troubleshooting Routing, on page 65
Consistency checker commands	Added commands for Layer 2 and VLANs.	6.1(2)I2(1)	Consistency Checker Commands, on page 96
DCNM	Introduced this feature.	6.1(2)I2(1)	Before Contacting Technical Support, on page 91
Layer 2	Added support for Layer 2 connectivity.	6.1(2)I2(1)	Overview, on page 3
Software upgrades	Added support for software upgrades.	6.1(2)I2(1)	Troubleshooting Installations, Upgrades, and Reboots, on page 11

Feature	Description	Changed in Release	Where Documented
Spanning Tree Protocol	Introduced this feature.	6.1(2)I2(1)	Troubleshooting STP, on page 57
Trunk ports	Introduced this feature.	6.1(2)I2(1)	Overview, on page 3
VLANs	Introduced this feature.	6.1(2)I2(1)	Troubleshooting VLANs, on page 53
vPCs	Introduced this feature.	6.1(2)I2(1)	Troubleshooting vPCs, on page 47



CHAPTER 2

Overview

- [Software Image, on page 3](#)
- [About the Troubleshooting Process, on page 3](#)
- [Symptoms, on page 5](#)
- [Troubleshooting with Logs, on page 8](#)
- [Troubleshooting Modules, on page 8](#)
- [Viewing NVRAM Logs, on page 9](#)
- [Contacting Customer Support, on page 9](#)

Software Image

The Cisco NX-OS software consists of one NXOS software image. This image runs on all Cisco Nexus 3400 Series switches.

About the Troubleshooting Process

To troubleshoot your network, follow these general guidelines:

- Maintain a consistent Cisco NX-OS release across all your devices.
- See the Cisco NX-OS release notes for your Cisco NX-OS release for the latest features, limitations, and caveats.
- Enable system message logging.
- Troubleshoot any new configuration changes after implementing the change.
- Gather information that defines the specific symptoms.
- Verify the physical connectivity between your device and end devices.
- Verify the Layer 2 connectivity.
- Verify the end-to-end connectivity and the routing configuration.
- After you have determined that your troubleshooting attempts have not resolved the problem, contact Cisco TAC or your technical support representative.

This section describes the tools that are commonly used to troubleshoot problems within your network.



Note You should have an accurate topology of your network to isolate problem areas. Contact your network architect for this information. Use the following commands to gather general information on your device:

- **show module**
- **show version**
- **show running-config**
- **show logging log**
- **show interfaces brief**
- **show vlan**
- **show spanning-tree**
- **show {ip | ipv6} route**
- **show processes | include ER**
- **show accounting log**

Verifying Ports

Answer the following questions to verify that your ports are connected correctly and are operational:

- Are you using the correct media (copper, optical, fiber type)?
- Is the media broken or damaged?
- Is the port LED green on the module?
- Is the interface operational?

See for more troubleshooting tips for ports.

Verifying Layer 2 Connectivity

Use the following commands to verify Layer 2 connectivity:

- Use the **show vlan all-ports** command to verify that all the necessary interfaces are in the same VLAN. The status should be active for the VLAN.
- Use the **show port-channel compatibility-parameters** command to verify that all of the ports in a port channel are configured the same for the speed, the duplex, and the trunk mode.
- Use the **show running-config spanning-tree** command to verify that the Spanning Tree Protocol (STP) is configured the same on all devices in the network.
- Use the **show processes | include ER** command to verify that nonessential Layer 2 processes are in the error state.

- Use the **show mac address-table dynamic vlan** command to determine if learning or aging is occurring at each node.

Verifying Layer 3 Connectivity

Answer the following questions to verify Layer 3 connectivity:

- Have you configured a default gateway?
- Have you configured the same dynamic routing protocol parameters throughout your routing domain or configured static routes?
- Are any IP access lists, filters, or route maps blocking route updates?

Use the following commands to verify your routing configuration:

- **show ip arp**
- **show {ip | ipv6}**
- **show ipv6 neighbor**

Symptoms

This document uses a symptom-based troubleshooting approach that allows you to diagnose and resolve your Cisco NX-OS problems by comparing the symptoms that you observed in your network with the symptoms listed in each chapter.

By comparing the symptoms in this publication to the symptoms that you observe in your own network, you should be able to diagnose and correct software configuration issues and inoperable hardware components so that the problems are resolved with minimal disruption to the network. Those problems and corrective actions include the following:

- Identify key Cisco NX-OS troubleshooting tools.
- Obtain and analyze protocol traces using SPAN or Ethalyzer on the CLI.
- Identify or rule out physical port issues.
- Identify or rule out switch module issues.
- Diagnose and correct Layer 2 issues.
- Diagnose and correct Layer 3 issues.
- Recover from switch upgrade failures.
- Obtain core dumps and other diagnostic data for use by Cisco TAC or your customer support representative.

System Messages

The system software sends syslog (system) messages to the console (and, optionally, to a logging server on another device). Not all messages indicate a problem with your device. Some messages are purely informational, while others might help diagnose problems with links, internal hardware, or the device software.

System message text is a text string that describes the condition. This portion of the message might contain detailed information about the event, including terminal port numbers, network addresses, or addresses that correspond to locations in the system memory address space. Because the information in these variable fields changes from message to message, it is represented here by short strings enclosed in square brackets ([]). A decimal number, for example, is represented as [dec].

PORT-3-IF_UNSUPPORTED_TRANSCEIVER: Transceiver for interface [chars] is not supported.

Each system message is followed by an explanation and recommended action. The action may be as simple as "No action is required." It might involve a fix or a recommendation to contact technical support as shown in the following example:

Error Message PORT-3-IF_UNSUPPORTED_TRANSCEIVER: Transceiver for interface [chars] is not supported.

Explanation Transceiver (SFP) is not from an authorized vendor.

Recommended Action Enter the **show interface transceiver** CLI command or similar DCNM command to determine the transceiver being used. Please contact your customer support representative for a list of authorized transceiver vendors.

Syslog Server Implementation

The syslog facility allows the device to send a copy of the message log to a host for more permanent storage. This feature allows you to examine the logs over a long period of time or if the device is not accessible.

This example shows how to configure the device to use the syslog facility on a Solaris platform. Although a Solaris host is being used, the syslog configuration on all UNIX and Linux systems is very similar.

Syslog uses the facility to determine how to handle a message on the syslog server (the Solaris system in this example) and the message severity. Different message severities are handled differently by the syslog server. They could be logged to different files or e-mailed to a particular user. Specifying a severity level on the syslog server determines that all messages of that level and greater severity (lower number) will be acted upon as you configure the syslog server.



Note You should configure the syslog server so that the Cisco NX-OS messages are logged to a different file from the standard syslog file so that they cannot be confused with other non-Cisco syslog messages. Do not locate the logfile on the / file system. You do not want log messages to fill up the / file system. This example uses the following values:

- syslog client: switch1
- syslog server: 172.22.36.211
- (Solaris) syslog facility: local1
- syslog severity: notifications (level 5, the default)
- File to log Cisco NX-OS messages to: /var/adm/nxos_logs

To configure the syslog feature on Cisco NX-OS, follow these steps:

1. switch# **config terminal**
2. switch(config)# **logging server 192.0.2.1 6 facility local1**

Use the **show logging server** command to verify the syslog configuration.

```
switch1# show logging server
Logging server:          enabled
{172.22.36.211}
  server severity:      notifications
  server facility:      local1
  server VRF:           management
```

To configure a syslog server, follow these steps:

1. Modify /etc/syslog.conf to handle local1 messages. For Solaris, you must allow at least one tab between the facility.severity and the action (/var/adm/nxos_logs).

```
local1.notice /var/adm/nxos_logs
```

2. Create the log file.

```
touch /var/adm/nxos_logs
```

3. Restart the syslog process.

```
/etc/init.d/syslog stop
/etc/init.d/syslog start
```

```
syslog service starting.
```

4. Verify that the syslog process has started.

```
ps -ef |grep syslogd
```

Test the syslog server by creating an event in Cisco NX-OS. In this case, port e1/2 was shut down and reenabled, and the following was listed on the syslog server. The IP address of the device is listed in brackets.

```
tail -f /var/adm/MDS_logs
Sep 17 11:07:41 [172.22.36.142.2.2] : 2013 Sep 17 11:17:29 pacific:
PORT-5-IF_DOWN_INITIALIZING: %$VLAN 1%$ Interface e 1/2 is down (Initializing)

Sep 17 11:07:49 [172.22.36.142.2.2] : 2013 Sep 17 11:17:36 pacific: %PORT-5-IF_UP: %$VLAN
1%$ Interface e 1/2 is up in mode access

Sep 17 11:07:51 [172.22.36.142.2.2] : 2013 Sep 17 11:17:39 pacific:
%VSHD-5-VSHD_SYSLOG_CONFIG_I: Configuring console from pts/0 (dhcp-171-71-49-125.cisco.com
```

Troubleshooting with Logs

Cisco NX-OS generates many types of system messages on the device and sends them to a syslog server. You can view these messages to determine what events might have led up to the current condition that you are facing.

Use the following commands to access and view logs in Cisco NX-OS:

```
switch# show logging ?
console      Show console logging configuration
info        Show logging configuration

ip          IP configuration
last       Show last few lines of logfile
level      Show facility logging configuration
logfile     Show contents of logfile
loopback    Show logging loopback configuration
module      Show module logging configuration
monitor     Show monitor logging configuration
nvram       Show NVRAM log
onboard     show logging onboard
server      Show server logging configuration
source-interface Show logging source-interface configuration
timestamp   Show logging timestamp configuration
```

This example shows the output of the **show logging server** command:

```
switch# show logging server
Logging server:          enabled
{172.28.254.254}
  server severity:      notifications
  server facility:      local7
  server VRF:           management
```

Troubleshooting Modules

You can directly connect to a module console port to troubleshoot module bootup issues. Use the **attach console module** command to connect to the module console port.

Sometimes a Cisco Nexus End-of-Rack (EoR) switch may fail to boot because of space issue in bootflash. In such a case, verify the free space from the bash shell on the console and remove unnecessary files to get enough free disk space on bootflash. This will ensure smooth boot up of the EoR switch.

Viewing NVRAM Logs

System messages that are priority 0, 1, or 2 are logged into NVRAM on the supervisor module. After a switch reboots, you can display these syslog messages in NVRAM by using the **show logging nvram** command:

```
switch# show logging nvram
2013 Sep 10 15:51:58 switch %$ VDC-1 %$ %SYSMGR-2-NON_VOLATILE_DB_FULL: System non-volatile storage usage is unexpectedly high at 99%.
2013 Sep 10 15:52:13 switch %$ VDC-1 %$ %PLATFORM-2-PFM_SYSTEM_RESET: Manual system restart from Command Line Interface
2013 Sep 10 15:57:49 switch %$ VDC-1 %$ %KERN-2-SYSTEM_MSG: Starting kernel... - kernel
2013 Sep 10 15:58:00 switch %$ VDC-1 %$ %CARDCLIENT-2-REG: Sent
2013 Sep 10 15:58:01 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: R2D2: P1 SUP NO GMTL FOR P1 SUP - r2d2
2013 Sep 10 15:58:01 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: R2D2: P1 SUP NO GMTL FOR P1 SUP - r2d2
2013 Sep 10 15:58:05 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: R2D2: P1 SUP: Reset Tx/Rx during QOS INIT - r2d2
2013 Sep 10 15:58:16 switch %$ VDC-1 %$ %USER-2-SYSTEM_MSG: can't dlsym ssnmgr_i_s_session_command: please link this binary with ssnmgr.so! - svi
2013 Sep 10 15:58:16 switch %$ VDC-1 %$ %CARDCLIENT-2-SSE: LC_READY sent
2013 Sep 10 15:58:17 switch %$ VDC-1 %$ snmpd: load_mib_module :Error, while loading the mib module /isan/lib/libpmsnmp_common.so (/isan/lib/libpmsnmp_common.so : undefined symbol: sme_mib_get_if_info)
2013 Sep 10 15:58:17 switch %$ VDC-1 %$ %CARDCLIENT-2-SSE: MOD:6 SUP ONLINE
```

Contacting Customer Support

If you are unable to solve a problem after using the troubleshooting suggestions in this document, contact a customer service representative for assistance and further instructions. Before you call, have the following information ready to help your service provider assist you as quickly as possible:

- Date that you received the device
- Chassis serial number (located on a label on the right side of the rear panel of the chassis)
- Type of software and release number
- Maintenance agreement or warranty information
- Brief description of the problem
- Brief explanation of the steps that you have already taken to isolate and resolve the problem

For more information on steps to take before calling Technical Support, see [Steps to Perform Before Calling TAC, on page 91](#).



CHAPTER 3

Troubleshooting Installations, Upgrades, and Reboots

- [About Upgrades and Reboots, on page 11](#)
- [Upgrade and Reboot Checklist, on page 11](#)
- [Verifying Software Upgrades, on page 12](#)
- [Troubleshooting Software Upgrades and Downgrades, on page 13](#)
- [Troubleshooting Software System Reboots, on page 14](#)
- [Changing the Administrator Password, on page 33](#)

About Upgrades and Reboots

Upgrades and reboots are ongoing network maintenance activities. You should try to minimize the risk of disrupting the network when performing these operations in production environments and to know how to recover quickly when something does go wrong.



Note This publication uses the term upgrade to refer to both Cisco NX-OS upgrades and downgrades.

Upgrade and Reboot Checklist

Use the following checklist to prepare for an upgrade or reboot:

Checklist	Done
Read the Release Notes for the release to which you are upgrading or downgrading.	
Ensure that an FTP or TFTP server is available to download the software image.	
Copy the new image onto your supervisor modules in bootflash: or slot0:.	
Use the show install all impact command to verify that the new image is healthy and the impact that the new load will have on any hardware with regard to compatibility. Check for compatibility.	
Copy the startup-config file to a snapshot configuration in NVRAM. This step creates a backup copy of the startup configuration file.	

Checklist	Done
Save your running configuration to the startup configuration.	
Back up a copy of your configuration to a remote TFTP server.	
Schedule your upgrade during an appropriate maintenance window for your network.	

After you have completed the checklist, you are ready to upgrade or reboot the systems in your network.



Note It is normal for the active supervisor to become the standby supervisor during an upgrade.



Note Up to 100 log messages with a severity level of critical and below (levels 0, 1, and 2) are saved in NVRAM. You can view this log at any time by entering the **show logging nvram** command.

Verifying Software Upgrades

You can use the **show install all status** command to watch the progress of your software upgrade or to view the ongoing **install all** command or the log of the last installed **install all** command from a console, SSH, or Telnet session. This command shows the **install all** output on both the active and standby supervisor module even if you are not connected to the console terminal.

Troubleshooting Software Upgrades and Downgrades

Software Upgrade Ends with Error

Problem	Possible Cause	Solution
The upgrade ends with an error	The standby supervisor module bootflash: file system does not have sufficient space to accept the updated image.	Use the delete command to remove unnecessary files from the file system.
	The install all command is entered on the standby supervisor module.	Enter the command on the active supervisor module only.
	A module was inserted while the upgrade was in progress.	Restart the installation.
	The system experienced a power disruption while the upgrade was in progress.	Restart the installation.
	An incorrect software image path was specified.	Specify the entire path for the remote location accurately.
	Another upgrade is already in progress.	Verify the state of the system at every stage and restart the upgrade after 10 seconds. If you restart the upgrade within 10 seconds, the command is rejected. An error message displays, indicating that an upgrade is currently in progress.
	A module failed to upgrade.	Restart the upgrade or use the install module command to upgrade the failed module.

Upgrading the Cisco NX-OS Software

You can perform an automated software upgrade on any system from the CLI.

Before you begin

Log into the system through the console, Telnet, or SSH port of the active supervisor.

Create a backup of your existing configuration file, if required.

Procedure

	Command or Action	Purpose
Step 1	install all [nxos bootflash: <i>filename</i>]	Performs the upgrade.

	Command or Action	Purpose
		<p>Note If the configuration meets all guidelines when the install all command is used, all modules (supervisor and switching) are upgraded.</p> <p>Note If you enter the install all command without specifying a filename, the command performs a compatibility check, notifies you of the modules that will be upgraded, and confirms that you want to continue with the installation. If you choose to proceed, it installs the NXOS software image that is currently running on the switch and upgrades the BIOS of various modules from the running image if required.</p>
Step 2	show module	Exits the system console and opens a new terminal session to view the upgraded supervisor module.

Troubleshooting Software System Reboots

Power-On or Switch Reboot Hangs

Problem	Possible Cause	Solution
A power-on or switch reboot hangs for a dual supervisor configuration	The bootflash is corrupted.	See Corrupted Bootflash Recovery, on page 15 .
	The BIOS is corrupted.	Replace this module. Contact your customer support representative to return the failed module.
	The nx-os image is corrupted.	Power cycle the switch if required and press Ctrl-C when the switch displays the "Loading Boot Loader" message to interrupt the boot process at the >loader prompt.
	Boot parameters are incorrect.	Verify and correct the boot parameters and reboot.

Corrupted Bootflash Recovery

All device configurations reside in the internal bootflash. If you have a corrupted internal bootflash, you could potentially lose your configuration. Be sure to save and back up your configuration files periodically. The regular system boot goes through the following sequence:

1. The basic input/output system (BIOS) loads the loader.
2. The loader loads the nx-os image into RAM and starts the image.
3. The nx-os image reads the startup configuration file.

If the nx-os image on your system is corrupted and you cannot proceed (error state), you can interrupt the system boot sequence and recover the image by entering the BIOS configuration utility described in the following section. Access this utility only when needed to recover a corrupted internal disk.



Caution The BIOS changes explained in this section are required only to recover a corrupted bootflash.

Recovery procedures require the regular sequence to be interrupted. The internal sequence goes through three phases between the time that you turn on the system and the time that the system prompt appears on your terminal—BIOS, boot loader, and nx-os image. The following table describes the steps in the recovery interruption process.

Table 2: Recovery Interruption

Phase	Normal Prompt (appears at the end of each phase)	Recovery Prompt (appears when the system cannot progress to the next phase)	Description
BIOS	loader>	No bootable device	The BIOS begins the power-on self test, memory test, and other operating system applications. While the test is in progress, press Ctrl-C to enter the BIOS configuration utility and use the netboot option.
Boot loader	Starting nx-os	loader>	The boot loader uncompresses the loaded software to boot an image using its filename as a reference. The image is made available through bootflash. When the memory test is over, press Esc to enter the boot loader prompt.

Phase	Normal Prompt (appears at the end of each phase)	Recovery Prompt (appears when the system cannot progress to the next phase)	Description
nx-os image	Uncompressing system	switch(boot)#	<p>When the boot loader phase is over, press Ctrl-] (Control key plus right bracket key) to enter the switch(boot)# prompt. Depending on your Telnet client, these keys might be reserved, and you might need to remap the keystroke. See the documentation provided by your Telnet client. If the corruption causes the console to stop at this prompt, copy the nx-os image and reboot the system.</p> <p>The nx-os image then loads the configuration file of the last saved running configuration and returns a switch login prompt.</p>

Recovery from the loader> Prompt

Use the **help** command at the loader> prompt to display a list of commands available at this prompt or to obtain more information about a specific command in that list.

Before you begin

This procedure uses the **init system** command, which reformats the file system of the device. Be sure that you have made a backup of the configuration files before you begin this procedure.

The loader> prompt is different from the regular switch# or switch(boot)# prompt. The CLI command completion feature does not work at the loader> prompt and might result in undesired errors. You must type the command exactly as you want the command to appear.

If you boot over TFTP from the loader> prompt, you must supply the full path to the image on the remote server.

Procedure

	Command or Action	Purpose
Step 1	loader> set ip <i>ip-address</i> Example: loader> set ip 172.21.55.213 255.255.255.224	Specifies the local IP address and the subnet mask for the system.
Step 2	loader> set gw <i>gw-address</i> Example: loader> set gw 172.21.55.193	Specifies the IP address of the default gateway.
Step 3	loader> cmdline recoverymode=1 Example:	Configures the boot process to stop at the switch(boot)# prompt.

	Command or Action	Purpose
	loader> cmdline recoverymode=1	
Step 4	loader> boot tftp: <i>tftp-path</i> Example: loader> boot tftp://172.28.255.18/tftpboot/n9000-dk9.6.1.2.I1.1.bin	Boots the nx-os image file from the required server. The switch(boot)# prompt indicates that you have a usable nx-os image.
Step 5	switch(boot)# init system Example: switch(boot)# init system	Enters the nx-os system. Caution Be sure that you have made a backup of the configuration files before you enter this command.
Step 6	switch(boot)# reload-nxos Example: switch(boot)# reload-nxos	Completes the upload of the nx-os image file.

Example

This example shows how to configure the local IP address and the subnet mask for the system:

```

loader> set ip 172.21.55.213 255.255.255.224
set ip 172.21.55.213 255.255.255.224
Correct - ip addr is 172.21.55.213, mask is 255.255.255.224
Found Intel 82546GB [2:9.0] at 0xe040, ROM address 0xf980
Probing...[Intel 82546GB]
Management interface
Link UP in 1000/full mode
Ethernet addr: 00:1B:54:C1:28:60
Address: 172.21.55.213
Netmask: 255.255.255.224
Server: 0.0.0.0
Gateway: 172.21.55.193
    
```

This example shows how to configure the IP address of the default gateway:

```

loader> set gw 172.21.55.193
Correct gateway addr 172.21.55.193
Address: 172.21.55.213
Netmask: 255.255.255.224
Server: 0.0.0.0
Gateway: 172.21.55.193
    
```

This example shows how to boot the nx-os image from the server:

```

loader> boot tftp://172.28.255.18/tftpboot/n9000-dk9.6.1.2.I1.1.bin
Address: 172.21.55.213
Netmask: 255.255.255.224
Server: 172.28.255.18
Gateway: 172.21.55.193
    
```

```

Filesystem type is tftp, using whole disk
Booting: /tftpboot/n9000-dk9.6.1.2.I1.1.gbin console=ttyS0,9600n8nn quiet loader
_ver="3.17.0"....
.....Im
age verification OK

Starting kernel...
INIT: version 2.85 booting
Checking all filesystems..r.r.r.. done.
Setting kernel variables: sysctlnet.ipv4.ip_forward = 0
net.ipv4.ip_default_ttl = 64
net.ipv4.ip_no_pmtu_disc = 1
.
Setting the System Clock using the Hardware Clock as reference...System Clock set. Local
time: Wed Oct  1
11:20:11 PST 2013
WARNING: image sync is going to be disabled after a loader netboot
Loading system software
No system image Unexporting directories for NFS kernel daemon...done.
INIT: Sending processes the KILL signal
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
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such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php
switch(boot)#
    
```

System or Process Restarts

When a recoverable or nonrecoverable error occurs, the system or a process on the system might reset. This table lists possible causes and solutions.

Problem	Possible Cause	Solution
The system or a process on the system resets.	A recoverable error occurred on the system or on a process in the system.	The system has automatically recovered from the problem. See Recovering System Restarts, on page 19 .
	A nonrecoverable error occurred on the system.	The system cannot recover automatically from the problem. See Recovering System Restarts, on page 19 to determine the cause.
	A clock module failed.	Verify that a clock module failed. Replace the failed clock module during the next maintenance window.

Recovering System Restarts

Every process restart generates a syslog message and a Call Home event. Even if the event does not affect service, you should identify and resolve the condition immediately because future occurrences could cause a service interruption.



Note After following the steps, determine the cause and resolution for the restart condition by contacting your technical support representative and asking the representative to review your core dump.

Before you begin

The following conditions apply:

- The system automatically copies the core files to a TFTP server every 4 minutes. This time interval is not configurable.
- The copy of a specific core file to a TFTP server can be manually triggered by using the **copy core://module#/pid# tftp://tftp_ip_address/file_name** command.
- If a supervisor failover occurs, the cores might be in the secondary logflash rather than the primary logflash.
- The maximum number of times that a process can be restarted is part of the high-availability (HA) policy for any process. (This parameter is not configurable.) If the process restarts more than the maximum number of times, the older core files are overwritten.
- The maximum number of core files that can be saved for any process is part of the HA policy for any process. (This parameter is not configurable, and it is set to three.)

Procedure

	Command or Action	Purpose
Step 1	<p>switch# show log include error</p> <p>Example:</p> <pre>switch# show log logfile include error Sep 10 23:31:31 dot-6 % LOG_SYSMGR-3-SERVICE_TERMINATED: Service "sensor" (PID 704) has finished with error code SYSMGR_EXITCODE_SY. switch# show logging logfile include fail Jan 27 04:08:42 88 %LOG_DAEMON-3-SYSTEM_MSG: bind() fd 4, family 2, port 123, ad dr 0.0.0.0, in_classd=0 flags=1 fails: Address already in use Jan 27 04:08:42 88 %LOG_DAEMON-3-SYSTEM_MSG: bind() fd 4, family 2, port 123, ad dr 127.0.0.1, in_classd=0 flags=0 fails: Address already in use Jan 27 04:08:42 88 %LOG_DAEMON-3-SYSTEM_MSG: bind() fd 4,</pre>	Displays the syslog file so you can see which process restarted and why it restarted.

	Command or Action	Purpose
	<pre>family 2, port 123, ad dr 127.1.1.1, in_classd=0 flags=1 fails: Address already in use Jan 27 04:08:42 88 %LOG_DAEMON-3-SYSTEM_MSG: bind() fd 4, family 2, port 123, ad dr 172.22.93.88, in_classd=0 flags=1 fails: Address already in use Jan 27 23:18:59 88 % LOG_PORT-5-IF_DOWN: Interface fc1/13 is down (Link failure or not-connected) Jan 27 23:18:59 88 % LOG_PORT-5-IF_DOWN: Interface fc1/14 is down (Link failure or not-connected) Jan 28 00:55:12 88 % LOG_PORT-5-IF_DOWN: Interface fc1/1 is down (Link failure or not-connected) Jan 28 00:58:06 88 % LOG_ZONE-2-ZS_MERGE_FAILED: Zone merge failure, Isolating port fc1/1 (VSAN 100) Jan 28 00:58:44 88 % LOG_ZONE-2-ZS_MERGE_FAILED: Zone merge failure, Isolating port fc1/1 (VSAN 100) Jan 28 03:26:38 88 % LOG_ZONE-2-ZS_MERGE_FAILED: Zone merge failure, Isolating port fc1/1 (VSAN 100) Jan 29 19:01:34 88 % LOG_PORT-5-IF_DOWN: Interface fc1/1 is down (Link failure or not-connected) switch#</pre>	
Step 2	<pre>switch# show processes Example: switch# show processes PID State PC Start_cnt TTY Process ----- 1 S 2ab8e33e 1 - init 2 S 0 1 - keventd 3 S 0 1 - ksoftirqd_CPU0 4 S 0 1 - kswapd 5 S 0 1 - bdflush 6 S 0 1 - kupdated 71 S 0 1 - kjournald</pre>	<p>Displays the processes that are running and the status of each process.</p> <p>The following codes are used in the system output for the state (process state):</p> <ul style="list-style-type: none"> • D = uninterruptible sleep (usually I/O) • R = runnable (on run queue) • S = sleeping • T = traced or stopped • Z = defunct (zombie) process • NR = not running • ER = should be running but currently not running

	Command or Action	Purpose
	<pre> 136 S 0 1 - kjournald 140 S 0 1 - kjournald 431 S 2abe333e 1 - httpd 443 S 2abfd33e 1 - xinetd 446 S 2ac1e33e 1 - sysmgr 452 S 2abe91a2 1 - httpd 453 S 2abe91a2 1 - httpd 456 S 2ac73419 1 S0 vsh 469 S 2abe91a2 1 - httpd 470 S 2abe91a2 1 - httpd </pre>	<p>Note ER usually is the state that a process enters if it has been restarted too many times and has been detected as faulty by the system and disabled.</p>
Step 3	<p>switch# show process log</p> <p>Example:</p> <pre> switch# show process log Process PID Normal-exit Stack-trace Core Log-create-time ----- ----- ntp 919 N N N Jan 27 04:08 snsm 972 N Y N Jan 24 20:50 </pre>	<p>Displays the processes that have had abnormal exits and if there is a stack-trace or core dump.</p>
Step 4	<p>switch# show process log pid pid</p> <p>Example:</p> <pre> switch# show processes log pid 898 Service: idehsd Description: ide hotswap handler Daemon Started at Mon Sep 16 14:56:04 2013 (390923 us) Stopped at Thu Sep 19 14:18:42 2013 (639239 us) Uptime: 2 days 23 hours 22 minutes 22 seconds Start type: SRV_OPTION_RESTART_STATELESS (23) Death reason: SYSMGR_DEATH_REASON_FAILURE_SIGTERM (3) Exit code: signal 15 (no core) CWD: /var/sysmgr/work Virtual Memory: CODE 08048000 - 0804D660 DATA 0804E660 - 0804E824 BRK 0804E9A0 - 08050000 STACK 7FFFFFFD10 Register Set: EBX 00000003 ECX 0804E994 EDX 00000008 </pre>	<p>Displays detailed information about a specific process that has restarted.</p>

	Command or Action	Purpose
	<pre> ESI 00000005 EDI 7FFFFFFC9C EBP 7FFFFFFCAC EAX 00000008 XDS 0000002B XES 0000002B EAX 00000003 (orig) EIP 2ABF5EF4 XCS 00000023 EFL 00000246 ESP 7FFFFFFC5C XSS 0000002B Stack: 128 bytes. ESP 7FFFFFFC5C, TOP 7FFFFFFD10 0x7FFFFFFC5C: 0804F990 0804C416 00000003 0804E994 0x7FFFFFFC6C: 00000008 0804BF95 2AC451E0 2AC24A4Q.*.\$.* 0x7FFFFFFC7C: 7FFFFFFD14 2AC2C581 0804E6BC 7FFFFFFCA8*..... 0x7FFFFFFC8C: 7FFFFFFC94 00000003 00000001 00000003 0x7FFFFFFC9C: 00000001 00000000 00000068 00000000h..... 0x7FFFFFFCAC: 7FFFFFFCE8 2AB4F819 00000001 7FFFFFFD14*..... 0x7FFFFFFCBC: 7FFFFFFD1C 0804C470 00000000 7FFFFFFCE8p..... 0x7FFFFFFCCC: 2AB4F7E9 2AAC1F00 00000001 08048A2C ...*...*.....,.... PID: 898 SAP: 0 UUID: 0 switch# </pre>	
Step 5	<pre> switch# show system uptime Example: switch# show system uptime Start Time: Fri Sep 13 12:38:39 2013 Up Time: 0 days, 1 hours, 16 minutes, 22 seconds </pre>	<p>Displays if the restart recently occurred.</p> <p>To determine if the restart is repetitive or a one-time occurrence, compare the length of time that the system has been up with the timestamp of each restart.</p>
Step 6	<pre> switch# show cores Example: switch# show cores Module Instance Process-name PID Date(Year-Month-Day Time) ----- ----- 28 1 bgp-64551 5179 2013-09-13 23:51:26 </pre>	<p>Displays all cores that are presently available for upload from the active supervisor.</p>
Step 7	<pre> switch# copy core: core path Example: switch# copy core://5/1524 tftp://1.1.1.1/abcd </pre>	<p>Copies the FSPF core dump to a TFTP server with an IP address.</p>
Step 8	<pre> switch# show processes log pid pid Example: </pre>	<p>Displays the file named zone_server_log.889 in the log directory,</p>

Command or Action	Purpose
<pre> switch# '''show processes log pid 1473''' Service: ips Description: IPS Manager Started at Tue Jan 8 17:07:42 2013 (757583 us) Stopped at Thu Jan 10 06:16:45 2013 (83451 us) Uptime: 1 days 13 hours 9 minutes 9 seconds Start type: SRV_OPTION_RESTART_STATELESS (23) Death reason: SYSMGR_DEATH_REASON_FAILURE_SIGNAL (2) Exit code: signal 6 (core dumped) CWD: /var/sysmgr/work Virtual Memory: CODE 08048000 - 080FB060 DATA 080FC060 - 080FCBA8 BRK 081795C0 - 081EC000 STACK 7FFFFFF0 TOTAL 20952 KB Register Set: EBX 000005C1 ECX 00000006 EDX 2AD721E0 ESI 2AD701A8 EDI 08109308 EBP 7FFFFFF2EC EAX 00000000 XDS 0000002B XES 0000002B EAX 00000025 (orig) EIP 2AC8CC71 XCS 00000023 EFL 00000207 ESP 7FFFFFF2C0 XSS 0000002B Stack: 2608 bytes. ESP 7FFFFFF2C0, TOP 7FFFFFFCF0 0x7FFFFFF2C0: 2AC8C944 000005C1 00000006 2AC735E2 D..*.....5.* 0x7FFFFFF2D0: 2AC8C92C 2AD721E0 2AAB76F0 00000000 ,...*!.*.v.*.... 0x7FFFFFF2E0: 7FFFFFF320 2AC8C920 2AC513F8 7FFFFFF42C *....*,... 0x7FFFFFF2F0: 2AC8E0BB 00000006 7FFFFFF320 00000000 ...*..... </pre>	

	Command or Action	Purpose
	<pre> 0x7FFF300: 2AC8DFF8 2AD721E0 08109308 2AC65AFC ...*!.*.....Z.* 0x7FFF310: 00000393 2AC6A49C 2AC621CC 2AC513F8*!.*...* 0x7FFF320: 00000020 00000000 00000000 00000000 0x7FFF330: 00000000 00000000 00000000 00000000 0x7FFF340: 00000000 00000000 00000000 00000000 0x7FFF350: 00000000 00000000 00000000 00000000 0x7FFF360: 00000000 00000000 00000000 00000000 0x7FFF370: 00000000 00000000 00000000 00000000 0x7FFF380: 00000000 00000000 00000000 00000000 0x7FFF390: 00000000 00000000 00000000 00000000 0x7FFF3A0: 00000002 7FFF3F4 2AAB752D 2AC5154C output abbreviated ... Stack: 128 bytes. ESP 7FFF830, TOP 7FFFCD0 </pre>	
Step 9	<pre> switch# system cores tftp: tftp-path Example: switch(config)# system cores tftp://10.1.1.1/cores </pre>	<p>Configures the system to use TFTP to send the core dump to a TFTP server.</p> <p>This command causes the system to enable the automatic copy of core files to a TFTP server.</p>

Unrecoverable System Restarts

An unrecoverable system restart might occur in the following cases:

- A critical process fails and is not restartable.
- A process restarts more times than is allowed by the system configuration.
- A process restarts more frequently than is allowed by the system configuration.

The effect of a process reset is determined by the policy configured for each process. An unrecoverable reset might cause functionality loss, the active supervisor to restart, a supervisor switchover, or the system to restart.

The **show system reset-reason** command displays the following information:

- The last four reset-reason codes for a specific module in a given slot. If a module is absent, the reset-reason codes for that module are not displayed.
- The overall history of when and why expected and unexpected reloads occur.
- The time stamp of when the reset or reload occurred.
- The reason for the reset or reload of a module.
- The service that caused the reset or reload (not always available).

- The software version that was running at the time of the reset or reload.

```
switch# show system reset-reason module 27
----- reset reason for Supervisor-module 27 (from Supervisor in slot 27) -----
1) At 281000 usecs after Wed Jun 26 20:16:34 2013
   Reason: Reset Requested by CLI command reload
   Service:
   Version: 6.1(2)I1(1)
2) At 791071 usecs after Wed Jun 26 20:04:50 2013
   Reason: Reset Requested by CLI command reload
   Service:
   Version: 6.1(2)I1(1)
3) At 70980 usecs after Wed Jun 26 19:55:52 2013
   Reason: Reset Requested by CLI command reload
   Service:
   Version: 6.1(2)I1(1)
4) At 891463 usecs after Wed Jun 26 23:44:48 2013
   Reason: Reset Requested by CLI command reload
   Service:
   Version: 6.1(2)I1(1)
```

Standby Supervisor Fails to Boot

The standby supervisor does not boot after an upgrade. You may see the following system message:

```
SYSMGR-2-STANDBY_BOOT_FAILED
```

This message is printed if the standby supervisor does not complete its boot procedure (does not reach the login prompt on the local console) 3 to 6 minutes after the loader has been loaded by the BIOS. This message is usually caused by boot variables not properly set for the standby supervisor. This message can also be caused by a user intentionally interrupting the boot procedure at the loader prompt (by pressing ESC).

Connect to the local console of the standby supervisor. If the supervisor is at the loader prompt, try to use the **boot** command to continue the boot procedure. Otherwise, enter the **reload** command for the standby supervisor from a vsh session on the active supervisor, specifying the **force-dnld** option. Once the standby is online, fix the problem by setting the boot variables appropriately.

Symptom	Possible Cause	Solution
Standby supervisor does not boot.	Active supervisor nx-os image booted from TFTP.	Reload the active supervisor from bootflash:.

Recovering the Administrator Password

You can recover the network administrator password using one of these methods:

- From the CLI with a username that has network-admin privileges
- By power cycling the device
- By reloading the device

Using the CLI with Network-Admin Privileges to Recover the Administrator Password

Procedure

	Command or Action	Purpose
Step 1	<p>switch# show user-account</p> <p>Example:</p> <pre>switch# show user-account user:admin this user account has no expiry date roles:network-admin user:dbgusr this user account has no expiry date roles:network-admin network-operator</pre>	Shows that your username has network-admin privileges.
Step 2	<p>switch# config terminal</p> <p>Example:</p> <pre>switch# config terminal switch(config)#</pre>	Enters global configuration mode.
Step 3	<p>switch(config)# username admin password <i>new-password</i></p> <p>Example:</p> <pre>switch(config)# username admin password egBdf</pre>	<p>Assigns a new network administrator password if your username has network-admin privileges.</p> <p>Note The <i>new-password</i> does not allow the \$ character.</p>
Step 4	<p>switch(config)# copy running-config startup-config</p> <p>Example:</p> <pre>switch(config)# copy running-config startup-config</pre>	Copies the running configuration to the startup configuration.

Power Cycling the Device to Recover the Administrator Password

If you cannot start a session on the device that has network-admin privileges, you can recover the network administrator password by power cycling the device.



Caution The password recovery procedure disrupts all traffic on the device. All connections to the device will be lost for 2 to 3 minutes.



Note You cannot recover the administrator password from a Telnet or Secure Shell (SSH) session to the management interface. You must have access to the local console connection.



Note Password recovery updates the new administrator password only in the local user database and not on the remote AAA servers. The new password works only if local authentication is enabled; it does not work for remote authentication. When a password is recovered, local authentication is enabled for logins through a console so that the admin user can log in with a new password from a console.



Note If you need to recover the password because the username was not specified in the configuration file when you performed a **copy configuration-file startup-config** followed by the **fast-reload** or **reload** command, you will need to perform a **write erase** in Step 12 below.

Before you begin

On a device with two supervisor modules, you must perform the password recovery procedure on the supervisor module that will become the active module after you complete the recovery procedure. To ensure that the other supervisor module does not become active, perform one of the following tasks:

- Remove the other supervisor module from the chassis.
- Change the console prompt of the other supervisor module to one of the following two prompts until the recovery procedure completes:
 - loader >
 - switch(boot)#

Procedure

	Command or Action	Purpose
Step 1	Establish a terminal session on the console port of the active supervisor module.	— Note If you are using a non-U.S. keymap, the key sequence that you need to press to generate the break sequence might not work. In this case, we recommend that you set your terminal to a U.S. keymap. You can enter Ctrl-C instead of Ctrl-] (right square bracket) due to keyboard mapping.
Step 2	If you use SSH or a terminal emulator to access the console port, go to Step 6 .	—

	Command or Action	Purpose
Step 3	<p>If you use Telnet to access the console port, press Ctrl-] (right square bracket) to verify that it does not conflict with the Telnet escape sequence.</p> <p>Example:</p> <pre>switch login: Ctrl-]</pre>	<p>—</p> <p>Note If the Cisco NX-OS login prompt remains and the Telnet prompt does not appear, go to Step 6.</p>
Step 4	<p>If the Telnet prompt appears, change the Telnet escape sequence to a character sequence other than Ctrl-] (right square bracket).</p> <p>Example:</p> <pre>telnet> set escape ^\ Escape Character is 'CTRL+\'</pre>	<p>The example shows how to set Ctrl-\ as the escape key sequence in Microsoft Telnet.</p> <p>Note If the Cisco NX-OS login prompt remains and the Telnet prompt does not appear, go to Step 6.</p>
Step 5	<p>Press Enter one or more times to return to the Cisco NX-OS login prompt.</p> <p>Example:</p> <pre>telnet> <Enter> switch login:</pre>	<p>—</p>
Step 6	<p>Power cycle the device.</p>	<p>—</p>
Step 7	<p>Press Ctrl-C to access the loader> prompt.</p> <p>Example:</p> <pre>Ctrl-C loader></pre>	<p>—</p>
Step 8	<p>loader> cmdline recoverymode=1</p> <p>Example:</p> <pre>loader> cmdline recoverymode=1</pre>	<p>Enters recovery mode.</p>
Step 9	<p>loader> boot n9000-dk9.x.x.x.bin</p> <p>Example:</p> <pre>loader> boot n9000-dk9.x.x.x.bin Booting iash Trying diskboot Filesystem type is ext2fs, partition type 0x83 Image valid MD5Sum mismatch INIT: Loading IGB driver ... Signature Envelope.(36)Invalid Tag in Signature Envelope Installing SSE module ... done</pre>	<p>Restarts the device with the nx-os image to reach the switch(boot)# prompt.</p>

	Command or Action	Purpose
	<pre> Creating the sse device node ... done Installing CTRL driver for card_type 3 ... Checking all filesystems..... Installing SPROM driver ... Installing default sprom values ... done.Configuring network ... Installing psdev ... Installing veobc ... Installing OBFL driver ... Starting portmap daemon... creating NFS state directory: done starting 8 nfsd kernel threads: done starting mountd: done starting statd: done Loading system software No system image is specified INIT: Sending processes the TERM signal INIT: Sending processes the KILL signal Bad terminal type: "linux". Will assume vt100. Cisco Nexus Operating System (NX-OS) Software TAC support: http://www.cisco.com/tac Copyright (c) 2002-2013, Cisco Systems, Inc. All rights reserved. The copyrights to certain works contained in this software are owned by other third parties and used and distributed under license. Certain components of this software are licensed under the GNU General Public License (GPL) version 2.0 or the GNU Lesser General Public License (LGPL) Version 2.1. A copy of each such license is available at http://www.opensource.org/licenses/gpl-2.0.php and http://www.opensource.org/licenses/lgpl-2.1.php switch(boot) # </pre>	
Step 10	<p>Press Enter one or more times to return to the Cisco NX-OS login prompt.</p> <p>Example:</p> <pre>telnet> <Enter> switch login:</pre>	—
Step 11	<p>switch(boot)# config terminal</p> <p>Example:</p> <pre>switch(boot)# config terminal Enter configuration commands, one per</pre>	Enters boot configuration mode.

	Command or Action	Purpose
	<pre>line. End with CNTL/Z. switch(boot)(config)#</pre>	
Step 12	<p>switch(boot)(config)# admin-password new-password</p> <p>Example:</p> <pre>switch(boot)(config)# admin-password egBdf WARNING! Remote Authentication for login through console has been disabled</pre>	<p>Resets the network administrator password.</p> <p>Note If you are performing this password recovery procedure because the username was not specified in the configuration file when you performed a copy configuration-file startup-config followed by the fast-reload or reload command, skip this step, enter the write erase command instead, and then go to the next step.</p>
Step 13	<p>switch(boot)(config)# exit</p> <p>Example:</p> <pre>switch(boot)(config)# exit switch(boot)#</pre>	Exits boot configuration mode.
Step 14	<p>switch(boot)# load-nxos</p> <p>Example:</p> <pre>switch(boot)# load-nxos</pre>	Loads the nx-os image. You must enter the load-nxos command exactly as shown. Do not enter the image filename with this command.
Step 15	<p>Log into the device using the new administrator password.</p> <p>Example:</p> <pre>switch login: admin Password: egBdf</pre>	<p>The running configuration indicates that local authentication is enabled for logins through a console. You should not change the running configuration in order for the new password to work for future logins. You can enable remote authentication after you reset and remember the administrator password that is configured on the AAA servers.</p> <pre>switch# show running-config aaa !Command: show running-config aaa !Time: Fri Jun 7 02:39:23 2013 version 6.1(2)I1(1) logging level aaa 5 aaa authentication login ascii-authentication</pre>
Step 16	<p>switch# config terminal</p> <p>Example:</p> <pre>switch# config terminal switch(config)#</pre>	Enters global configuration mode.

	Command or Action	Purpose
Step 17	<p>switch(config)# username admin password new-password</p> <p>Example:</p> <pre>switch(config)# username admin password egBdf</pre>	Resets the new password to ensure that it is also the Simple Network Management Protocol (SNMP) password.
Step 18	<p>switch(config)# exit</p> <p>Example:</p> <pre>switch(config)# exit switch#</pre>	Exits global configuration mode.
Step 19	Insert the previously removed standby supervisor module into the chassis, if necessary.	—
Step 20	Boot the nx-os image on the standby supervisor module, if necessary.	—
Step 21	<p>switch(config)# copy running-config startup-config</p> <p>Example:</p> <pre>switch(config)# copy running-config startup-config</pre>	Copies the running configuration to the startup configuration.

Reloading the Device to Recover the Administrator Password

You can reset the network administrator password by reloading the device.



Caution This procedure disrupts all traffic on the device. All connections to the device will be lost for 2 to 3 minutes.



Note You cannot recover the administrator password from a Telnet or Secure Shell (SSH) session to the management interface. You must have access to the local console connection.



Note Password recovery updates the new administrator password only in the local user database and not on the remote AAA servers. The new password works only if local authentication is enabled; it does not work for remote authentication. When a password is recovered, local authentication is enabled for logins through a console so that the admin user can log in with a new password from a console.

Procedure

	Command or Action	Purpose
Step 1	Establish a terminal session on the console port of the active supervisor module.	—
Step 2	<p>switch# reload</p> <p>Example:</p> <pre>switch# reload This command will reboot the system. (y/n)? [n] Y 2013 Jun 7 13:09:56 switch %\$ VDC-1 %\$ %PLATFORM-2-PFM_SYSTEM_RESET: Manual system restart from Command Line Interface writing reset reason 9, GNU GRUB version 0.97 Autobooting bootflash:/n9000-dk9.x.x.x.bin bootflash:/n... Filesystem type is ext2fs, partition type 0x83 Booting nx-os image: bootflash:/n9000-dk9.x.x.x.bin....(----> Press Ctrl + C) ...Aborting Image Boot GNU GRUB version 0.97 Loader Version 3.22.0 loader></pre>	<p>Reloads the device to reach the loader prompt. You need to press Ctrl-C when the following appears:</p> <pre>Booting nx-os image: bootflash:/n9000-dk9.x.x.x.bin....</pre>
Step 3	<p>loader> boot n9000-dk9.x.x.x.bin</p> <p>Example:</p> <pre>loader> boot n9000-dk9.x.x.x.bin Filesystem type is ext2fs, partition type 0x83 Booting nx-os image: n9000-dk9.6.1.2.I1.1.gbin....Image verification OK Lesser General Public License (LGPL) Version 2.1. A copy of each such license is available at http://www.opensource.org/licenses/gpl-2.0.php and http://www.opensource.org/licenses/lgpl-2.1.php switch(boot) #</pre>	<p>Restarts the device with only the nx-os image to reach the switch boot prompt.</p>
Step 4	Reset the network administrator password by following Steps 6 through 20 in Power Cycling the Device to Recover the Administrator Password , on page 26.	—

Changing the Administrator Password

You must be logged in as admin to change the network administrator password.

Guidelines and Limitations for Changing the Administrator Password

Follow these guidelines and limitations to change an administrator password:

- You must be an admin to enable or disable the CLI command, no service password-recovery.
- You must be logged in as admin to change the admin password.
- You cannot change the admin password from a boot prompt if the CLI was disabled by the admin on a previous boot.



Note If you are not logged in as admin, you see an error.



CHAPTER 4

Troubleshooting Licensing Issues

- [About Troubleshooting Licensing Issues](#) , on page 35
- [Guidelines and Limitations for Licensing](#), on page 35
- [Initial Troubleshooting Checklist for Licensing](#), on page 36
- [Displaying License Information Using the CLI](#), on page 36
- [Licensing Installation Issues](#), on page 37

About Troubleshooting Licensing Issues

Cisco NX-OS requires licenses for select features. The licenses enable those features on your system. You must purchase a license for each system on which you want to enable the licensed features.

Chassis Serial Numbers

Licenses are created using the serial number of the chassis where the license file is to be installed. Once you order a license based on a chassis serial number, you cannot use this license on any other system.

Swapping out a Chassis

If you swap out a chassis which included licenses, you must contact TAC to generate a new license. The old license was based on the chassis serial number and will not work with the new chassis.

Guidelines and Limitations for Licensing

Follow these guidelines when dealing with licenses for Cisco NX-OS:

- Carefully determine the license(s) that you require based on the features that require a license.
- Order your license accurately, as follows:
 - Enter the Product Authorization Key that appears in the Proof of Purchase document that comes with your system.
 - Enter the correct chassis serial number when ordering the license. The serial number must be for the same chassis on which you plan to install the license. Use the **show license host-id** command to obtain your chassis serial number.
 - Enter serial numbers accurately. Do not use the letter "O" instead of a zero in the serial number.

- Order the license that is specific to your chassis.
- Back up the license file to a remote, secure place. Archiving your license files ensures that you will not lose the licenses in the case of a failure on your system.
- Install the correct licenses on each system, using the licenses that were ordered using that system's serial number. Licenses are serial-number specific and platform specific.
- Use the **show license usage** command to verify the license installation.
- Never modify a license file or attempt to use it on a system for which it was not ordered. If you return a chassis, contact your customer support representative to order a replacement license for the new chassis.

Initial Troubleshooting Checklist for Licensing

Begin troubleshooting license issues by checking the following issues first:

Checklist	Done
Verify the chassis serial number for all licenses ordered.	
Verify the platform or module type for all licenses ordered.	
Verify that the Product Authorization Key that you used to order the licenses comes from the same chassis from which you retrieved the chassis serial number.	
Verify that you have installed all licenses on all systems that require the licenses for the features you enable.	

Displaying License Information Using the CLI

Procedure

	Command or Action	Purpose
Step 1	show license [host-id usage [<i>package</i>]] Example: <pre>switch# show license usage LAN_ENTERPRISE_SERVICES_PKG</pre>	Displays license information configured on this system. Use the host-id keyword to display the host ID for the license. Use the usage keyword to display a list of all licensed features or a list of features in a specified package.

Example

This example displays all installed license key files and contents:

```
switch# show license
entp.lic:
SERVER this_host ANY
VENDOR cisco
INCREMENT LAN_ENTERPRISE_SERVICES_PKG cisco 1.0 permanent uncounted \
    VENDOR_STRING=<LIC_SOURCE>MDS_SWIFT</LIC_SOURCE><SKU>N95-LAN1K9=</SKU> \
```

```
HOSTID=VDH=TBC10412106 \ >
NOTICE="<LicFileID>20071025133322456</LicFileID>LicLineID>1/LicLineID>
```

This example displays information about current license usage:

```
switch# show license usage
Feature          Ins   Lic   Status   Expiry Date Comments          Count
-----
LAN_ENTERPRISE_SERVICES_PKG  No    -    In use
```

This example displays a list of features in a specified package:

```
switch# show license usage LAN_ENTERPRISE_SERVICES_PKG
Application
-----
bgp
pim
msdp
ospf
ospfv3
-----
```

This example displays the host ID for the license:

```
switch# show license host-id
License hostid: VDH=FOX0646S017
```



Note Use the entire ID that appears after the colon (:). The VHD is the Vendor Host ID.

Licensing Installation Issues

Serial Number Issues

Make sure that you use the correct chassis serial number when ordering your license. Use the **show license host-id** command to obtain the correct chassis serial number for your system using the CLI.

If you use a license meant for another chassis, you might see the following system message:

Error Message: LICMGR-3-LOG_LIC_INVALID_HOSTID: Invalid license hostid VDH=[chars] for feature [chars].

Explanation: The feature has a license with an invalid license Host ID. This can happen if a supervisor module with licensed features for one system is installed on another system.

Recommended Action: Reinstall the correct license for the chassis where the supervisor module is installed.



Note When entering the chassis serial number during the license ordering process, do not use the letter "O" instead of any zeros in the serial number.

RMA Chassis Errors or License Transfers Between Systems

A license is specific to the system for which it is issued and is not valid on any other system. If you need to transfer a license from one system to another, contact your technical support representative.

License Listed as Missing

After a license is installed and operating properly, it might show up as missing if you modify your system hardware or encounter a bootflash: issue.

Symptom	Possible Causes	Solutions
A license is listed as missing.	The supervisor module was replaced after the license was installed.	See Corrupted Bootflash Recovery , on page 15 to recover from the corrupted bootflash:. Reinstall the license.
	The supervisor bootflash: is corrupted.	



CHAPTER 5

Troubleshooting Ports

- [About Troubleshooting Ports, on page 39](#)
- [Guidelines and Limitations for Troubleshooting Ports, on page 39](#)
- [Initial Port Troubleshooting Checklist, on page 40](#)
- [Viewing Port Information, on page 40](#)
- [Troubleshooting Port Statistics from the CLI, on page 41](#)
- [Troubleshooting Port-Interface Issues, on page 41](#)

About Troubleshooting Ports

Before a device can relay frames from one data link to another, the characteristics of the interfaces through which the frames are received and sent must be defined. The configured interfaces can be Ethernet interfaces, VLAN interfaces (SVIs), or the management interface (mgmt0).

Each interface has an associated administrative configuration and operational status as follows:

- The administrative configuration does not change unless you modify it. This configuration has various attributes that you can configure in administrative mode.
- The operational status represents the current status of a specified attribute such as the interface speed. This status cannot be changed and is read-only. Some values may not be valid when the interface is down (such as the operation speed).

For a complete description of port modes, administrative states, and operational states, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide*.

Guidelines and Limitations for Troubleshooting Ports

Follow these guidelines when you configure a port interface:

- Before you begin configuring a device, make sure that the modules in the chassis are functioning as designed. Use the **show module** command to verify that a module is OK or active before continuing the configuration.
- When configuring dedicated ports in a port group, follow these port mode guidelines:
 - You can configure only the one port in each four-port group in dedicated mode. The other three ports are not usable and remain shut down.

- If any of the other three ports are enabled, you cannot configure the remaining port in dedicated mode. The other three ports continue to remain enabled.
- There are no licensing requirements for port configuration in Cisco NX-OS.

Initial Port Troubleshooting Checklist

Begin troubleshooting the port configuration by checking the following issues:

Checklist	Done
Check the physical media to ensure that there are no damaged parts.	
Verify that the SFP (small form-factor pluggable) devices in use are those authorized by Cisco and that they are not faulty.	
Verify that you have enabled the port by using the no shutdown command.	
Use the show interface command to verify the state of the interface. See the <i>Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide</i> for reasons why a port might be in a down operational state.	
Verify that you have configured a port as dedicated and make sure that you have not connected to the other three ports in the port group.	

Viewing Port Information

You can use the **show interface counters** command to view port counters. Typically, you only observe counters while actively troubleshooting, in which case you should first clear the counters to create a baseline. The values, even if they are high for certain counters, can be meaningless for a port that has been active for an extended period. Clearing the counters provides a better idea of the link behavior as you begin to troubleshoot.

Use one of the following commands to clear all port counters or the counters for specified interfaces:

- **clear counters interface all**
- **clear counters interface *range***

The counters can identify synchronization problems by displaying a significant disparity between received and transmitted frames.

Use the following commands to gather more information about ports:

- **show interface status**
- **show interface capabilities**
- **show udd**
- **show tech-support udd**

Troubleshooting Port Statistics from the CLI

To display complete information for an interface, use the **show interface** command. In addition to the state of the port, this command displays the following:

- Speed
- Trunk VLAN status
- Number of frames sent and received
- Transmission errors, including discards, errors, and invalid frames

```
switch# show interface ethernet 2/45
Ethernet2/45 is down (Administratively down)
  Hardware is 10/100/1000 Ethernet, address is 0019.076c.4dd8 (bia 0019.076c.4dd8)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA
  auto-duplex, auto-speed
  Beacon is turned off
  Auto-Negotiation is turned on
  Input flow-control is off, output flow-control is off
  Auto-mdix is turned on
  Last clearing of "show interface" counters never
  1 minute input rate 0 bytes/sec, 0 packets/sec
  1 minute output rate 0 bytes/sec, 0 packets/sec
  L3 Switched:
    input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
  Rx
    0 input packets 0 unicast packets 0 multicast packets
    0 broadcast packets 0 jumbo packets 0 storm suppression packets
    0 bytes
  Tx
    0 output packets 0 multicast packets
    0 broadcast packets 0 jumbo packets
    0 bytes
    0 input error 0 short frame 0 watchdog
    0 no buffer 0 runt 0 CRC 0 ecc
    0 overrun 0 underrun 0 ignored 0 bad etype drop
    0 bad proto drop 0 if down drop 0 input with dribble
    0 output error 0 collision 0 deferred
    0 late collision 0 lost carrier 0 no carrier
    0 babble
    0 Rx pause 0 Tx pause 0 reset
  Receive data field Size is 2112
```

Troubleshooting Port-Interface Issues

The Interface Configuration Has Disappeared

You may have a problem where your interface configuration disappears.

Symptoms	Possible Cause	Solution
The interface configuration has disappeared.	The interface mode has changed to or from the switchport mode.	Cisco NX-OS removes the interface configuration when you switch between Layer 2 and Layer 3 port mode. You must reconfigure the interface.

You Cannot Enable an Interface

You might have a problem when enabling an interface.

Problem	Possible Cause	Solution
You cannot enable an interface.	The interface is part of a dedicated port group.	You cannot enable the other three ports in a port group if one port is dedicated. Use the show running-config interface CLI command to verify the rate mode setting.
	The interface configuration is incompatible with a remote port.	Use the show interface capabilities command on both ports to determine if both ports have the same capabilities. Modify the configuration as needed to make the ports compatible.
	The Layer 2 port is not associated with an access VLAN, or the VLAN is suspended.	Use the show interface brief command to see if the interface is configured in a VLAN. Use the show vlan brief command to determine the status of the VLAN. Use the state active command in VLAN configuration mode to configure the VLAN as active.
	An incorrect SFP is connected to the port.	Use the show interface brief command to see if you are using an incorrect transceiver. Replace with a Cisco-supported SFP.

You Cannot Configure a Dedicated Port

You may have a problem when trying to configure a port as dedicated.

Problem	Possible Cause	Solution
You cannot configure a dedicated port.	The other three ports in the port group are not shut down.	Use the shutdown command in interface configuration mode to disable the other three ports in the port group.
	The port is not the first port in the port group.	You can set only the first port in a port group to the dedicated mode.

A Port Remains in a Link Failure or Not Connected State

You may have a problem with ports or links becoming operational.

Problem	Possible Cause	Solution
A port remains in a link-failure state.	The port connection is bad.	Verify the type of media in use. Is it optical, single-mode (SM), or multimode (MM)? Use the shutdown command followed by the no shutdown command to disable and enable the port. If this problem persists, try moving the connection to a different port on the same or another module.
	There is no signal because of a transit fault in the small form-factor pluggable (SFP), or the SFP may be faulty.	When this problem occurs, the port stays in a transit port state and you see no signal. There is no synchronization at the MAC level. The problem might be related to the port speed setting or autonegotiation. Verify that the SFP on the interface is seated properly. If reseating the SFP does not resolve the issue, replace the SFP or try another port on the switch.
	The link is stuck in the initialization state, or the link is in a point-to-point state.	Use the show logging command to check for a "Link Failure, Not Connected system" message. Use the shutdown command followed by the no shutdown command to disable and enable the port. If this problem persists, try moving the connection to a different port on the same or another module.

An Unexpected Link Flapping Occurs

When a port is flapping, it cycles through the following states, in this order, and then starts over again:

1. Initializing—The link is initializing.
2. Offline—The port is offline.
3. Link failure or not connected—The physical layer is not operational, and there is no active device connection.

When you are troubleshooting an unexpected link flapping, you should know the following information:

- Who initiated the link flap.
- The actual link down reason.

Problem	Possible Cause	Solution
An unexpected link flapping occurs.	The bit rate exceeds the threshold and puts the port into the errDisabled state.	Use the shutdown command followed by the no shutdown command to return the port to the normal state.
	A problem in the system triggers the link flap action by the end device. Some of the causes are as follows: <ul style="list-style-type: none"> • A packet drop in the device occurs because of either a hardware failure or an intermittent hardware error such as an X-bar sync loss. • A packet drop results from a software error. • A control frame is erroneously sent to the device. 	Determine the link flap reason as indicated by the MAC driver. Use the debug facilities on the end device to troubleshoot the problem. An external device might choose to reinitialize the link when it encounters the error. In such cases, the method of reinitializing the link varies by device.

A Port Is in the ErrDisabled State

The ErrDisabled state indicates that the switch detected a problem with the port and disabled the port. This state could be caused by a flapping port which could indicate a problem with the media.

Problem	Possible Cause	Solution
A port is in the ErrDisabled state.	The port is flapping.	See Verifying the ErrDisable State Using the CLI, on page 44 to verify the SFP, cable, and connections.

Verifying the ErrDisable State Using the CLI

Procedure

	Command or Action	Purpose
Step 1	switch# show interface <i>interface slot/port</i> Example: switch# show interface ethernet 1/14 e1/7 is down (errDisabled)	Verifies that the device detected a problem and disabled the port. Note After verifying the port is disabled, check cables, SFPs, and optics.
Step 2	switch# show logging logfile Example: switch# show logging logfile	Displays the switch log file and view a list of port state changes.

Example

This example shows how to display the switch log file and view a list of port state changes. An error was recorded when someone attempted to add port e1/7 to port channel 7. The port was not configured identically to port channel 7, so the attempt failed:

```
switch# show logging logfile
. . .
Jan  4 06:54:04 switch %PORT_CHANNEL-5-CREATED: port-channel 7 created
Jan  4 06:54:24 switch %PORT-5-IF_DOWN_PORT_CHANNEL_MEMBERS_DOWN: Interface
port-channel 7 is down (No operational members)
Jan  4 06:54:40 switch %PORT_CHANNEL-5-PORT_ADDED: e1/8 added to port-channel 7
Jan  4 06:54:56 switch %PORT-5-IF_DOWN_ADMIN_DOWN: Interface e1/7 is down
(Administratively down)
Jan  4 06:54:59 switch %PORT_CHANNEL-3-COMPAT_CHECK_FAILURE:
speed is not compatible
Jan  4 06:55:56 switch%PORT_CHANNEL-5-PORT_ADDED: e1/7 added to port-channel 7
```




CHAPTER 6

Troubleshooting vPCs

- [About Troubleshooting vPCs, on page 47](#)
- [Initial Troubleshooting vPCs Checklist, on page 47](#)
- [Verifying vPCs Using the CLI, on page 48](#)
- [Received Type 1 Configuration Element Mismatch, on page 49](#)
- [Cannot Enable the vPC Feature, on page 50](#)
- [vPCs in Blocking State, on page 50](#)
- [VLANs on a vPC Moved to Suspend State, on page 50](#)
- [Hosts with an HSRP Gateway Cannot Access Beyond Their VLAN, on page 51](#)

About Troubleshooting vPCs

A vPC allows links that are physically connected to two different devices to appear as a single port channel by a third device.

Initial Troubleshooting vPCs Checklist

Begin troubleshooting vPC issues by checking the following issues first:

Checklist	Done
Is the vPC keepalive link mapped to a separate VRF? If not, it will be mapped to the management VRF by default. In this case, do you have a management switch connected to the management ports on both vPC peer devices?	
Verify that both the source and destination IP addresses used for the peer-keepalive messages are reachable from the VRF associated with the vPC peer-keepalive link.	
Verify that the peer-keepalive link is up. Otherwise, the vPC peer link will not come up.	
Verify that the vPC peer link is configured as a Layer 2 port channel trunk that allows only vPC VLANs.	
Verify that the vPC number that you assigned to the port channel that connects to the downstream device from the vPC peer device is identical on both vPC peer devices.	
If you manually configured the system priority, verify that you assigned the same priority value on both vPC peer devices.	

Checklist	Done
Check the show vpc consistency-parameters command to verify that both vPC peer devices have identical type-1 parameters.	
Verify that the primary vPC is the primary STP root and the secondary vPC is the secondary STP root.	

Verifying vPCs Using the CLI

To verify vPCs using the CLI, perform one of these tasks:

Command	Purpose
show running-config vpc	Verifies the vPC configuration.
show vpc	Checks the status of the vPCs.
show vpc peer-keepalive	Checks the status of the vPC peer-keepalive link.
show vpc consistency-parameters	Verifies that the vPC peers have the identical type-1 parameters.
show tech-support vpc	Displays detailed technical support information for vPCs.
show port-channel summary	Verifies that the members in the port channel are mapped to the vPC.
show spanning-tree	Verifies that the following STP parameters are identical when STP is enabled: <ul style="list-style-type: none"> • BPDU filter • BPDU guard • Cost • Link type • Priority • VLANs (PVRST+)

The following example shows sample output for the **show vpc** command:

Legend:

(*) - local vPC is down, forwarding via vPC peer-link

```
vPC domain id           : 1
Peer status             : peer link is down

vPC keep-alive status   : Suspended (Destination IP not reachable)
Configuration consistency status : failed
Per-vlan consistency status : success

Configuration inconsistency reason: Consistency Check Not Performed
Type-2 inconsistency reason   : Consistency Check Not Performed
vPC role                  : none established
```

```

Number of vPCs configured      : 2
Peer Gateway                   : Enabled
Dual-active excluded VLANs    : -
Graceful Consistency Check    : Disabled (due to peer configuration)
Auto-recovery status          : Disabled
    
```

vPC Peer-link status

```

-----
id   Port   Status Active vlans
--   -
1    Po10   down   -
    
```

vPC status

```

-----
id   Port   Status Consistency Reason           Active vlans
--   -
2    Po20   down   failed   Peer-link is down         -
50   Po50   down   failed   Peer-link is down         -
    
```

Received Type 1 Configuration Element Mismatch

You might have a problem where you cannot bring up a vPC link because of a type 1 configuration element mismatch.

Symptom	Possible Cause	Solution
Received a type 1 configuration element mismatch.	The vPC peer ports or membership ports do not have identical configurations.	Use the show vpc consistency-parameters interface command to determine where the configuration mismatch occurs.

This example shows how to display the vPC consistency parameters on a port channel:

```

switch# show vpc consistency-parameters interface po 10
Legend:
Type 1 : vPC will be suspended in case of mismatch
Name                                     Type Local Value Peer Value
-----
STP Mode                                1 Rapid-PVST Rapid-PVST
STP Disabled                             1 None None
STP MST Region Name                      1 "" ""
STP MST Region Revision                  1 0 0
STP MST Region Instance to
VLAN Mapping
STP Loopguard                            1 Disabled Disabled
STP Bridge Assurance                      1 Enabled Enabled
STP Port Type                             1 Normal Normal
STP MST Simulate PVST                    1 Enabled Enabled
Allowed VLANs                             - 1-10,15-20,30,37,99 1-10,15-20,30,37,99
    
```

Cannot Enable the vPC Feature

You might receive an error when you enable the vPC feature.

Symptom	Possible Cause	Solution
Cannot enable the vPC feature.	The hardware is incompatible with the vPC.	Use the show module command to determine the hardware version of each Ethernet module.

This example shows how to display the module hardware version:

```
switch# show module
Mod Ports Module-Type           Model           Status
-----
22   0   Fabric Module                 N9K-C9508-FM   ok
24   0   Fabric Module                 N9K-C9508-FM   ok
26   0   Fabric Module                 N9K-C9508-FM   ok
27   0   Supervisor Module            N9K-SUP-A      active *
29   0   System Controller            N9K-SC-A       active
30   0   System Controller            N9K-SC-A       standby

Mod Sw           Hw
-----
22  6.1(2)I1(1)    0.4040
24  6.1(2)I1(1)    0.4040
26  6.1(2)I1(1)    0.4040
27  6.1(2)I1(1)    0.4080
29  6.1(2)I1(1)    0.2170
30  6.1(2)I1(1)    0.2170
```

vPCs in Blocking State

vPCs might be in the blocking state because of bridge assurance (BA).

Symptom	Possible Cause	Solution
vPC is in blocking state.	BPDU only sends on a single link of a port channel. If a BA dispute is detected, the entire vPC will be in the blocking state.	Do not enable BA on the vPC.

VLANs on a vPC Moved to Suspend State

VLANs on a vPC might move to the suspend state.

Symptom	Possible Cause	Solution
VLANs on a vPC are moved to the suspend state.	VLANs allowed on the vPC have not been allowed on the vPC peer link.	All VLANs allowed on a vPC must also be allowed on the vPC peer link. Also, we recommend that only vPC VLANs are allowed on the vPC peer link.

Hosts with an HSRP Gateway Cannot Access Beyond Their VLAN

When HSRP is enabled on both vPC peer devices on a VLAN and hosts on that VLAN set the HSRP as their gateway, they might not be able to reach anything outside their own VLAN.

Symptom	Possible Cause	Solution
Hosts with an HSRP gateway cannot access beyond their VLAN.	If the host gateway MAC address is mapped to the physical MAC address of any one of the vPC peer devices, packets might get dropped due to the loop prevention mechanism in the vPC.	Map the host gateway's MAC address to the HSRP MAC address and not the physical MAC address of any one of the vPC peer devices. The peer gateway can be a workaround for this scenario. Read the configuration guide for more information about the peer gateway before you implement it.



CHAPTER 7

Troubleshooting VLANs

- [About Troubleshooting VLANs, on page 53](#)
- [Guidelines and Limitations for Troubleshooting VLANs, on page 53](#)
- [Initial Troubleshooting VLANs Checklist, on page 54](#)
- [Troubleshooting VLAN Issues, on page 55](#)

About Troubleshooting VLANs

VLANs provide a method of isolating devices that are physically connected to the same network but are logically considered to be part of different LANs that do not need to be aware of one another.

You should use only the following characters in a VLAN name:

- a through z or A through Z
- 0 through 9
- - (hyphen) or _ (underscore)

Guidelines and Limitations for Troubleshooting VLANs

Follow these guidelines when configuring VLANs:

- Keep user traffic off the management VLAN; keep the management VLAN separate from user data.
- You can apply different quality of service (QoS) configurations to primary, isolated, and community VLANs.
- VACLs that apply to the Layer 3 VLAN interface of a primary VLAN automatically apply to the associated isolated and community VLANs.
- If you do not map the secondary VLAN to the Layer 3 VLAN interface of the primary VLAN, you can have different VACLs for primary and secondary VLANs.
- IGMP runs only on the primary VLAN and uses the configuration of the primary VLAN for all secondary VLANs.
- Any IGMP join request in the secondary VLAN is treated as if it is received in the primary VLAN.

- A destination SPAN port cannot be an isolated port. (However, a source SPAN port can be an isolated port.)
- You can configure SPAN to span both primary and secondary VLANs or, alternatively, to span either one if you are interested only in ingress or egress traffic.
- A MAC address learned in a secondary VLAN is placed in the shared table of the primary VLAN. When the secondary VLAN is associated to the primary VLAN, its MAC address tables are merged into one shared MAC table.
- You can configure a private VLAN (PVLAN) port as a SPAN source port.
- A PVLAN host or promiscuous port cannot be a SPAN destination port.
- TFTP download to Cisco Nexus 9000 Series switches is not supported when the transfer is done when you are using In-band Management, for example, VLAN SVI that is in default or custom VRF. The TFTP transfer times out and fails. CoPP for TFTP traffic only matches the TFTP connections on the ports and it does not match the concurrent data transfers that are on the dynamic ports. All the other TFTP traffic after an initial connection is placed in default class and it is dropped.

Possible workarounds for the download are:

- Use the management port for TFTP as the management VRF does not participate in CoPP.
- Use FTP or another file transfer protocol to transfer the files. (It is sorted into the management class of CoPP and it is not sorted in the default class.)
- Edit the CoPP policy to accommodate the TFTP traffic from the TFTP server that is to be grouped into another CoPP class as displayed in the following example:

1. Create an ACL permitting only TFTP server address:

```
switch# show ip access-lists copp_udp
IP access list copp_udp
    10 permit udp x.x.x.x/32 any <-- TFTP server address
```

2. Copy the CoPP policy and apply the ACL in the management class:

```
switch(config)# copp copy profile strict suffix udp-customized
switch(config)# class-map type control-plane match-any
copp-class-management-udp-customized
switch(config-cmap)# match access-group name copp_udp
```

3. Apply the new CoPP policy to the Cisco Nexus 9000 Series switch:

```
switch(config)# control-plane
switch(config-cp)# service-policy input copp-policy-strict-udp-customized
```

4. Verify that your applied CoPP policy contains the ACL in the management class:

```
switch(config-cp)# show policy-map interface control-plane | b tftp prev 10
```

Initial Troubleshooting VLANs Checklist

Troubleshooting a VLAN problem involves gathering information about the configuration and connectivity of individual devices and the entire network. Begin your troubleshooting VLAN issues by checking the following issues first:

Checklist	Done
Verify the physical connectivity for any problem ports or VLANs.	
Verify that you have both end devices in the same VLAN.	

The following CLI commands are used to display VLAN information:

- **show vlan *vlan-id***
- **show vlan all-ports**
- **show tech-support vlan**
- **show vlan private-vlan [*type*]**
- **show interface vlan *vlan-id* private-vlan mapping**

Troubleshooting VLAN Issues

You Cannot Create a VLAN

You may have a problem when creating a VLAN.

Symptom	Possible Cause	Solution
You cannot create a VLAN	You are using a reserved VLAN ID.	VLANs 3968 to 4047 and 4094 are reserved for internal use; you cannot change or use these reserved VLANs.

You Cannot Create a PVLAN

You may experience issues when creating a private VLAN (PVLAN).

Symptom	Possible Cause	Solution
You cannot create a PVLAN.	The PVLAN feature is not enabled.	Use the feature private-vlan command to enable the PVLAN feature.

The VLAN Interface is Down

You might have a problem when configuring VLAN interfaces.

Symptom	Possible Cause	Solution
The VLAN interface is down.	The VLAN does not exist.	Use the show vlan command to determine if the VLAN exists. Use the vlan command to create the VLAN.
	The interface is in the wrong VRF.	Use the show vrf interface command to determine the interface to which the VLAN interface is assigned.



CHAPTER 8

Troubleshooting STP

- [About Troubleshooting STP, on page 57](#)
- [Initial Troubleshooting STP Checklist, on page 57](#)
- [Troubleshooting STP Data Loops, on page 58](#)
- [Troubleshooting Excessive Packet Flooding, on page 61](#)
- [Troubleshooting Convergence Time Issues, on page 62](#)
- [Securing the Network Against Forwarding Loops, on page 62](#)

About Troubleshooting STP

STP provides a loop-free network at the Layer 2 level. Layer 2 LAN ports send and receive STP frames at regular intervals. Network devices do not forward these frames but use the frames to construct a loop-free path. For more information on Layer 2, see the *Cisco Nexus 9000 Series Layer 2 Configuration Guide*.

Initial Troubleshooting STP Checklist

Troubleshooting an STP problem involves gathering information about the configuration and connectivity of individual devices and the entire network.

Begin troubleshooting STP issues by checking the following issues first:

Checklist	Done
Verify the type of spanning tree configured on your device.	
Verify the network topology including all interconnected ports and switches. Identify all redundant paths on the network and verify that the redundant paths are blocking.	
Use the show spanning-tree summary totals command to verify that the total number of logical interfaces in the Active state are less than the maximum allowed. For information on these limits, see the <i>Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide</i> .	
Verify the primary and secondary root bridge and any configured Cisco extensions.	

Use the following commands to view STP configuration and operational details:

- **show running-config spanning-tree**

- **show spanning-tree summary**
- **show spanning-tree detail**
- **show spanning-tree bridge**
- **show spanning-tree mst**
- **show spanning-tree mst configuration**
- **show spanning-tree interface *interface-type slot/port* [detail]**
- **show tech-support stp**
- **show spanning-tree vlan**

Use the **show spanning-tree blockedports** command to display the ports that are blocked by STP.

Use the **show mac address-table dynamic vlan** command to determine if learning or aging occurs at each node.

Troubleshooting STP Data Loops

Data loops are a common problem in STP networks. Some of the symptoms of a data loop are as follows:

- High link utilization, up to 100 percent
- High CPU and backplane traffic utilization
- Constant MAC address relearning and flapping
- Excessive output drops on an interface

When the l2fm logging level is greater than or equal to 4, the switch logs occurrences of host MAC address flapping to help you locate STP data loops. If it detects a MAC address move within less than 1 second and if 10 consecutive moves occur, the switch disables learning on the VLAN for one of the ports between which the MAC address is moving. Learning is disabled for 120 seconds and reenabled automatically. Syslogs are generated while learning is disabled and enabled. You can configure the logging level using the **logging level l2fm log-level** command.

Procedure

	Command or Action	Purpose
Step 1	<p>switch# show interface <i>interface-type slot/port</i> include rate</p> <p>Example:</p> <pre>switch# show interface ethernet 2/1 include rate 1 minute input rate 19968 bits/sec, 0 packets/sec 1 minute output rate 3952023552 bits/sec, 957312 packets/sec</pre>	Identifies the ports involved in the loop by looking at the interfaces with high link utilization.

	Command or Action	Purpose
Step 2	<p>switch(config)# interface <i>interface-type</i> <i>slot/port</i></p> <p>Example:</p> <pre>switch(config)# interface ethernet 2/1</pre>	Configures the interface type and location.
Step 3	<p>switch(config-if)# shutdown</p> <p>Example:</p> <pre>switch(config-if)# shutdown</pre>	<p>Shuts down or disconnects the affected ports.</p> <p>After disconnecting the affected ports, locate every switch in the redundant paths using your network topology diagram.</p>
Step 4	<p>switch(config-if)# show spanning-tree vlan <i>vlan-id</i></p> <p>Example:</p> <pre>switch(config-if)# show spanning-tree vlan 9 VLAN0009 Spanning tree enabled protocol rstp Root ID Priority 32777'' Address 0018.bad7.db15'' Cost 4 ...</pre>	Verifies that the switch lists the same STP root bridge as the other nonaffected switches.
Step 5	<p>(Optional) switch(config-if)# show spanning-tree interface <i>interface-type slot/port</i> detail</p> <p>Example:</p> <pre>switch(config-if)# show spanning-tree interface ethernet 3/1 detail Port 385 (Ethernet3/1) of VLAN0001 is root forwarding Port path cost 4, Port priority 128, Port Identifier 128.385 Designated root has priority 32769, address 0018.bad7.db15 Designated bridge has priority 32769, address 0018.bad7.db15 Designated port id is 128.385, designated path cost 0 Timers: message age 16, forward delay 0, hold 0 Number of transitions to forwarding state: 1 The port type is network by default Link type is point-to-point by default BPDUs: sent 1265, received 1269</pre>	Verifies that the root port and alternate ports are regularly receiving BPDUs.
Step 6	<p>(Optional) switch(config-if)# show interface counters errors</p> <p>Example:</p>	Checks the hardware packet statistic (error drop) counters.

Command or Action	Purpose
switch(config-if)# show interface counters errors	
<pre> Port Align-Err FCS-Err Xmit-Err Rcv-Err UnderSize OutDiscards mgmt0 -- -- -- -- -- -- Eth1/1 0 0 0 0 0 0 Eth1/2 0 0 0 0 0 0 Eth1/3 0 0 0 0 0 0 Eth1/4 0 0 0 0 0 0 Eth1/5 0 0 0 0 0 0 Eth1/6 0 0 0 0 0 0 Eth1/7 0 0 0 0 0 0 Eth1/8 0 0 0 0 0 0 </pre>	

Example

This example shows that the designated port is regularly sending BPDUs:

```

switch# show spanning-tree interface ethernet 3/1 detail
Port 385 (Ethernet3/1) of VLAN0001 is root forwarding
  Port path cost 4, Port priority 128, Port Identifier 128.385
  Designated root has priority 32769, address 0018.bad7.db15
  Designated bridge has priority 32769, address 0018.bad7.db15
  Designated port id is 128.385, designated path cost 0
  Timers: message age 16, forward delay 0, hold 0
  Number of transitions to forwarding state: 1
  The port type is network by default
  Link type is point-to-point by default
  BPDUs: sent 1265, received 1269
                    
```

This example shows how to check the hardware packet statistic counters for a possible BPDU error drop:

```

switch# show interface counters errors
-----
Port Align-Err FCS-Err Xmit-Err Rcv-Err UnderSize OutDiscards
-----
mgmt0  --      --      --      --      --      --
Eth1/1 0      0      0      0      0      0
Eth1/2 0      0      0      0      0      0
Eth1/3 0      0      0      0      0      0
Eth1/4 0      0      0      0      0      0
Eth1/5 0      0      0      0      0      0
Eth1/6 0      0      0      0      0      0
Eth1/7 0      0      0      0      0      0
Eth1/8 0      0      0      0      0      0
                    
```

Troubleshooting Excessive Packet Flooding

Unstable STP topology changes can trigger excessive packet flooding in your STP network. With Rapid STP or Multiple STP (MST), a change of the port's state to forwarding, as well as the role change from designated to root, can trigger a topology change. Rapid STP immediately flushes the Layer 2 forwarding table. 802.1D shortens the aging time. The immediate flushing of the forwarding table restores connectivity faster but causes more flooding.

In a stable topology, a topology change should not trigger excessive flooding. Link flaps can cause a topology change, so continuous link flaps can cause repetitive topology changes and flooding. Flooding slows the network performance and can cause packet drops on an interface.

Procedure

	Command or Action	Purpose
Step 1	<p>switch# show spanning-tree vlan <i>vlan-id</i> detail</p> <p>Example:</p> <pre>switch# show spanning-tree vlan 9 detail VLAN0009 is executing the rstp compatible Spanning Tree protocol Bridge Identifier has priority 32768, sysid 9, address 0018.bad8.27ad Configured hello time 2, max age 20, forward delay 15 Current root has priority 32777, address 0018.bad7.db15 Root port is 385 (Ethernet3/1), cost of root path is 4 Topology change flag not set, detected flag not set '' Number of topology changes 8 last change occurred 1:32:11 ago'' '' from Ethernet3/1'' Times: hold 1, topology change 35, notification 2 ...</pre>	<p>Determines the source of the excessive topology change.</p>
Step 2	<p>switch# show spanning-tree vlan <i>vlan-id</i> detail</p> <p>Example:</p> <pre>switch# show spanning-tree vlan 9 detail VLAN0009 is executing the rstp compatible Spanning Tree protocol Bridge Identifier has priority 32768, sysid 9, address 0018.bad8.27ad Configured hello time 2, max age 20, forward delay 15 Current root has priority 32777, address 0018.bad7.db15 Root port is 385 (Ethernet3/1), cost of root path is 4 Topology change flag not set, detected flag not set Number of topology changes 8 last</pre>	<p>Determines the interface where the topology change occurred.</p> <p>Repeat this step on devices connected to the interface until you can isolate the device that originated the topology change.</p> <p>Check for link flaps on the interfaces on this device.</p>

	Command or Action	Purpose
	<pre>change occurred 1:32:11 ago '' from Ethernet3/1'' Times: hold 1, topology change 35, notification 2 ...</pre>	

Troubleshooting Convergence Time Issues

STP convergence can take longer than expected or result in an unexpected final network topology.

To troubleshoot convergence issues, check the following issues:

- Errors in the documented network topology diagram.
- Misconfiguration of the timers; diameter; Cisco extension features such as bridge assurance, root guard, and BPDU guard; and so on.
- Overloaded switch CPU during convergence that exceeds the recommended logical port (port-vlan) limit.
- Software defects that affect STP.

Securing the Network Against Forwarding Loops

To handle the inability of STP to deal correctly with certain failures, Cisco has developed a number of features and enhancements to protect the networks against forwarding loops.

Troubleshooting STP helps to isolate and find the cause for a particular failure, while the implementation of these enhancements is the only way to secure the network against forwarding loops.

Before you begin

- Enable the Cisco-proprietary Unidirectional Link Detection (UDLD) protocol on all the switch-to-switch links. For information, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide*.
- Set up the bridge assurance feature by configuring all the switch-to-switch links as the spanning tree network port type.



Note You should enable the bridge assurance feature on both sides of the links. Otherwise, Cisco NX-OS will put the port in the blocked state because of a bridge assurance inconsistency.

- Set up all the end-station ports as a spanning tree edge port type.

You must set up the STP edge port to limit the amount of topology change notices and subsequent flooding that can affect the performance of the network. Use this command only with ports that connect to end stations. Otherwise, an accidental topology loop can cause a data-packet loop and disrupt the device and network operation.

- Enable the Link Aggregation Control Protocol (LACP) for port channels to avoid any port-channel misconfiguration issues. For information, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide*.

Do not disable autonegotiation on the switch-to-switch links. Autonegotiation mechanisms can convey remote fault information, which is the quickest way to detect failures at the remote side. If failures are detected at the remote side, the local side brings down the link even if the link is still receiving pulses.



Caution Be careful when you change STP timers. STP timers are dependent on each other, and changes can impact the entire network.

Procedure

	Command or Action	Purpose
Step 1	(Optional) switch(config)# spanning-tree loopguard default Example: switch(config) # spanning-tree loopguard default	Secures the network STP perimeter with root guard. Root guard and BPDU guard allow you to secure STP against influence from the outside.
Step 2	switch(config)# spanning-tree bpduguard enable Example: switch(config) # spanning-tree bpduguard enable	Enables BPDU guard on STP edge ports to prevent STP from being affected by unauthorized network devices (such as hubs, switches, and bridging routers) that are connected to the ports. Root guard prevents STP from outside influences. BPDU guard shuts down the ports that are receiving any BPDUs (not only superior BPDUs). Note Short-living loops are not prevented by root guard or BPDU guard if two STP edge ports are connected directly or through the hub.
Step 3	switch(config)# vlan vlan-range Example: switch(config) # vlan 9	Configures separate VLANs and avoids user traffic on the management VLAN. The management VLAN is contained to a building block, not the entire network.
Step 4	switch(config)# spanning-tree vlan vlan-range root primary Example: switch(config) # spanning-tree vlan 9 root primary	Configures a predictable STP root.

	Command or Action	Purpose
Step 5	<pre>switch(config)# spanning-tree vlan <i>vlan-range</i> root secondary</pre> <p>Example:</p> <pre>switch(config)# spanning-tree vlan 12 root secondary</pre>	<p>Configures a predictable backup STP root placement.</p> <p>You must configure the STP root and backup STP root so that convergence occurs in a predictable way and builds optimal topology in every scenario. Do not leave the STP priority at the default value.</p>



CHAPTER 9

Troubleshooting Routing

- [About Troubleshooting Routing Issues, on page 65](#)
- [Initial Troubleshooting Routing Checklist, on page 65](#)
- [Troubleshooting Routing, on page 66](#)
- [Troubleshooting Policy-Based Routing, on page 69](#)

About Troubleshooting Routing Issues

Layer 3 routing involves determining optimal routing paths and packet switching. You can use routing algorithms to calculate the optimal path from the router to a destination. This calculation depends on the algorithm selected, route metrics, and other considerations such as load balancing and alternate path discovery.

Cisco NX-OS supports multiple virtual routing and forwarding (VRF) instances and multiple routing information bases (RIBs) to support multiple address domains. Each VRF is associated with a RIB, and this information is collected by the Forwarding Information Base (FIB).

See the following documents for more information on routing:

- *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*
- *Cisco Nexus 9000 Series NX-OS Multicast Routing Configuration Guide*

Initial Troubleshooting Routing Checklist

You can troubleshoot routing issues by checking these items first:

Checklist	Done
Verify that the routing protocol is enabled.	
Verify that the address family is configured if necessary.	
Verify that you have configured the correct VRF for your routing protocol.	

Use the following commands to display routing information:

- **show ip arp**
- **show ip traffic**

- **show ip static-route**
- **show ip client**
- **show ip fib**
- **show ip process**
- **show ip route**
- **show vrf**
- **show vrf interface**

Troubleshooting Routing

Procedure

	Command or Action	Purpose
Step 1	<p>switch# show ospf</p> <p>Example:</p> <pre>switch# show ospf % invalid command detected at '^' marker.</pre>	<p>Verifies that the routing protocol is enabled.</p> <p>If the feature is not enabled, Cisco NX-OS reports that the command is invalid.</p>
Step 2	<p>switch# show running-config eigrp all</p> <p>Example:</p> <pre>switch# show running-config eigrp all</pre>	<p>Verifies the configuration for this routing protocol.</p>
Step 3	<p>switch# show running-config eigrp</p> <p>Example:</p> <pre>switch# show running-config eigrp version 6.1(2)I1(1) feature eigrp router eigrp 99 address-family ipv4 unicast router-id 192.0.2.1 vrf red stub</pre>	<p>Verifies the VRF configuration for this routing protocol.</p>
Step 4	<p>switch# show processes memory include isis</p> <p>Example:</p> <pre>switch# show processes memory include isis 8913 9293824 bffff1d0/bffff0d0 isis 32243 8609792 bfffe0c0/bfffdfc0 isis</pre>	<p>Checks the memory utilization for this routing protocol.</p>

	Command or Action	Purpose
Step 5	<p>switch# show ip client pim</p> <p>Example:</p> <pre>switch# show ip client pim Client: pim, uuid: 284, pid: 3839, extended pid: 3839 Protocol: 103, client-index: 10, routing VRF id: 255 Data MTS-SAP: 1519 Data messages, send successful: 2135, failed: 0</pre>	Verifies that the routing protocol is receiving packets.
Step 6	<p>switch# show ip interface loopback-interface</p> <p>Example:</p> <pre>switch# show ip interface loopback0 loopback0, Interface status: protocol-up/link-up/admin-up, iod: 36, Context:"default" IP address: 1.0.0.1, IP subnet: 1.0.0.0/24 ... IP multicast groups locally joined: 224.0.0.2 224.0.0.1 224.0.0.13 ...</pre>	Verifies that the routing protocol is enabled on an interface.
Step 7	<p>switch# show vrf interface loopback -interface</p> <p>Example:</p> <pre>switch# show vrf interface loopback 99 Interface VRF-Name VRF-ID loopback99 1 default</pre>	Verifies that the interface is in the correct VRF.
Step 8	<p>switch# show routing unicast clients</p> <p>Example:</p> <pre>switch# show routing unicast clients</pre>	Verifies that the routing protocol is registered with the RIB.
Step 9	<p>switch# show forwarding distribution multicast client</p> <p>Example:</p> <pre>switch# show forwarding distribution multicast client Number of Clients Registered: 3 Client-name Client-id Shared Memory Name igmp 1 N/A mrib 2 /procket/shm/mrib-mfdm</pre>	Verifies that the RIB is interacting with the forwarding plane.

Example

This example shows how to display the EIGRP routing protocol configuration:

```

switch# show running-config eigrp all
version 6.1(2)I1(1)
feature eigrp
router eigrp 99
log-neighbor-warnings
  log-neighbor-changes
  log-adjacency-changes
  graceful-restart
nsf
timers nsf signal 20
distance 90 170
metric weights 0 1 0 1 0 0
metric maximum-hops 100
default-metric 100000 100 255 1 1500
maximum-paths 16
address-family ipv4 unicast
  log-neighbor-warnings
  log-neighbor-changes
  log-adjacency-changes
  graceful-restart
  router-id 192.0.2.1
  nsf
  timers nsf signal 20
  distance 90 170
  metric weights 0 1 0 1 0 0
  metric maximum-hops 100
  default-metric 100000 100 255 1 1500
  maximum-paths 16
  
```

This example shows how to display that the unicast routing protocol is registered with the RIB:

```

switch# show routing unicast clients
CLIENT: am
index mask: 0x00000002
epid: 3908      MTS SAP: 252      MRU cache hits/misses:      2/1
Routing Instances:
VRF: management      table: base
Messages received:
Register      : 1      Add-route      : 2      Delete-route      : 1
Messages sent:
Add-route-ack  : 2      Delete-route-ack : 1
CLIENT: rpm
index mask: 0x00000004
epid: 4132      MTS SAP: 348      MRU cache hits/misses:      0/0
Messages received:
Register      : 1
Messages sent:
...
CLIENT: eigrp-99
index mask: 0x00002000
epid: 3148      MTS SAP: 63775    MRU cache hits/misses:      0/1
Routing Instances:
VRF: default      table: base      notifiers: self
Messages received:
Register      : 1      Delete-all-routes : 1
Messages sent:
...
  
```

Troubleshooting Policy-Based Routing

- Make sure the ACLs match the incoming traffic.
- Make sure the route is available:
 - For IP network routes, use the **show ip route** command to make sure the IP network route is available for the next hop specified in the **set ip next-hop** command.
 - For IP host routes, use the **show ip arp** command to make sure the IP host route is available for the next hop specified in the **set ip next-hop** command.
 - For IPv6 network routes, use the **show ipv6 route** command to make sure the IPv6 network route is available for the next hop specified in the **set ipv6 next-hop** command.
 - For IPv6 host routes, use the **show ipv6 neighbor** command to make sure the IPv6 host route is available for the next hop specified in the **set ipv6 next-hop** command.
- Make sure the policy is active in the system (using the **show ip policy** command).
- Check the statistics for the entry (using the **show route-map map-name pbr-statistics** command).



CHAPTER 10

Troubleshooting Memory

- [About Troubleshooting Memory, on page 71](#)
- [General/High Level Assessment of Platform Memory Utilization, on page 71](#)
- [User Processes, on page 73](#)
- [Built-in Platform Memory Monitoring, on page 73](#)

About Troubleshooting Memory

Dynamic random access memory (DRAM) is a limited resource on all platforms and must be controlled or monitored to ensure utilization is kept in check.

Cisco NX-OS uses memory in the following three ways:

- **Page cache**—When you access files from persistent storage (CompactFlash), the kernel reads the data into the page cache, which means that when you access the data in the future, you can avoid the slow access times that are associated with disk storage. Cached pages can be released by the kernel if the memory is needed by other processes. Some file systems (tmpfs) exist purely in the page cache (for example, /dev/sh, /var/sysmgr, /var/tmp), which means that there is no persistent storage of this data and that when the data is removed from the page cache, it cannot be recovered. tmpfs-cached files release page-cached pages only when they are deleted.
- **Kernel**—The kernel needs memory to store its own text, data, and Kernel Loadable Modules (KLMs). KLMs are pieces of code that are loaded into the kernel (as opposed to being a separate user process). An example of kernel memory usage is when an inband port driver allocates memory to receive packets.
- **User processes**—This memory is used by Cisco NX-OS or Linux processes that are not integrated in the kernel (such as text, stack, heap, and so on).

When you are troubleshooting high memory utilization, you must first determine what type of utilization is high (process, page cache, or kernel). Once you have identified the type of utilization, you can use additional troubleshooting commands to help you figure out which component is causing this behavior.

General/High Level Assessment of Platform Memory Utilization

You can assess the overall level of memory utilization on the platform by using two basic CLI commands: `show system resources` and `show processes memory`.

User Processes

If page cache and kernel issues have been ruled out, utilization might be high as a result of some user processes taking up too much memory or a high number of running processes (due to the number of features enabled).



Note Cisco NX-OS defines memory limits for most processes (rlimit). If this rlimit is exceeded, sysmgr will crash the process, and a core file is usually generated. Processes close to their rlimit may not have a large impact on platform utilization but could become an issue if a crash occurs.

Determining Which Process Is Using a Lot of Memory

The following commands can help you identify if a specific process is using a lot of memory:

- The **show process memory** command displays the memory allocation per process.

```
switch# show processes memory
PID      MemAlloc MemLimit  MemUsed   StackBase/Ptr    Process
-----
4662    52756480 562929945 150167552 bfffd970/bfffd970 netstack
```



Note The output of the **show process memory** command might not provide a completely accurate picture of the current utilization (allocated does not mean in use). This command is useful for determining if a process is approaching its limit.

Built-in Platform Memory Monitoring

Cisco NX-OS has built-in kernel monitoring of memory usage to help avoid system hangs, process crashes, and other undesirable behavior. The platform manager periodically checks the memory utilization (relative to the total RAM present) and automatically generates an alert event if the utilization passes the configured threshold values. When an alert level is reached, the kernel attempts to free memory by releasing pages that are no longer needed (for example, the page cache of persistent files that are no longer being accessed), or if critical levels are reached, the kernel will kill the highest utilization process. Other Cisco NX-OS components have introduced memory alert handling, such as the Border Gateway Protocol's (BGP's) graceful low memory handling, that allows processes to adjust their behavior to keep memory utilization under control.

Memory Thresholds

When many features are deployed, baseline memory requires the following thresholds:

- MINOR
- SEVERE

- CRITICAL

Because the default thresholds are calculated on boot up depending on the DRAM size, its value varies depending on the DRAM size that is used on the platform. The thresholds are configurable using the **system memory-thresholds minor percentage severe percentage critical percentage** command.



CHAPTER 11

Troubleshooting Packet Flow Issues

- [Packet Flow Issues, on page 75](#)

Packet Flow Issues

Packets could be dropped for the following reasons:

- Software-switched packets could be dropped because of Control Plane Policing (CoPP).
- Hardware-switched packets could be dropped by the hardware because of a bandwidth limitation.

Packets Dropped Because of Rate Limits

Use the **show hardware rate-limit** command to determine if packets are being dropped because of a rate limit.

```
switch(config)# show hardware rate-limit module 1
```

Units for Config: packets per second

Allowed, Dropped & Total: aggregated since last clear counters

Rate Limiter Class	Parameters
access-list-log	Config : 100 Allowed : 0 Dropped : 0 Total : 0

Packets Dropped Because of CoPP

Use the **show policy-map interface control-plane** command to determine if packets are being dropped because of CoPP.

```
switch# show policy-map interface control-plane
class-map copp-system-p-class-exception (match-any)
  match exception ip option
  match exception ip icmp unreachable
  match exception ttl-failure
  match exception ipv6 option
  match exception ipv6 icmp unreachable
  match exception mtu-failure
```

```
set cos 1
police cir 200 pps , bc 32 packets

module 27 :
  transmitted 0 packets;
  dropped 0 packets;

module 28 :
  transmitted 0 packets;
  dropped 0 packets;
```



CHAPTER 12

Troubleshooting PowerOn Auto Provisioning

- [Switch Does Not Come Up in Time for POAP to Complete, on page 77](#)
- [POAP Fails, on page 77](#)

Switch Does Not Come Up in Time for POAP to Complete

If the switch does not come up in a reasonable duration for POAP to complete, connect to the switch through the serial line and check to see if it is stuck at the following prompt:

```
Waiting for system online status before starting POAP ...
Waiting for system online status before starting POAP ...
Waiting for system online status before starting POAP ...
```

```
System is not fully online. Skip POAP? (yes/no)[n]:
```

You can continue with POAP by entering **no** at the prompt. If POAP does not start properly on the second attempt, proceed with the normal setup by entering **yes** at the prompt when it returns.

POAP Fails

Take these actions if PowerOn Auto Provisioning (POAP) fails for any reason:

- Stop the POAP process to continue with the normal switch bring-up steps. It might take a few minutes for a full stop of POAP, so be patient.

```
2013 Oct 29 22:24:59 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Assigned IP address:
172.23.40.221
2013 Oct 29 22:24:59 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Netmask: 255.255.255.0
2013 Oct 29 22:24:59 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: DNS Server: 172.21.157.5
2013 Oct 29 22:24:59 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Default Gateway: 172.23.40.1
2013 Oct 29 22:24:59 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Script Server: 172.23.40.6
2013 Oct 29 22:24:59 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Script Name: /pxelinux.0
2013 Oct 29 22:25:09 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: The POAP Script download has
started
2013 Oct 29 22:25:09 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: The POAP Script is being
downloaded from [copy tftp://172.23.40.6//pxelinux.0 bootflash:scripts/script.sh vrf
management ]
2013 Oct 29 22:25:10 switch %$ VDC-1 %$ %POAP-2-POAP_FAILURE: POAP boot file download
failed.
2013 Oct 29 22:25:10 switch %$ VDC-1 %$ %POAP-2-POAP_FAILURE: POAP DHCP discover phase
failed
```

```

2013 Oct 29 22:25:12 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Abort Power On Auto
Provisioning and continue with normal setup?(yes/no)[n]:
2013 Oct 29 22:25:46 switch %$ VDC-1 %$ %POAP-2-POAP_DHCP_DISCOVER_START: POAP DHCP
Discover phase started
2013 Oct 29 22:25:46 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Abort Power On Auto
Provisioning and continue with normal setup?(yes/no)[n]:

Abort Auto Provisioning and continue with normal setup?(yes/no)[n]: yes

```

- Check the failure reason in the log files. Two POAP log files are saved on the bootflash. Logs from the POAP process are stored in the file that ends with `poap_pid_init.log` as shown below. The failure reason should appear toward the end of this file.

```

bash-4.2# tail 20131029_222312_poap_5367_init.log -n 3
Tue Oct 29 22:27:41 2013:poap_net_rx_pkt: Droppping the pakcet due to Ethernet hdrparsing
error on if_index - 5000000
Tue Oct 29 22:27:41 2013:DEST IP is not Broadcast
Tue Oct 29 22:27:41 2013:poap_net_rx_pkt: Droppping the pakcet due to Ethernet hdrparsing
error on if_index - 5000000

```

- Check to see if the POAP script file that is downloaded from your DHCP or TFTP server fails in the process of running. Depending on the stage of the failure, the device might proceed with the normal setup or reboot.

```

2013 Oct 29 22:42:34 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Assigned IP address:
172.23.40.181
2013 Oct 29 22:42:34 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Netmask: 255.255.255.0
2013 Oct 29 22:42:34 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: DNS Server: 172.21.157.5
2013 Oct 29 22:42:34 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Default Gateway: 172.23.40.1
2013 Oct 29 22:42:34 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Script Server: 172.23.40.6
2013 Oct 29 22:42:34 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Script Name: poap.py
2013 Oct 29 22:42:45 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: The POAP Script download has
started
2013 Oct 29 22:42:45 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: The POAP Script is being
downloaded from [copy tftp://172.23.40.6/poap.py bootflash:scripts/script.sh vrf
management ]
2013 Oct 29 22:42:46 switch %$ VDC-1 %$ %POAP-2-POAP_SCRIPT_DOWNLOADED: Successfully
downloaded POAP script file
2013 Oct 29 22:42:46 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: Script file size 21965, MD5
checksum 1bd4b86892439c5785a20a3e3ac2b0de
2013 Oct 29 22:42:46 switch %$ VDC-1 %$ %POAP-2-POAP_SCRIPT_STARTED_MD5_NOT_VALIDATED:
POAP script execution started(MD5 not validated)
2013 Oct 29 22:47:57 switch %$ VDC-1 %$ %POAP-2-POAP_FAILURE: POAP script execution
aborted

```

- The POAP script file logs are written to a file under the bootflash scheme. The filename starts with `poap.log`. If there are multiple file logs, look at the one with the most recent time stamp for any errors.

```

bash-4.2# tail poap.log.22_42_46
CLI : show file volatile:poap.cfg.md5.poap_md5 | grep -v '^#' | head lines 1 | sed 's/
.*$//'
INFO: md5sum 46684d8f8b7c5ffac3b37ac8560928e5 (.md5 file)
CLI : show file volatile:poap.cfg md5sum
INFO: md5sum 46684d8f8b7c5ffac3b37ac8560928e5 (recalculated)

CLI : config terminal ; boot nxos bootflash:poap/system.img
CLI : copy running-config startup-config
CLI : copy volatile:poap.cfg scheduled-config
INFO: Configuration successful

```



CHAPTER 13

Troubleshooting the Python API

- [Receiving Python API Errors, on page 79](#)

Receiving Python API Errors

Take these actions if any of the following Python API errors appear:

Symptom	Solution	Example
The Python cli API throws a <code>NameError</code> .	Import the cli module into the global namespace.	<pre>>>> cli('show clock') Traceback (most recent call last): File "<stdin>", line 1, in <module> NameError: name 'cli' is not defined >>> from cli import * >>> cli('show clock') '20:23:33.967 UTC Fri Nov 01 2013\n'</pre>
The Python clid API throws a <code>structured_output_not_supported_error</code> .	Use the cli or clip API. The clid API works only with commands that support structured data output.	<pre>>>> clid('show clock') Traceback (most recent call last): File "<stdin>", line 1, in <module> File "/isan/python/scripts/cli.py", line 45, in clid raise structured_output_not_supported_error(cmd) errors.structured_output_not_supported_error: 'show clock'</pre>

Symptom	Solution	Example
<p>The cli API and cisco objects throw a Permission denied error.</p>	<p>Make sure your login ID has sufficient permissions to access the command or resource. If necessary, ask your network administrator for additional permissions.</p>	<pre> >>> from cli import * >>> cli('clear counters') Traceback (most recent call last): File "<stdin>", line 1, in <module> File "/isan/python/scripts/cli.py", line 20, in cli raise cmd_exec_error(msg) errors.cmd_exec_error: '% Permission denied for the role\n\nCmd exec error.\n' >>> from cisco.interface import * >>> i=Interface('Ethernet3/2') Traceback (most recent call last): File "<stdin>", line 1, in <module> File "/isan/python/scripts/cisco/interface.py", line 75, in __new__ cls._Interfaces[name].config(True) File "/isan/python/scripts/cisco/interface.py", line 91, in config s, o = nxcli('show runn interface %s' % self.name) File "/isan/python/scripts/cisco/nxcli.py", line 46, in nxcli raise SyntaxError, 'Error status %d\n%s' % (status, output) SyntaxError: Error status 30 % Permission denied for the role Cmd exec error. >>> import os >>> os.system('whoami') test </pre>

Symptom	Solution	Example
<p>The urllib2 or socket connection is not processed.</p>	<p>Make sure you are using the correct virtual routing context. If not, switch to the correct one.</p>	<pre>>>> import urllib2 >>> u=urllib2('http://172.23.40.211:8000/welcome.html') Traceback (most recent call last): File "<stdin>", line 1, in <module> TypeError: 'module' object is not callable >>> u=urllib2.urlopen('http://172.23.40.211:8000/welcome.html') Traceback (most recent call last): File "<stdin>", line 1, in <module> File "/isan/python/python2.7/urllib2.py", line 127, in urlopen return _opener.open(url, data, timeout) File "/isan/python/python2.7/urllib2.py", line 404, in open response = self._open(req, data) File "/isan/python/python2.7/urllib2.py", line 422, in _open '_open', req) File "/isan/python/python2.7/urllib2.py", line 382, in _call_chain result = func(*args) File "/isan/python/python2.7/urllib2.py", line 1214, in http_open return self.do_open(httplib.HTTPConnection, req) File "/isan/python/python2.7/urllib2.py", line 1184, in do_open raise URLError(err) urllib2.URLError: <urlopen error [Errno 113] No route to host> >>> from cisco.vrf import * >>> VRF.get_vrf_name_by_id(get_global_vrf()) 'default'</pre>



CHAPTER 14

Troubleshooting NX-API

- [NX-API Guidelines, on page 83](#)
- [NX-API Is Not Responding, on page 83](#)
- [Configuration Fails, on page 84](#)
- [Permission Is Denied for Bash, on page 84](#)
- [Output Cannot Be Retrieved from the Browser Sandbox, on page 84](#)
- [CLI Command Errors Are Appearing, on page 84](#)
- [Error Messages Are Appearing, on page 84](#)
- [Temporary Files Are Disappearing, on page 85](#)
- [Chunks of the Command Output Are Not Being Delivered, on page 85](#)

NX-API Guidelines

NX-API performs authentication through a programmable authentication module (PAM) on the switch. Use cookies to reduce the number of PAM authentications and thus reduce the load on PAM.

NX-API Is Not Responding

Take these actions if NX-API is not responding:

- Make sure that NX-API is enabled by using the **show feature | grep nxapi** command.
- Make sure that HTTP or HTTPS is enabled by using the **show nxapi** command.
- Make sure that NX-API is listening on the expected port by using the **show nxapi** command.
- Check for a long running command. Currently NX-API runs on a single worker process and is single threaded. If one command takes a long time to complete, it will block other commands. NX-API caches the request. When the current request completes, the others will be served.
- Enable Bash. For instructions, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.
- Check the `/var/sysmgr_nxapi/logs/error.log` to see if there are any errors.
- If NX-API is still not responding, enter the **no feature nxapi** and **feature nxapi** commands to restart NX-API. NX-API is stateless, and it is safe to restart.

Configuration Fails

Take these actions if the user cannot execute configuration commands:

- Make sure that the user has the correct privileges to execute the commands.

Permission Is Denied for Bash

Take these actions if users receive a "Permission Denied" message for Bash:

- Make sure that Bash is enabled by using the **show feature | grep bash** command.
- Make sure that the current user has the correct privileges to access Bash.
- For more information on Bash, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.

Output Cannot Be Retrieved from the Browser Sandbox

Take these actions if you cannot retrieve the output from the browser sandbox:

- When the output is large or the command execution takes a long time, the browser might not be able to handle the load and might time out. Try using the Python client to access the NX-API. For instructions, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.



Note The recommended browser is Mozilla Firefox.

CLI Command Errors Are Appearing

Take these actions if CLI command errors appear when the user runs multiple commands:

- Check to see how multiple commands are separated. Show and configure commands must be separated by a [space]. Bash commands must be separated by a semicolon (;).

Error Messages Are Appearing

Take these actions if error messages are appearing in the output:

- Follow the instructions in the error message.
- If the Bash commands do not go through, make sure that Bash is enabled by using the **show feature | grep bash** command. For more information on Bash, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.
- Make sure that the user has the correct privileges to execute the command.

- Follow the instructions in [NX-API Is Not Responding, on page 83](#).

Temporary Files Are Disappearing

For every request, a temporary file is created in /volatile to store the command output that is sent back to the client. If the chunk parameter on the request is 0, the file is deleted right before the command output is sent back to the client. If the request does have chunk = 1, the file is retained so that the chunks can be extracted from it and sent to the client. That file will be cleaned up on a periodic basis. Currently that cleanup is set to occur once every 100 requests. Files are cleaned up if they are not accessed within 60 seconds of being created or are not modified or their status is not updated within 600 seconds.

Chunks of the Command Output Are Not Being Delivered

For requests where chunk = 1, if the sid is set to the same value, you will get the same chunk of the command output. This functionality allows for situations where a client requests a specific chunk and does not receive it in a timely manner because it is dropped or blocked somewhere in the network. The clients can request the same chunk again, and they will receive the correct data as long as the temporary file has not been cleaned up (as described in [Temporary Files Are Disappearing, on page 85](#)).



CHAPTER 15

Troubleshooting Service Failures

- [Identifying Memory Allocations for Processes, on page 87](#)
- [Identifying CPU Utilization for Processes, on page 88](#)
- [Monitoring Process Core Files, on page 89](#)
- [Processing the Crash Core Files, on page 89](#)
- [Clearing the Core, on page 89](#)
- [Enabling Auto-Copy for Core Files, on page 90](#)

Identifying Memory Allocations for Processes

You can identify the allocation, limit, memory allocation, and usage for each process in the memory. The following is a sample output from the `show processes memory` command. This output has been abbreviated to make the example more concise.

```
switch# show processes memory
PID MemAlloc MemLimit MemUsed StackBase/Ptr Process
-----
1 159744 0 2027520 ff808d30/ffffffff init
2 0 0 0 0/0 kthreadd
3 0 0 0 0/0 migration/0
4 0 0 0 0/0 ksoftirqd/0
5 0 0 0 0/0 watchdog/0
6 0 0 0 0/0 migration/1
7 0 0 0 0/0 ksoftirqd/1
8 0 0 0 0/0 watchdog/1
9 0 0 0 0/0 migration/2
10 0 0 0 0/0 ksoftirqd/2
11 0 0 0 0/0 watchdog/2
12 0 0 0 0/0 migration/3
13 0 0 0 0/0 ksoftirqd/3
14 0 0 0 0/0 watchdog/3
15 0 0 0 0/0 migration/4
16 0 0 0 0/0 ksoftirqd/4
17 0 0 0 0/0 watchdog/4
18 0 0 0 0/0 migration/5
19 0 0 0 0/0 ksoftirqd/5
20 0 0 0 0/0 watchdog/5
21 0 0 0 0/0 migration/6
22 0 0 0 0/0 ksoftirqd/6
23 0 0 0 0/0 watchdog/6
24 0 0 0 0/0 migration/7
25 0 0 0 0/0 ksoftirqd/7
26 0 0 0 0/0 watchdog/7
```

```

27          0 0          0          0/0 events/0
28          0 0          0          0/0 events/1
29          0 0          0          0/0 events/2
30          0 0          0          0/0 events/3
31          0 0          0          0/0 events/4
32          0 0          0          0/0 events/5
33          0 0          0          0/0 events/6
34          0 0          0          0/0 events/7
35          0 0          0          0/0 khelper
36          0 0          0          0/0 netns
37          0 0          0          0/0 kblockd/0
    
```

The **show processes memory** command includes the following keywords:

Keyword	Description
>	Redirects the output to a file.
>>	Adds the output to an existing file.
shared	Displays shared memory information.

Identifying CPU Utilization for Processes

You can identify the CPU utilization for running process in the memory. The following is a sample output from the **show processes cpu** command. This output has been abbreviated to make the example more concise.

```
switch# show processes cpu
```

```
CPU utilization for five seconds: 0%/0%; one minute: 1%; five minutes: 2%
```

```

PID      Runtime(ms) Invoked  uSecs  5Sec   1Min   5Min   TTY  Process
-----
1         28660    405831    70    0.00%  0.00%  0.00%  -    init
2          21      1185     18    0.00%  0.00%  0.00%  -    kthreadd
3          468    36439     12    0.00%  0.00%  0.00%  -    migration/0
4         79725   8804385    9    0.00%  0.00%  0.00%  -    ksoftirqd/0
5           0         4      65    0.00%  0.00%  0.00%  -    watchdog/0
6          472    35942     13    0.00%  0.00%  0.00%  -    migration/1
7        33967   953376     35    0.00%  0.00%  0.00%  -    ksoftirqd/1
8           0         11      3    0.00%  0.00%  0.00%  -    watchdog/1
9          424    35558     11    0.00%  0.00%  0.00%  -    migration/2
10        58084   7683251    7    0.00%  0.00%  0.00%  -    ksoftirqd/2
11           0         3        1    0.00%  0.00%  0.00%  -    watchdog/2
12         381    29760     12    0.00%  0.00%  0.00%  -    migration/3
13        17258   265884     64    0.00%  0.00%  0.00%  -    ksoftirqd/3
14           0         2         0    0.00%  0.00%  0.00%  -    watchdog/3
15        46558  1300598     35    0.00%  0.00%  0.00%  -    migration/4
16       1332913  4354439   306    0.00%  0.00%  0.00%  -    ksoftirqd/4
17           0         6         2    0.00%  0.00%  0.00%  -    watchdog/4
18        45808  1283581     35    0.00%  0.00%  0.00%  -    migration/5
19       981030  1973423   497    0.00%  0.00%  0.00%  -    ksoftirqd/5
20           0         16      3    0.00%  0.00%  0.00%  -    watchdog/5
21        48019  1334683     35    0.00%  0.00%  0.00%  -    migration/6
22       1084448  2520990   430    0.00%  0.00%  0.00%  -    ksoftirqd/6
23           0         31      3    0.00%  0.00%  0.00%  -    watchdog/6
24        46490  1306203     35    0.00%  0.00%  0.00%  -    migration/7
    
```

25	1187547	2867126	414	0.00%	0.00%	0.00%	-	ksoftirqd/7
26	0	16	3	0.00%	0.00%	0.00%	-	watchdog/7
27	21249	2024626	10	0.00%	0.00%	0.00%	-	events/0
28	8503	1990090	4	0.00%	0.00%	0.00%	-	events/1
29	11675	1993684	5	0.00%	0.00%	0.00%	-	events/2
30	9090	1973913	4	0.00%	0.00%	0.00%	-	events/3
31	74118	2956999	25	0.00%	0.00%	0.00%	-	events/4
32	76281	2837641	26	0.00%	0.00%	0.00%	-	events/5
33	129651	3874436	33	0.00%	0.00%	0.00%	-	events/6
34	8864	2077714	4	0.00%	0.00%	0.00%	-	events/7
35	0	8	23	0.00%	0.00%	0.00%	-	khelper
36	234	34	6884	0.00%	0.00%	0.00%	-	netns

The `show processes cpu` command includes the following keywords:

Keyword	Description
>	Redirects the output to a file.
>>	Adds the output to an existing file.
history	Displays information about the CPU utility.
sort	Sorts the list based on the memory usage.

Monitoring Process Core Files

You can monitor the process core files by using the `show cores` command.

```
switch# show cores
Module Instance Process-name PID Date (Year-Month-Day Time)
-----
28 1 bgp-64551 5179 2013-11-08 23:51:26
```

The output shows all cores that are presently available for upload from the active supervisor.

Processing the Crash Core Files

You can process the crash core files by using the `show processes log` command.

```
switch# show process log
Process PID Normal-exit Stack-trace Core Log-create-time
-----
ntp 919 N N N Jun 27 04:08
snsm 972 N Y N Jun 24 20:50
```

Clearing the Core

You can clear the core by using the `clear cores` command.

```
switch# clear cores
```

Enabling Auto-Copy for Core Files

You can enter the `system cores` command to enable the automatic copy of core files to a TFTP server, the flash drive, or a file.

```
switch(config)# system cores tftp://10.1.1.1/cores
```



CHAPTER 16

Before Contacting Technical Support

- [Steps to Perform Before Calling TAC, on page 91](#)
- [Copying Files to or from Cisco NX-OS, on page 93](#)
- [Using Core Dumps, on page 94](#)

Steps to Perform Before Calling TAC

At some point, you might need to contact your technical support representative or Cisco TAC for some additional assistance. This section outlines the steps that you should perform before you contact your next level of support in order to reduce the amount of time spent resolving the issue.

To prepare for contacting your customer support representative, follow these steps:

1. Collect the system information and configuration. You should collect this information before and after the issue has been resolved. Use one of the following three methods to gather this information:
 - Configure your Telnet or Secure Shell (SSH) application to log the screen output to a text file. Use the **terminal length 0** command and then use the **show tech-support details** command.



Note If certain **show tech** commands generate a large amount of data and occupy more disk space, they can be stored in a compressed format. See the following example:

```
bash-4.2# time vsh -c " show tech-support platform-sdk" | gzip > /bootflash/pltfm-tech.gz
```



Note SSH timeout period must be longer than the time of the tac-pac generation time. Otherwise, the VSH log might show %VSHD-2-VSHD_SYSLOG_EOL_ERR error. Ideally, set to 0 (infinity) before collecting tac-pac or showtech.

- Use the **tac-pac filename** command to redirect the output of the **show tech-support details** command to a file, and then **gzip** the file.

```
switch# tac-pac bootflash://showtech.switch1
```

- If you do not specify a filename, Cisco NX-OS creates the file as `volatile:show_tech_out.gz`. Copy the file from the device using the procedure in [Copying Files to or from Cisco NX-OS, on page 93](#).

2. If an error occurs in DCNM, take a screen shot of the error. In Windows, press **Alt+PrintScreen** to capture the active window, or press **PrintScreen** to capture the entire desktop. Paste the screenshot into a new Microsoft Paint (or similar program) session and save the file.
3. Capture the exact error codes that you see in the message logs from either DCNM or the CLI.
 - Choose **Event Browser** in DCNM to see the recent list of messages generated.
 - Copy the error from the message log, which you can display by using either the **show logging logfile** or the **show logging last *number*** command to view the last lines of the log.
4. Answer the following questions before you contact your technical support representative:
 - On which device or port is the problem occurring?
 - Which Cisco NX-OS software, driver versions, operating systems versions, and storage device firmware are in your network?
 - What is the network topology? (In DCNM, choose **Topology > Save layout.**)
 - Were any changes made to the environment (VLANs, upgrades, or adding modules) prior to or at the time of this event?
 - Are there other similarly configured devices that could have this problem but do not?
 - Where was this problematic device connected (which device and interface)?
 - When did this problem first occur?
 - When did this problem last occur?
 - How often does this problem occur?
 - How many devices have this problem?
 - Were any traces or debug output captured during the problem time? What troubleshooting steps have you attempted? Which, if any, of the following tools were used?
 - Ethalyzer, local or remote SPAN
 - CLI debug commands
 - traceroute, ping
 - DCNM tools
5. Answer the following questions if your problem is related to a software upgrade attempt:
 - What was the original Cisco NX-OS version?
 - What is the new Cisco NX-OS version?
 - Collect the output from the following commands and forward them to your customer support representative:
 - **show install all status**
 - **show log nvram**

Copying Files to or from Cisco NX-OS

You might need to move files to or from the device. These files may include the log, configuration, or firmware files.

Cisco NX-OS offers protocols to use for copying to or from the device. The device always acts as a client, so that an FTP, SCP, or TFTP session always originates from Cisco NX-OS and either pushes files to an external system or pulls files from an external system.

```
File Server: 172.22.36.10
File to be copied to the switch: /etc/hosts
```

The **copy** command supports the FTP, SCP, SFTP, and TFTP transfer protocols and many different sources for copying files.

```
switch# copy ?
bootflash:      Select source filesystem
core:           Select source filesystem
debug:         Select source filesystem
ftp:           Select source filesystem
http:          Select source filesystem

licenses       Backup license files
log:           Select source filesystem
logflash:      Select source filesystem
nvram:         Select source filesystem
running-config Copy running configuration to destination
scp:           Select source filesystem
sftp:          Select source filesystem
startup-config Copy startup configuration to destination
system:        Select source filesystem
tftp:          Select source filesystem
usb1:          Select source filesystem
usb2:          Select source filesystem
volatile:      Select source filesystem
```

You can use secure copy (SCP) as the transfer mechanism, as follows:

```
scp: [//[username@]server][[/path]]
```

This example copies /etc/hosts from 172.22.36.10 to hosts.txt, for user user1:

```
switch# copy scp://user1@172.22.36.10/etc/hosts bootflash:hosts.txt
user1@172.22.36.10's password:
hosts 100% |*****| 2035 00:00
```

This example backs up the startup configuration to an SFTP server:

```
switch# copy startup-config sftp://user1@172.22.36.10/test/startup configuration.bak1
Connecting to 172.22.36.10...
User1@172.22.36.10's password:
switch#
```



Note You should back up the startup configuration to a server on a daily basis and prior to any changes. You could write a short script to run on Cisco NX-OS to perform a save and then a backup of the configuration. The script needs to contain two commands: **copy running-configuration startup-configuration** and **copy startup-configuration tftp://server/name**. To execute the script, use the **run-script filename** command.

Using Core Dumps

Core dumps contain detailed information about the system and software status prior to a crash. Use core dumps in situations where unknown problems exist. You can send core dumps to a TFTP server or to a Flash card in slot0: of the local system. You should set up your system to generate core dumps under the instruction of your technical support representative. Core dumps are decoded by technical support engineers.

Set up core dumps to go to a TFTP server so that you can e-mail these core dumps directly to your technical support representative.

Use the **system cores** command to set up core dumps on your system as follows:

```
switch# system cores tftp://10.91.51.200/jsmith_cores
switch# show system cores
Cores are transferred to tftp://10.91.51.200/jsmith_cores
```



Note The filename (indicated by `jsmith_cores`) must exist in the TFTP server directory.



CHAPTER 17

Troubleshooting Tools and Methodology

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- [Configuration Files, on page 98](#)
- [CLI Debug, on page 98](#)
- [Ping and Traceroute, on page 99](#)
- [Monitoring Processes and CPUs, on page 101](#)
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- [Additional References for Troubleshooting Tools and Methodology, on page 117](#)

Command-Line Interface Troubleshooting Commands

The command-line interface (CLI) allows you to configure and monitor Cisco NX-OS using a local console or remotely using a Telnet or Secure Shell (SSH) session. The CLI provides a command structure similar to Cisco IOS software, with context-sensitive help, **show** commands, multiuser support, and roles-based access control.

Each feature has **show** commands that provide information about the feature configuration, status, and performance. Additionally, you can use the following command for more information:

- **show system**—Provides information about system-level components, including cores, errors, and exceptions. Use the **show system error-id** command to find details on error codes.

```
switch# copy running-config startup-config
[#####] 100%
2013 May 16 09:59:29 zoom %$ VDC-1 %$ %BOOTVAR-2-AUTOCOPY_FAILED: Autocopy of file
/bootflash/n9000-dk9.6.1.2.I1.1.bin to standby
```

```
switch# show system error-id 0x401e0008
Error Facility:      sysmgr
Error Description:  request was aborted, standby disk may be full
```

Consistency Checker Commands

Cisco NX-OS provides consistency checker commands to validate the software state with the hardware state. The result of the consistency checker is logged as either PASSED or FAILED.

```
2013 Nov 1 16:31:39 switch vshd: CC_LINK_STATE:
Consistency Check: PASSED
```

Cisco NX-OS supports the following consistency checker commands:

- **show consistency-checker l2 module *module-number***—Verifies that learned MAC addresses are consistent between the software and the hardware. It also shows extra entries that are present in the hardware but not in the software and missing entries in the hardware.
- **show consistency-checker l3-interface module *module-number* [brief | detail]**—Checks for Layer 3 settings of all interfaces in the module and for the following configuration in the hardware: L3 VLAN, CML Flags, IPv4 Enable, VPN ID. This command works for physical interfaces and interfaces that are part of a port channel. It does not validate subinterfaces.
- **show consistency-checker link-state module *module-number* [brief | detail]**—Verifies the software link state of all the interfaces in the module against its hardware link state.
- **show consistency-checker membership port-channels [interface port-channel *channel-number*] [brief | detail]**—Checks for port-channel membership in the hardware in all modules and validates it with the software state.
- **show consistency-checker membership vlan *vlan-id* {native-vlan | private-vlan interface {ethernet *slot/port* | port-channel *number* | native-vlan}} [brief | detail]**—Determines that the VLAN membership in the software is the same as programmed in the hardware. It also ignores the interfaces that are in the STP BLK state.
- **show consistency-checker racl {module *module-number* | port-channels interface port-channel *channel-number* | svi interface vlan *vlan-id*}**—Validates the IPv4 RACL programming consistency between the hardware and software and verifies if <label, entry-location> pairs are consistent between the hardware and software.
 - When invoked per module, this command verifies IPv4 ACL consistency for all the physical interfaces in that module.
 - When invoked on a specific port channel, this command verifies for all the member ports.
 - When invoked on all port channels, this command verifies for each port channel that has an ACL applied.



Note Currently, this command does not verify IPv4 and IPv6 ACLs, does not verify on subinterfaces, and does not verify if qualifiers and actions are matching.

- **show consistency-checker stp-state vlan *vlan-id***—Determines whether the spanning tree state in the software is the same as programmed in the hardware. This command is run only on interfaces that are operational (up).

Multicast Consistency Checker

The multicast consistency checker is a single-route consistency checker for Layer 2 and Layer 3 routes for verifying the state of multicast routes. The multicast consistency checker executes the show commands in each component, parses the relevant information, and then compares the processed information against the other components to check for inconsistencies. The multicast consistency checker commands terminate upon encountering a failure. The **show consistency-checker I2 multicast group** and **show consistency-checker I3 multicast group** commands return the differences in the expected value and the actual value.

The commands support the following output formats:

- **verbose**: Displays the results in text format.
- **detail**: Displays the results in JSON format.
- **brief**: Displays the results in JSON format with minimal details.

The multicast consistency checker supports the following devices:

- Cisco Nexus 92304QC, 9272Q, 9236C, 92300YC, 93108TC-EX, 93180LC-EX, 93180YC-EX platform switches and N9K-X9736C-EX, N9K-X97160YC-EX, N9K-X9732C-EX, and N9K-X9732C-EXM line cards.
- Cisco Nexus 9500 Series switches with N9K-X96136YC-R, N9K-X9636C-R, and N9K-X9636Q-R line cards.

The multicast consistency checker verifies the programming consistency of the following Layer 2 components:

- IGMP snooping
- MFDM
- MFIBPI
- MFIBPD
- Hardware tables

The multicast consistency checker verifies the programming consistency of the following Layer 3 components:

- PIM
- MRIB
- IGMP snooping
- MFDM
- MFIBPI
- MFIBPD
- Hardware tables

Configuration Files

Configuration files contain the Cisco NX-OS commands used to configure the features on a Cisco NX-OS device. Cisco NX-OS has two types of configuration files: running configuration and startup configuration. The device uses the startup configuration (startup-config) during the device startup to configure the software features. The running configuration (running-config) contains the current changes that you make to the startup-configuration file. You should create a backup version of your configuration files before modifying that configuration. You can back up the configuration files to a remote server. See the configuration file information in the *Cisco Nexus 9000 Series NX-OS Fundamentals Configuration Guide*. You can also create a checkpoint copy of the configuration file that you can roll back to if problems occur. See the rollback feature in the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Cisco NX-OS features can create internal locks on the startup configuration file. In rare cases, these locks might not be removed by the features. Use the **system startup-config unlock** command to remove these locks.

CLI Debug

Cisco NX-OS supports an extensive debugging feature set for actively troubleshooting a network. Using the CLI, you can enable debugging modes for each feature and view a real-time updated activity log of the control protocol exchanges. Each log entry has a time stamp and is listed chronologically. You can limit access to the debug feature through the CLI roles mechanism to partition access on a per-role basis. While the **debug** commands show real-time information, you can use the **show** commands to list historical and real-time information.



Caution Use the **debug** commands only under the guidance of your Cisco technical support representative because some **debug** commands can impact your network performance.



Note You can log debug messages to a special log file, which is more secure and easier to process than sending the debug output to the console.

By using the **?** option, you can see the options that are available for any feature. A log entry is created for each entered command in addition to the actual debug output. The debug output shows a time-stamped account of the activity that occurred between the local device and other adjacent devices.

You can use the debug facility to track events, internal messages, and protocol errors. However, you should be careful when using the debug utility in a production environment because some options might prevent access to the device by generating too many messages to the console or creating CPU-intensive events that could seriously affect network performance.



Note We recommend that you open a second Telnet or SSH session before you enter any **debug** commands. If the debug session overwhelms the current output window, you can use the second session to enter the **undebug all** command to stop the debug message output.

Debug Filters

You can filter out unwanted debug information by using the **debug-filter** command. The **debug-filter** command allows you to limit the debug information produced by related **debug** commands.

The following example limits EIGRP hello packet debug information to Ethernet interface 2/1:

```
switch# debug-filter ip eigrp interface ethernet 2/1
switch# debug eigrp packets hello
```

Ping and Traceroute



Note Use the ping and traceroute features to troubleshoot problems with connectivity and path choices. Do not use these features to identify or resolve network performance issues.

The **ping** and **traceroute** commands are two of the most useful tools for troubleshooting TCP/IP networking problems. The ping utility generates a series of echo packets to a destination across a TCP/IP internetwork. When the echo packets arrive at the destination, they are rerouted and sent back to the source.

The traceroute utility operates in a similar fashion but can also determine the specific path that a frame takes to its destination on a hop-by-hop basis.

Using Ping

Use the **ping** command to verify connectivity and latency to a particular destination across an IPv4 routed network.

Use the **ping6** command to verify connectivity and latency to a particular destination across an IPv6 routed network.

The ping utility allows you to send a short message to a port or end device. By specifying the IPv4 or IPv6 address, you can send a series of frames to a target destination. Once these frames reach the target, they are looped back to the source and a time stamp is taken.



Note We do not recommend using the Ping utility to test network performance with the IP address configured on the system.

```
switch# ping 172.28.230.1 vrf management
PING 172.28.230.1 (172.28.230.1): 56 data bytes
64 bytes from 172.28.230.1: icmp_seq=0 ttl=254 time=1.095 ms
64 bytes from 172.28.230.1: icmp_seq=1 ttl=254 time=1.083 ms
64 bytes from 172.28.230.1: icmp_seq=2 ttl=254 time=1.101 ms
64 bytes from 172.28.230.1: icmp_seq=3 ttl=254 time=1.093 ms
64 bytes from 172.28.230.1: icmp_seq=4 ttl=254 time=1.237 ms

--- 172.28.230.1 ping statistics ---
```

```
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 1.083/1.121/1.237 ms
```

Using Traceroute

Use traceroute to do the following:

- Trace the route followed by the data traffic.
- Compute the interswitch (hop-to-hop) latency.

The traceroute utility identifies the path taken on a hop-by-hop basis and includes a time stamp at each hop in both directions. You can use traceroute to test the connectivity of ports along the path between the generating device and the device closest to the destination.

Use the **traceroute** *{dest-ipv4-addr | hostname} [vrf vrf-name]* command for IPv4 networks and the **traceroute6** *{dest-ipv6-addr | hostname} [vrf vrf-name]* command for IPv6 networks. If the destination cannot be reached, the path discovery traces the path up to the point of failure.

```
switch# traceroute 172.28.254.254 vrf management
traceroute to 172.28.254.254 (172.28.254.254), 30 hops max, 40 byte packets
 1 172.28.230.1 (172.28.230.1) 0.941 ms 0.676 ms 0.585 ms
 2 172.24.114.213 (172.24.114.213) 0.733 ms 0.7 ms 0.69 ms
 3 172.20.147.46 (172.20.147.46) 0.671 ms 0.619 ms 0.615 ms
 4 172.28.254.254 (172.28.254.254) 0.613 ms 0.628 ms 0.61 ms
```

Press **Ctrl-C** to terminate a running traceroute.

You can use the following commands to specify a source interface for the traceroute:

Command	Purpose
<p>traceroute <i>{dest-ipv4-addr hostname} [source {dest-ipv4-addr hostname interface}] [vrf vrf-name]</i></p> <p>Example:</p> <pre>switch# traceroute 112.112.112.1 source vlan 10</pre>	<p>Specifies the source IPv4 address of the traceroute packets from the specified IP address, hostname, or interface.</p>
<p>traceroute6 <i>{dest-ipv6-addr hostname} [source {dest-ipv6-addr hostname interface}] [vrf vrf-name]</i></p> <p>Example:</p> <pre>switch# traceroute6 2010:11:22:0:1000::1 source ethernet 2/2</pre>	<p>Specifies the source IPv6 address of the traceroute6 packets from the specified IP address, hostname, or interface.</p>
<p>[no] ip traceroute source-interface interface [vrf vrf-name]</p> <p>Example:</p> <pre>switch(config)# ip traceroute source-interface loopback 1</pre>	<p>Generates traceroute or traceroute6 packets with the source IP address from the configured interface.</p>

Command	Purpose
<p>show ip traceroute source-interface [<i>vrf vrf-name</i>]</p> <p>Example:</p> <pre>switch# show ip traceroute source-interface vrf all VRF Name Interface default loopback1</pre>	<p>Displays the configured source interface for the traceroute.</p>
<p>ip icmp-errors source-interface <i>interface</i></p> <p>Example 1:</p> <pre>switch(config)# ip icmp-errors source-interface loopback 1</pre> <p>Example 2:</p> <pre>switch(config)# vrf context vrf-blue switch(config-vrf)# ip icmp-errors source-interface loopback 2</pre>	<p>Generates ICMP error packets with the source IPv4 or IPv6 address from the configured interface.</p> <p>You can also optionally configure this command within a virtual routing and forwarding instance (VRF).</p>

Monitoring Processes and CPUs

Use the **show processes** command to identify the processes that are running and the status of each process. The command output includes the following:

- PID = process ID.
- State = process state.
- PC = current program counter in hexadecimal format.
- Start_cnt = how many times a process has been started (or restarted).
- TTY = terminal that controls the process. A - (hyphen) usually means a daemon not running on any particular TTY.
- Process = name of the process.

Process states are as follows:

- D = uninterruptible sleep (usually I/O).
- R = runnable (on run queue).
- S = sleeping.
- T = traced or stopped.
- Z = defunct (zombie) process.
- NR = not-running.

- ER = should be running but currently not-running.



Note Typically, the ER state designates a process that has been restarted too many times, causing the system to classify it as faulty and disable it.

```
switch# show processes ?
cpu      Show processes CPU Info
log      Show information about process logs
memory   Show processes Memory Info
```

```
switch# show processes
PID      State  PC          Start_cnt  TTY  Type  Process
-----  -----  -----  -----  ---  ---  -----
1        S      b7f9e468    1          -    O     init
2        S      0           1          -    O     migration/0
3        S      0           1          -    O     ksoftirqd/0
4        S      0           1          -    O     desched/0
5        S      0           1          -    O     migration/1
6        S      0           1          -    O     ksoftirqd/1
7        S      0           1          -    O     desched/1
8        S      0           1          -    O     events/0
9        S      0           1          -    O     events/1
10       S      0           1          -    O     khelper
15       S      0           1          -    O     kthread
24       S      0           1          -    O     kacpid
103      S      0           1          -    O     kblockd/0
104      S      0           1          -    O     kblockd/1
117      S      0           1          -    O     khubd
184      S      0           1          -    O     pdflush
185      S      0           1          -    O     pdflush
187      S      0           1          -    O     aio/0
188      S      0           1          -    O     aio/1
189      S      0           1          -    O     SerrLogKthread
```

...

Using the show processes cpu Command

Use the **show processes cpu** command to display CPU utilization. The command output includes the following:

- Runtime(ms) = CPU time that the process has used, expressed in milliseconds.
- Invoked = Number of times that the process has been invoked.
- uSecs = Average CPU time, in microseconds, for each process invocation.
- 1Sec = Percentage of CPU utilization for the last 1 second.

```
switch# show processes cpu
PID      Runtime(ms)  Invoked  uSecs  1Sec  Process
-----  -----  -----  -----  ---  -----
1        2264        108252   20     0     init
2        950         211341   4      0     migration/0
3        1154        32833341 0      0     ksoftirqd/0
4        609         419568   1      0     desched/0
5        758         214253   3      0     migration/1
6        2462        155309355 0      0     ksoftirqd/1
7        2496        392083   6      0     desched/1
```

```

      8          443      282990      1      0  events/0
      9          578      260184      2      0  events/1
     10           56       2681     21      0  khelper
     15           0         30     25      0  kthread
     24           0         2       5      0  kacpid
    103          81         89    914      0  kblockd/0
    104          56        265    213      0  kblockd/1
    117           0         5      17      0  khubd
    184           0         3       3      0  pdflush
    185        1796     104798     17      0  pdflush
    187           0         2       3      0  aio/0
    188           0         2       3      0  aio/1
    189           0         1       3      0  SerrLogKthread
...

```

Using the show system resources Command

Use the **show system resources** command to display system-related CPU and memory statistics. The output includes the following:

- Load average is defined as the number of running processes. The average reflects the system load over the past 1, 5, and 15 minutes.
- Processes displays the number of processes in the system and how many are actually running when the command is issued.
- CPU states show the CPU usage percentage in user mode, kernel mode, and idle time in the last 1 second.
- Memory usage provides the total memory, used memory, free memory, memory used for buffers, and memory used for cache in kilobytes. Buffers and cache are also included in the used memory statistics.

```

switch# show system resources
Load average:  1 minute: 0.00  5 minutes: 0.02  15 minutes: 0.05
Processes   :   355 total, 1 running
CPU states  :   0.0% user,  0.2% kernel,  99.8% idle
  CPU0 states :   0.0% user,  1.0% kernel,  99.0% idle
  CPU1 states :   0.0% user,  0.0% kernel, 100.0% idle
  CPU2 states :   0.0% user,  0.0% kernel, 100.0% idle
  CPU3 states :   0.0% user,  0.0% kernel, 100.0% idle
Memory usage: 16402560K total,  2664308K used, 13738252K free
Current memory status: OK

```

Using Onboard Failure Logging

Cisco NX-OS provides the facility to log failure data to the persistent storage, which can be retrieved and displayed for analysis. This onboard failure logging (OBFL) feature stores failure and environmental information in nonvolatile memory on the module. This information will help you analyze failed modules.

The data stored by the OBFL facility includes the following:

- Time of initial power on
- Slot number of the module in the chassis
- Initial temperature of the module
- Firmware, BIOS, FPGA, and ASIC versions

- Serial number of the module
- Stack trace for crashes
- CPU hog information
- Memory leak information
- Software error messages
- Hardware exception logs
- Environmental history
- OBFL specific history information
- ASIC interrupt and error statistics history
- ASIC register dumps

For more information about configuring OBFL, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Using Diagnostics

Generic online diagnostics (GOLD) define a common framework for diagnostic operations across Cisco platforms. The GOLD implementation checks the health of hardware components and verifies proper operation of the system data and control planes. Some tests take effect when the system is booting up; other tests take effect when the system is operational. A booting module goes through a series of checks before coming online to allow the system to detect faults in the hardware components at bootup and to ensure that a failing module is not introduced in a live network.

Defects are also diagnosed during system operation or runtime. You can configure a series of diagnostic checks to determine the condition of an online system. You must distinguish between disruptive and nondisruptive diagnostic tests. Although nondisruptive tests occur in the background and do not affect the system data or control planes, disruptive tests do affect live packet flows. You should schedule disruptive tests during special maintenance windows. The **show diagnostic content module** command output displays test attributes such as disruptive or nondisruptive tests.

You can configure runtime diagnostic checks to run at a specific time or to run continually in the background.

Health-monitoring diagnostic tests are nondisruptive, and they run in the background while the system is in operation. The role of online diagnostic health monitoring is to proactively detect hardware failures in the live network environment and inform you of a failure.

GOLD collects diagnostic results and detailed statistics for all tests including the last execution time, the first and last test pass time, the first and last test failure time, the total run count, the total failure count, the consecutive failure count, and the error code. These test results help administrators determine the condition of a system and understand the reason for a system failure. Use the **show diagnostic result** command to view diagnostic results.

For more information about configuring GOLD, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Using Embedded Event Manager

Embedded Event Manager (EEM) is a policy-based framework that allows you to monitor key system events and then act on those events through a set policy. The policy is a preprogrammed script that you can load that defines actions that the device should invoke based on set events occurring. The script can generate actions, including, but not limited to, generating custom syslog or SNMP traps, invoking CLI commands, forcing a failover, and much more.

For more information about configuring EEM, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Using Ethalyzer

Ethalyzer is a Cisco NX-OS protocol analyzer tool implementation of the open source software TShark which is a terminal version of Wireshark (formerly Ethereal). You can use Ethalyzer to troubleshoot your network by capturing and analyzing control-plane traffic on inband and management interfaces across all Nexus platforms.

To configure Ethalyzer, use the following commands:

Command	Purpose
ethalyzer local interface inband	Captures packets sent or received by the supervisor through the inband interface and displays summarized protocol information for captured packets.
ethalyzer local interface inband-in	Captures packets received by the supervisor through the inband interface and displays summarized protocol information for captured packets.
ethalyzer local interface inband-out	Captures packets sent by the supervisor through the inband interface and displays summarized protocol information for captured packets.
ethalyzer local interface mgmt	Captures packets sent or received by the management interface and displays summarized protocol information for captured packets.
ethalyzer local interface front-panel	<p>Captures packets sent or received by the supervisor through a Layer 3 (routed) front-panel port and displays summarized protocol information for captured packets.</p> <p>Note This command does not support capturing packets sent or received by the supervisor through Layer 2 (switchport) front-panel ports.</p>

Command	Purpose
ethalyzer local interface port-channel	<p>Captures packets sent or received by the supervisor through a Layer 3 (routed) port-channel interface and displays summarized protocol information for captured packets.</p> <p>Note This command does not support capturing packets sent or received by the supervisor through Layer 2 (switchport) port-channel interfaces.</p>
ethalyzer local interface vlan	Captures packets sent or received by the supervisor through a Layer 3 Switch Virtual Interface (SVI) and displays summarized protocol information.
ethalyzer local interface netstack	Captures packets sent or received by the supervisor through the Netstack software component and displays summarized protocol information.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} limit-captured-frames	Limits the number of frames to capture within the Ethalyzer session. The number of frames can be an integer value from 0 to 500,000. If 0 is provided, then a maximum of 500,000 frames will be captured before the Ethalyzer session automatically stops.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} limit-frame-size	Limits the length of the frame to capture. The length of frame can be an integer value from 192 to 65,536.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} capture-filter	Filters the types of packets to capture using Berkeley Packet Filter (BPF) syntax.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} display-filter	Filtersthe types of captured packets to display using Wireshark or TShark Display Filters.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} write	Saves the captured data to a file. Valid storage options include the switch's bootflash, logflash, a USB storage device, or volatile storage.
ethalyzer local read	Opens a captured data file and analyzes the file. Valid storage options include the switch's bootflash, logflash, a USB storage device, or volatile storage.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} autostop	Specifies a condition that will automatically stop the Ethalyzer session. You can specify the duration of the session in seconds, number of files to capture when writing captured packets to a file using the write keyword, and file size when writing captured packets to a file using the write keyword.

Command	Purpose
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} capture-ring-buffer	Specifies the capture ring buffer options for Ethalyzer. This option will continuously write to one or more files in a ring buffer when combined with the write keyword. You can specify the duration in seconds that Ethalyzer will wait before writing to a new file, the number of files to keep as part of the ring buffer, and the file size of each individual file in the ring buffer.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} detail	Displays detailed protocol information for captured packets.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} raw	Displays captured packets in hex format.
ethalyzer local interface {front-panel inband inband-in inband-out mgmt port-channel vlan} vrf	Specifies the VRF that the Layer 3 interface is a member of if the Layer 3 interface is in a non-default VRF.

Guidelines and Limitations

- If a Layer 3 interface is a member of a non-default VRF and is specified in an Ethalyzer session (for example, through the **ethalyzer local interface front-panel ethernet1/1** or **ethalyzer local interface port-channel1** commands), you must specify the VRF that the Layer 3 interface is a member of within the Ethalyzer session using the **vrf** keyword. For example, to capture packets received or sent by the supervisor through Layer 3 front-panel port Ethernet1/1 in VRF "red", use the **ethalyzer local interface front-panel ethernet1/1 vrf red** command.
- When writing to a file, Ethalyzer will automatically stop if the Ethalyzer session captures 500,000 packets, or if the size of the file reaches ~11 megabytes, whichever comes first.

Examples

```
switch(config)# ethalyzer local interface inband
<CR>
> Redirect it to a file
>> Redirect it to a file in append mode
autostop Capture autostop condition
capture-filter Filter on ethalyzer capture capture-ring-buffer Capture ring buffer option
decode-internal Include internal system header decoding detail Display detailed protocol
information
display-filter Display filter on frames captured
limit-captured-frames Maximum number of frames to be captured (default is 10) limit-frame-size
  Capture only a subset of a frame
mirror Filter mirrored packets
raw Hex/Ascii dump the packet with possibly one line summary
write Filename to save capture to
| Pipe command output to filter

switch(config)# ethalyzer local interface inband Capturing on 'ps-inb'

1 2021-07-26 09:36:36.395756813 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 64 PRI:
7 DEI: 0 ID: 4033
```

```

2 2021-07-26 09:36:36.395874466 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 205 PRI:
7 DEI: 0 ID: 4033
4 3 2021-07-26 09:36:36.395923840 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 806 PRI:
7 DEI: 0 ID: 4033
4 2021-07-26 09:36:36.395984384 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 1307 PRI:
7 DEI: 0 ID: 4033
5 2021-07-26 09:37:36.406020552 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 64 PRI:
7 DEI: 0 ID: 4033
6 2021-07-26 09:37:36.406155603 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 205 PRI:
7 DEI: 0 ID: 4033
7 2021-07-26 09:37:36.406220547 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 806 PRI:
7 DEI: 0 ID: 4033
8 8 2021-07-26 09:37:36.406297734 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 1307
PRI: 7 DEI: 0 ID: 4033
9 2021-07-26 09:38:36.408983263 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 64 PRI:
7 DEI: 0 ID: 4033
10 10 2021-07-26 09:38:36.409101470 00:22:bd:cf:b9:01 → 00:22:bd:cf:b9:00 0x3737 205
PRI: 7 DEI: 0 ID: 4033

```

Use the `detail` option for detailed protocol information. Ctrl+C can be used to abort and get the switch prompt back in the middle of the capture, if required.

```

switch(config)# ethanalyzer local interface inband detail
Capturing on 'ps-inb'
Frame 1: 64 bytes on wire (512 bits), 64 bytes captured (512 bits) on interface ps-inb, id
0
Interface id: 0 (ps-inb) Interface name: ps-inb
Encapsulation type: Ethernet (1)
Arrival Time: Jul 26, 2021 11:54:37.155791496 UTC
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1627300477.155791496 seconds
[Time delta from previous captured frame: 0.000000000 seconds] [Time delta from previous
displayed frame: 0.000000000 seconds] [Time since reference or first frame: 0.000000000
seconds] Frame Number: 1
Frame Length: 64 bytes (512 bits)
Capture Length: 64 bytes (512 bits) [Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:vlan:ethertype:data] Ethernet II, Src: 00:22:bd:cf:b9:01,
  Dst: 00:22:bd:cf:b9:00
Destination: 00:22:bd:cf:b9:00 Address: 00:22:bd:cf:b9:00
.... ..0. .... .. = LG bit: Globally unique address (factory default)
.... ..0 .... .. = IG bit: Individual address (unicast) Source: 00:22:bd:cf:b9:01
Address: 00:22:bd:cf:b9:01
.... ..0. .... .. = LG bit: Globally unique address (factory default)
.... ..0 .... .. = IG bit: Individual address (unicast) Type: 802.1Q Virtual
LAN (0x8100)
802.1Q Virtual LAN, PRI: 7, DEI: 0, ID: 4033
111. .... .. = Priority: Network Control (7) 4 ...0 .... .. = DEI: Ineligible
.... 1111 1100 0001 = ID: 4033
Type: Unknown (0x3737) Data (46 bytes)

0000 a9 04 00 00 7d a2 fe 60 47 4f 4c 44 00 0b 0b 0b ....}..`GOLD....
0010 0b .....

0020 0b .....
Data: a90400007da2fe60474f4c44000b0b0b0b0b0b0b0b0b... [Length: 46]

```

Use the `capture-filter` option to select which packets to display or save to disk during capture. A capture filter maintains a high rate of capture while it filters. Because full dissection has not been done on the packets, the filter fields are predefined and limited.

Use the `display-filter` option to change the view of a capture file. A display filter uses fully dissected packets, so you can do very complex and advanced filtering when you analyze a network tracefile. Ethalyzer writes captured data to a temporary file if it is not instructed to write captured data to a file elsewhere. This temporary file can fill quickly when a display filter is used without the user's knowledge, since all packets matching the `capture-filter` option are written to the temporary file, but only packets matching the `display-filter` option are displayed.

In this example, `limit-captured-frames` is set to 5. With the `capture-filter` option, Ethalyzer shows you five packets which match the filter `host 10.10.10.2`. With the `display-filter` option, Ethalyzer first captures five packets then displays only the packets that match the filter `ip.addr==10.10.10.2`.

```
switch(config)# ethalyzer local interface inband capture-filter "host 10.10.10.2"
limit-captured-frames 5
Capturing on inband
2013-02-10 12:51:52.150404 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:52.150480 10.10.10.2 -> 10.10.10.1 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:52.496447 10.10.10.2 -> 10.10.10.1 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:52.497201 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:53.149831 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200
5 packets captured
switch(config)# ethalyzer local interface inband display-filter "ip.addr==10.10.10.2"
limit-captured-frame 5
Capturing on inband
2013-02-10 12:53:54.217462 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:53:54.217819 10.10.10.2 -> 10.10.10.1 UDP Source port: 3200 Destination port:
3200
2 packets captured
```

The `write` option lets you write the capture data to a file in one of the storage devices (such as bootflash or logflash) on the Cisco Nexus 9000 Series Switch for later analysis. The capture file size is limited to 10 MB.

An example Ethalyzer command with a `write` option is `ethalyzer local interface inband write bootflash:capture_file_name`. The following is an example of a `write` option with `capture-filter` and an output file name of `first-capture`:

```
switch(config)# ethalyzer local interface inband capture-filter "host 10.10.10.2"
limit-captured-frame 5 write ?
bootflash: Filename logflash: Filename slot0:      Filename
usb1:      Filename
usb2: Filename volatile: Filename
switch(config)# ethalyzer local interface inband capture-filter "host 10.10.10.2"
limit-captured-frame 5 write bootflash:first-capture
```

When the capture data is saved to a file, the captured packets are, by default, not displayed in the terminal window. The `display` option forces Cisco NX-OS to display the packets while it saves the capture data to a file.

The `capture-ring-buffer` option creates multiple files after a specified number of seconds, a specified number of files, or a specified file size. The following are the definitions of those options:

```
switch(config)# ethalyzer local interface inband capture-ring-buffer ?
duration Stop writing to the file or switch to the next file after value seconds have elapsed
files Stop writing to capture files after value number of files were written or begin again
  with the first file after value number of files were
  written (form a ring buffer)
filesize Stop writing to a capture file or switch to the next file after it reaches a size
  of value kilobytes
```

The **read** option lets you read the saved file on the device itself.

```
switch(config)# ethalyzer local read bootflash:first-capture
2013-02-10 12:51:52.150404 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:52.150480 10.10.10.2 -> 10.10.10.1 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:52.496447 10.10.10.2 -> 10.10.10.1 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:52.497201 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200
2013-02-10 12:51:53.149831 10.10.10.1 -> 10.10.10.2 UDP Source port: 3200 Destination port:
3200

switch(config)# ethalyzer local read bootflash:first-capture detail Frame 1 (110 bytes
on wire, 78 bytes captured)
-----SNIP-----
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:data]
Ethernet II Src: 00:24:98:6f:ba:c4 (00:24:98:6f:ba:c4), Dst: 00:26:51:ce:0f:44
(00:26:51:ce:0f:44)
Destination: 00:26:51:ce:0f:44 (00:26:51:ce:0f:44) Address: 00:26:51:ce:0f:44
(00:26:51:ce:0f:44)
.... 0. .... = IG bit: Individual address (unicast)
.... 0. .... = LG bit: Globally unique address (factory default) Source:
00:24:98:6f:ba:c4 (00:24:98:6f:ba:c4)
Address: 00:24:98:6f:ba:c4 (00:24:98:6f:ba:c4)
.... 0. .... = IG bit: Individual address (unicast)
.... 0. .... = LG bit: Globally unique address (factory default) Type: IP
(0x0800)
Internet Protocol, Src: 10.10.10.1 (10.10.10.1), Dst: 10.10.10.2 (10.10.10.2)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0xc0 (DSC) 0x30: Class Selector 6; ECN: 0x00)
-----SNIP-----
```

You can also transfer the file to a server or a PC and read it with Wireshark or any other application that can read files with .cap or .pcap file formats.

```
switch(config)# copy bootflash:first-capture tftp:
Enter vrf (If no input, current vrf 'default' is considered): management
Enter hostname for the tftp server: 192.168.21.22
Trying to connect to tftp server.....
Connection to Server Established. TFTP put operation was successful
Copy complete.
```

The **decode-internal** option reports internal information on how the Nexus 9000 forwards the packet. This information helps you understand and troubleshoot the flow of packets through the CPU.

```
switch(config)# ethalyzer local interface inband decode-internal capture-filter "host
10.10.10.2" limit-captured-frame 5 detail
Capturing on inband NXOS Protocol
NXOS VLAN: 0====->VLAN in decimal=0=L3 interface
NXOS SOURCE INDEX: 1024====->PIXN LTL source index in decimal=400=SUP
inband
NXOS DEST INDEX: 2569====-> PIXN LTL destination index in decimal=0xa09=e1/25
Frame 1: (70 bytes on wire, 70 bytes captured)
Arrival Time: Feb 10, 2013 22:40:02.216492000
[Time shift for this packet: 0.000000000 seconds]
Epoch Time: 1627300477.155791496 seconds
[Time delta from previous captured frame: 0.000000000 seconds] [Time delta from previous
displayed frame: 0.000000000 seconds] [Time since reference or first frame: 0.000000000
seconds] Frame Number: 1
Frame Length: 70 bytes Capture Length: 70 bytes [Frame is marked: False]
[Protocols in frame: eth:ip:udp:data]
```

```
Ethernet II, Src: 00:26:51:ce:0f:43 (00:26:51:ce:0f:43), Dst: 00:24:98:6f:ba:c3
(00:24:98:6f:ba:c3)
Destination: 00:24:98:6f:ba:c3 (00:24:98:6f:ba:c3) Address: 00:24:98:6f:ba:c3
(00:24:98:6f:ba:c3)
.... ..0 .... .. = IG bit: Individual address (unicast)
.... ..0. .... .. = LG bit: Globally unique address (factory default) Source:
00:26:51:ce:0f:43 (00:26:51:ce:0f:43)
-----SNIP-----
```

Convert the NX-OS index to hexadecimal, then use the **show system internal pixm info ltl {index}** command to map the local target logic (LTL) index to a physical or logical interface.

Capture Traffic to or from an IP Host

```
host 1.1.1.1
```

Capture Traffic to or from a Range of IP Addresses

```
net 172.16.7.0/24
```

```
net 172.16.7.0 mask 255.255.255.0
```

Capture Traffic from a Range of IP Addresses

```
src net 172.16.7.0/24
```

```
src net 172.16.7.0 mask 255.255.255.0
```

Capture Traffic to a Range of IP Addresses

```
dst net 172.16.7.0/24
```

```
dst net 172.16.7.0 mask 255.255.255.0
```

Capture UDLD, VTP, or CDP Traffic

UDLD is Unidirectional Link Detection, VTP is the VLAN Trunking Protocol, and CDP is the Cisco Discovery Protocol.

```
ether host 01:00:0c:cc:cc:cc
```

Capture Traffic to or from a MAC Address

```
ether host 00:01:02:03:04:05
```



Note and = &&
 or = ||
 not = !
 MAC address format : xx:xx:xx:xx:xx:xx

Common Control Plane Protocols

- UDLD: Destination Media Access Controller (DMAC) = 01-00-0C-CC-CC-CC and EthType = 0x0111

- LACP: DMAC = 01:80:C2:00:00:02 and EthType = 0x8809. LACP stands for Link Aggregation Control Protocol
- STP: DMAC = 01:80:C2:00:00:00 and EthType = 0x4242 - or - DMAC = 01:00:0C:CC:CC:CD and EthType = 0x010B
- CDP: DMAC = 01-00-0C-CC-CC-CC and EthType = 0x2000
- LLDP: DMAC = 01:80:C2:00:00:0E or 01:80:C2:00:00:03 or 01:80:C2:00:00:00 and EthType = 0x88CC
- DOT1X: DMAC = 01:80:C2:00:00:03 and EthType = 0x888E. DOT1X stands for IEEE 802.1x
- IPv6: EthType = 0x86DD
- List of UDP and TCP port numbers

Ethalyzer does not capture data traffic that Cisco NX-OS forwards in the hardware.

Ethalyzer uses the same capture filter syntax as **tcpdump** and uses the Wireshark display filter syntax.

This example shows captured data (limited to four packets) on the management interface:

```
switch(config)# ethalyzer local interface mgmt limit-captured-frames 4
Capturing on eth1

2013-05-18 13:21:21.841182 172.28.230.2 -> 224.0.0.2 BGP Hello (state Standby)
2013-05-18 13:21:21.842190 10.86.249.17 -> 172.28.231.193 TCP 4261 > telnet [AC] Seq=0 Ack=0
  Win=64475 Len=0
2013-05-18 13:21:21.843039 172.28.231.193 -> 10.86.249.17 TELNET Telnet Data ..
2013-05-18 13:21:21.850463 00:13:5f:1c:ee:80 -> ab:00:00:02:00:00 0x6002 DEC DN

Remote Console
4 packets captured
```

This example shows detailed captured data for one HSRP packet:

```
switch(config)# ethalyzer local interface mgmt capture-filter "udp port 1985"
limit-captured-frames 1
Capturing on eth1
Frame 1 (62 bytes on wire, 62 bytes captured)
Arrival Time: May 18, 2013 13:29:19.961280000
[Time delta from previous captured frame: 1203341359.961280000 seconds]
[Time delta from previous displayed frame: 1203341359.961280000 seconds]
[Time since reference or first frame: 1203341359.961280000 seconds]
Frame Number: 1
Frame Length: 62 bytes
Capture Length: 62 bytes
[Frame is marked: False]
[Protocols in frame: eth:ip:udp:hsrp]

Ethernet II, Src: 00:00:0c:07:ac:01 (00:00:0c:07:ac:01), Dst: 01:00:5e:00:00:02
(01:00:5e:00:00:02)
Destination: 01:00:5e:00:00:02 (01:00:5e:00:00:02)
Address: 01:00:5e:00:00:02 (01:00:5e:00:00:02)
.... 01 ..... = IG bit: Group address (multicast/broadcast)
.... 00 ..... = LG bit: Globally unique address (factory default)
Source: 00:00:0c:07:ac:01 (00:00:0c:07:ac:01)
Address: 00:00:0c:07:ac:01 (00:00:0c:07:ac:01)

.... 00 ..... = IG bit: Individual address (unicast)
```

```

.... ..0. .... .. = LG bit: Globally unique address (factory default)

Type: IP (0x0800)
Internet Protocol, Src: 172.28.230.3 (172.28.230.3), Dst: 224.0.0.2 (224.0.0.2)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00)
1100 00.. = Differentiated Services Codepoint: Class Selector 6 (0x30)
.... ..0. = ECN-Capable Transport (ECT): 0
.... ...0 = ECN-CE: 0

Total Length: 48
Identification: 0x0000 (0)
Flags: 0x00
0... = Reserved bit: Not set
.0.. = Don't fragment: Not set
..0. = More fragments: Not set
Fragment offset: 0
Time to live: 1
Protocol: UDP (0x11)
Header checksum: 0x46db [correct]
[Good: True]
[Bad : False]

Source: 172.28.230.3 (172.28.230.3)
Destination: 224.0.0.2 (224.0.0.2)
User Datagram Protocol, Src Port: 1985 (1985), Dst Port: 1985 (1985)
Source port: 1985 (1985)
Destination port: 1985 (1985)
Length: 28
Checksum: 0x8ab9 [correct]
[Good Checksum: True]
[Bad Checksum: False]

Cisco Hot Standby Router Protocol
Version: 0
Op Code: Hello (0)
State: Active (16)
Hellotime: Default (3)
Holdtime: Default (10)
Priority: 105
Group: 1
Reserved: 0Authentication Data: Default (cisco)
Virtual IP Address: 172.28.230.1 (172.28.230.1)

1 packets captured

```

This example uses a display filter to show only those HSRP packets that have an active HSRP state:

```

switch(config)# ethalyzer local interface mgmt display-filter "hsrp.state==Active"
limit-captured-frames 2
Capturing on eth1

2013-05-18 14:35:41.443118 172.28.230.3 -> 224.0.0.2 HSRP Hello (state Active)
2013-05-18 14:35:44.326892 172.28.230.3 -> 224.0.0.2 HSRP Hello (state Active)
2 packets captured

```

Beginning with Cisco NX-OS, release 10.1(2) Ethalyzer Autocollection CLI is supported on all Cisco Nexus 9000 Series platforms.

References

- [Wireshark: CaptureFilters](#)
- [Wireshark: DisplayFilters](#)
- [Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide](#)
- [Cisco Nexus 9000 Series NX-OS VXLAN Configuration Guide](#)
- [Cisco Nexus 9000 NX-OS Interface Configuration Guide](#)
- [Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide](#)

SNMP and RMON Support

Cisco NX-OS provides extensive SNMPv1, v2, and v3 support, including Management Information Bases (MIBs) and notifications (traps and informs).

The SNMP standard allows any third-party applications that support the different MIBs to manage and monitor Cisco NX-OS.

SNMPv3 provides extended security. Each device can be selectively enabled or disabled for SNMP service. In addition, each device can be configured with a method of handling SNMPv1 and v2 requests.

Cisco NX-OS also supports Remote Monitoring (RMON) alarms and events. RMON alarms and events provide a mechanism for setting thresholds and sending notifications based on changes in network behavior.

The *Alarm Group* allows you to set alarms. Alarms can be set on one or multiple parameters within a device. For example, you can set an RMON alarm for a specific level of CPU utilization on a device. The *EventGroup* allows you to configure events that are actions to be taken based on an alarm condition. The types of events that are supported include logging, SNMP traps, and log-and-trap.

For more information about configuring SNMP and RMON, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Using RADIUS

The RADIUS protocol is used to exchange attributes or credentials between a head-end RADIUS server and a client device. These attributes relate to three classes of services:

- Authentication
- Authorization
- Accounting

Authentication refers to the authentication of users for access to a specific device. You can use RADIUS to manage user accounts for access to a Cisco NX-OS device. When you try to log into a device, Cisco NX-OS validates you with information from a central RADIUS server.

Authorization refers to the scope of access that you have once you have been authenticated. Assigned roles for users can be stored in a RADIUS server with a list of actual devices that the user should have access to.

Once the user has been authenticated, the device can then refer to the RADIUS server to determine the access that the user will have.

Accounting refers to the log information that is kept for each management session in a device. You can use this information to generate reports for troubleshooting purposes and user accountability. You can implement accounting locally or remotely (using RADIUS).

This example shows how to display accounting log entries:

```
switch# show accounting log
Sun May 12 04:02:27 2007:start:/dev/pts/0_1039924947:admin
Sun May 12 04:02:28 2007:stop:/dev/pts/0_1039924947:admin:vsh exited normally
Sun May 12 04:02:33 2007:start:/dev/pts/0_1039924953:admin
Sun May 12 04:02:34 2007:stop:/dev/pts/0_1039924953:admin:vsh exited normally
Sun May 12 05:02:08 2007:start:snmp_1039928528_172.22.95.167:public
Sun May 12 05:02:08 2007:update:snmp_1039928528_172.22.95.167:public:Switchname
```



Note The accounting log shows only the beginning and end (start and stop) for each session.

Using syslog

The system message logging software saves messages in a log file or directs the messages to other devices. This feature provides the following capabilities:

- Logging information for monitoring and troubleshooting
- Selection of the types of logging information to be captured
- Selection of the destination of the captured logging information

You can use syslog to store a chronological log of system messages locally or to send this information to a central syslog server. The syslog messages can also be sent to the console for immediate use. These messages can vary in detail depending on the configuration that you choose.

The syslog messages are categorized into seven severity levels from debug to critical events. You can limit the severity levels that are reported for specific services within the device. For example, you might want to report debug events only for the OSPF service but record all severity level events for the BGP service.

Log messages are not saved across system reboots. However, a maximum of 100 log messages with a severity level of critical and below (levels 0, 1, and 2) are saved in NVRAM. You can view this log at any time with the **show logging nvram** command.

Logging Levels

Cisco NX-OS supports the following logging levels:

- 0-emergency
- 1-alert
- 2-critical

- 3-error
- 4-warning
- 5-notification
- 6-informational
- 7-debugging

By default, the device logs normal but significant system messages to a log file and sends these messages to the system console. Users can specify which system messages should be saved based on the type of facility and the severity level. Messages have a time stamp to enhance real-time debugging and management.

Enabling Logging for Telnet or SSH

System logging messages are sent to the console based on the default or configured logging facility and severity values.

- To disable console logging, use the **no logging console** command in configuration mode.
- To enable logging for Telnet or SSH, use the **terminal monitor** command in EXEC mode.
- When logging to a console session is disabled or enabled, that state is applied to all future console sessions. If a user exits and logs in again to a new session, the state is preserved. However, when logging to a Telnet or SSH session is enabled or disabled, that state is applied only to that session. The state is not preserved after the user exits the session.

The **no logging console** command disables console logging and is enabled by default.

```
switch(config)# no logging console
```

The **terminal monitor** command enables logging for Telnet or SSH and is disabled by default.

```
switch# terminal monitor
```

For more information about configuring syslog, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Using SPAN

You can use the Switched Port Analyzer (SPAN) utility to perform detailed troubleshooting or to take a sample of traffic from a particular application host for proactive monitoring and analysis.

When you have a problem in your network that you cannot solve by fixing the device configuration, you typically need to take a look at the protocol level. You can use **debug** commands to look at the control traffic between an end node and a device. However, when you need to focus on all the traffic that originates from or is destined to a particular end node, you can use a protocol analyzer to capture protocol traces.

To use a protocol analyzer, you must insert the analyzer inline with the device under analysis, which disrupts input and output (I/O) to and from the device.

In Ethernet networks, you can solve this problem by using the SPAN utility. SPAN allows you to take a copy of all traffic and direct it to another port within the device. The process is nondisruptive to any connected devices and is facilitated in the hardware, which prevents any unnecessary CPU load.

SPAN allows you to create independent SPAN sessions within the device. You can apply a filter to capture only the traffic received or the traffic transmitted.

For more information about configuring SPAN, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Using the Blue Beacon Feature

On some platforms, you can cause the platform LEDs to blink. This feature is a useful way to mark a piece of hardware so that a local administrator can quickly identify the hardware for troubleshooting or replacement.

To flash the LEDs on a hardware entity, use the following commands:

Command	Purpose
blink chassis	Flashes the chassis LED.
blink fan <i>number</i>	Flashes one of the fan LEDs.
blink module <i>slot</i>	Flashes the selected module LED.
blink powersupply <i>number</i>	Flashes one of the power supply LEDs.

Additional References for Troubleshooting Tools and Methodology

Related Documents

Related Topic	Document Title
System management tools	<i>Cisco Nexus 9000 Series NX-OS System Management Configuration Guide</i>
MIBs	<i>Cisco Nexus 7000 Series and 9000 Series NX-OS MIB Quick Reference</i>



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