Troubleshooting the Software Configuration

This chapter describes how to identify and resolve software problems related to the Cisco IOS software on the switch. Depending on the nature of the problem, you can use the command-line interface (CLI), Device Manager, or Network Assistant to identify and solve problems.

Additional troubleshooting information, such as LED descriptions, is provided in the hardware installation guide.

Information About Troubleshooting the Software Configuration

Software Failure on a Switch

Switch software can be corrupted during an upgrade by downloading the incorrect file to the switch, and by deleting the image file. In all of these cases, there is no connectivity.

Lost or Forgotten Password on a Device

The default configuration for the device allows an end user with physical access to the device to recover from a lost password by interrupting the boot process during power-on and by entering a new password. These recovery procedures require that you have physical access to the device.

Note On these devices, a system administrator can disable some of the functionality of this feature by allowing an end user to reset a password only by agreeing to return to the default configuration. If you are an end user trying to reset a password when password recovery has been disabled, a status message reminds you to return to the default configuration during the recovery process.

Note You cannot recover encryption password key, when Cisco WLC configuration is copied from one Cisco WLC to another (in case of an RMA).

Follow the steps described in the section Recovering from a Lost or Forgotten Password, on page 10 to recover from a lost or forgotten password.

Power over Ethernet Ports

A Power over Ethernet (PoE) switch port automatically supplies power to one of these connected devices if the switch detects that there is no power on the circuit:

- a Cisco pre-standard powered device (such as a Cisco IP Phone or a Cisco Aironet Access Point)
- an IEEE 802.3af-compliant powered device
- an IEEE 802.3at-compliant powered device

A powered device can receive redundant power when it is connected to a PoE switch port and to an AC power source. The device does not receive redundant power when it is only connected to the PoE port.

After the switch detects a powered device, the switch determines the device power requirements and then grants or denies power to the device. The switch can also detect the real-time power consumption of the device by monitoring and policing the power usage.

For more information, see the "Configuring PoE" chapter in the . *Interface and Hardware Component Configuration Guide (Catalyst 9400 Switches)*

Refere the section Scenarios to Troubleshoot Power over Ethernet (PoE), on page 21 for various PoE troubleshooting scenarios.

Disabled Port Caused by Power Loss

If a powered device (such as a Cisco IP Phone 7910) that is connected to a PoE device port and powered by an AC power source loses power from the AC power source, the device might enter an error-disabled state. To recover from an error-disabled state, enter the **shutdown** interface configuration command, and then enter the **no shutdown** interface command. You can also configure automatic recovery on the device to recover from the error-disabled state.

On a device, the **errdisable recovery cause loopback** and the **errdisable recovery interval** *seconds* global configuration commands automatically take the interface out of the error-disabled state after the specified period of time.

Disabled Port Caused by False Link-Up

If a Cisco powered device is connected to a port and you configure the port by using the **power inline never** interface configuration command, a false link-up can occur, placing the port into an error-disabled state. To take the port out of the error-disabled state, enter the **shutdown** and the **no shutdown** interface configuration commands.

You should not connect a Cisco powered device to a port that has been configured with the **power inline never** command.

Ping

The device supports IP ping, which you can use to test connectivity to remote hosts. Ping sends an echo request packet to an address and waits for a reply. Ping returns one of these responses:

- Normal response—The normal response (*hostname* is alive) occurs in 1 to 10 seconds, depending on network traffic.
- Destination does not respond—If the host does not respond, a *no-answer* message is returned.
- Unknown host—If the host does not exist, an *unknown host* message is returned.
- Destination unreachable—If the default gateway cannot reach the specified network, a *destination-unreachable* message is returned.
- Network or host unreachable—If there is no entry in the route table for the host or network, a *network or host unreachable* message is returned.

Refere the section Executing Ping, on page 15 to understand how **ping** works.

Layer 2 Traceroute

The Layer 2 traceroute feature allows the switch to identify the physical path that a packet takes from a source device to a destination device. Layer 2 traceroute supports only unicast source and destination MAC addresses. Traceroute finds the path by using the MAC address tables of the devices in the path. When the Device detects a device in the path that does not support Layer 2 traceroute, the Device continues to send Layer 2 trace queries and lets them time out.

The Device can only identify the path from the source device to the destination device. It cannot identify the path that a packet takes from source host to the source device or from the destination device to the destination host.

Layer 2 Traceroute Guidelines

- Cisco Discovery Protocol (CDP) must be enabled on all the devices in the network. For Layer 2 traceroute to function properly, do not disable CDP.

  If any devices in the physical path are transparent to CDP, the switch cannot identify the path through these devices.
- A device is reachable from another device when you can test connectivity by using the **ping** privileged EXEC command. All devices in the physical path must be reachable from each other.
- The maximum number of hops identified in the path is ten.

- You can enter the **traceroute mac** or the **traceroute mac ip** privileged EXEC command on a device that is not in the physical path from the source device to the destination device. All devices in the path must be reachable from this switch.
- The **traceroute mac** command output shows the Layer 2 path only when the specified source and destination MAC addresses belong to the same VLAN. If you specify source and destination MAC addresses that belong to different VLANs, the Layer 2 path is not identified, and an error message appears.
- If you specify a multicast source or destination MAC address, the path is not identified, and an error message appears.
- If the source or destination MAC address belongs to multiple VLANs, you must specify the VLAN to which both the source and destination MAC addresses belong. If the VLAN is not specified, the path is not identified, and an error message appears.
- The **traceroute mac ip** command output shows the Layer 2 path when the specified source and destination IP addresses belong to the same subnet. When you specify the IP addresses, the device uses the Address Resolution Protocol (ARP) to associate the IP addresses with the corresponding MAC addresses and the VLAN IDs.
  - If an ARP entry exists for the specified IP address, the device uses the associated MAC address and identifies the physical path.
  - If an ARP entry does not exist, the device sends an ARP query and tries to resolve the IP address. If the IP address is not resolved, the path is not identified, and an error message appears.
- When multiple devices are attached to one port through hubs (for example, multiple CDP neighbors are detected on a port), the Layer 2 traceroute feature is not supported. When more than one CDP neighbor is detected on a port, the Layer 2 path is not identified, and an error message appears.
- This feature is not supported in Token Ring VLANs.
- Layer 2 traceroute opens a listening socket on the User Datagram Protocol (UDP) port 2228 that can be accessed remotely with any IPv4 address, and does not require any authentication. This UDP socket allows to read VLAN information, links, presence of particular MAC addresses, and CDP neighbor information, from the device. This information can be used to eventually build a complete picture of the Layer 2 network topology.
- Layer 2 traceroute is enabled by default and can be disabled by running the **no l2 traceroute** command in global configuration mode. To re-enable Layer 2 traceroute, use the **l2 traceroute** command in global configuration mode.

IP Traceroute

You can use IP traceroute to identify the path that packets take through the network on a hop-by-hop basis. The command output displays all network layer (Layer 3) devices, such as routers, that the traffic passes through on the way to the destination.

Your Device can participate as the source or destination of the **traceroute** privileged EXEC command and might or might not appear as a hop in the **traceroute** command output. If the Device is the destination of the traceroute, it is displayed as the final destination in the traceroute output. Intermediate devices do not show up in the traceroute output if they are only bridging the packet from one port to another within the same VLAN. However, if the intermediate Device is a multilayer Device that is routing a particular packet, this device shows up as a hop in the traceroute output.

The **traceroute** privileged EXEC command uses the Time To Live (TTL) field in the IP header to cause routers and servers to generate specific return messages. Traceroute starts by sending a User Datagram Protocol (UDP) datagram to the destination host with the TTL field set to 1. If a router finds a TTL value of 1 or 0, it drops the datagram and sends an Internet Control Message Protocol (ICMP) time-to-live-exceeded message to the sender. Traceroute finds the address of the first hop by examining the source address field of the ICMP time-to-live-exceeded message.

To identify the next hop, traceroute sends a UDP packet with a TTL value of 2. The first router decrements the TTL field by 1 and sends the datagram to the next router. The second router sees a TTL value of 1, discards the datagram, and returns the time-to-live-exceeded message to the source. This process continues until the TTL is incremented to a value large enough for the datagram to reach the destination host (or until the maximum TTL is reached).

To learn when a datagram reaches its destination, traceroute sets the UDP destination port number in the datagram to a very large value that the destination host is unlikely to be using. When a host receives a datagram destined to itself containing a destination port number that is unused locally, it sends an ICMP *port-unreachable* error to the source. Because all errors except port-unreachable errors come from intermediate hops, the receipt of a port-unreachable error means that this message was sent by the destination port.

Go to Example: Performing a Traceroute to an IP Host, on page 24 to see an example of IP traceroute process.

Time Domain Reflector Guidelines

You can use the Time Domain Reflector (TDR) feature to diagnose and resolve cabling problems. When running TDR, a local device sends a signal through a cable and compares the reflected signal to the initial signal.

TDR can detect these cabling problems:

- Open, broken, or cut twisted-pair wires—The wires are not connected to the wires from the remote device.
- Shorted twisted-pair wires—The wires are touching each other or the wires from the remote device. For example, a shorted twisted pair can occur if one wire of the twisted pair is soldered to the other wire.

  If one of the twisted-pair wires is open, TDR can find the length at which the wire is open.

Use TDR to diagnose and resolve cabling problems in these situations:

- Replacing a device.
- Setting up a wiring closet
- Troubleshooting a connection between two devices when a link cannot be established or when it is not operating properly

When you run TDR, the device reports accurate information in these situations:

- The cable for the gigabit link is a solid-core cable.
- The open-ended cable is not terminated.

When you run TDR, the device does not report accurate information in these situations:

- The cable for the gigabit link is a twisted-pair cable or is in series with a solid-core cable.
- The link is a 10-megabit or a 100-megabit link.

- The cable is a stranded cable.
- The link partner is a Cisco IP Phone.
- The link partner is not IEEE 802.3 compliant.

Note We recommend that you keep one end of the cable open when you run TDR on a port. The cable length and other relevant status information are obtained correctly when the cables are open at one end. You can do this either by physically removing the cable at one end or shutting it at one end and reading the result at the other end.

Go to Running TDR and Displaying the Results, on page 16 to know the TDR commands.

Debug Commands

Caution Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. It is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

All **debug** commands are entered in privileged EXEC mode, and most **debug** commands take no arguments.

System Report

System reports or crashinfo files save information that helps Cisco technical support representatives to debug problems that caused the Cisco IOS image to fail (crash). It is necessary to quickly and reliably collect critical crash information with high fidelity and integrity. Further, it is necessary to collect this information and bundle it in a way that it can be associated or identified with a specific crash occurrence.

System reports are generated in these situations:

- In case of a switch failure—A system report is generated on the switch that failed
- In case of a switchover—System reports are generated only on high availability (HA) member switches. Reports are not generated for non-HA members.

The system does not generate reports in case of a reload.

During a process crash, the following is collected locally from the switch:

1. Full process core
2. Tracelogs
3. IOS syslogs (not guaranteed in case of non-active crashes)
4. System process information
5. Bootup logs

6. Reload logs
7. Certain types of /proc information

This information is stored in separate files which are then archived and compressed into one bundle. This makes it convenient to get a crash snapshot in one place, and can be then moved off the box for analysis. This report is generated before the switch goes down to rommon/bootloader.

Except for the full core and tracelogs, everything else is a text file.

Use the **request platform software process core fed active** command to generate the core dump.

```
Device# request platform software process core fed active
Process : fed main event (28155) encountered fatal signal 6
Process : fed main event stack :

SUCCESS: Core file generated.

Device# dir bootflash:core
Directory of bootflash:/core/

178483  -rw-               1  May 23 2017 06:05:17 +00:00  .callhome
194710  drwx            4096  Aug 16 2017 19:42:33 +00:00  modules
178494  -rw-         10829893  Aug 23 2017 09:46:23 +00:00
h2-macallan1_RP_0_fed_28155_20170823-094616-UTC.core.gz
```

Crashinfo Files

By default the system report file will be generated and saved into the /crashinfo directory. Ifit cannot be saved to the crashinfo partition for lack of space, then it will be saved to the /flash directory.

To display the files, enter the **dir crashinfo:** command. The following is sample output of a crashinfo directory:

```
Device# dir crashinfo:
Directory of crashinfo:/


23665 drwx 86016 Jun 9 2017 07:47:51 -07:00 tracelogs
11 -rw- 0 May 26 2017 15:32:44 -07:00 koops.dat
12 -rw- 4782675 May 29 2017 15:47:16 -07:00 system-report_1_20170529-154715-PDT.tar.gz
1651507200 bytes total (1519386624 bytes free)
```

System reports are located in the crashinfo directory in the following format:

```
system-report_[switch number]_[date]-[timestamp]-UTC.gz
```

After a switch crashes, check for a system report file. The name of the most recently generated system report file is stored in the last_systemreport file under the crashinfo directory. The system report and crashinfo files assist TAC while troubleshooting the issue.

The system report generated can be further copied using TFTP, HTTP and few other options.

```
Device# copy crashinfo: ?
crashinfo:     Copy to crashinfo: file system
flash:         Copy to flash: file system
ftp:           Copy to ftp: file system
http:          Copy to http: file system
https:         Copy to https: file system
null:          Copy to null: file system
nvram:         Copy to nvram: file system
rcp:           Copy to rcp: file system
running-config Update (merge with) current system configuration
scp:           Copy to scp: file system
startup-config Copy to startup configuration
```

```
syslog:        Copy to syslog: file system
system:        Copy to system: file system
tftp:          Copy to tftp: file system
tmpsys:        Copy to tmpsys: file system
```

The general syntax for copying onto TFTP server is as follows:

```
Device# copy crashinfo: tftp:
Source filename [system-report_1_20150909-092728-UTC.gz]?
Address or name of remote host []? 1.1.1.1
Destination filename [system-report_1_20150909-092728-UTC.gz]?
```

The tracelogs can be collected by issuing a trace archive command. This command provides time period options. The command syntax is as follows:

```
Device# request platform software trace archive ?
last     Archive trace files of last x days
target   Location and name for the archive file
```

The tracelogs stored in crashinfo: or flash: directory from within the last 3650 days can be collected.

```
Device# request platform software trace archive last ?
<1-3650> Number of days (1-3650)
Device# request platform software trace archive last 3650 days target ?
crashinfo: Archive file name and location
flash:     Archive file name and location
```

Note It is important to clear the system reports or trace archives from flash or crashinfo directory once they are copied out, in order to have space available for tracelogs and other purposes.

In a complex network it is difficult to track the origin of a system-report file. This task is made easier if the system-report files are uniquely identifiable. Starting with the Cisco IOS XE Amsterdam 17.3.x release, the hostname will be prepended to the system-report file name making the reports uniquely identifiable.

The following example displays system-report files with the hostname prepended:

```
HOSTNAME# dir flash:/core | grep HOSTNAME
40486  -rw-        108268293  Oct 21 2019 16:07:50 -04:00
HOSTNAME-system-report_20191021-200748-UTC.tar.gz
40487  -rw-            17523  Oct 21 2019 16:07:56 -04:00
HOSTNAME-system-report_20191021-200748-UTC-info.txt
40484  -rw-         48360998  Oct 21 2019 16:55:24 -04:00
HOSTNAME-system-report_20191021-205523-UTC.tar.gz
40488  -rw-            14073  Oct 21 2019 16:55:26 -04:00
HOSTNAME-system-report_20191021-205523-UTC-info.txt
```

Onboard Failure Logging on the Switch

You can use the onboard failure logging (OBFL) feature to collect information about the device. The information includes uptime, temperature, and voltage information and helps Cisco technical support representatives to troubleshoot device problems. We recommend that you keep OBFL enabled and do not erase the data stored in the flash memory.

By default, OBFL is enabled. It collects information about the device and small form-factor pluggable (SFP) modules. The device stores this information in the flash memory:

- CLI commands—Record of the OBFL CLI commands that are entered on a standalone device.
- Message—Record of the hardware-related system messages generated by a standalone device .

- Power over Ethernet (PoE)—Record of the power consumption of PoE ports on a standalone device .
- Temperature—Temperature of a standalone deicev .
- Uptime data—Time when a standalone device starts, the reason the device restarts, and the length of time the device has been running since it last restarted.
- Voltage—System voltages of a standalone device .

You should manually set the system clock or configure it by using Network Time Protocol (NTP).

When the device is running, you can retrieve the OBFL data by using the **show logging onboard** privileged EXEC commands. If the device fails, contact your Cisco technical support representative to find out how to retrieve the data.

When an OBFL-enabled device is restarted, there is a 10-minute delay before logging of new data begins.

Fan Failures

By default, the feature is disabled. When more than one of the fans fails in a field-replaceable unit (FRU) or in a power supply, the device does not shut down, and this error message appears:

```
WARNING:Fan PS1/0 in slot 1 has the error: Error Status,
Please replace it with a new fan.
```

The device might overheat and shut down.

When an individual fan fails, the following message appears:

```
The fan in slot PS17/1 is encountering a failure condition
```

The following messages appears when the entire fan tray fails and the system shuts down:

```
 Shutting down system now because the fans in slot PS17 have all failed.
```

To restart the device, it must be power cycled.

For more information on Fan failures, referCisco Catalyst 9400 Series Switches Hardware Installation Guide .

Possible Symptoms of High CPU Utilization

Excessive CPU utilization might result in these symptoms, but the symptoms might also result from other causes, some of which are the following:

- Spanning tree topology changes
- EtherChannel links brought down due to loss of communication
- Failure to respond to management requests (ICMP ping, SNMP timeouts, slow Telnet or SSH sessions)
- UDLD flapping
- IP SLAs failures because of SLAs responses beyond an acceptable threshold
- DHCP or IEEE 802.1x failures if the switch does not forward or respond to requests

How to Troubleshoot the Software Configuration

Recovering from a Lost or Forgotten Password

The default configuration for the switch allows an end user with physical access to the switch to recover from a lost password by interrupting the boot process during power-on and by entering a new password. These recovery procedures require that you have physical access to the switch.

Note On these switches, a system administrator can disable some of the functionality of this feature by allowing an end user to reset a password only by agreeing to return to the default configuration. If you are an end user trying to reset a password when password recovery has been disabled, a status message shows this during the recovery process.

Procedure

Step 1 Connect a terminal or PC to the switch.

- Connect a terminal or a PC with terminal-emulation software to the switch console port.
- Connect a PC to the Ethernet management port.

Step 2 Set the line speed on the emulation software to 9600 baud.

Step 3 Power off the standalone switch or the entire switch stack.

Step 4 For a device with dual supervisor module, remove the standy supervisor from the chassis before the password recovery procedure. Reconnect the power cord to the switch or the active supervisor module. Press Ctrl-C to prevent autoboot and to get into ROMMON mode while the switch or the active supervisor module is booting up.

Proceed to the *Procedure with Password Recovery Enabled* section, and follow the steps.

Step 5 After recovering the password, reload the switch or the active switch.

On a switch:

```
Switch> reload
Proceed with reload? [confirm] y
```

Procedure with Password Recovery Enabled

Procedure

Step 1 Enable manual boot mode.

```
Device: MANUAL_BOOT=yes
```

Step 2 Ignore the startup configuration with the following command:

```
Device: SWITCH_IGNORE_STARTUP_CFG=1
```

Step 3 Boot the switch with the *packages.conf* file from flash.

```
Device: boot flash:packages.conf
```

Step 4 Terminate the initial configuration dialog by answering **No**.

```
Would you like to enter the initial configuration dialog? [yes/no]: No
```

Step 5 At the switch prompt, enter privileged EXEC mode.

```
Device> enable
Device#
```

Step 6 Copy the startup configuration to running configuration.

```
Device# copy startup-config running-config Destination filename [running-config]?
```

Press Return in response to the confirmation prompts. The configuration file is now reloaded, and you can change the password.

Step 7 Enter global configuration mode and change the **enable** password.

```
Device# configure terminal
Device(config)# enable secret password
```

Step 8 Set the SWITCH_IGNORE_STARTUP_CFG parameter to 0.

```
Device(config)# no system ignore startupconfig switch all
Device(config)# end
```

Step 9 Write the running configuration to the startup configuration file and save the configuration.

```
Device# copy running-config startup-config
```

```
Device# write memory
```

Step 10 Confirm that manual boot mode is enabled.

```
Device# show boot
```

```
BOOT variable = flash:packages.conf;
Manual Boot = yes
Enable Break = yes
```

Step 11 Reload the device.

```
Device# reload
```

Step 12 Boot the device with the *packages.conf* file from flash.

```
Device: boot flash:packages.conf
```

Step 13 After the device boots up, disable manual boot on the device.

```
Device(config)# no boot manual
```

Procedure with Password Recovery Disabled

If the password-recovery mechanism is disabled, this message appears:

```
The password-recovery mechanism has been triggered, but
is currently disabled.  Access to the boot loader prompt
through the password-recovery mechanism is disallowed at
this point.  However, if you agree to let the system be
reset back to the default system configuration, access
to the boot loader prompt can still be allowed.

Would you like to reset the system back to the default configuration (y/n)?
```

Caution Returning the device to the default configuration results in the loss of all existing configurations. We recommend that you contact your system administrator to verify if there are backup device and VLAN configuration files.

- If you enter **n** (no), the normal boot process continues as if the **Ctrl-C** had not been pressed; you cannot access the boot loader prompt, and you cannot enter a new password. You see the message:

  ```
  Press Enter to continue........
  ```

- If you enter **y** (yes), the configuration file in flash memory and the VLAN database file are deleted. When the default configuration loads, you can reset the password.

Procedure

Step 1 Choose to continue with password recovery and delete the existing configuration:

```
Would you like to reset the system back to the default configuration (y/n)? Y
```

Step 2 Display the contents of flash memory:

```
Device: dir flash:
```

The device file system appears.

Step 3 Boot up the system:

```
Device: boot
```

You are prompted to start the setup program. To continue with password recovery, enter **N** at the prompt:

```
Continue with the configuration dialog? [yes/no]: N
```

Step 4 At the device prompt, enter privileged EXEC mode:

```
Device> enable
```

Step 5 Enter global configuration mode:

```
Device# configure terminal
```

Step 6 Change the password:

```
Device(config)# enable secret password
```

The secret password can be from 1 to 25 alphanumeric characters, can start with a number, is case sensitive, and allows spaces but ignores leading spaces.

Step 7 Return to privileged EXEC mode:

```
Device(config)# exit
Device#
```

Step 8 Write the running configuration to the startup configuration file:

```
Device# copy running-config startup-config
```

The new password is now in the startup configuration.

Step 9 You must now reconfigure the device. If the system administrator has the backup device and VLAN configuration files available, you should use those.

Preventing Autonegotiation Mismatches

The IEEE 802.3ab autonegotiation protocol manages the device settings for speed (10 Mb/s, 100 Mb/s, and 1000 Mb/s, excluding SFP module ports) and duplex (half or full). There are situations when this protocol can incorrectly align these settings, reducing performance. A mismatch occurs under these circumstances:

- A manually set speed or duplex parameter is different from the manually set speed or duplex parameter on the connected port.
- A port is set to autonegotiate, and the connected port is set to full duplex with no autonegotiation.

To maximize the device performance and ensure a link, follow one of these guidelines when changing the settings for duplex and speed:

- Let both ports autonegotiate both speed and duplex.
- Manually set the speed and duplex parameters for the ports on both ends of the connection.

Note If a remote device does not autonegotiate, configure the duplex settings on the two ports to match. The speed parameter can adjust itself even if the connected port does not autonegotiate.

Troubleshooting SFP Module Security and Identification

Cisco small form-factor pluggable (SFP) modules have a serial EEPROM that contains the module serial number, the vendor name and ID, a unique security code, and cyclic redundancy check (CRC). When an SFP module is inserted in the device, the device software reads the EEPROM to verify the serial number, vendor name and vendor ID, and recompute the security code and CRC. If the serial number, the vendor name or vendor ID, the security code, or CRC is invalid, the software generates a security error message and places the interface in an error-disabled state.

Note The security error message references the GBIC_SECURITY facility. The device supports SFP modules and does not support GBIC modules. Although the error message text refers to GBIC interfaces and modules, the security messages actually refer to the SFP modules and module interfaces.

If you are using a non-Cisco SFP module, remove the SFP module from the device, and replace it with a Cisco module. After inserting a Cisco SFP module, use the **errdisable recovery cause gbic-invalid** global configuration command to verify the port status, and enter a time interval for recovering from the error-disabled state. After the elapsed interval, the device brings the interface out of the error-disabled state and retries the operation. For more information about the **errdisable recovery** command, see the command reference for this release.

If the module is identified as a Cisco SFP module, but the system is unable to read vendor-data information to verify its accuracy, an SFP module error message is generated. In this case, you should remove and reinsert the SFP module. If it continues to fail, the SFP module might be defective.

Monitoring SFP Module Status

You can check the physical or operational status of an SFP module by using the **show interfaces transceiver** privileged EXEC command. Note that this command will work only on the SFPs which support Digital Optics Monitoring (DOM) functionality. This command shows the operational status, such as the temperature and the current for an SFP module on a specific interface and the alarm status. You can also use the command to check the speed and the duplex settings on an SFP module. For more information, see the **show interfaces transceiver** command in the command reference for this release.

Executing Ping

If you attempt to ping a host in a different IP subnetwork, you must define a static route to the network or have IP routing configured to route between those subnets.

IP routing is disabled by default on all devices.

Note Though other protocol keywords are available with the **ping** command, they are not supported in this release.

Use this command to ping another device on the network from the device:

Command	Purpose
ping ip *host* | *address* `Device# ping 172.20.52.3`	Pings a remote host through IP or by supplying the hostname or network address.

Monitoring Temperature

The Device monitors the temperature conditions and uses the temperature information to control the fans.

Use the **show env** privileged EXEC command to display the temperature value, state, and thresholds. The temperature value is the temperature in the Device(not the external temperature).

Monitoring the Physical Path

You can monitor the physical path that a packet takes from a source device to a destination device by using one of these privileged EXEC commands:

Table 1: Monitoring the Physical Path

Command	Purpose
tracetroute mac [**interface** *interface-id*] {*source-mac-address*} [**interface** *interface-id*] {*destination-mac-address*} [**vlan** *vlan-id*] [**detail**]	Displays the Layer 2 path taken by the packets from the specified source MAC address to the specified destination MAC address.
tracetroute mac ip {*source-ip-address* | *source-hostname*}{*destination-ip-address* | *destination-hostname*} [**detail**]	Displays the Layer 2 path taken by the packets from the specified source IP address or hostname to the specified destination IP address or hostname.

Executing IP Traceroute

Note Though other protocol keywords are available with the **traceroute** privileged EXEC command, they are not supported in this release.

Command	Purpose
traceroute ip *host* `Device# traceroute ip 192.51.100.1`	Traces the path that packets take through the network.

Running TDR and Displaying the Results

To run TDR, enter the **test cable-diagnostics tdr interface** *interface-id* privileged EXEC command.

To display the results, enter the **show cable-diagnostics tdr interface** *interface-id* privileged EXEC command.

Redirecting Debug and Error Message Output

By default, the network server sends the output from **debug** commands and system error messages to the console. If you use this default, you can use a virtual terminal connection to monitor debug output instead of connecting to the console port .

Possible destinations include the console, virtual terminals, internal buffer, and UNIX hosts running a syslog server. The syslog format is compatible with 4.3 Berkeley Standard Distribution (BSD) UNIX and its derivatives.

Note Be aware that the debugging destination you use affects system overhead. When you log messages to the console, very high overhead occurs. When you log messages to a virtual terminal, less overhead occurs. Logging messages to a syslog server produces even less, and logging to an internal buffer produces the least overhead of any method.

For more information about system message logging, see *Configuring System Message Logging*.

Using the show platform Command

The output from the **show platform hardware fed active** privileged EXEC command provides some useful information about the forwarding results if a packet entering an interface is sent through the system. Depending upon the parameters entered about the packet, the output provides lookup table results and port maps used to calculate forwarding destinations, bitmaps, and egress information.

Most of the information in the output from the command is useful mainly for technical support personnel, who have access to detailed information about the device application-specific integrated circuits (ASICs). However, packet forwarding information can also be helpful in troubleshooting.

Using the show debug command

The **show debug** command is entered in privileged EXEC mode. This command displays all debug options available on the switch.

To view all conditional debug options run the command **show debug condition** The commands can be listed by selecting either a condition identifier <*1-1000*> or *all* conditions.

To disable debugging, use the **no debug all** command.

Caution Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

Troubleshooting Packet Loss

If your system exhibits partial or full loss of network connectivity or packet loss, perform basic troubleshooting procedures to eliminate the common causes. The common causes include:

- Bad cabling
- A bad port
- Speed and Duplex mismatch
- Network interface card (NIC) issues

1. If you troubleshoot these common reasons and you are not able to narrow down the problem, enter the **show platform hardware iomd 1/0 data-path** command to check the packet loss. If there are symptoms of packet loss, enter the **reload** command to soft reset the switch.
2. If the reload results in supervisor module diagnostic failure, power cycle the switch.
3. Enter the Generic On Line Diagnostics (GOLD) **show diagnostic bootup** command to determine if diagnostics fail.

   If diagnostics fail again, the problem is most likely the hardware.

   Contact Cisco Technical Support for further assistance.
4. If the supervisor module passes the diagnostic tests without any failure after the power cycle in Step 2, perform these steps:
   a. Collect the output from the **show tech-support** command.
   b. Remove all power supplies from the box, and collect the serial numbers, Cisco part number, and manufacturer of the power supplies.
   c. Contact Cisco Technical Support with the information that you collected.

Troubleshooting When Module Not Online

You may have a module failure if you see a red status LED or if you see one of these statuses in the output of the **show module** command:

- other

  Make sure that the module is properly seated and that you have completely screwed down the module. If the module still does not come online, enter the **hw-module slot** *slot-number* **reset** command. If the module still does not come online, try the module in a spare slot, swap the module with the slot of a module that works, or try the module in a different chassis.

- faulty

  If the status is "faulty", run the shutdown and then no shutdown comands on the port. If this does not resolve the problem, run the Generic Online Diagnostics (GOLD) diagnostic **start module** *mod-number* **test** command to start the diagnostics on the selected module.

- power-deny

  If the status is "power-deny," the switch does not have enough power available to power this module. Enter the **show power** command in order to confirm whether enough power is available.

- power-bad

  If the status is “power-bad,” the switch detects a switching module but is unable to allocate power. This situation is possible if the supervisor engine is unable to access the serial PROM (SPROM) contents on the module in order to determine the identification of the line card. Enter the **show idprom** *module slot* command to verify that the SPROM is readable. If the SPROM is not accessible, reset the module.

  Enter the **show diagnostics online** *module slot-number* command to identify hardware failures on the module. If the module still does not come online, create a service request with Cisco Technical Support in order to troubleshoot further. Use the logs of the switch that you collected in the above output and the troubleshooting steps that you performed.

Troubleshooting Interface Problems

If you see an error mentioned in the output of the command, **show interface** command, the reason could be:

- A physical layer problem, such as a faulty cable or NIC
- A configuration problem, such as a speed and duplex mismatch
- A performance problem, such as an oversubscription.

To understand and troubleshoot thses problems, refer the *Troubleshooting Switch Port and Interface Problems* at http://www.cisco.com/en/US/products/hw/switches/ps708/products_tech_note09186a008015bfd6.shtml

Troubleshooting when a Workstation Is Unable to Log In to the Network

If you observe that a workstation is unable to log into the network during startup or unable to obtain the DHCP address when you have powered up a client machine or rebooted, an initial connectivity delay that the switch introduced could be the problem. To verify this, check the following:

- Microsoft network client displays "No Domain Controllers Available".
- DHCP reports "No DHCP Servers Available".
- A Novell Internetwork Packet Exchange (IPX) network workstation does not have the Novell login screen upon bootup.
- An AppleTalk network client displays, "Access to your AppleTalk network has been interrupted. In order to reestablish your connection, open and close the AppleTalk control panel." The AppleTalk client chooser application can either fail to display a zone list or display an incomplete zone list.
- IBM Network stations can have one of these messages:
  - NSB83619—Address resolution failed
  - NSB83589—Failed to boot after 1 attempt
  - NSB70519—Failed to connect to a server

The reason for these symptoms can be an interface delay that either Spanning Tree Protocol (STP), EtherChannel, trunking, or an autonegotiation delay causes.

Verifying Troubleshooting of the Software Configuration

Displaying OBFL Information

Table 2: Commands for Displaying OBFL Information

Command
show logging onboard RP active clilog
show logging onboard RP active environment
show logging onboard RP active message
show logging onboard RP active counter
show logging onboard RP active temperature
show logging onboard RP active uptime
show logging onboard RP active voltage

Command
show logging onboard RP active status

Example: Verifying the Problem and Cause for High CPU Utilization

To determine if high CPU utilization is a problem, enter the **show processes cpu sorted** privileged EXEC command. Note the underlined information in the first line of the output example.

```
Device# show processes cpu sorted
CPU utilization for five seconds: 8%/0%; one minute: 7%; five minutes: 8%
PID Runtime(ms) Invoked uSecs 5Sec 1Min 5Min TTY Process
309 42289103 752750 56180 1.75% 1.20% 1.22% 0 RIP Timers
140 8820183 4942081 1784 0.63% 0.37% 0.30% 0 HRPC qos request
100 3427318 16150534 212 0.47% 0.14% 0.11% 0 HRPC pm-counters
192 3093252 14081112 219 0.31% 0.14% 0.11% 0 Spanning Tree
143 8 37 216 0.15% 0.01% 0.00% 0 Exec
...
<output truncated>
```

This example shows normal CPU utilization. The output shows that utilization for the last 5 seconds is 8%/0%, which has this meaning:

- The total CPU utilization is 8 percent, including both time running Cisco IOS processes and time spent handling interrupts.
- The time spent handling interrupts is zero percent.

Table 3: Troubleshooting CPU Utilization Problems

Type of Problem	Cause	Corrective Action
Interrupt percentage value is almost as high as total CPU utilization value.	The CPU is receiving too many packets from the network.	Determine the source of the network packet. Stop the flow, or change the switch configuration.
Total CPU utilization is greater than 50% with minimal time spent on interrupts.	One or more Cisco IOS process is consuming too much CPU time. This is usually triggered by an event that activated the process.	Identify the unusual event, and troubleshoot the root cause.

Scenarios for Troubleshooting the Software Configuration

Scenarios to Troubleshoot Power over Ethernet (PoE)

Table 4: Power over Ethernet Troubleshooting Scenarios

Symptom or Problem	Possible Cause and Solution
Only one port does not have PoE. Trouble is on only one switch port. PoE and non-PoE devices do not work on this port, but do on other ports.	Verify that the powered device works on another PoE port. Use the **show run**, or **show interface status** user EXEC commands to verify that the port is not shut down or error-disabled. **Note** Most switches turn off port power when the port is shut down, even though the IEEE specifications make this optional. Verify that **power inline never** is not configured on that interface or port. Verify that the Ethernet cable from the powered device to the switch port is good: Connect a known good non-PoE Ethernet device to the Ethernet cable, and make sure that the powered device establishes a link and exchanges traffic with another host. **Note** Cisco powered device works only with straight cable and not with crossover one. Verify that the total cable length from the switch front panel to the powered device is not more than 100 meters. Disconnect the Ethernet cable from the switch port. Use a short Ethernet cable to connect a known good Ethernet device directly to this port on the switch front panel (not on a patch panel). Verify that it can establish an Ethernet link and exchange traffic with another host, or ping the port VLAN SVI. Next, connect a powered device to this port, and verify that it powers on. If a powered device does not power on when connected with a patch cord to the switch port, compare the total number of connected powered devices to the switch power budget (available PoE). Use the **show power inline** command to verify the amount of available power.

Symptom or Problem	Possible Cause and Solution
No PoE on all ports or a group of ports. Trouble is on all switch ports. Nonpowered Ethernet devices cannot establish an Ethernet link on any port, and PoE devices do not power on.	If there is a continuous, intermittent, or reoccurring alarm related to power, replace the power supply if possible it is a field-replaceable unit. Otherwise, replace the switch. If the problem is on a consecutive group of ports but not all ports, the power supply is probably not defective, and the problem could be related to PoE regulators in the switch. Use the **show log** privileged EXEC command to review alarms or system messages that previously reported PoE conditions or status changes. If there are no alarms, use the **show interface status** command to verify that the ports are not shut down or error-disabled. If ports are error-disabled, use the **shut** and **no shut** interface configuration commands to reenable the ports. Use the **show env power** and **show power inline** privileged EXEC commands to review the PoE status and power budget (available PoE). Review the running configuration to verify that **power inline never** is not configured on the ports. Connect a nonpowered Ethernet device directly to a switch port. Use only a short patch cord. Do not use the existing distribution cables. Enter the **shut** and **no shut** interface configuration commands, and verify that an Ethernet link is established. If this connection is good, use a short patch cord to connect a powered device to this port and verify that it powers on. If the device powers on, verify that all intermediate patch panels are correctly connected. Disconnect all but one of the Ethernet cables from switch ports. Using a short patch cord, connect a powered device to only one PoE port. Verify the powered device does not require more power than can be delivered by the switch port. Use the **show power inline** privileged EXEC command to verify that the powered device can receive power when the port is not shut down. Alternatively, watch the powered device to verify that it powers on. If a powered device can power on when only one powered device is connected to the switch, enter the **shut** and **no shut** interface configuration commands on the remaining ports, and then reconnect the Ethernet cables one at a time to the switch PoE ports. Use the **show interface status** and **show power inline** privileged EXEC commands to monitor inline power statistics and port status. If there is still no PoE at any port, a fuse might be open in the PoE section of the power supply. This normally produces an alarm. Check the log again for alarms reported earlier by system messages.

Symptom or Problem	Possible Cause and Solution
Cisco pre-standard powered device disconnects or resets. After working normally, a Cisco phone intermittently reloads or disconnects from PoE.	Verify all electrical connections from the switch to the powered device. Any unreliable connection results in power interruptions and irregular powered device functioning such as erratic powered device disconnects and reloads. Verify that the cable length is not more than 100 meters from the switch port to the powered device. Notice what changes in the electrical environment at the switch location or what happens at the powered device when the disconnect occurs. Notice whether any error messages appear at the same time a disconnect occurs. Use the **show log** privileged EXEC command to review error messages. Verify that an IP phone is not losing access to the Call Manager immediately before the reload occurs. (It might be a network problem and not a PoE problem.) Replace the powered device with a non-PoE device, and verify that the device works correctly. If a non-PoE device has link problems or a high error rate, the problem might be an unreliable cable connection between the switch port and the powered device.
IEEE 802.3af-compliant or IEEE 802.3at-compliant powered devices do not work on Cisco PoE switch. A non-Cisco powered device is connected to a Cisco PoE switch, but never powers on or powers on and then quickly powers off. Non-PoE devices work normally.	Use the **show power inline** command to verify that the switch power budget (available PoE) is not depleted before or after the powered device is connected. Verify that sufficient power is available for the powered device type before you connect it. Use the **show interface status** command to verify that the switch detects the connected powered device. Use the **show log** command to review system messages that reported an overcurrent condition on the port. Identify the symptom precisely: Does the powered device initially power on, but then disconnect? If so, the problem might be an initial surge-in (or *inrush*) current that exceeds a current-limit threshold for the port.

Configuration Examples for Troubleshooting Software

Example: Pinging an IP Host

This example shows how to ping an IP host:

```
Device# ping 172.20.52.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 172.20.52.3, timeout is 2 seconds:
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
Device#
```

Table 5: Ping Output Display Characters

Character	Description
!	Each exclamation point means receipt of a reply.
.	Each period means the network server timed out while waiting for a reply.
U	A destination unreachable error PDU was received.
C	A congestion experienced packet was received.
I	User interrupted test.
?	Unknown packet type.
&	Packet lifetime exceeded.

To end a ping session, enter the escape sequence (**Ctrl-^ X** by default). Simultaneously press and release the **Ctrl**, **Shift**, and **6** keys and then press the **X** key.

Example: Performing a Traceroute to an IP Host

This example shows how to perform a **traceroute** to an IP host:

```
Device# traceroute ip 192.0.2.10

Type escape sequence to abort.
Tracing the route to 192.0.2.10

  1 192.0.2.1 0 msec 0 msec 4 msec
  2 192.0.2.203 12 msec 8 msec 0 msec
  3 192.0.2.100 4 msec 0 msec 0 msec
  4 192.0.2.10 0 msec 4 msec 0 msec
```

The display shows the hop count, the IP address of the router, and the round-trip time in milliseconds for each of the three probes that are sent.

Table 6: Traceroute Output Display Characters

Character	Description
*	The probe timed out.
?	Unknown packet type.
A	Administratively unreachable. Usually, this output means that an access list is blocking traffic.
H	Host unreachable.
N	Network unreachable.

Character	Description
P	Protocol unreachable.
Q	Source quench.
U	Port unreachable.

To end a trace in progress, enter the escape sequence (**Ctrl-^ X** by default). Simultaneously press and release the **Ctrl**, **Shift**, and **6** keys and then press the **X** key.

Additional References for Troubleshooting Software Configuration

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	*Command Reference (Catalyst 9400 Series Switches)*

Feature History for Troubleshooting Software Configuration

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Everest 16.6.1	Troubleshooting Software Configuration	Troubleshooting software configuration describes how to identify and resolve software problems related to the Cisco IOS software on the switch.
Cisco IOS XE Amsterdam 17.3.1	System-Report Files	The hostname is prepended to the system-report files. This makes the system-report files uniquely identifiable.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.