CHAPTER 12

Configuring Online Diagnostics

This chapter describes how to configure the generic online diagnostics (GOLD) feature on Cisco NX-OS devices.

This chapter includes the following sections:

Note For complete syntax and usage information for the commands in this chapter, see the *Cisco Nexus 7000 Series NX-OS System Management Command Reference*.

Information About Online Diagnostics

Online diagnostics help you verify that hardware and internal data paths are operating as designed so that you can rapidly isolate faults.

This section includes the following topics:

Online Diagnostic Overview

With online diagnostics, you can test and verify the hardware functionality of the device while the device is connected to a live network.

The online diagnostics contain tests that check different hardware components and verify the data path and control signals. Disruptive online diagnostic tests (such as the disruptive loopback test) and nondisruptive online diagnostic tests (such as the ASIC register check) run during bootup, line module online insertion and removal (OIR), and system reset. The nondisruptive online diagnostic tests run as part of the background health monitoring, and you can run these tests on demand.

Online diagnostics are categorized as bootup, runtime or health-monitoring diagnostics, and on-demand diagnostics. Bootup diagnostics run during bootup, health-monitoring tests run in the background, and on-demand diagnostics run once or at user-designated intervals when the device is connected to a live network.

Bootup Diagnostics

Bootup diagnostics run during bootup and detect faulty hardware before Cisco NX-OS brings a module online. For example, if you insert a faulty module in the device, bootup diagnostics test the module and take it offline before the device uses the module to forward traffic.

Bootup diagnostics also check the connectivity between the supervisor and module hardware and the data and control paths for all the ASICs. Table 12-1 describes the bootup diagnostic tests for a supervisor.

Table 12-1 Bootup Diagnostics

Test ID	Diagnostic	Description
1	ManagementPortLoopback	Disruptive test, not an on-demand test Tests loopback on the management port of a module.
2	EOBCPortLoopback	Disruptive test, not an on-demand test Ethernet out of band
4	USB	Nondisruptive test Checks the USB controller initialization on a module.
5	CryptoDevice	Nondisruptive test Checks the Cisco Trusted Security (CTS) device initialization on a module.

Note Modules run the EOBCPortLoopback diagnostic as a nondisruptive bootup test, using test ID 1.

Bootup diagnostics log failures to onboard failure logging (OBFL) and syslog and trigger a diagnostic LED indication (on, off, pass, or fail).

You can configure Cisco NX-OS to either bypass the bootup diagnostics or run the complete set of bootup diagnostics. See the "Setting the Bootup Diagnostic Level" section on page 12-5.

Runtime or Health Monitoring Diagnostics

Runtime diagnostics are also called health monitoring (HM) diagnostics. These diagnostics provide information about the health of a live device. They detect runtime hardware errors, memory errors, the degradation of hardware modules over time, software faults, and resource exhaustion.

Health monitoring diagnostics are nondisruptive and run in the background to ensure the health of a device that is processing live network traffic. You can enable or disable health monitoring tests or change their runtime interval. Table 12-2 describes the health monitoring diagnostics and test IDs for a supervisor.

Table 12-2 Health Monitoring Nondisruptive Diagnostics for a Supervisor

Test ID	Diagnostic	Default Interval	Default Setting	Description
3	ASICRegisterCheck	20 seconds	active	Checks read/write access to scratch registers for the ASICs on a module.
5	PortLoopback	15 minutes	active	Verifies connectivity through every port on every module in the system.
6	NVRAM	30 seconds	active	Verifies the sanity of the NVRAM blocks on a supervisor.
7	RealTimeClock	5 minutes	active	Verifies that the real-time clock on the supervisor is ticking.
8	PrimaryBootROM	30 minutes	active	Verifies the integrity of the primary boot device on the supervisor.
9	SecondaryBootROM	30 minutes	active	Verifies the integrity of the secondary boot device on the supervisor.
10	CompactFlash	30 minutes	active	Verifies access to the internal compact flash devices.
11	ExternalCompactFlash	30 minutes	active	Verifies access to the external compact flash devices.
12	PwrMgmtBus	30 seconds	active	Verifies the standby power management control bus.
13	SpineControlBus	30 seconds	active	Verifies the availability of the standby spine module control bus.
14	SystemMgmtBus	30 seconds	active	Verifies the availability of the standby system management bus.
15	StatusBus	30 seconds	active	Verifies the status trasmitted the status bus for the supervisor, modules, and fabric cards.
16	StandbyFabricLoopback	60 seconds	active	Verifies the connectivity of the standby supervisor to the crossbars on the spine card.

Table 12-3 describes the health monitoring diagnostics for a module.

Table 12-3 Health Monitoring Nondisruptive Diagnostics for a Module

Test ID	Diagnostic	Default Interval	Default Setting	Description
2	ASICRegisterCheck	1 minute	active	Checks read/write access to scratch registers for the ASICs on a module.
3	PrimaryBootROM	30 minutes	active	Verifies the integrity of the primary boot device on a module.
4	SecondaryBootROM	30 minutes	active	Verifies the integrity of the secondary boot device on a module.
5	PortLoopback[1]	15 minutes	active	Tests the packet path from the supervisor module to the physical port in ADMIN DOWN state on modules.
6	RewriteEngineLoopback	60 seconds	active	Tests nondisruptive loopback for all ports up to the Rewrite Engine ASIC device.

1. PortLoopback test supported on 32-port 10-Gbps Ethernet module and 48-port 1-G optical ethernet module.

On-Demand Diagnostics

On-demand tests help localize faults and are usually needed in one of the following situations:

- To respond to an event that has occurred, such as isolating a fault.
- In anticipation of an event that may occur, such as a resource exceeding its utilization limit.

You can run all the health monitoring tests on demand.

You can schedule on-demand diagnostics to run immediately. See the "Starting or Stopping an On-Demand Diagnostic Test" section on page 12-8 for more information.

You can also modify the default interval for a health monitoring test. See the "Activating a Diagnostic Test" section on page 12-6 for more information.

High Availability

A key part of high availability is detecting hardware failures and taking corrective action while the device runs in a live network. Online diagnostics in high availability detect hardware failures and provide feedback to high availability software components to make switchover decisions.

Cisco NX-OS supports stateless restarts for online diagnostics. After a reboot or supervisor switchover, Cisco NX-OS applies the running configuration.

Virtualization Support

Cisco NX-OS supports online diagnostics in the default virtual device context (VDC). By default, Cisco NX-OS places you in the default VDC. See the *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 4.x* for more information.

Online diagnostics are virtual routing and forwarding (VRF) aware. You can configure online diagnostics to use a particular VRF to reach the online diagnostics SMTP server.

Licensing Requirements for Online Diagnostics

Product	License Requirement
NX-OS	Online diagnostics require no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For a complete explanation of the NX-OS licensing scheme. For more information, see the *Cisco NX-OS Licensing Guide*.

Prerequisites for Online Diagnostics

Online diagnostics have the following prerequisite:

- If you configure VDCs, install the Advanced Services license and go to the VDC that you want to configure. For more information, see the document, *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 4.x.*

Guidelines and Limitations

You cannot run disruptive online diagnostic tests on demand.

Configuring Online Diagnostics

This section includes the following topics:

Note Be aware that the Cisco NX-OS commands for this feature may differ from those commands used in Cisco IOS.

Setting the Bootup Diagnostic Level

You can configure the bootup diagnostics to run the complete set of tests, or you can bypass all bootup diagnostic tests for a faster module bootup time.

Note We recommend that you set the bootup online diagnostics level to **complete**. We do not recommend bypassing the bootup online diagnostics.

BEFORE YOU BEGIN

Make sure that you are in the correct VDC. To change the VDC, use the **switchto vdc** command.

SUMMARY STEPS

1. **config t**
2. **diagnostic bootup level** [*complete* | *bypass*]
3. **show diagnostic bootup level**
4. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`switch(config)#`
		Places you in global configuration mode.

Step 2	**diagnostic bootup level** [*complete* | *bypass*] **Example:** `switch(config)# diagnostic bootup level complete`	Configures the bootup diagnostic level to trigger diagnostics as follows when the device boots: • complete—Perform all bootup diagnostics. The default is complete. • bypass—Do not perform any bootup diagnostics.
Step 3	**show diagnostic bootup level** **Example:** `switch(config)# show diagnostic bootup level`	(Optional) Displays the bootup diagnostic level (bypass or complete) that is currently in place on the device.
Step 4	**copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Activating a Diagnostic Test

You can set a diagnostic test as active and optionally modify the interval (in hours, minutes, and seconds) at which the test runs.

BEFORE YOU BEGIN

Make sure that you are in the correct VDC. To change the VDC, use the **switchto vdc** command.

SUMMARY STEPS

1. **config t**
2. **diagnostic monitor interval module** *slot* **test** [*test-id* | *name* | **all**] **hour** *hour* **min** *minutes* **second** *sec*
3. **diagnostic monitor module** *slot* **test** [*test-id* | *name* | **all**]
4. **show diagnostic content module** {*slot* | **all**}

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`switch(config)#`
		Places you in global configuration mode.

Step 2	**diagnostic monitor interval module** *slot* **test** [*test-id* | *name* | **all**] **hour** *hour* **min** *minutes* **second** *sec* **Example:** `switch(config)# diagnostic monitor interval module 6 test 3 hour 1 min 0 sec 0`	(Optional) Configures the interval at which the specified test is run. If no interval is set, the test runs at the interval set previously, or the default interval. The argument ranges are as follows: • slot—The range is from 1 to 10. • test-id—The range is from 1 to 14. • name—Can be any case-sensitive alphanumeric string up to 32 characters. • hour —The range is from 0 to 23 hours. • minute—The range is from 0 to 59 minutes. • second —The range is from 0 to 59 seconds.
Step 3	**diagnostic monitor module** *slot* **test** [*test-id* | *name* | **all**] **Example:** `switch(config)# diagnostic monitor interval module 6 test 3`	Activates the specified test. The argument ranges are as follows: • slot—The range is from 1 to 10. • test-id—The range is from 1 to 14. • name—Can be any case-sensitive alphanumeric string up to 32 characters.
Step 4	**show diagnostic content module** {*slot* | **all**} **Example:** `switch(config)# show diagnostic content module 6`	(Optional) Displays information about the diagnostics and their attributes.

Setting a Diagnostic Test as Inactive

You can set a diagnostic test as inactive. Inactive tests keep their current configuration but do not run at at the scheduled interval.

Use the following command in global configuration mode to set a diagnostic test as inactive:

Command	Purpose
no diagnostic monitor module *slot* **test** [*test-id* | *name* | **all**] **Example:** `switch(config)# no diagnostic monitor interval module 6 test 3`	Inactivates the specified test. The argument ranges are as follows: • *slot*—The range is from 1 to 10. • *test-id*—The range is from 1 to 14. • *name*—Can be any case-sensitive alphanumeric string up to 32 characters.

Starting or Stopping an On-Demand Diagnostic Test

You can start or stop an on-demand diagnostic test. You can optionally modify the number of iterations to repeat this test, and the action to take if the test fails.

We recommend that you only manually start a disruptive diagnostic test during a scheduled network maintenance time.

BEFORE YOU BEGIN

Make sure that you are in the correct VDC. To change the VDC, use the **switchto vdc** command.

SUMMARY STEPS

1. **diagnostic ondemand iteration** *number*
2. **diagnostic ondemand action-on-failure** {**continue failure-count** *num-fails* | **stop**}
3. **diagnostic start module** *slot* **test** [*test-id* | *name* | **all** | **non-disruptive**] [**port** *port-number* | **all**]
4. **diagnostic stop module** *slot* **test** [*test-id* | *name* | **all**]
5. **show diagnostic status module** *slot*

DETAILED STEPS

	Command	Purpose
Step 1	**diagnostic ondemand iteration** *number* **Example:** switch# diagnostic ondemand iteration 5	(Optional) Configures the number of times that the on-demand test runs. The range is from 1 to 999. The default is 1.
Step 2	**diagnostic ondemand action-on-failure** {**continue failure-count** *num-fails* | **stop**} **Example:** switch# diagnostic ondemand action-on-failure stop	(Optional) Configures the action to take if the on-demand test fails. The *num-fails* range is from 1 to 999. The default is 1.
Step 3	**diagnostic start module** *slot* **test** [*test-id* | *name* | **all** | **non-disruptive**] [**port** *port-number* | **all**] **Example:** switch# diagnostic start module 6 test all	Starts one or more diagnostic tests on a module. The module slot range is from 1 to 10. The *test-id* range is from 1 to 14. The test name can be any case-sensitive alphanumeric string up to 32 characters. The port range is from 1 to 48.
Step 4	**diagnostic stop module** *slot* **test** [*test-id* | *name* | **all**] **Example:** switch# diagnostic stop module 6 test all	Stops one or more diagnostic tests on a module. The module slot range is from 1 to 10. The *test-id* range is from 1 to 14. The test name can be any case-sensitive alphanumeric string up to 32 characters.
Step 5	**show diagnostic status module** *slot* **Example:** switch# show diagnostic status module 6	(Optional) Verifies that the diagnostic has been scheduled.

Clearing Diagnostic Results

You can clear diagnostic test results.

Use the following command in any mode to clear the diagnostic test results:

Command	Purpose
diagnostic clear result module [*slot* | **all**] **test** {*test-id* | **all**} **Example:** switch# diagnostic clear result module 2 test all	Clears the test result for the specified test. The argument ranges are as follows: • *slot*—The range is from 1 to 10. • *test-id*—The range is from 1 to 14.

Simulating Diagnostic Results

You can simulate a diagnostic test result.

Use the following command in any mode to simulate a diagnostic test result:

Command	Purpose
diagnostic test simulation module *slot* **test** *test-id* {fail | random-fail | success} [**port** *number* | **all**] **Example:** switch# diagnostic test simulation module 2 test 2 fail	Simulates a test result. The *test-id* range is from 1 to 14. The port range is from 1 to 48.

Use the following command in any mode to clear the simulated diagnostic test result:

Command	Purpose
diagnostic test simulation module *slot* **test** *test-id* **clear** **Example:** switch# diagnostic test simulation module 2 test 2 clear	Clears the simulated test result. The *test-id* range is from 1 to 14.

Verifying Online Diagnostics Configuration

To display online diagnostics configuration information, perform one of the following tasks:

Command	Purpose
show diagnostic bootup level	Displays information about bootup diagnostics.
show diagnostic content module {*slot* | **all**}	Displays information about diagnostic test content for a module.
show diagnostic description module *slot* **test** [*test-name* | **all**]	Displays the diagnostic description.
show diagnostic events [**error** | **info**]	Displays diagnostic events by error and information event type.
show diagnostic ondemand setting	Displays information about on-demand diagnostics.
show diagnostic results module *slot* [**test** [*test-name* | **all**]] [**detail**]	Displays information about the results of a diagnostic.
show diagnostic simulation module *slot*	Displays information about a simulated diagnostic.
show diagnostic status module *slot*	Displays the test status for all tests on a module.

Command	Purpose
show hardware capacity [**eobc** | **fabric-utilization** | **forwarding** | **interface** | **module** | **power**]	Displays information about the hardware capabilities and current hardware utilization by the system.
show module	Displays module information including the online diagnostic test status.

Online Diagnostic Example Configuration

This example shows how to start all on-demand tests on module 6:

```
diagnostic start module 6 test all
```

This example shows how to activate test 2 and set the test interval on module 6:

```
conf t
 diagnostic monitor module 6 test 2
 diagnostic monitor interval module 6 test 2 hour 3 min 30 sec 0
```

Default Settings

Table 12-4 lists the default settings for online diagnostic parameters.

Table 12-4 Default Online Diagnostic Parameters

Parameters	Default
Bootup diagnostics level	complete
Nondisruptive tests	active

Additional References

For additional information related to implementing online diagnostics, see the following sections:

- Related Documents, page 12-11
- Standards, page 12-12

Related Documents

Related Topic	Document Title
Online diagnostics CLI commands	*Cisco Nexus 7000 Series NX-OS System Management Command Reference*
VDCs and VRFs	*Cisco Nexus 7000 Series NX-OS Virtual Device Context Command Reference*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

Feature History for Online Diagnostics

Table 12-5 lists the release history for this feature.

Table 12-5 Feature History for Online Diagnostics

Feature Name	Releases	Feature Information
Updated GOLD tests	4.2(1)	Added support for PortLoopback, StatusBus, and StandbyFabricLoopback tests.
Online diagnostics (GOLD)	4.0(q)	Feature was introduced.