



Managing Router Hardware

This chapter describes the concepts and tasks used to manage and configure the hardware components of a router running the Cisco IOS XR software.

This module contains the following topics:

- [RP Redundancy and Switchover, on page 1](#)
- [NPU Power Optimization, on page 6](#)
- [Dynamic Power Management, on page 11](#)
- [Ability to Set Maximum Power Limit for the Router , on page 27](#)
- [Upgrading FPD for PSU, on page 28](#)
- [Configuring the Compatibility Mode for Q100 and Q200-based Line Cards, on page 30](#)
- [Storage Media Sanitization, on page 34](#)
- [Excluding Sensitive Information in Show Running Configurations Output, on page 39](#)

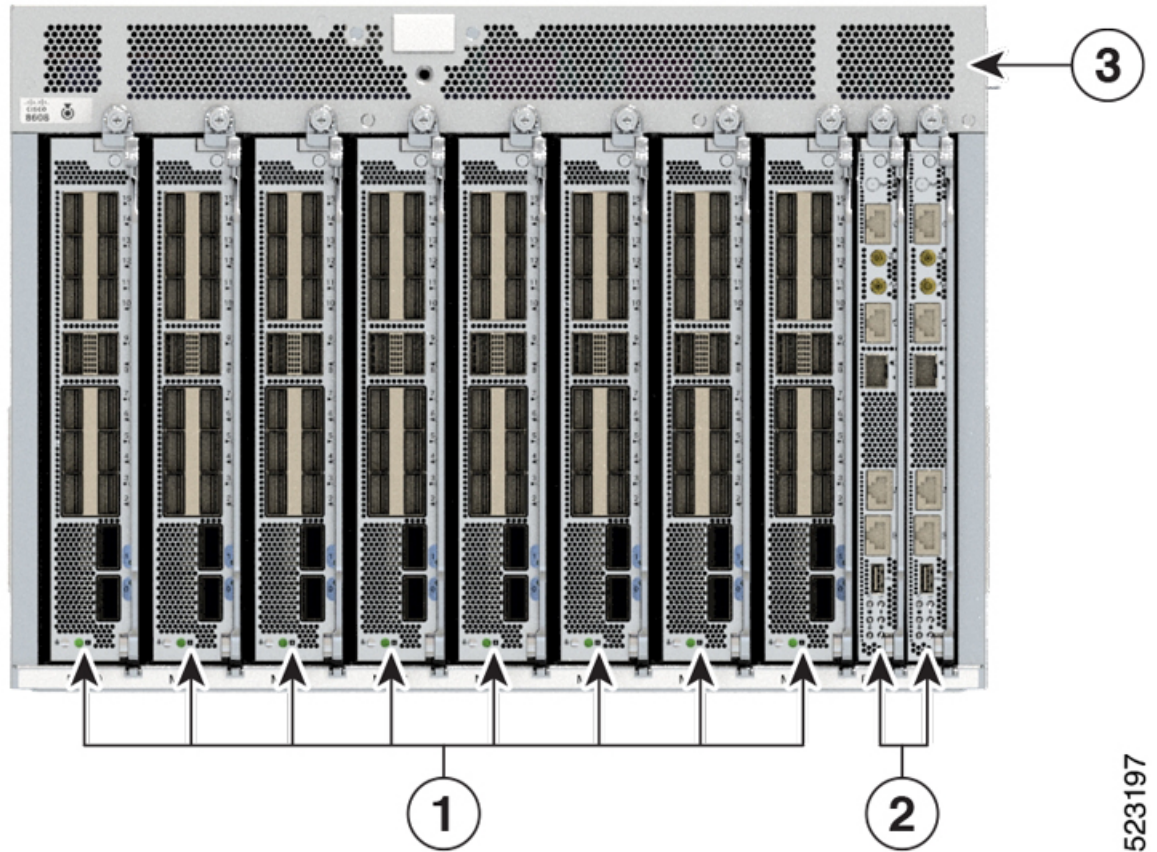
RP Redundancy and Switchover

This section describes RP redundancy and switchover commands and issues.

Establishing RP Redundancy

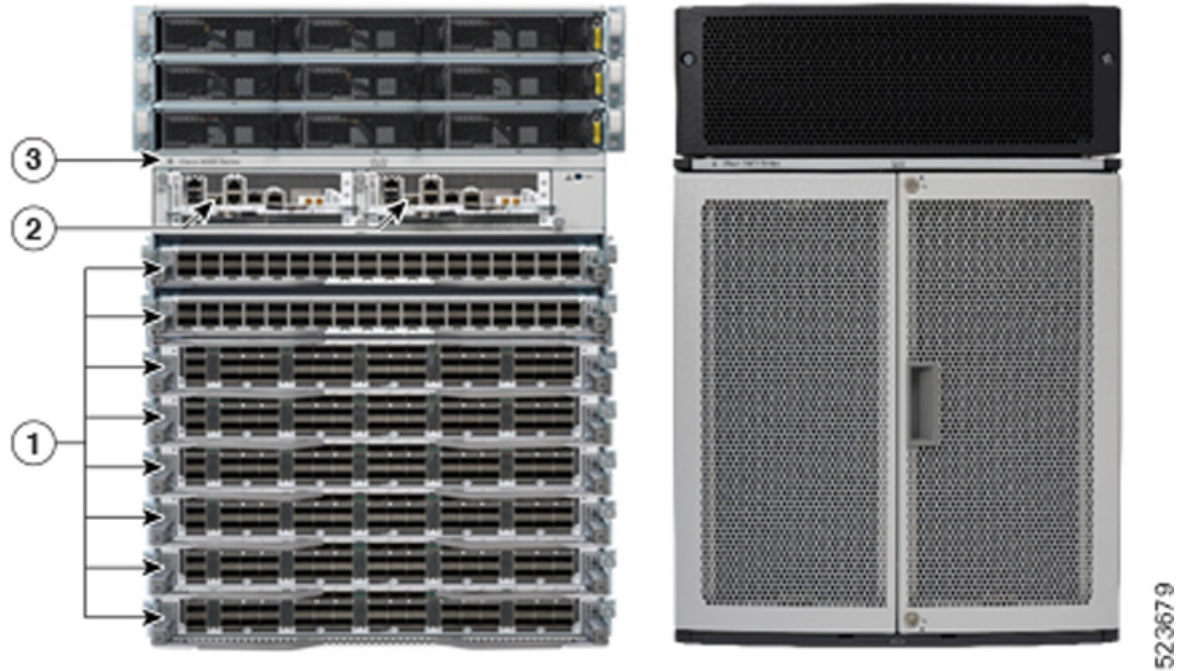
Your router has two slots for RPs: RP0 and RP1 (see [Figure 1: Redundant Set of RP Installed in Slots RP0 and RP1 in an Cisco 8608 8-Slot Centralized Chassis, on page 2](#) and [Figure 2: Redundant Set of RP Installed in Slots RP0 and RP1 in an Cisco 8808 8-Slot Distributed Chassis, on page 3](#)). RP0 is the slot on the left, facing the front of the chassis, and RP1 is the slot on right. These slots are configured for redundancy by default, and the redundancy cannot be eliminated. To establish RP redundancy, install RP into both slots.

Figure 1: Redundant Set of RP Installed in Slots RP0 and RP1 in an Cisco 8608 8-Slot Centralized Chassis



523197

Figure 2: Redundant Set of RP Installed in Slots RP0 and RP1 in an Cisco 8808 8-Slot Distributed Chassis



1	Modular Port Adaptors (MPAs)
2	Route Processors (RPs)
3	Chassis

Determining the Active RP in a Redundant Pair

During system startup, one RP in each redundant pair becomes the active RP. You can tell which RP is the active RP in the following ways:

- The active RP can be identified by the green Active LED on the faceplate of the card. When the Active LED turns on, it indicates that the RP is active and when it turns off, it indicates that the RP is in standby.
- The slot of the active RP is indicated in the CLI prompt. For example:

```
RP/0/RP1/CPU0:router#
```

In this example, the prompt indicates that you are communicating with the active RP in slot RP1.

- Enter the **show redundancy** command in EXEC mode to display a summary of the active and standby RP status. For example:

```
RP/0/RP0/CPU0:router# show redundancy

This node (0/RP0/CPU0) is in ACTIVE role
Partner node (0/RP1/CPU0) is in STANDBY role
Standby node in 0/RP1/CPU0 is ready
```

```

Reload and boot info
-----
RP reloaded Fri Apr  9 03:44:28 2004: 16 hours, 51 minutes ago
This node booted Fri Apr  9 06:19:05 2004: 14 hours, 16 minutes ago
Last switch-over Fri Apr  9 06:53:18 2004: 13 hours, 42 minutes ago
Standby node boot Fri Apr  9 06:54:25 2004: 13 hours, 41 minutes ago
Standby node last not ready Fri Apr  9 20:35:23 2004: 0 minutes ago
Standby node last ready Fri Apr  9 20:35:23 2004: 0 minutes ago
There have been 2 switch-overs since reload

```

Role of the Standby RP

The second RP to boot in a redundant pair automatically becomes the standby RP. While the active RP manages the system and communicates with the user interface, the standby RP maintains a complete backup of the software and configurations for all cards in the system. If the active RP fails or goes off line for any reason, the standby RP immediately takes control of the system.

Summary of Redundancy Commands

RP redundancy is enabled by default in the Cisco IOS XR software, but you can use the commands described in [Table 1: RP Redundancy Commands, on page 4](#) to display the redundancy status of the cards or force a manual switchover.

Table 1: RP Redundancy Commands

Command	Description
show redundancy	Displays the redundancy status of the RP. This command also displays the boot and switch-over history for the RP.
redundancy switchover	Forces a manual switchover to the standby RP. This command works only if the standby RP is installed and in the “ready” state.
show platform	Displays the status for node, including the redundancy status of the RP cards. In EXEC mode, this command displays status for the nodes assigned to the SDR. In administration EXEC mode, this command displays status for all nodes in the system.

Automatic Switchover

Automatic switchover from the active RP to the standby RP occurs only if the active RP encounters a serious system error, such as the loss of a mandatory process or a hardware failure. When an automatic switchover occurs, the RPs respond as follows:

- If a standby RP is installed and “ready” for switchover, the standby RP becomes the active RP. The original active RP attempts to reboot.
- If the standby RP is not in “ready” state, then both RPs reboot. The first RP to boot successfully assumes the role of active RP.

RP Redundancy During RP Reload

The **reload** command causes the active RP to reload the Cisco IOS XR software. When an RP reload occurs, the RPs respond as follows:

- If a standby RP is installed and “ready” for switchover, the standby RP becomes the active RP. The original active RP reboots and becomes the standby RP.
- If the standby RP is not in the “ready” state, then both RPs reboot. The first RP to boot successfully assumes the role of active RP.

Manual Switchover

If a standby RP is installed and ready for switchover, you can force a manual switchover using the **redundancy switchover** command or reloading the active RP using the **reload** command.

Manual Switchover Using the Reload Command

You can force a manual switchover from the active RP to the standby RP by reloading the active RP using the **reload** command. As active RP reboots, the current standby RP becomes active RP, and rebooting RP switches to standby RP.

```
RP/0/RP0/CPU0:router# reload
RP/0/RP1/CPU0:router#
```

Manual Switchover Using the Redundancy Switchover Command

You can force a manual switchover from the active RP to the standby RP using the **redundancy switchover** command.

If a standby RP is installed and ready for switchover, the standby RP becomes the active RP. The original active RP becomes the standby RP. In the following example, partial output for a successful redundancy switchover operation is shown:

```
RP/0/RP0/CPU0:router# show redundancy

This node (0/RP0/CPU0) is in ACTIVE role
Partner node (0/RP1/CPU0) is in STANDBY role
Standby node in 0/RP1/CPU0 is ready

RP/0/RP0/CPU0:router# redundancy switchover
Updating Commit Database. Please wait...[OK]
Proceed with switchover 0/RP0/CPU0 -> 0/RP1/CPU0? [confirm]
Initiating switch-over.
RP/0/RP0/CPU0:router#

<Your 'TELNET' connection has terminated>
```

In the preceding example, the Telnet connection is lost when the previously active RP resets. To continue management of the router, you must connect to the newly activated RP as shown in the following example:

```
User Access Verification

Username: xxxxx
```

```

Password: xxxxx
Last switch-over Sat Apr 15 12:26:47 2009: 1 minute ago

RP/0/RP1/CPU0:router#

```

If the standby RP is not in “ready” state, the switchover operation is not allowed. In the following example, partial output for a failed redundancy switchover attempt is shown:

```

RP/0/RP0/CPU0:router# show redundancy

Redundancy information for node 0/RP1/CPU0:
=====
Node 0/RP0/CPU0 is in ACTIVE role
Partner node (0/RP1/CPU0) is in UNKNOWN role

Reload and boot info
-----
RP reloaded Wed Mar 29 17:22:08 2009: 2 weeks, 2 days, 19 hours, 14 minutes ago
Active node booted Sat Apr 15 12:27:58 2009: 8 minutes ago
Last switch-over Sat Apr 15 12:35:42 2009: 1 minute ago
There have been 4 switch-overs since reload

RP/0/RP0/CPU0:router# redundancy switchover

Switchover disallowed: Standby node is not ready.

```

Communicating with a Standby RP

The active RP automatically synchronizes all system software, settings, and configurations with the standby RP.

If you connect to the standby RP through the console port, you can view the status messages for the standby RP. The standby RP does not display a CLI prompt, so you cannot manage the standby card while it is in standby mode.

If you connect to the standby RP through the management Ethernet port, the prompt that appears is for the active RP, and you can manage the router the same as if you had connected through the management Ethernet port on the active RP.

NPU Power Optimization

Table 2: Feature History Table

Feature Name	Release Information	Description
NPU Power Optimization	Release 7.3.15	This feature lets you choose a predefined NPU power mode based on your network's individual requirements, and consequently reducing NPU power consumption. The hw-module npu-power-profile command is introduced for this feature.

Cisco 8000 series routers are powered by Cisco Silicon One Q200 and Q100 series processors. Cisco Silicon One processors offer high performance, flexible, and power-efficient routing silicon in the market.

NPU Power Optimization feature helps to reduce NPU power consumption by running a processor in a predefined mode. There are three NPU power modes—high, medium, and low. Based on your network traffic and power consumption requirements, you can choose to run the processor in any one of the three NPU power modes.

- High: The router will use the maximum amount of power, resulting in the best possible performance.
- Medium: The router power consumption and performance levels are both average.
- Low: The router operates with optimal energy efficiency while providing a modest level of performance.



Note We recommend that you work with your Cisco account representatives before implementing this feature in your network.

On a Q200-based Cisco 8200 series chassis, you can configure an NPU power mode on the entire router.

On a Q200-based Cisco 8800 series chassis, you can configure an NPU power mode only on fabric cards and line cards.

The following table lists the supported hardware, and their default NPU power mode:

Table 3: Supported Hardware and Default Modes

Supported Hardware	Default NPU Power Mode
Cisco 8200 32x400 GE 1RU fixed chassis (8201-32FH)	High
88-LC0-36FH without MACSec, based on Q200 Silicon Chip	Medium
88-LC0-36FH-M with MACSec, based on Q200 Silicon Chip	Medium
8808-FC0 Fabric Card, based on Q200 Silicon Chip	Low
8818-FC0 Fabric Card, based on Q200 Silicon Chip	Medium



Caution We recommend that you use the default NPU power mode on your router.

Limitations

The NPU power optimization is not supported on the Q100-based systems.

The NPU Power Profile mode is not supported on the following Q200-based line cards:

Table 4: Limitation on Hardware and Power Profile Modes

Hardware	Power Profile Mode
88-LC0-36FH-M	High
88-LC0-34H14FH	High

Configuring NPU Power Mode

Configuring NPU power mode on a fixed chassis:

The following example shows how to configure an NPU power mode on a fixed chassis:

```
RP/0/RP0/CPU0:ios(config)#hw-module npu-power-profile high
RP/0/RP0/CPU0:ios(config)#commit

RP/0/RP0/CPU0:ios(config)#reload
```



Note Note: Reload the chassis for the configurations changes to take effect.

Verifying NPU power mode configuration on a fixed chassis:

Use the **show controllers npu driver** command to verify the NPU power mode configuration:

```
RP/0/RP0/CPU0:ios#show controllers npu driver location 0/RP0/CPU0
Mon Aug 24 23:29:34.302 UTC
=====
NPU Driver Information
=====
Driver Version: 1
SDK Version: 1.32.0.1
Functional role: Active,      Rack: 8203, Type: lcc, Node: 0
Driver ready      : Yes
NPU first started : Mon Aug 24 23:07:41 2020
Fabric Mode:
NPU Power profile: High
Driver Scope: Node
Respawn count    : 1
Availablity masks :
      card: 0x1,   asic: 0x1,   exp asic: 0x1
...

```

Configuring NPU power mode on a modular chassis

The following example shows how to configure an NPU power mode on a fabric card and a line card:

```
RP/0/RP0/CPU0:ios(config)#hw-module npu-power-profile card-type FC high
RP/0/RP0/CPU0:ios(config)#hw-module npu-power-profile card-type LC low location 0/1/cpu0
RP/0/RP0/CPU0:ios(config)#commit
```




Note For the configurations to take effect, you must:

- Reload a line card if the configuration is applied on the line card.
- Reload a router if the configuration is applied on a fabric card.

Verifying the NPU power mode configuration on a modular chassis

Use the **show controllers npu driver location** command to verify the NPU power mode configuration:

```
RP/0/RP0/CPU0:ios#show controllers npu driver location 0/1/CPU0
```

```
Functional role: Active,      Rack: 8808, Type: lcc, Node: 0/RP0/CPU0
Driver ready      : Yes
NPU first started : Mon Apr 12 09:57:27 2021
Fabric Mode: FABRIC/8FC
NPU Power profile: High
Driver Scope: Rack
Respawn count    : 1
Availability masks :
      card: 0xba,     asic: 0xcfcc,      exp asic: 0xcfcc
Weight distribution:
      Unicast: 80,      Multicast: 20
```

Process / Lib	Connection status	Registration status	Connection requests	DLL registration
FSDB	Active	Active	1	n/a
FGID	Active	Active	1	n/a
AEL	n/a	n/a	n/a	Yes
SM	n/a	n/a	n/a	Yes

```
Asics :
HP - HotPlug event, PON - Power On reset
HR - Hard Reset,      WB - Warm Boot
```

Asic inst. (R/S/A)	fap id	HP Slice state	Asic type	Admin state	Oper state	Asic state	Last init	PON (#)	HR (#)	FW Rev
0/FC1/2	202	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC1/3	203	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC3/6	206	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC3/7	207	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC4/8	208	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC4/9	209	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC5/10	210	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC5/11	211	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC7/14	214	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000
0/FC7/15	215	1 UP	s123	UP	UP	NRML	PON	1	0	0x0000

```
SI Info :
```

Card	Board	SI Board	SI Param	Retimer SI	Retimer SI	Front Panel
	HW Version	Version	Version	Board Version	Param Version	PHY

FC1	0.22	1	6	NA	NA	NA
FC3	0.21	1	6	NA	NA	NA
FC4	0.21	1	6	NA	NA	NA
FC5	0.21	1	6	NA	NA	NA
FC7	0.21	1	6	NA	NA	NA

```

-----+
Functional role: Active,      Rack: 8808, Type: lcc, Node: 0/1/CPU0
Driver ready      : Yes
NPU first started : Mon Apr 12 09:58:10 2021
Fabric Mode: FABRIC/8FC
NPU Power profile: Low
Driver Scope: Node
Respawn count    : 1
Availability masks :
    card: 0x1,    asic: 0x7,    exp asic: 0x7
Weight distribution:
    Unicast: 80,    Multicast: 20
-----+

```

Process / Lib	Connection status	Registration status	Connection requests	DLL registration
FSDB	Active	Active	1	n/a
FGID	Inactive	Inactive	0	n/a
AEL	n/a	n/a	n/a	Yes
SM	n/a	n/a	n/a	Yes

```

Asics :
HP - HotPlug event, PON - Power On reset
HR - Hard Reset,    WB - Warm Boot
-----+

```

Asic inst. (R/S/A)	fap id	HP slice	Asic state	Admin state	Oper state	Asic state	Last init	PON (#)	HR (#)	FW Rev
0/2/0	8	1	UP	npn	UP	UP	NRML	PON	1	0 0x0000
0/2/1	9	1	UP	npn	UP	UP	NRML	PON	1	0 0x0000
0/2/2	10	1	UP	npn	UP	UP	NRML	PON	1	0 0x0000

```

SI Info :
-----+

```

Card	Board	SI Board	SI Param	Retimer SI	Retimer SI	Front Panel
	HW Version	Version	Version	Board Version	Param Version	PHY
LC2	0.41	1	9	NA	NA	DEFAULT

Dynamic Power Management

Table 5: Feature History Table

Feature Name	Release Information	Description
Dynamic Power Management	Release 7.3.15	<p>The Dynamic Power Management feature considers certain dynamic factors before allocating power to the fabric and line cards.</p> <p>This feature has the following benefits:</p> <ul style="list-style-type: none"> • Reduces number of PSUs required by accurately representing the maximum power consumption • Improves PSU efficiency by providing more accurate power allocation <p>This feature thus optimizes power allocation and avoids overprovisioning power to a router.</p>
Dynamic Power Management	Release 7.3.2	<p>Previously available for fabric and line cards, this feature that helps avoid excess power allocation by considering dynamic factors before allocating power to them is now available for optical modules.</p> <p>To view the power allocation on a per port basis, a new command “show environment power allocated [details]” is introduced.</p>
Dynamic Power Management	Release 7.3.3	<p>The Dynamic Power Management feature is now supported on the following Cisco 8100 and 8200 series routers:</p> <ul style="list-style-type: none"> • Cisco 8201 • Cisco 8202 • Cisco 8201-32-FH • Cisco 8101-32-FH
Dynamic Power Management	Release 7.5.2	<p>The Cisco 8202-32FH-M router will now consider dynamic factors, such as optical modules, NPU power profile, and MACsec mode to enable improved power allocation and utilization.</p>

Prior to Cisco IOS XR Release 7.3.15, when Cisco 8000 series routers were powered on or reloaded, the power management feature reserved power to fabric cards and allocated maximum power to line cards. The

power management feature wouldn't consider dynamic factors, such as the type of fabric or line cards in the chassis, or whether a fabric or line card was present in a slot.

The Dynamic Power Management feature considers such dynamic factors before allocating power to the fabric and line cards.

This feature has the following benefits:

- Reduces number of PSUs required by accurately representing the maximum power consumption
- Improves PSU efficiency by providing more accurate power allocation

This feature thus optimizes power allocation and avoids overprovisioning power to a router.

This feature is supported on the following Cisco 8000 series routers:

- Cisco 8804, 8808, 8812, and 8818 routers
- Cisco 8201, 8202, 8201-32-FH, and 8202-32FH-M routers
- Cisco 8101-32-FH

By default, this feature is enabled on the router.

The Dynamic Power Management feature allocates the total power to a router and its fabric card or line card based on the following parameters:

- Number and type of fabric cards installed on the router
- Fabric cards operating modes (5FC or 8FC)
- Number and type of line cards installed on the router
- Combination of line card and fabric card types installed
- NPU power mode configured on a fabric card
- Number and type of optics installed (supported in Cisco IOS XR Software Release 7.3.2 and later)
- MACSec-enabled ports (supported from Cisco IOS XR Software Release 7.3.3 and later)

For details, see *Dynamic Power Management for MACSec-Enabled Ports* section in the *Configuring MACSec* chapter in the *System Security Configuration Guide for Cisco 8000 Series Routers*.

On 8202-32FH-M router, the Dynamic Power Management feature allocates the total power to a router based on the following parameters:

- Optical modules installed.
- NPU power profile. To identify the mode on which the router is operating, use the `hw-module npu-power-profile` command.
- MACSec mode. By default, MACSec mode is disabled on 8202-32FH-M router.



Note We recommend you work with your Cisco account representatives to calculate power requirements for the Cisco 8000 series router.

Power Allocation to Empty Card Slot

This feature allocates a minimum required power for all empty LC or FC slots. This minimum power is required to boot the CPU and FPGAs immediately when a card is inserted. The feature doesn't control booting up the CPU and FPGAs. Also, the minimum power is required to detect the card type before the feature decides if there's enough power to power up the data path.

For example, the following **show environment power** command output displays various LC or FC card statuses, and also shows allocated and used power.



Note The allocated power capacity shown in the following **show** command output isn't standard capacity. The allocated power capacity varies depending on various other factors.

```
Router# show environment power
Thu Apr 22 12:03:06.754 UTC
=====
CHASSIS LEVEL POWER INFO: 0
=====
Total output power capacity (N + 1)      : 9600W + 6300W
Total output power required              : 9241W
Total power input                        : 6146W
Total power output                       : 5826W
=====
```

Power Module	Supply Type	-----Input-----		-----Output---		Status
		Volts A/B	Amps A/B	Volts	Amps	
0/PT0-PM0	PSU6.3KW-HV	245.5/245.7	5.1/5.0	54.7	43.1	OK
0/PT0-PM1	PSU6.3KW-HV	0.0/245.2	0.0/7.4	54.3	31.7	OK
0/PT0-PM2	PSU6.3KW-HV	0.0/246.9	0.0/7.5	54.1	32.3	OK
Total of Power Modules:		6146W/25.0A		5826W/107.1A		

Location	Card Type	Power Allocated Watts	Power Used Watts	Status
0/RP0/CPU0	8800-RP	95	69	ON
0/RP1/CPU0	-	95	-	RESERVED
0/0/CPU0	88-LC0-36FH	796	430	ON
0/1/CPU0	-	102	-	RESERVED
0/2/CPU0	88-LC0-36FH	796	430	ON
0/3/CPU0	-	102	-	RESERVED
0/4/CPU0	-	102	-	RESERVED
0/5/CPU0	-	102	-	RESERVED
0/6/CPU0	-	102	-	RESERVED
0/7/CPU0	-	102	-	RESERVED
0/8/CPU0	-	102	-	RESERVED
0/9/CPU0	88-LC0-36FH	102	-	OFF
0/10/CPU0	-	102	-	RESERVED
0/11/CPU0	-	102	-	RESERVED
0/FC0	-	26	-	RESERVED
0/FC1	-	26	-	RESERVED
0/FC2	-	26	-	RESERVED
0/FC3	8812-FC	784	509	ON
0/FC4	8812-FC	784	503	ON
0/FC5	8812-FC	26	-	OFF
0/FC6	8812-FC	26	-	OFF
0/FC7	8812-FC	26	-	OFF

0/FT0	8812-FAN	1072	1000	ON
0/FT1	8812-FAN	1072	1012	ON
0/FT2	8812-FAN	1072	861	ON
0/FT3	8812-FAN	1072	1033	ON

This table describes the card slot statuses:

Table 6: Router Card Slot Status

Status	Description
RESERVED	When a slot is empty
OFF	When a card is inserted in a slot but power isn't allocated to the card
ON	When a card is allocated power and the card is in operational state

Low-Power Condition

When you insert an LC or FC in a card slot at the time when the router doesn't have enough power available to allocate to the new card, the dynamic power management feature doesn't provision power to the card. It raises the `ev_power_budget_not_ok` alarm, and gracefully shuts down the card.

In the following `show` command output, an FC inserted in the card slot location 0/FC6 is gracefully shut down due to lack of power:

```
Router# show shelfmgr history events location 0/FC6
Thu Apr 22 12:03:11.763 UTC
NODE NAME      : 0/FC6
CURRENT STATE  : CARD_SHUT_POWERED_OFF
TIME STAMP     : Apr 20 2021 16:49:52
-----
DATE           TIME (UTC)  EVENT                               STATE
-----
Apr 20 2021 16:49:52  ev_powered_off          CARD_SHUT_POWERED_OFF
Apr 20 2021 16:49:52  ev_device_offline       STATE_NOT_CHANGED
Apr 20 2021 16:49:52  ev_unmapped_event       STATE_NOT_CHANGED
Apr 20 2021 16:49:48  transient_condition     CARD_SHUTDOWN
Apr 20 2021 16:49:48  ev_check_card_down_reaso CHECKING_DOWN_REASON
Apr 20 2021 16:49:48  ev_timer_expiry         CARD_SHUTDOWN_IN_PROGRESS
Apr 20 2021 16:48:46  ev_power_budget_not_ok  CARD_SHUTDOWN_IN_PROGRESS
Apr 20 2021 16:48:45  transient_condition     POWER_BUDGET_CHECK
Apr 20 2021 16:48:45  ev_fpd_upgrade_not_reqd CARD_STATUS_CHECK_COMPLETE
Apr 20 2021 16:47:45  ev_card_status_check    CARD_STATUS_CHECK
Apr 20 2021 16:47:45  ev_card_info_rcvd       CARD_INFO_RCVD
Apr 20 2021 16:47:44  ev_device_online        DEVICE_ONLINE
Apr 20 2021 16:47:43  ev_timer_expiry         CARD_POWERED_ON
Apr 20 2021 16:47:33  ev_powered_on           CARD_POWERED_ON
Apr 20 2021 16:47:33  init                    CARD_DISCOVERED
-----
```

However, after an LC, FC, or chassis reload, the dynamic power management feature can't ensure that the same LCs, FCs, optics, or interfaces, which were operational earlier (before the reload), would become active again.



Note During a low-power condition, this feature doesn't borrow power from a redundant power supply.

Power Allocation to Optics

From Cisco IOS XR Release 7.3.2 onwards, power requirement for optics is also considered before allocating power to them.

To identify the power allocated for a particular interface, use the **show environment power allocated [details] location location** command.

When the optical modules are inserted, power is automatically allocated for that interface. If power has been allocated to the interface, then use the “**no shut**” command to enable the interface.

```
Router# show environment power allocated location 0/3/CPU0
Thu Oct 7 22:27:35.732 UTC
```

Location	Components	Power Allocated Watts
0/3/CPU0	Data-path	772
	OPTICS	138
	Total	910

```
Router# show environment power allocated details location 0/3/CPU0
Thu Oct 7 22:27:42.221 UTC
```

Location	Components	Power Allocated Watts
0/3/CPU0	Data-path	772
	0/3/0/0	3
	0/3/0/1	3
	0/3/0/2	3
	0/3/0/3	3
	0/3/0/4	3
	0/3/0/5	3
	0/3/0/6	3
	0/3/0/7	3
	0/3/0/8	3
	0/3/0/9	3
	0/3/0/10	3
	0/3/0/11	3
	0/3/0/12	3
	0/3/0/13	3
	0/3/0/14	3
	0/3/0/15	3
	0/3/0/16	3
	0/3/0/17	3
	0/3/0/18	3
	0/3/0/19	3
	0/3/0/20	3
	0/3/0/21	3
	0/3/0/22	3
	0/3/0/23	3
	0/3/0/24	3

```

0/3/0/25          3
0/3/0/26          3
0/3/0/27          3
0/3/0/28          3
0/3/0/29          3
0/3/0/30          3
0/3/0/31          3
0/3/0/32          3
0/3/0/33          3
0/3/0/34          3
0/3/0/35          3
0/3/0/36          3
0/3/0/37          3
0/3/0/38          3
0/3/0/39          3
0/3/0/40          3
0/3/0/41          3
0/3/0/42          3
0/3/0/43          3
0/3/0/44          3
0/3/0/46          3

```

```

=====
Total                910

```

When the power is not allocated to the interface, the following syslog error and alarms are displayed

```

!<--Syslog Error-->!
#LC/0/3/CPU0:Oct  7 22:46:48.114 UTC: optics_driver[165]: %PKT_INFRA-FM-3-FAULT_MAJOR :
ALARM_MAJOR :POWER ALLOCATION FAIL :DECLARE :0/3/CPU0: Optics0/3/0/44
LC/0/3/CPU0:Oct  7 22:46:48.114 UTC: optics_driver[165]:
%L2-OPTICS-2-QSFP_POWER_ALLOCATION_FAILURE : Not enough power available to enable Optics
0/3/0/44

```

```

!<--Alarm-->!
Router#show alarms brief system active
Thu Oct  7 22:47:19.569 UTC

```

```

-----
Active Alarms
-----

```

Location	Severity	Group	Set Time	Description
----------	----------	-------	----------	-------------

0/3/CPU0	Major	Software	10/07/2021 22:46:48 UTC	Optics0/3/0/44 - hw_optics: Lack of available power to enable the optical module
----------	-------	----------	-------------------------	----------------------------------------------------------------------------------

0/3/CPU0	Major	Software	10/07/2021 22:47:06 UTC	Optics0/3/0/46 - hw_optics: Lack of available power to enable the optical module
----------	-------	----------	-------------------------	----------------------------------------------------------------------------------

If power is not allocated to an interface and you attempt to enable that interface using the “**no shut**” command, the following syslog error is displayed:

```

LC/0/2/CPU0:Aug 30 18:01:14.930 UTC: eth_intf_ea[262]: %PLATFORM-VEEA-1-PORT_NOT_ENABLED :
Power not allocated to enable the interface HundredGigE0_2_0_6.

```

Power Allocation to Fixed-Port Routers

The following **show environment power** command output displays power information for fixed-port routers and components.


```

Router# show environment power
Wed Feb 16 21:05:10.001 UTC
=====
CHASSIS LEVEL POWER INFO: 0
=====
Total output power capacity (Group 0 + Group 1) : 1400W + 1400W
Total output power required : 1033W
Total power input : 390W
Total power output : 255W

Power Group 0:
=====
Power Supply -----Input-----Output--- Status
Module Type Volts Amps Volts Amps
=====
0/PM0 PSU1.4KW-ACPE 244.5 0.8 12.0 11.1 OK

Total of Group 0: 195W/0.8A 133W/11.1A

Power Group 1:
=====
Power Supply -----Input-----Output--- Status
Module Type Volts Amps Volts Amps
=====
0/PM1 PSU1.4KW-ACPE 244.2 0.8 12.0 10.2 OK

Total of Group 1: 195W/0.8A 122W/10.2A

=====
Location Card Type Power Power Status
Allocated Used
Watts Watts
=====
0/RP0/CPU0 8201 893 - ON
0/FT0 FAN-1RU-PE 28 - ON
0/FT1 FAN-1RU-PE 28 - ON
0/FT2 FAN-1RU-PE 28 - ON
0/FT3 FAN-1RU-PE 28 - ON
0/FT4 FAN-1RU-PE 28 - ON

```

To identify the power allocated for a particular interface, use the **show environment power allocated [details] location *location*** command.

```

Router# show environment power allocated location 0/RP0/CPU0
Wed Feb 16 21:05:21.360 UTC
=====
Location Components Power
Allocated
Watts
=====
0/RP0/CPU0 Data-path 858
OPTICS 35
=====
Total 893

```

```

Router# show environment power allocated details location 0/RP0/CPU0
Wed Feb 16 21:05:36.142 UTC
=====
Location Components Power
Allocated
Watts
=====
0/RP0/CPU0 Data-path 858

```

0/0/0/19	21
0/0/0/18	14
=====	
Total	893

Disabling Dynamic Power Management

By default, the dynamic power management is enabled on a router. The following example shows how to disable dynamic power management:

```
RP/0/RP0/CPU0:ios(config)#power-mgmt action disable
RP/0/RP0/CPU0:ios(config)#commit
```



Caution After disabling the dynamic power management feature, you must manage the router power on your own. So, use this command with caution.



Note To reenable dynamic power management, use the **no power-mgmt action disable** command.

On-demand transfer of Redundant Power Modules to Power Reservation Pool

Table 7: Feature History Table

Feature Name	Release Information	Feature Description
On-demand transfer of Redundant Power Modules to Power Reservation Pool	Release 7.11.1	The Cisco 8800 Series Modular Routers now have a functionality that allows them to transfer their redundant Power Supply Units (PSUs) to the power reservation pool when there is inadequate power supply. This capability helps prevent the router from shutting down hardware components due to a lack of power in the reservation pool, which used to occur due to the router prioritizing redundancy over power availability in the power reservation pool. Consequently, the router now raises an alarm indicating redundancy loss when it transfers PSUs to the power reservation pool. This feature ensures that the router components reserve the necessary power, even when redundancy is enabled.

The Cisco 8000 Series Modular Routers offer redundancy while managing Power Supply Units (PSUs), providing continuous operation if there is PSU failure. By default, the router operates in N+1 redundancy, where N represents the number of PSUs allotted to the power reservation pool for powering the router components, and 1 indicates the backup PSU. You can use the `power-mgmt redundancy-num-pms number` command in XR Config mode to configure the PSU redundancy from N+1 to N+x, where x is the number of redundant PSUs required. The total number of functioning PSUs must be at least x more than the number of PSUs required to support the power demanded by all the components in the system for optimal router functionality. The range of values assigned to x is 0–11, where 0 implies no power redundancy. The router uses the redundant PSUs only when there is a PSU failure. But, if the power requirement of the router increases than the available power offered by PSUs, the router prioritizes maintaining PSU redundancy overpowering the components.

Starting from Cisco IOS XR Release 7.11.1, the Cisco 8800 Modular Routers prioritize powering the router components over preserving redundancy. The router transfers the redundant PSUs to a power reservation pool to power the router components on demand. The router utilizes the redundant PSUs to increase the power capacity in the power reservation pool rather than maintaining redundancy. For example, consider a scenario with 18900W (3 6300W PSUs) available power. Initially, the router reserves 12600W (using 2 PSUs) in the power reservation pool and retains 6300W (one PSU) as a backup to maintain N+1 redundancy. Suppose the router needs to reserve power for any components to power up and needs more power than is available in the reservation pool. In that case, the router uses the entire 18900W with all three PSUs to power the components by transferring the redundant PSU to the power reservation pool. The router then triggers a redundancy loss alarm with such an assignment. However, if any further actions result in reduced power consumption in the router, the system automatically restores redundancy and clears the redundancy lost alarm.

On redundancy loss, the router raises a **Critical** severity **Power Module redundancy lost** alarm. You can use the `show alarms brief` command to view the redundancy lost alarm.

Syslog messages for transforming redundant PSU into borrowable resource:

Syslog message created while redundancy loss (transforming redundant PSU to functional PSU):

```
RP/0/RP0/CPU0:Jul 24 11:49:01.316 UTC: envmon[214]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR
:Power Module redundancy lost :DECLARE :0:
```

Syslog message created while restoring redundancy:

```
RP/0/RP0/CPU0:Jul 24 11:49:11.375 UTC: envmon[214]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR
:Power Module redundancy lost :CLEAR :0:
```

You can also use the `show environment` view the redundancy status of the PSUs in the router.

The following section details the commands to verify the redundancy status in the router:

Router with N+1 redundancy:

```
Router:ios# show environment power
```

```
=====
CHASSIS LEVEL POWER INFO: 0
=====

Total output power capacity (N + 1)      : 12600W + 6300W
Total output power required              : 11545W
Total power input                         : 3302W
Total power output                       : 3004W

=====

Power      Supply      -----Input-----  ----Output---  Status
Module     Type                Volts A/B   Amps A/B   Volts   Amps
=====
```

On-demand transfer of Redundant Power Modules to Power Reservation Pool

```

0/PT5-PM0  PSU6.3KW-HV  240.5/241.3  2.2/2.4  55.1  18.3  OK
0/PT5-PM1  PSU6.3KW-HV  240.5/240.8  2.1/2.3  54.8  17.3  OK
0/PT5-PM2  PSU6.3KW-HV  242.2/241.1  2.3/2.4  54.9  19.1  OK
    
```

```

Total of Power Modules:      3302W/13.7A      3004W/54.7A
    
```

```

=====
Location      Card Type      Power      Power      Status
Allocated    Used
Watts        Watts
=====
0/RP0/CPU0    8800-RP        105         78         ON
0/RP1/CPU0    -              105         -          RESERVED
0/0/CPU0      8800-LC-36FH   1097        513        ON
0/1/CPU0      -              102         -          RESERVED
0/2/CPU0      88-LC0-36FH    102         0          OFF
0/3/CPU0      -              102         -          RESERVED
0/4/CPU0      -              102         -          RESERVED
0/5/CPU0      -              102         -          RESERVED
0/6/CPU0      -              102         -          RESERVED
0/7/CPU0      -              102         -          RESERVED
0/8/CPU0      -              102         -          RESERVED
0/9/CPU0      -              102         -          RESERVED
0/10/CPU0     -              102         -          RESERVED
0/11/CPU0     -              102         -          RESERVED
0/12/CPU0     -              102         -          RESERVED
0/13/CPU0     -              102         -          RESERVED
0/14/CPU0     -              102         -          RESERVED
0/15/CPU0     -              102         -          RESERVED
0/16/CPU0     -              102         -          RESERVED
0/17/CPU0     -              102         -          RESERVED
0/FC0         -              32          -          RESERVED
0/FC1         -              32          -          RESERVED
0/FC2         8818-FC0       584         475        ON
0/FC3         -              32          -          RESERVED
0/FC4         8818-FC0       584         472        ON
0/FC5         -              32          -          RESERVED
0/FC6         -              32          -          RESERVED
0/FC7         -              32          -          RESERVED
0/FT0         8818-FAN       1786        237        ON
0/FT1         8818-FAN       1786        228        ON
0/FT2         8818-FAN       1786        234        ON
0/FT3         8818-FAN       1786        228        ON
    
```

Router with redundancy loss:

Router:ios# **sh env power**

```

=====
CHASSIS LEVEL POWER INFO: 0
=====
Total output power capacity (N + 1)      : 18900W +      0W
Total output power required              : 12689W
Total power input                        : 3302W
Total power output                       : 3004W
=====

Power      Supply      -----Input-----      -----Output-----      Status
Module     Type          Volts A/B  Amps A/B  Volts      Amps
=====
    
```

```

0/PT5-PM0 PSU6.3KW-HV 240.5/241.3 2.2/2.4 55.1 18.3 OK
0/PT5-PM1 PSU6.3KW-HV 240.5/240.8 2.1/2.3 54.8 17.3 OK
0/PT5-PM2 PSU6.3KW-HV 242.2/241.1 2.3/2.4 54.9 19.1 OK
    
```

```

Total of Power Modules:      3302W/13.7A      3004W/54.7A
    
```

```

=====
Location      Card Type      Power      Power      Status
Allocated    Used
Watts        Watts
=====
0/RP0/CPU0    8800-RP        105         78         ON
0/RP1/CPU0    -              105         -          RESERVED
0/0/CPU0      8800-LC-36FH   1097        513        ON
0/1/CPU0      -              102         -          RESERVED
0/2/CPU0      88-LC0-36FH   916         510        ON
0/3/CPU0      -              102         -          RESERVED
0/4/CPU0      -              102         -          RESERVED
0/5/CPU0      -              102         -          RESERVED
0/6/CPU0      -              102         -          RESERVED
0/7/CPU0      -              102         -          RESERVED
0/8/CPU0      -              102         -          RESERVED
0/9/CPU0      -              102         -          RESERVED
0/10/CPU0     -              102         -          RESERVED
0/11/CPU0     -              102         -          RESERVED
0/12/CPU0     -              102         -          RESERVED
0/13/CPU0     -              102         -          RESERVED
0/14/CPU0     -              102         -          RESERVED
0/15/CPU0     -              102         -          RESERVED
0/16/CPU0     -              102         -          RESERVED
0/17/CPU0     -              102         -          RESERVED
0/FC0         -              32          -          RESERVED
0/FC1         -              32          -          RESERVED
0/FC2         8818-FC0       749         475        ON
0/FC3         -              32          -          RESERVED
0/FC4         8818-FC0       749         472        ON
0/FC5         -              32          -          RESERVED
0/FC6         -              32          -          RESERVED
0/FC7         -              32          -          RESERVED
0/FT0         8818-FAN       1786        237        ON
0/FT1         8818-FAN       1786        225        ON
0/FT2         8818-FAN       1786        234        ON
0/FT3         8818-FAN       1786        228        ON
    
```

Router:ios# **sh alarms brief system active**

Active Alarms

```

-----
Location      Severity      Group      Set Time
Description
-----
0/RP0/CPU0    Critical      Software    10/27/2023 00:22:08 UTC
Redundancy Partner Not Present

0             Major        Environ     10/27/2023 00:23:48 UTC    Power
Module redundancy lost
    
```

On-demand transfer of Redundant Power Modules to Power Reservation Pool

Plane-0 status	0/RP0/CPU0	Minor	Fabric	10/27/2023 00:22:39 UTC	Fabric
Plane-1 status	0/RP0/CPU0	Minor	Fabric	10/27/2023 00:22:39 UTC	Fabric
Plane-3 status	0/RP0/CPU0	Minor	Fabric	10/27/2023 00:22:39 UTC	Fabric
Plane-5 status	0/RP0/CPU0	Minor	Fabric	10/27/2023 00:22:39 UTC	Fabric
Plane-6 status	0/RP0/CPU0	Minor	Fabric	10/27/2023 00:22:39 UTC	Fabric
Plane-7 status	0/RP0/CPU0	Minor	Fabric	10/27/2023 00:22:39 UTC	Fabric
Communications Failure With Cisco Licensing Cloud	0/RP0/CPU0	Major	Software	10/27/2023 00:22:59 UTC	
Module redundancy lost	0	Major	Environ	10/27/2023 00:23:48 UTC	Power

Power Redundancy Protection

Table 8: Feature History Table

Feature Name	Release Information	Feature Description
Power Redundancy Protection	Release 24.1.1	<p>You can now prevent power module exhaustion or failure due to power redundancy issues in the power feeds with the help of alarms that warn that the total output power required by the router exceeds the total feed redundancy capacity. You can configure either single-fault protection or dual fault protection, depending on whether you want to trigger alarms during redundancy failures in the power supply feed, PSU redundancy, or both.</p> <p>The feature introduces these changes:</p> <p>CLI:</p> <ul style="list-style-type: none"> • <code>power-mgmt feed-redundancy</code> • The <code>Total feed redundancy capacity</code> field is added to the <code>show environment</code> command.

The Cisco 8000 Series Modular Routers have two redundancy mechanisms to ensure the router continues functioning even during power supply failures:

- The PSU redundancy involves having extra power supplies that can take over if one fails, ensuring continuous operation.
- The power feed redundancy divides the input power into A and B feeds. When both feeds are functioning normally, they share the power load equally. However, if one of the feeds fails, the other feed scales up to its maximum capacity or the power supply unit (PSU) will operate with reduced input to ensure that the power supply to the router is uninterrupted.

These power redundancy options provide a high level of reliability and minimize the risk of network downtime due to power supply failures.

The routers now have power redundancy protection that triggers alarms for PSU and feed redundancy failures when the total output power required by the router exceeds its total feed redundancy capacity. You can configure the total feed redundancy capacity in two modes- single fault protection and dual fault protection.

The **single fault protection** mode monitors the router against a **power supply feed or PSU** redundancy failure. Meanwhile, the **dual fault protection** monitors the router against a **power supply feed and PSU** redundancy failure simultaneously. You can also customize the PSU single feed capacity in the router. Each

PSU has a default power range for the single feed; you can configure a value within the range to meet your specific infrastructure requirements.

The feed redundancy alarm is triggered when the total output power required exceeds the total feed redundancy capacity. The router's total feed capacity is determined by the least of two factors: feed redundancy capacity and PSU redundancy capacity. The PSU redundancy capacity is the number of power supply units minus the redundant ones (N) multiplied by a dual feed capacity. On the other hand, the feed redundancy capacity is the total number of PSUs multiplied by a single feed capacity. In single-fault protection, the PSU refers to the router's total number of power supply units (N+1). In dual-fault protection, the PSU refers to the number of power supply units minus the redundant ones (N).

For example, consider a router that has a total of 9 PSUs with a default N + 1 power redundancy configuration. The PSU feed capacity with dual feed is 4800 W and the single feed capacity value is set 3200 W, then the total feed redundancy capacity would be:

Power Redundancy Protection	Total Number of PSUs	PSU redundancy	Number of PSUs minus the redundant ones (N)	Dual Feed Capacity	Single Feed Capacity	Feed Redundancy Capacity	PSU Redundancy Capacity	Total Feed Redundancy Capacity
Single fault protection	9	N+1	8	4800 W	3200 W	28800 W	38400 W	28800 W
Dual fault protection	9	N+1	8	4800 W	3200 W	25600 W	38400 W	25600 W

Guidelines and Restrictions for Power Redundancy Protection

- By default, the router doesn't enable Power Redundancy Protection.
- The Power Redundancy Protection feature doesn't impact the power budgeting in the routers.
- For maximum power redundancy protection, use the dual fault protection.
- For total feed redundancy capacity calculations, the router considers only the PSUs with A and B inputs. Both A and B inputs must be within the operating range in healthy conditions. If either feed is unavailable, the router excludes such PSUs from the calculations.
- The router considers all PSUs, including redundant PSUs with two feeds (within the operating range in healthy condition) for feed redundancy capacity in single fault protection. However, the router excludes the redundant PSUs for feed redundancy capacity in dual fault protection. If the router has 8 PSUs and N+3 redundancy, single fault protection calculation considers all eight PSUs, whereas dual fault protection considers just 5 PSUs.

Configure Power Redundancy Protection

To configure the power redundancy protection mode and PSU single feed capacity, you can use the [power-mgmt feed-redundancy](#) command.

Single fault protection with PSU single feed capacity set to 2400 Watts

Configuration:


```
Router# config
Router(config)# power-mgmt feed-redundancy single-fault-protection capacity 2400
Router(config)# commit
```

Running Configuration:

```
Router# show run power
...
power-mgmt feed-redundancy single-fault-protection capacity 2400
...
```

Verification:

```
Router# show env power
=====
CHASSIS LEVEL POWER INFO: 0
=====
Total output power capacity (N + 1)      : 28800W + 4800W
Total output power required          : 6679W >>>>> 1
Total power input                        : 2394W
Total power output                      : 2066W
Total feed redundancy capacity (Single Fault) : 16800W >>>>> 2
/*The router triggers feed redundancy loss alarm when 1 > 2.**//
=====
Power      Supply      -----Input-----  -----Output---  Status
Module     Type                Volts A/B    Amps A/B    Volts    Amps
=====
0/PT0-PM0  PSU4.8KW-DC100     62.8/62.7   2.6/2.5    55.2     5.3    OK
0/PT0-PM1  PSU4.8KW-DC100     62.7/62.7   2.7/2.6    55.3     5.3    OK
0/PT0-PM3  PSU4.8KW-DC100     61.0/62.7   2.6/2.5    55.2     4.8    OK
0/PT1-PM0  PSU4.8KW-DC100     67.3/67.3   2.7/2.5    55.3     5.2    OK
0/PT1-PM1  PSU4.8KW-DC100     67.3/67.2   2.8/2.7    55.3     5.7    OK
0/PT1-PM2  PSU4.8KW-DC100     67.3/67.4   2.7/2.7    55.2     5.6    OK
0/PT1-PM3  PSU4.8KW-DC100     67.3/67.3   2.6/2.5    55.3     5.5    OK
=====
Total of Power Modules:      2394W/36.7A                2066W/37.4A
```

Dual fault protection with PSU single feed capacity set to 2400 Watts

Configuration:

```
Router# config
Router(config)# power-mgmt feed-redundancy dual-fault-protection capacity 2400
Router(config)# commit
```

Running Configuration:

```
Router# show run power
...
power-mgmt feed-redundancy dual-fault-protection capacity 2400
...
```

Verification:

```
Router# show env power
=====
CHASSIS LEVEL POWER INFO: 0
=====
Total output power capacity (N + 1)      : 28800W + 4800W
Total output power required          : 6679W >>>>> 1
Total power input                        : 2394W
Total power output                      : 2066W
Total feed redundancy capacity (Dual Fault) : 14400W >>>>> 2
/*The router triggers feed redundancy loss alarm when 1 > 2.**//
=====
```

Power Module	Supply Type	-----Input-----		-----Output---		Status
		Volts A/B	Amps A/B	Volts	Amps	
0/PT0-PM0	PSU4.8KW-DC100	62.8/62.7	2.6/2.5	55.2	5.3	OK
0/PT0-PM1	PSU4.8KW-DC100	62.7/62.7	2.7/2.6	55.3	5.3	OK
0/PT0-PM3	PSU4.8KW-DC100	61.0/62.7	2.6/2.5	55.2	4.8	OK
0/PT1-PM0	PSU4.8KW-DC100	67.3/67.3	2.7/2.5	55.3	5.2	OK
0/PT1-PM1	PSU4.8KW-DC100	67.3/67.2	2.8/2.7	55.3	5.7	OK
0/PT1-PM2	PSU4.8KW-DC100	67.3/67.4	2.7/2.7	55.2	5.6	OK
0/PT1-PM3	PSU4.8KW-DC100	67.3/67.3	2.6/2.5	55.3	5.5	OK
Total of Power Modules:		2394W/36.7A		2066W/37.4A		

Alarms for power redundancy loss

You can use the [show alarms brief](#) command to view the power redundancy alarm:



Note The router triggers the Power Module redundancy feed mode lost alarm only when **Total output power required** exceeds **Total feed redundancy capacity**.

```
Router# show alarms brief system active
```

```
-----
```

```
Active Alarms
```

```
-----
```

Location	Severity	Group	Set Time	Description
----------	----------	-------	----------	-------------

```
-----
```

```
0          Major      Environ      11/27/2023 12:55:08 UTC  Power Module redundancy
```

```
feed mode lost
```

System Log messages for power redundancy loss

Syslog message created while power redundancy loss (total output power exceeds total feed redundancy capacity):

```
RP/0/RP0/CPU0:Dec 15 10:24:29.489 UTC: envmon [123]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR
```

```
:Power Feed redundancy lost :DECLARE :0
```

Ability to Set Maximum Power Limit for the Router

Table 9: Feature History Table

Feature Name	Release Information	Feature Description
Ability to Set Maximum Power Limit for the Router	Release 7.11.1	<p>We are introducing functionality to set the maximum power limit for a router to improve power management and distribution in the PSUs. It prevents a router from using more than the configured power and also gives the ability to limit the reservation pool regardless of how many power supplies are present. In the previous releases, the ability to prevent a router from using more than a configured amount of power was unavailable.</p> <p>This feature introduces the following change:</p> <p>CLI</p> <ul style="list-style-type: none"> power-mgmt configured-power-capacity

In the earlier releases, there was no mechanism to limit the power a router consumed. Routers could draw more than the infrastructure could handle. Over power consumption could result in system brownout.

With the Cisco IOS XR Software Release 7.11.1, you can allocate system power based on max power capacity configuration. This prevents the router from allocating more power than the infrastructure can handle. It also gives you the ability to limit power to a router according to your infrastructure requirements. The max power capacity parameter doesn't allow power consumed by the hardware to cross the configured amount.

The criteria to set maximum power limit is that the value must be set between the current allocated power and the available maximum power at time of configuration.

This feature is not applicable for fixed routers.

A new command **power-mgmt configured-power-capacity** has been introduced with this feature.

A new alarm **PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR :Power reservation exceeds configured power** is introduced to be raised when the max power capacity is crossed.



Note This alarm is extremely rare and is raised only when the power reservation exceeds configured power. This can only happen when hardware is inserted, it is granted power without a request, such as a fan tray.

Upgrading FPD for PSU

Table 10: Feature History Table

Feature Name	Release Information	Feature Description
Optimized PSU FPD Upgrade	Release 7.8.1	<p>We have optimized the upgrade process of Field-Programmable Devices (FPDs) associated with the Power Supply Unit (PSUs) on the router. During the installation and PSU insertion process on the router, the FPDs associated with the PSUs are automatically upgraded.</p> <p>Starting this release, the PSU FPDs are grouped in the form of a parent FPD and its related child FPDs, and the upgrade image is downloaded only once. The upgrade is then triggered on the parent FPD PSU and replicated to the child FPD PSUs.</p> <p>In earlier releases, you downloaded the FPD image for each FPD associated with that PSU, and the upgrade process was then triggered sequentially. This process was time-consuming.</p> <p>The feature is supported on the following PSUs:</p> <ul style="list-style-type: none"> • PSU2KW-ACPI • PSU2KW-HVPI • PSU3KW-HVPI • PSU4.8KW-DC100

From Cisco IOS XR Software Release 7.8.1, the PSU FPD upgrade is optimized. PSU FPDs are now grouped in the form of parent PSU FPD which are related to the child PSU FPDs. The software image is downloaded once for the parent FPD and replicated to the children FPDs in the same group. Prior to this release, for example, if a PSU with five FPDs that share the same image across the FPDs needed a software upgrade, there were five upgrades triggered serially. As it is the same image which used to get downloaded five times, one for each FPD. It was redundant and time consuming.

The parent and child FPDs contain the same group info. If upgrade is required on the parent or the child PSU FPD, the parent FPD is added to the upgrade queue and the upgrade is triggered through CLI. Once upgrade is completed, the parent and child FPD software versions are updated.

If you want to upgrade the software version for a FPD PSU which is not a parent, it gets blocked in CLI by the FPD server.



Note You must disable **auto FPD upgrade** for PSUs before upgrading the router to Cisco IOS XR Software Release 7.9.1 or later if your router uses any of the following PSUs:

- PSU2KW-ACPI
- PSU2KW-ACPE
- PSU2KW-HVPI
- PSU4.8KW-DC100

To disable auto FPD upgrade, use the following command:

fpd auto-upgrade exclude pm

```
RP/0/RSP0/CPU0:ios# show running-config fpd auto-upgrade
RP/0/RP0/CPU0:ios(config)#fpd auto-upgrade exclude pm
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios#
```

Automatic FPD Upgrade for PSU

Feature Name	Release Information	Feature Description
Automatic FPD upgrade for PSU	Release 7.5.2	Automatic FPD upgrade for PSUs is now enabled. In earlier releases, automatic upgrades did not apply to FPDs associated with the PSUs.

During the installation and Power Supply Unit (PSU) insertion process, the Field-Programmable Devices (FPD) associated with the PSUs are automatically upgraded.



Note The PSUs are upgraded sequentially, hence the PSU FPD upgrades take longer. You can choose to exclude PSUs from the auto upgrade flow. This restricts the PSUs from being upgraded either upon insertion, or during system upgrade.

To exclude the PSU FPDs from auto upgrading, use the following CLI:

fpd auto-upgrade exclude pm

```
RP/0/RSP0/CPU0:router# show running-config fpd auto-upgrade
Wed Mar 30 20:52:55.079 UTC
fpd auto-upgrade enable
fpd auto-upgrade exclude pm
```



Note When you upgrade from an earlier unsupported version to a version that supports Automatic FPD upgrade for PSU, the PSU upgrade might happen on bootup.

Auto upgrade support for SC/MPA

In Spitfire-Centralized, the auto upgrade on bootup path is being supported for new CPU less cards SC and MPA.

The RP and SC cards together form a domain in Active and Standby nodes. The respective domain lead (RP) is responsible to trigger the auto upgrade of respective SC cards.

Configuring the Compatibility Mode for Q100 and Q200-based Line Cards

Table 11: Feature History Table

Feature Name	Release Information	Description
Configure Compatibility Mode for Q100 and Q200-based Line Cards	Release 7.7.1	<p>You can now configure the compatibility behavior of line cards to operate in Q100 mode (default behavior) or in Q200 mode when you have a mix of Q100-based line cards and Q200-based line cards that are installed in a router.</p> <p>In earlier releases, in a mixed mode combination, where multiple generations of line cards were installed, the behavior was to make the second-generation line cards interoperate with the first-generation line cards. However, this led the NPUs to set lower resource limits for the newer generation line cards to ensure backward compatibility. Also, the router didn't fully utilize the improved scale, higher capacity, and feature-rich capabilities of the newer generation line cards.</p> <p>This compatibility feature now enables you to select if you want the line cards to operate in Q100 or Q200 mode.</p> <p>The hw-module profile npu-compatibility command is introduced for this feature.</p>

In earlier releases, if you install a mix of Q100-based line cards and Q200-based line cards, the Q200-based line cards operate in a scaled-down (Q100) mode by default.

The compatibility feature now allows you to choose if you want line cards to operate in Q100 mode (default behavior) or in Q200 mode. In Q200 mode, the router boots only the Q200-based line cards and gracefully shuts down the Q100-based line cards.

For example, if a router has a Q100 ASIC family line card and you try to add a line card from the Q200 ASIC family, the Q200 ASIC line card operates in a scaled down mode to be able to work with the older generation-Q100 line cards. With the new implementation, you can choose if you want the router to work in the Q100 mode or shutdown the Q100-based linecards, and use the Q200 ASIC line cards in the Q200 mode.

FAQs About the New Implementation

- **Can the line cards still be used in scaled down mode, like in the previous scenario?**

Yes, you can still switch to the previous implementation, if you may, to the scaled down mode.

- **What all ASICs can participate in the new implementation?**

Q200 and Q100

- **Is there any default ASIC set by the system?**

For a distributed chassis, the default ASIC is Q100.

- **Do I need to reboot the router after implementing a new ASIC line card?**

Yes, reboot the router for the new ASIC line cards to take effect.

Usage Guidelines and Limitations

The following guidelines and limitations apply when you configure the line cards from different ASIC families:

- By default, a mix of Q100 and Q200 line cards results in the Q200 line cards operating in Q100 (scaled-down) mode. Configuring Q100 mode results in the same (default) behavior.
- To be able to use the Q200-based line cards to their full capacity, use the `hw-module profile npu-compatibility` command and set it to operate in the Q200 mode. Else, the Q200-based line cards scale down to the Q100 mode, which is the default behavior.
- Reboot the router for the compatibility mode to take effect. If the system detects a noncompatible line card, it shuts down that line card. For example, in Q200 mode, the router boots only the Q200-based line cards and gracefully shuts down the Q100-based line cards.
- The `hw-module profile npu-compatibility` command isn't configurable on the Cisco 8100 and 8200 Series fixed chassis.

This table lists the Q100 and Q200-based line cards that support the compatibility mode:

ASIC Family	Line Card
Q100-based line cards	8800-LC-48H
	8800-LC-36FH
Q200-based line cards	88-LC0-34H14FH
	88-LC0-36FH
	88-LC0-36FH-M

Line Card Behavior

The following table explains how the various line cards take precedence when installed from different ASIC families. The precedence followed by the system is: Q200 > Q100, where the newer generation line cards take precedence over an older generation line card.

ASIC Family of Installed Line Cards	Compatibility Mode Configured?	Compatibility Mode	Router Behavior during Bootup for the Line Cards
Q200 and Q100	N	Default (Q100)	Q200 line cards boot up and operate in Q100 mode, Q100 up.
	Y	Q200	Q200 line cards boot up, Q100 line cards shut down.
	Y	Q100	All line cards boot up, Q200 line cards operate in Q100 mode.
Q200 and Q200	N	Default (Q100)	Both the Q200 line cards boot up and operate in Q100 mode.
	Y	Q200	Both the Q200 line cards boot up

Configuring Line Cards from Different ASICs

To configure a router for handling line cards of different ASIC families, use the `hw-module profile npu-compatibility` command. To go back to the default mode, use the `no` form of this command.

The following are the options available in command and their descriptions:

<code>npu-compatibility</code>	Allows you to make a router compatible with an ASIC family.
<code>mode-name</code>	Allows you to set the mode, such as Q100 or Q200.

The following is a configuration example:

```
Router:ios(config)#hw-module profile npu-compatibility q200
Tue Dec 7 15:06:53.697 UTC
Chassis mode will be activated after a manual reload of chassis/all line cards
Router:ios(config)#commit
Tue Dec 7 15:06:54.646 UTC
LC/0/1/CPU0:Dec 7 15:06:54.796 UTC: npu_drvr292:
%FABRIC-NPU_DRV-3-HW_MODULE_PROFILE_NPU_COMPATIBILITY_CHASSIS_CFG_CHANGED : Please reload
chassis for the configuration to take effect
end
Router:ios(config)#end
Router:ios#
```

Running Configuration

```
RP/0/RP0/CPU0:ios# show ver
```



```

Mon Jun 27 19:25:52.947 UTC
Cisco IOS XR Software, Version 7.7.1.27I LNT
Copyright (c) 2013-2022 by Cisco Systems, Inc.

```

Build Information:

```

Built By      : ingunawa
Built On     : Wed Jun 01 23:50:09 UTC 2022
Build Host   : iox-ucs-060
Workspace    : /auto/iox-ucs-060-san1/prod/7.7.1.27I.SIT_IMAGE/8000/ws
Version     : 7.7.1.27I
Label       : 7.7.1.27I

```

```

cisco 8000 (VXR)
cisco 8808 (VXR) processor with 32GB of memory
ios uptime is 3 minutes
Cisco 8808 8-slot Chassis

```

```
RP/0/RP0/CPU0:ios#
```

```
RP/0/RP0/CPU0:ios# conf
```

```
Mon Jun 27 19:24:40.621 UTC
```

```
RP/0/RP0/CPU0:ios(config)# hw-module profile npu-compatibility ?
```

```
  Q100 Use Q100 for Chassis mode
```

```
  Q200 Use Q200 for Chassis mode
```

Verification

```
RP/0/RP0/CPU0:ios# show hw-module profile npu-compatibility matrix
```

```
Mon Jun 27 19:41:47.560 UTC
```

```

Node                Card Type                NPU Type
-----
0/0/CPU0            8800-LC-48H                Q100

```

```

NPU Type    Compatibility    Compatibility
             Mode Q100        Mode Q200
-----
Q100        Compatible        Not Compatible
Q200        Compatible        Compatible

```

```
Default mode: Q100
```

```
RP/0/RP0/CPU0:ios# show hw-module profile npu-compatibility
```

```
Mon Jun 27 19:41:59.318 UTC
```

```

-----
Knob                Status                Applied    Action
-----
npu_compatibility  Unconfigured         N/A       None

```

```
RP/0/RP0/CPU0:ios#
```

Storage Media Sanitization

Table 12: Feature History Table

Feature Name	Release Information	Feature Description
Storage Media Sanitization	Release 7.5.1 Release 7.3.4	<p>To comply with NIST SP 800-88 guidelines for Media Sanitization, it is important that your organization ensures that no easily reconstructible data is stored in the router and associated devices after it has left the control of your organization or is no longer protected by confidentiality categorization.</p> <p>With this feature, you can erase and overwrite any sensitive data, configuration, or keys present in the route processor or line card, ensuring media sanitization and preventing unauthorized data retrieval.</p>

When you identify an RP or line card for RMA, or you require to ship it outside your organization, a service personnel may not be available on-site to remove the card immediately. However, you can reset your RP or line card to erase customer-sensitive data and let the RP or line card remain in the slot. The RP or line card shuts down automatically after the factory reset is complete.

Guidelines

- We recommend using **factory-reset** without performing **commit replace** for securely removing the files in the misc/config folder.
- The RP or line card shuts down automatically if the factory reset takes more than 30 minutes, you can perform the factory reset again. The console displays the following log message during automatic shutdown:


```
[ TIME ] Timed out starting Power-Off.
[ !! ] Forcibly powering off as result of failure.
```
- If your router has dual RPs, and to perform the factory reset on both the RPs, first reset the standby RP from the active RP. After the reset is complete, the standby RP automatically shuts down, you can then reset the active RP.

Prerequisites

The RP or line card must be operational to perform factory reset.

Commands

Use the **factory-reset** command for erasing the following folders of RP or line card:

- /misc/disk1
- /misc/scratch
- /var/log
- /misc/config

Run the following command through the console port of the router to erase customer-sensitive data in the RP or line card:

factory-reset location <location-id> - erases customer-sensitive data in the specified location



Note Factory-reset logs are displayed on the console port of the node where the reset is performed.

The following steps explain how to reset your RP or line card to factory settings:

1. Erasing the RP or line card folder contents: Run the **factory-reset location** command to delete the encryption keys and erase the customer-sensitive data from the RP or line card.

The following example shows how to perform the factory-reset command on an RP:

```
Router#factory-reset location 0/RP1/CPU0
Factory reset requested
Started punching watchdog
Started cleaning up mount point: /misc/scratch
Started syncing folder: /misc/scratch
Finished syncing folder: /misc/scratch
Finished cleaning up mount point: /misc/scratch
factory_reset_stop.sh
+++++
Started cleaning up mount point: /var/log
Started syncing folder: /var/log
Finished syncing folder: /var/log
Finished cleaning up mount point: /var/log
factory_reset_stop.sh
+++++
Started cleaning up mount point: /misc/disk1
Started syncing folder: /misc/disk1
Finished syncing folder: /misc/disk1
Finished cleaning up mount point: /misc/disk1
factory_reset_stop.sh
+++++
Started cleaning up folder: /misc/config
UTC 2022 Started syncing folder: /misc/config
Finished syncing folder: /misc/config
Finished cleaning up folder: /misc/config
factory_reset_stop.sh
+++++
Started cleaning up folder: /var/xr/enc/misc/config
/var/xr/enc/misc/config not present
Finished cleaning up folder: /var/xr/enc/misc/config
factory_reset_stop.sh
+++++
Started cleaning up folder: /mnt/rootfs/misc/config
/mnt/rootfs/misc/config not present
```

```

Finished cleaning up folder: /mnt/rootfs/misc/config
factory_reset_stop.sh
+++++
Encrypted logical volume does not exist. Nothing to remove.
/usr/local/etc/fpga-functions: line 797: 10912 Terminated
/usr/local/etc/punch-wd.sh
Stopped punching watchdog

```

2. Verifying factory reset: Use the **show shelfmgr history events location** command to verify the successful completion of the factory-reset in the standby RP or line card.

The following example shows how to verify the factory-reset command:

```

RP/0/RP0/CPU0:Router#show shelfmgr history events location 0/RP1/CPU0
Tue Mar 15 01:45:56.402 UTC
NODE NAME      : 0/RP1/CPU0
CURRENT STATE  : CARD_SHUT_POWERED_OFF
TIME STAMP     : Mar 15 2022 01:44:47
-----
DATE           TIME (UTC)  EVENT                               STATE
-----
Mar 15 2022 01:44:47  ev_powered_off                       CARD_SHUT_POWERED_OFF
Mar 15 2022 01:44:47  transient_condition                   CARD_SHUTDOWN
Mar 15 2022 01:44:47  ev_check_card_down_reaso             CHECKING_DOWN_REASON
Mar 15 2022 01:44:47  ev_os_halted                         OS_HALTED
Mar 15 2022 01:44:43  ev_factory_reset_done                 FACTORY_RESET_DONE
Mar 15 2022 01:33:16  ev_factory_reset_started              FACTORY_RESET_IN_PROGRESS
Mar 15 2022 01:33:11  ev_os_halting                         OS_HALT_IN_PROGRESS
Mar 15 2022 01:33:10  ev_xr_shut                            START_OS_HALT
Mar 15 2022 01:33:09  ev_ack_ok                             STATE_NOT_CHANGED
Mar 15 2022 01:33:09  ev_graceful_shut                      CARD_SHUTDOWN_IN_PROGRESS
Mar 15 2022 00:55:31  ev_xr_ready                           XR_RUN

```

Commands

Use the **factory-reset** command for erasing the following folders of RP or line card:

- /misc/disk1
- /misc/scratch
- /var/log
- /misc/config

Run the following command through the console port of the router to erase customer-sensitive data in the RP or line card:

factory-reset { reload | shutdown } location <location-id> - erases customer-sensitive data in the specified location. Use the reload option in the command to reload the RP or line card after the factory reset and use the shutdown option to shut down the RP or line card after the factory reset.



Note Factory-reset logs are displayed on the console port of the node where the reset is performed.

The following steps explain how to reset your RP or line card to factory settings:

1. Erasing the RP or line card folder contents: Run the **factory-reset { reload | shutdown } location** command to delete the encryption keys and erase the customer-sensitive data from the RP or line card.

The following example shows how to perform the factory-reset shutdown command on an RP:

```
Router#factory-reset shutdown location 0/RP1/CPU0
Factory reset requested
Started punching watchdog
Started cleaning up mount point: /misc/scratch
Started syncing folder: /misc/scratch
Finished syncing folder: /misc/scratch
Finished cleaning up mount point: /misc/scratch
factory_reset_stop.sh
+++++
Started cleaning up mount point: /var/log
Started syncing folder: /var/log
Finished syncing folder: /var/log
Finished cleaning up mount point: /var/log
factory_reset_stop.sh
+++++
Started cleaning up mount point: /misc/disk1
Started syncing folder: /misc/disk1
Finished syncing folder: /misc/disk1
Finished cleaning up mount point: /misc/disk1
factory_reset_stop.sh
+++++
Started cleaning up folder: /misc/config
UTC 2022 Started syncing folder: /misc/config
Finished syncing folder: /misc/config
Finished cleaning up folder: /misc/config
factory_reset_stop.sh
+++++
Started cleaning up folder: /var/xr/enc/misc/config
/var/xr/enc/misc/config not present
Finished cleaning up folder: /var/xr/enc/misc/config
factory_reset_stop.sh
+++++
Started cleaning up folder: /mnt/rootfs/misc/config
/mnt/rootfs/misc/config not present
Finished cleaning up folder: /mnt/rootfs/misc/config
factory_reset_stop.sh
+++++
Encrypted logical volume does not exist. Nothing to remove.
/usr/local/etc/fpga-functions: line 797: 10912 Terminated
/usr/local/etc/punch-wd.sh
Stopped punching watchdog
```

The following example shows how to perform the factory-reset reload command on an RP:

```
Router#factory-reset reload location 0/RP1/CPU0
Factory reset requested
Started punching watchdog
Started cleaning up mount point: /misc/scratch
Started syncing folder: /misc/scratch
Finished syncing folder: /misc/scratch
Finished cleaning up mount point: /misc/scratch
+++++
Started cleaning up mount point: /var/log
Started syncing folder: /var/log
Finished syncing folder: /var/log
Finished cleaning up mount point: /var/log
+++++
Started cleaning up mount point: /misc/disk1
Started syncing folder: /misc/disk1
Finished syncing folder: /misc/disk1
Finished cleaning up mount point: /misc/disk1
```

```

+++++
Started cleaning up folder: /misc/config
Started syncing folder: /misc/config
Finished syncing folder: /misc/config
Finished cleaning up folder: /misc/config
+++++
Started cleaning up folder: /var/xr/enc/misc/config
/var/xr/enc/misc/config not present
Finished cleaning up folder: /var/xr/enc/misc/config
+++++
Started cleaning up folder: /mnt/rootfs/misc/config
/mnt/rootfs/misc/config not present
Finished cleaning up folder: /mnt/rootfs/misc/config
+++++
Encrypted logical volume does not exist. Nothing to remove.
/usr/local/etc/fpga-functions: line 790: 4137 Terminated
/usr/local/etc/punch-wd.sh
Stopped punching watchdog

```

2. Verifying factory reset: Use the **show shelfmgr history events location** command to verify the successful completion of the factory-reset in the standby RP or line card.

The following example shows how to verify the factory-reset shutdown command:

```

RP/0/RP0/CPU0:Router#show shelfmgr history events location 0/RP1/CPU0
Tue Mar 15 01:45:56.402 UTC
NODE NAME      : 0/RP1/CPU0
CURRENT STATE  : CARD_SHUT_POWERED_OFF
TIME STAMP     : Mar 15 2022 01:44:47
-----
DATE           TIME (UTC)  EVENT                               STATE
-----
Mar 15 2022 01:44:47  ev_powered_off          CARD_SHUT_POWERED_OFF
Mar 15 2022 01:44:47  transient_condition     CARD_SHUTDOWN
Mar 15 2022 01:44:47  ev_check_card_down_reaso CHECKING_DOWN_REASON
Mar 15 2022 01:44:47  ev_os_halted           OS_HALTED
Mar 15 2022 01:44:43  ev_factory_reset_done   FACTORY_RESET_DONE
Mar 15 2022 01:33:16  ev_factory_reset_started FACTORY_RESET_IN_PROGRESS
Mar 15 2022 01:33:11  ev_os_halting          OS_HALT_IN_PROGRESS
Mar 15 2022 01:33:10  ev_xr_shut             START_OS_HALT
Mar 15 2022 01:33:09  ev_ack_ok              STATE_NOT_CHANGED
Mar 15 2022 01:33:09  ev_graceful_shut       CARD_SHUTDOWN_IN_PROGRESS
Mar 15 2022 00:55:31  ev_xr_ready            XR_RUN

```

The following example shows how to verify the factory-reset reload command:

```

RP/0/RP0/CPU0:Router#show shelfmgr history events location 0/RP0/CPU0
Tue Mar 15 01:45:56.402 UTC
NODE NAME      : 0/RP0/CPU0
CURRENT STATE  : CARD_SHUT_POWERED_OFF
TIME STAMP     : Mar 15 2022 01:44:47
-----
DATE           TIME (UTC)  EVENT                               STATE
-----
Jun 29 2022 13:48:34  ev_xr_ready            XR_RUN
Jun 29 2022 13:48:10  ev_card_info_rcvd      CARD_INFO_RCVD
Jun 29 2022 13:47:52  ev_xr_init             XR_INITIALIZING
Jun 29 2022 13:47:44  ev_kernel_booting      STATE_NOT_CHANGED
Jun 29 2022 13:47:14  ev_kernel_booting      KERNEL_BOOTING
Jun 29 2022 13:46:53  ev_unmapped_event      STATE_NOT_CHANGED
Jun 29 2022 13:46:53  ev_bios_started        BIOS_STARTED
Jun 29 2022 13:46:51  ev_bios_ready          BIOS_READY
Jun 29 2022 13:46:10  ev_unmapped_event      STATE_NOT_CHANGED

```

```

Jun 29 2022 13:46:10 ev_powered_on CARD_POWERED_ON
Jun 29 2022 13:46:05 ev_card_reset_done CARD_RESET
Jun 29 2022 13:46:05 transient_condition CARD_RESETTING
Jun 29 2022 13:46:05 ev_check_card_down_reaso CHECKING_DOWN_REASON
Jun 29 2022 13:46:05 ev_os_halted OS_HALTED
Jun 29 2022 13:45:50 ev_factory_reset_done FACTORY_RESET_DONE
Jun 29 2022 13:34:09 ev_factory_reset_started FACTORY_RESET_IN_PROGRESS
Jun 29 2022 13:33:59 ev_os_haltng OS_HALT_IN_PROGRESS
Jun 29 2022 13:33:58 ev_xr_shut START_OS_HALT
Jun 29 2022 13:33:56 ev_graceful_reload CARD_SHUTDOWN_IN_PROGRESS
Jun 29 2022 09:18:43 ev_xr_ready XR_RUN
Jun 29 2022 09:17:37 ev_card_info_rcvd CARD_INFO_RCVD
Jun 29 2022 09:17:32 ev_powered_on CARD_POWERED_ON
Jun 29 2022 09:17:31 init CARD_DISCOVERED
    
```

Excluding Sensitive Information in Show Running Configurations Output

Table 13: Feature History Table

Feature Name	Release Information	Feature Description
Excluding Sensitive Information in Show Running Configurations Command Output	Release 7.5.4	<p>You can now exclude sensitive information such as strings, usernames, passwords, comments, or IP addresses within the show running-configuration command output by enabling sanitization on the nonvolatile generation (NVGEN) process.</p> <p>With this feature, you can achieve better data protection to prevent cybersecurity risks compared to regular router algorithms.</p> <p>This feature introduces the nvgen default-sanitize command.</p>

The **show running configuration** command uses the nonvolatile generation (NVGEN) process in IOS-XR software to collect configuration information from every system component and construct a running configuration file to create its output. However, this file may contain sensitive information, including usernames, passwords, and IP addresses, which could pose a security threat when obfuscation algorithms in the router are weak compared to modern cryptographic standards.

In this feature, you can mask the following types of sensitive information in the show running configurations:

- Strings
- Usernames
- Passwords
- Comments

- IP Addresses

On enabling the sanitization in show running configurations, the NVGEN process replaces the corresponding information with **<removed>** string. For example, if you enable sanitization for IP Addresses, the show running configuration includes the **<removed>** string in place of all the IP Addresses in the output.

Sanitizing Strings

Configuration

```
Router# config
Router:(config)# nvgen default-sanitize strings
Router:(config)# commit
```

Running Configuration

```
Router# show run nvgen
nvgen
  default-sanitize strings
!
```

Verification

```
Router# show run int Hu0/2/0/4
interface HundredGigE0/2/0/4
  ! This is comment 1
  description <removed>
!
```

Sanitizing Usernames

Configuration

```
Router# config
Router:(config)# nvgen default-sanitize usernames
Router:(config)# commit
```

Running Configuration

```
Router# show run nvgen
nvgen
  default-sanitize usernames
!
```

Verification

```
Router# show run username test
username <removed>
  group root-lr
  password 7 172864HJWBHBCWH
!
```

Sanitizing Passwords

Configuration

```
Router# config
Router:(config)# nvgen default-sanitize passwords
Router:(config)# commit
```

Running Configuration

```
Router# show run nvgen
nvgen
```



```
default-sanitize passwords
!
```

Verification

```
Router# show run username test
username test
  group root-lr
  password 7 <removed>
!
```

Sanitizing Comments

Configuration

```
Router# config
Router:(config)# nvgen default-sanitize comments
Router:(config)# commit
```

Running Configuration

```
Router# show run nvgen
nvgen
  default-sanitize comments
!
```

Verification

```
Router# show run int Hu0/2/0/4
interface HundredGigE0/2/0/4
  ! <comments removed>
  description This is bundle member
!
```

Sanitizing IP Addresses

Configuration

```
Router# config
Router:(config)# nvgen default-sanitize ipaddrs
Router:(config)# commit
```

Verification

```
Router# show run int Hu0/2/0/4
interface HundredGigE0/2/0/4
  ! This is comment 1
  description This is bundle member
  ipv4 address <removed> <removed>
!
```

