Managing the Router Hardware

This chapter describes the command-line interface (CLI) techniques and commands used to manage and configure the hardware components of a router running the Cisco IOS XR software.

For complete descriptions of the commands listed in this module, see Additional References, on page 39. To locate documentation for other commands that might appear in the course of performing a configuration task, search online in Cisco IOS XR Commands Master List for the Cisco XR 12000 Series Router.

Table 1: Feature History for Managing Router Hardware with Cisco IOS XR Software

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 3.2</td>
<td>This feature was introduced. Logical router (LR) was first supported.</td>
</tr>
<tr>
<td>Release 3.3.0</td>
<td>The term logical router (LR) was changed to secure domain router (SDR).</td>
</tr>
<tr>
<td>Release 3.5.0</td>
<td>Flash disk recovery was implemented.</td>
</tr>
</tbody>
</table>

This module contains the following topics:

- Prerequisites for Managing Router Hardware, page 2
- Displaying Hardware Status, page 2
- RP Redundancy and Switchover, page 16
- Reloading, Shutting Down, or Power Cycling a Node, page 20
- Flash Disk Recovery, page 27
- Using Controller Commands to Manage Hardware Components, page 27
- Formatting Hard Drives, Flash Drives, and Other Storage Devices, page 28
- Removing and Replacing Cards, page 28
- Upgrading the CPU Controller Bits, page 39
- Additional References, page 39
Prerequisites for Managing Router Hardware

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Displaying Hardware Status

This section describes how to display different types of hardware status information.

Displaying SDR Hardware Version Information

To display hardware version information for the components assigned to a secure domain router (SDR), connect to the appropriate designated secure domain router shelf controller (DSDRSC) and enter the `show diag` command in EXEC mode. The displayed information includes the card serial number and the ROMMON software version.

The syntax for the `show diag` command in EXEC mode is:

`show diag [node-id | details | summary]`

In the following example, the `show diag` command displays information for all nodes in the SDR:

```
RP/0/0/CPU0:router(admin)# show diag
Tue Jan 13 12:13:34.254 PST DST
SLOT 0 (RP/LC 0): Cisco 12000 Series - Multi-Service Blade
  MAIN: type 150, 800-25972-02 rev A0 dev 0
    HW config: 0x00  SW key: 00-00-00
    PCA: 73-9289-04 rev A0 ver 3
    HW version 1.0 S/N SAD11360218
    MBUS: Embedded Agent
      Test hist: 0x00  RMA#: 00-00-00  RMA hist: 0x00
    DIAG: Test count: 0x00000000  Test results: 0x00000000
    FRU: Linecard/Module: 12000-ServEngCard
    L3 Engine: Service Engine - ISE OC192 (10 Gbps)
    MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
    Using CAN Bus A
    ROM Monitor version 1.3
    Fabric Downloader version used 3.2 (ROM version is 3.2)
    Primary clock is CSC0
    Board State is IOS-XR RUN
    Last Reset Reason: Initial load
    Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)
    DRAM size: 2147483648 bytes
    FxFab SDRAM size: 1610612736 bytes
    ToFab SDRAM size: 268435456 bytes
    0 resets since restart/fault forgive

SLOT 1 (RP/LC 1): Cisco 12000 Series - Multi-Service Blade
  MAIN: type 150, 800-25972-02 rev A0 dev 0
    HW config: 0x00  SW key: 00-00-00
    PCA: 73-9289-04 rev A0 ver 3
    HW version 1.0 S/N SAD1124079R
    MBUS: Embedded Agent
      Test hist: 0x00  RMA#: 00-00-00  RMA hist: 0x00
    DIAG: Test count: 0x00000000  Test results: 0x00000000
    FRU: Linecard/Module: 12000-ServEngCard
    L3 Engine: Service Engine - ISE OC192 (10 Gbps)
```
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)  
Using CAN Bus A  
ROM Monitor version 1.3  
Fabric Downloader version used 3.2 (ROM version is 3.2)  
Primary clock is CSC0  
Board State is IOS-XR RUN  
Last Reset Reason: Card ungraceful reboot  
Insertion time: Mon Jan 5 22:33:51 2009 (1w0d ago)  
DRAM size: 2147483648 bytes  
FrFab SDRAM size: 1610612736 bytes  
ToFab SDRAM size: 268435456 bytes  
0 resets since restart/fault forgive  

SLOT 2 (RP/LC 2): Cisco 12000 Series SPA Interface Processor- 601  
MAIN: type 149, 68-2647-01 rev A0 dev 85437  
HW config: 0x20 SW key: 00-00-00  
PCA: 73-9607-04 rev A0 ver 4  
HW version 1.0 S/N SAD10330441  
MBUS: Embedded Agent  
Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00  
DIAG: Test count: 0x00000000 Test results: 0x00000000  
FRU: Linecard/Module: 12000-SIP-601  
Route Memory: MEM-LC5-2048-  
Packet Memory: MEM-LC5-PKT-512-  
L3 Engine: 5 (MultiRate) - ISE CC192 (10 Gbps)  
Operational rate mode: 10 Gbps  
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)  
Using CAN Bus A  
ROM Monitor version 17.1  
Fabric Downloader version used 4.7 (ROM version is 4.7)  
Primary clock is CSC0  
Board State is IOS-XR RUN  
Last Reset Reason: Initial load  
Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)  
DRAM size: 2147483648 bytes  
FrFab SDRAM size: 268435456 bytes  
ToFab SDRAM size: 268435456 bytes  
0 resets since restart/fault forgive  
SPA Information:  
subslot 0/2/0: SPA-4XOC3-POS-V2 (0x526), status is ok  
subslot 0/2/1: SPA-IPSEC-2G-2 (0x549), status is ok  
subslot 0/2/2: SPA-6X1FE (0x4cf), status is ok  
subslot 0/2/3: Empty  

SLOT 4 (RP/LC 4): Cisco 12000 Series SPA Interface Processor- 601  
MAIN: type 149, 68-2647-02 rev C0 dev 0  
HW config: 0x20 SW key: 00-00-00  
PCA: 73-9607-05 rev B0 ver 4  
HW version 1.0 S/N SAD112709D6  
MBUS: Embedded Agent  
Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00  
DIAG: Test count: 0x00000000 Test results: 0x00000000  
FRU: Linecard/Module: 12000-SIP-601  
Route Memory: MEM-LC5-2048-  
Packet Memory: MEM-LC5-PKT-512-  
L3 Engine: 5 (MultiRate) - ISE CC192 (10 Gbps)  
Operational rate mode: 10 Gbps  
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)  
Using CAN Bus A  
ROM Monitor version 17.1  
Fabric Downloader version used 4.7 (ROM version is 4.7)  
Primary clock is CSC0  
Board State is IOS-XR RUN  
Last Reset Reason: Initial load  
Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)  
DRAM size: 2147483648 bytes  
FrFab SDRAM size: 268435456 bytes  
ToFab SDRAM size: 268435456 bytes  
0 resets since restart/fault forgive  
SPA Information:  
subslot 0/4/0: SPA-2X1GE-V2 (0x50b), status is ok  
subslot 0/4/1: SPA-2XOC48POS/RPR (0x46f), status is ok  
subslot 0/4/2: SPA-2XCHT3-CE-ATM (0x4fc), status is ok
subslot 0/4/3: SPA-4XT3/E3 (0x40b), status is ok
SLOT 5 (RP/LC 5): Cisco 12000 Series Performance Route Processor 2
MAIN: type 96, 800-23469-03 rev B0 dev 0
   HW config: 0x10 SW key: 00-00-00
   HW version 0.0 S/N SAD091702LB
   MBUS: MBUS Agent (1) 73-8048-07 rev A0 dev 0
   HW version 0.1 S/N SAL0852811R
   Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
   DIAG: Test count: 0x00000000 Test results: 0x00000000
   FRU: Linecard/Module: PRP-2
   MBUS Agent Software version 4.4 (RAM) (ROM version is 3.54)
   Using CAN Bus A
   ROM Monitor version 1.17dev(0.5)
   Primary clock is CSC0
   Board State is IOS-XR RUN
   Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)
   DRAM size: 2147483648 bytes
   0 resets since restart/fault forgive

In the following example, the `show diag` command displays information for a single node:

RP/0/0/CPU0:router# show diag 0/2/1
Tue Jan 13 12:14:15.844 PST DST

SUBSLOT 0/2/1 (SPA-IPSEC-2G-2): IPSec Shared Port Adapter with 2 Gbps DES/3DES/AES
   Product Number : SPA-IPSEC-2G-2
   Version Identifier (VID) : V01
   PCA Serial Number : JAB1043053B
   Top Assy. Part Number : 68-2721-02
   Top Assy. Revision : A0
   Hardware Revision : 1.0
   CLEI Code : IF9IAYPTCA
   Operational Status : ok

Displaying System Hardware Version Information

To display hardware version information for all or some of the components assigned in a system, connect to the designated shelf controller (DSC) and enter the `show diag` command in administration EXEC mode.

When this command is entered in administration EXEC mode, you can display information on RPs, line cards, and system components such as the chassis, fan trays, and power supplies.

**Note**

If you enter the `show diag` command in EXEC mode, the software displays only the hardware assigned to the SDR to which you are connected.

The syntax for the `show diag` command in administration EXEC mode is:

```
show diag [node-id | chassis | details | fans | memory | power-supply | summary]
```

**Tip**

For information on the software version, use the `show version` command.

In the following example, the `show diag` command displays information for all nodes in the system:
RP/0/0/CPU0:router(admin)# show diag

Tue Jan 13 12:47:57.509 PST DST
SLOT 0 (RP/LC 0): Cisco 12000 Series - Multi-Service Blade
MAIN: type 150, 800-25972-02 rev A0 dev 0
   HW config: 0x00  SW key: 00-00-00
PCA:  73-9289-04 rev A0 ver 3
   HW version 1.0  S/N SAD11360218
MBUS: Embedded Agent
   Test hist: 0x00  RMA#: 00-00-00  RMA hist: 0x00
DIAG: Test count: 0x00000000  Test results: 0x00000000
FRU: Linecard/Module: 12000-ServEngCard
   L3 Engine: Service Engine - ISE OC192 (10 Gbps)
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
Using CAN Bus A
ROM Monitor version 1.3
Fabric Downloader version used 3.2 (ROM version is 3.2)
   Primary clock is CSC0
   Board State is IOS-XR RUN
   Last Reset Reason: Initial load
   Insertion time: Mon Jan  5 21:58:33 2009 (1w0d ago)
   DRAM size: 2147483648 bytes
   FrFab SDRAM size: 1610612736 bytes
   ToFab SDRAM size: 268435456 bytes
   0 resets since restart/fault forgive

SLOT 1 (RP/LC 1): Cisco 12000 Series - Multi-Service Blade
MAIN: type 150, 800-25972-02 rev A0 dev 90070
   HW config: 0x00  SW key: 00-00-00
PCA:  73-9289-04 rev A0 ver 3
   HW version 1.0  S/N SAD1124079R
MBUS: Embedded Agent
   Test hist: 0x00  RMA#: 00-00-00  RMA hist: 0x00
DIAG: Test count: 0x00000000  Test results: 0x00000000
FRU: Linecard/Module: 12000-ServEngCard
   L3 Engine: Service Engine - ISE OC192 (10 Gbps)
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
Using CAN Bus A
ROM Monitor version 1.3
Fabric Downloader version used 3.2 (ROM version is 3.2)
   Primary clock is CSC0
   Board State is IOS-XR RUN
   Last Reset Reason: Card ungraceful reboot
   Insertion time: Mon Jan  5 22:33:51 2009 (1w0d ago)
   DRAM size: 2147483648 bytes
   FrFab SDRAM size: 1610612736 bytes
   ToFab SDRAM size: 268435456 bytes
   0 resets since restart/fault forgive

SLOT 2 (RP/LC 2): Cisco 12000 Series SPA Interface Processor- 601
MAIN: type 149, 68-2647-01 rev A0 dev 85437
   HW config: 0x20  SW key: 00-00-00
PCA:  73-9607-04 rev A0 ver 4
   HW version 1.0  S/N SAD10330441
MBUS: Embedded Agent
   Test hist: 0x00  RMA#: 00-00-00  RMA hist: 0x00
DIAG: Test count: 0x00000000  Test results: 0x00000000
FRU: Linecard/Module: 12000-SIP-601
   Route Memory: MEM-LC5-2048=
   Packet Memory: MEM-LC5-PKT-512=
   L3 Engine: 5 (MultiRate) - ISE OC192 (10 Gbps)
   Operational rate mode: 10 Gbps
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
Using CAN Bus A
ROM Monitor version 17.1
Fabric Downloader version used 4.7 (ROM version is 4.7)
   Primary clock is CSC0
   Board State is IOS-XR RUN
   Last Reset Reason: Initial load
   Insertion time: Mon Jan  5 21:58:33 2009 (1w0d ago)
   DRAM size: 2147483648 bytes
   FrFab SDRAM size: 268435456 bytes
   ToFab SDRAM size: 268435456 bytes
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0 resets since restart/fault forgive

SPA Information:
- subslot 0/2/0: SPA-4XOC3-POS-V2 (0x526), status is ok
- subslot 0/2/1: SPA-IPSEC-2G-2 (0x549), status is ok
- subslot 0/2/2: SPA-8X1FE (0x4c5), status is ok
- subslot 0/2/3: Empty

SLOT 5 (RP/LC 5): Cisco 12000 Series Performance Route Processor 2
- MAIN: type 96, 800-23469-03 rev B0 dev 0
  - HW config: 0x10 SW key: 00-00-00
  - PCA: 73-8812-06 rev A0 ver 5
  - HW version 0.0 S/N SAD091702LB
  - MBUS: MBUS Agent (1) 73-8048-07 rev A0 dev 0
  - HW version 0.1 S/N SAL0852811R
    - Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
  - DIAG: Test count: 0x00000000 Test results: 0x00000000
  - FRU: Linecard/Module: PRP-2
  - Using CAN Bus A
  - ROM Monitor version 1.17dev(0.5)
  - Primary clock is CSC0
  - Board State is IOS-XR RUN
  - Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)
  - DRAM size: 2147483648 bytes

SLOT 16 (CSC 0): GSR 12406 Clock Scheduler Card
- MAIN: type 29, 800-12096-03 rev A0 dev 86476
  - HW config: 0x00 SW key: 00-00-00
  - PCA: 73-5702-04 rev A0 ver 4
  - HW version 1.0 S/N SAI1049A6J7
  - MBUS: Embedded Agent
    - Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
    - DIAG: Test count: 0x00000000 Test results: 0x00000000
  - FRU: Linecard/Module: GSR6-CSC
  - MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
  - Using CAN Bus A
  - Primary clock is CSC0
  - Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)

SLOT 18 (SFC 0): GSR 12406 Switch Fabric Card
- MAIN: type 30, 800-12097-03 rev A0 dev 0
  - HW config: 0x00 SW key: 00-00-00
  - PCA: 73-5703-05 rev A0 ver 5
  - HW version 1.0 S/N SAI10425BKW
  - MBUS: Embedded Agent
    - Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
    - DIAG: Test count: 0x00000000 Test results: 0x00000000
  - FRU: Linecard/Module: GSR6-SFC
  - MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
  - Using CAN Bus A
  - Primary clock is CSC0
  - Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)

SLOT 19 (SFC 1): GSR 12406 Switch Fabric Card
- MAIN: type 30, 800-12097-03 rev A0 dev 0
  - HW config: 0x00 SW key: 00-00-00
  - PCA: 73-5703-05 rev A0 ver 5
  - HW version 1.0 S/N SAI10425BQ6
  - MBUS: Embedded Agent
    - Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
    - DIAG: Test count: 0x00000000 Test results: 0x00000000
  - FRU: Linecard/Module: GSR6-SFC
  - MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
  - Using CAN Bus A
  - Primary clock is CSC0
  - Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)

SLOT 20 (SFC 2): GSR 12406 Switch Fabric Card
- MAIN: type 30, 800-12097-03 rev A0 dev 0
  - HW config: 0x00 SW key: 00-00-00
  - PCA: 73-5703-05 rev A0 ver 5
In the following example, the `show diag` command displays information for a single system component:

```
RP/0/0/CPU0#show diag 0/4/cpu0
Tue Jan 13 12:48:23.938 PST DST
SLOT 4 (RP/LC 4): Cisco 12000 Series SPA Interface Processor- 601
 MAIN: type 149, 68-2647-02 rev C0 dev 0
 HW config: 0x20 SW key: 00-00-00
 PCA: 73-9607-05 rev B0 ver 4
 HW version 1.0 S/N SAD12709D6
 MBUS: Embedded Agent
 Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
 DIAG: Test count: 0x00000000 Test results: 0x00000000
 FRU: Linecard/Module: 12000-SIP-601
 Route Memory: MEM-LC5-2048=
 Packet Memory: MEM-LC5-PKT-512=
 L3 Engine: 5 (MultiRate) - ISE OC192 (10 Gbps)
 Operational rate mode: 10 Gbps
 MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
```
Using CAN Bus A
ROM Monitor version 17.1
Fabric Downloader version used 4.7 (ROM version is 4.7)
Primary clock is CSC0
Board State is IOS-XR RUN
Last Reset Reason: Initial load
Insertion time: Mon Jan 5 21:58:33 2009 (1w0d ago)
DRAM size: 2147483648 bytes
First Fab SDRAM size: 268435456 bytes
ToFab SDRAM size: 268435456 bytes
0 resets since restart/fault forgive
SPA Information:
subslot 0/4/0: SPA-2X1GE-V2 (0x50b), status is ok
subslot 0/4/1: SPA-2XOC48POS/RPR (0x46f), status is ok
subslot 0/4/2: SPA-2CHT3-CE-ATM (0x4fc), status is ok
subslot 0/4/3: SPA-4XT3/E3 (0x40b), status is ok

Displaying Software and Hardware Information

The `show version` command displays a variety of system information, including the hardware and software versions, router uptime, boot settings (including the configuration register), and active software.

The following is sample output from the `show version` command:

```
RP/0/0/CPU0:router# show version
Copyright (c) 2008 by Cisco Systems, Inc.
ROM: System Bootstrap, Version 12.0(20051020:160303) [sjabbar-CSCsa64979_4 1.17dev(0.5)] DEVELOPMENT SOFTWARE
Copyright (c) 1994-2005 by cisco Systems, Inc.
router uptime is 1 week, 15 hours, 20 minutes
System image file is "disk0:c12k-os-mbi-3.8.0.26I/mbiprp-rp.vm"
cisco 12406/FRP (7457) processor with 2097152K bytes of memory.
7457 processor at 1266Mhz, Revision 1.2
2 Cisco 12000 Series - Multi-Service Blade Controllers
2 Cisco 12000 Series SPA Interface Processor-601/501/401
1 Cisco 12000 Series Performance Route Processor
3 Management Ethernet
8 PLIM_QOS
6 SONET/SDH
6 Packet over SONET/SDH
6 T3
4 Serial network interface(s)
2 GigabitEthernet/IEEE 802.3 interface(s)
6 VLAN sub-interface(s)
4 FR point-to-point sub interface
28 T1
2 Asynchronous Transfer Mode
3 ATM network sub-interface(s)
8 FastEthernet
1018k bytes of non-volatile configuration memory.
800560k bytes of disk0: (Sector size 512 bytes).
800560k bytes of disk1: (Sector size 512 bytes).
65536k bytes of Flash internal SIMM (Sector size 256k).

Boot device on node 0/0/CPU0 is mem:
Package active on node 0/0/CPU0:
c12k-sbc, V 3.8.0.26I[SIT_IMAGE], Cisco Systems, at disk0:c12k-sbc-3.8.0.26I
Built on Thu Dec 11 07:08:15 PST 2008
By sjc-lds-364 in /auto/ioxbuild5/production/3.8.0.26I.SIT_IMAGE/c12k/workspace for c4.2.1-p0
```
Displaying SDR Node IDs and Status

In EXEC mode, the `show platform` command displays information for all nodes assigned to a secure domain router (SDR). For each node, this information includes the host card type, the operational state, and the configuration state. To display information on a single node, enter the command with a node ID.

The syntax for the `show platform` command is:

```
show platform
```

The following example displays the status for all nodes in the SDR to which you are connected:

```
RP/0/0/CPU0:router# show platform

Tue Jan 13 13:48:51.823 PST DST
Node  Type  PLIM State Config State
-------------------------------------------
0/0/CPU0  L3  Service Eng N/A IOS XR RUN PWR,NSHUT,MON
0/1/CPU0  L3  Service Eng N/A IOS XR RUN PWR,NSHUT,MON
0/2/CPU0 L3LC Eng 5+ Jacket Card IOS XR RUN PWR,NSHUT,MON
0/2/0 SPA SPA-4XOC3-POS-V READY PWR,NSHUT
0/2/1 SPA SPA-IPSEC-2G-2 READY PWR,NSHUT
0/2/2 SPA SPA-8XFE-TX READY PWR,NSHUT
0/4/CPU0 L3LC Eng 5+ Jacket Card IOS XR RUN PWR,NSHUT,MON
0/4/0 SPA SPA-2X1GE-V2 READY PWR,NSHUT
0/4/1 SPA SPA-2XOC48POS/R READY PWR,NSHUT
0/4/2 SPA SPA-2CHT3-CE-AT READY PWR,NSHUT
0/4/3 SPA SPA-4XT3/E3 READY PWR,NSHUT
0/5/CPU0 PRF(Active) N/A IOS XR RUN PWR,NSHUT,MON
```

The `node-id` appears in the `rack/slot/module` notation, and the `node-id` components are as follows:

- **rack** — In a single-shelf system the rack number is always "0."
- **slot** — Number of the physical slot in which the card is installed.
- **module** — Subslot number of a system hardware component.

Table 2: Node ID Components, on page 10 summarizes the `node-id` for each type of card.
Table 2: Node ID Components

<table>
<thead>
<tr>
<th>Card Type (the card to which you are issuing commands)</th>
<th>Rack (always “0”)</th>
<th>Slot (the logical slot number reported in command displays)</th>
<th>Module (the entity on the card that executes the command)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route processor</td>
<td>0</td>
<td>0-15 &lt;sup&gt;1, 2&lt;/sup&gt;</td>
<td>CPU0</td>
</tr>
<tr>
<td>Cisco XR 12000 Series line cards</td>
<td>0</td>
<td>0–15&lt;sup&gt;3&lt;/sup&gt;,</td>
<td>CPU0</td>
</tr>
<tr>
<td>Cisco XR 12000 Series SPA Interface Processor (SIP)-600</td>
<td>0</td>
<td>0–15&lt;sup&gt;3&lt;/sup&gt;</td>
<td>CPU0</td>
</tr>
<tr>
<td>1-Port 10-Gigabit Ethernet SPA</td>
<td>0</td>
<td>0–15&lt;sup&gt;5&lt;/sup&gt;</td>
<td>0-1 (SPA module number on the Cisco XR 12000 and 12000 Series SIP-600)</td>
</tr>
<tr>
<td>5-Port Gigabit Ethernet SPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-Port Gigabit Ethernet SPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Port OC-192c/STM-64c POS/RPR SPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clock and scheduler cards (CSCs)</td>
<td>0</td>
<td>CSC 0 and 1&lt;sup&gt;6&lt;/sup&gt;</td>
<td>CPU0</td>
</tr>
<tr>
<td>Switch fabric cards (SFCs)</td>
<td>0</td>
<td>SFC 0, 1, 2, 3, and 4&lt;sup&gt;7, 8&lt;/sup&gt;</td>
<td>CPU0</td>
</tr>
<tr>
<td>Consolidated switch fabric (CSF) card</td>
<td>0</td>
<td>Dedicated slot 17&lt;sup&gt;9&lt;/sup&gt;</td>
<td>CPU0</td>
</tr>
</tbody>
</table>

1 Depends on router model.
2 RP pairs can be in any adjacent slot pairs as long as the even-numbered slot is the smaller slot number. For example, an RP pair can be installed in slots 0 and 1, 2 and 3, or 14 and 15.
3 Depends on router model.
4 Depends on router model.
5 Depends on router model.
6 Not used on Cisco XR 12404 routers.
7 Not used on Cisco XR 12404 routers.
8 Total number of SFC slots depends on router model.
9 Used only on Cisco XR 12404 routers.

Displaying Router Node IDs and Status

In administration EXEC mode, the show platform command displays information for all router nodes. In administration EXEC mode, the command display also includes additional node IDs such as those for fabric...
cards, alarm modules, and fan controllers. For each node, this information includes the host card type, the operational state, and the configuration state. To display information on a single node, enter the command with a node ID.

The syntax for the `show platform` command is:

```
show platform
```

The following example displays the status for all nodes in the system:

```
RP/0/0/CPU0:router# show platform
```

<table>
<thead>
<tr>
<th>Node ID</th>
<th>Type</th>
<th>PLIM</th>
<th>State</th>
<th>Config State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/0/0</td>
<td>L3 Service Eng</td>
<td>N/A</td>
<td>Card Power down</td>
<td>NPWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/1/0</td>
<td>L3 Service Eng</td>
<td>N/A</td>
<td>Card Power down</td>
<td>NPWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/2/0</td>
<td>L3LC Eng 5+</td>
<td>Jacket Card</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/2/1</td>
<td>SPA</td>
<td>SPA-4XOC3-POS-V</td>
<td>READY</td>
<td>PWR,NSHUT</td>
</tr>
<tr>
<td>0/2/2</td>
<td>SPA</td>
<td>SPA-8XFE-TX</td>
<td>READY</td>
<td>PWR,NSHUT</td>
</tr>
<tr>
<td>0/4/0</td>
<td>L3LC Eng 5+</td>
<td>Jacket Card</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/4/1</td>
<td>SPA</td>
<td>SPA-2X1GE-V2</td>
<td>READY</td>
<td>PWR,NSHUT</td>
</tr>
<tr>
<td>0/4/2</td>
<td>SPA</td>
<td>SPA-2CHT3-CE-AT</td>
<td>READY</td>
<td>PWR,NSHUT</td>
</tr>
<tr>
<td>0/4/3</td>
<td>SPA</td>
<td>SPA-4XT3/E3</td>
<td>READY</td>
<td>PWR,NSHUT</td>
</tr>
<tr>
<td>0/5/0</td>
<td>PRP(Active)</td>
<td>N/A</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
</tbody>
</table>

The `node-id` appears in the `rack/slot/module` notation, and the `node-id` components are as follows:

- **rack** — In a single-shelf system the rack number is always "0."
- **slot** — Number of the physical slot in which the card is installed.
- **module** — Subslot number of a system hardware component.

Table 2: Node ID Components, on page 10 summarizes the `node-id` argument for each type of card.

### Displaying Router Environment Information

The `show environment` command displays hardware information for the system, including fan speeds, power supply voltage and current information, and temperatures.

The syntax for the `show environment` command is:

```
show environment [options]
```

You can use the `show environment` command options to limit the detail in the command display. To view the command options, enter the `show environment ?` command. The following example shows the full environment status report:

```
RP/0/0/CPU0:router# show environment
```

```
Temperature Information
```

```
R/S/I Modules Sensor Temp. (deg C)
--------------------------
0/0/* host Inlet 23.0
  host Hot 23.0
0/3/* host Inlet 24.0
  host Hot 33.0
```
### Threshold Information

<table>
<thead>
<tr>
<th>R/S/I Modules</th>
<th>Sensor</th>
<th>Minor (Lo/Hi)</th>
<th>Major (Lo/Hi)</th>
<th>Critical (Lo/Hi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/0/0* host InletTemp</td>
<td>--/ 55</td>
<td>--/ 60</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host HotTemp</td>
<td>--/ 66</td>
<td>--/ 69</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM_V4_1.6V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM_V5_1.8V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM_V3_2.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 3.4V</td>
<td>2950/3500</td>
<td>2900/3600</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 5V</td>
<td>4800/5150</td>
<td>4700/5200</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host Mbus5V</td>
<td>4700/5300</td>
<td>4500/5500</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>0/0/3* host InletTemp</td>
<td>--/ 55</td>
<td>--/ 60</td>
<td>--/ --</td>
<td>--/ 70</td>
</tr>
<tr>
<td>host HotTemp</td>
<td>--/ 66</td>
<td>--/ 69</td>
<td>--/ --</td>
<td>--/ 75</td>
</tr>
<tr>
<td>host PLIM V3 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V8 1.8V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V7 2.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 3.4V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 5V</td>
<td>4800/5200</td>
<td>4700/5300</td>
<td>4600/5400</td>
<td>--/ --</td>
</tr>
<tr>
<td>host Mbus5V</td>
<td>4700/5300</td>
<td>4600/5400</td>
<td>4500/5500</td>
<td>--/ --</td>
</tr>
<tr>
<td>0/0/4* host InletTemp</td>
<td>--/ 55</td>
<td>--/ 60</td>
<td>--/ --</td>
<td>--/ 70</td>
</tr>
<tr>
<td>host HotTemp</td>
<td>--/ 66</td>
<td>--/ 69</td>
<td>--/ --</td>
<td>--/ 75</td>
</tr>
<tr>
<td>host PLIM V3 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V8 1.8V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V7 2.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V6 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 3.4V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host Mbus5V</td>
<td>4700/5300</td>
<td>4600/5400</td>
<td>4500/5500</td>
<td>--/ --</td>
</tr>
<tr>
<td>0/0/5* host InletTemp</td>
<td>--/ 55</td>
<td>--/ 60</td>
<td>--/ --</td>
<td>--/ 70</td>
</tr>
<tr>
<td>host HotTemp</td>
<td>--/ 66</td>
<td>--/ 69</td>
<td>--/ --</td>
<td>--/ 75</td>
</tr>
<tr>
<td>host PLIM V3 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V8 1.8V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V7 2.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V6 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 3.4V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host Mbus5V</td>
<td>4700/5300</td>
<td>4600/5400</td>
<td>4500/5500</td>
<td>--/ --</td>
</tr>
<tr>
<td>0/0/6* host InletTemp</td>
<td>--/ 55</td>
<td>--/ 60</td>
<td>--/ --</td>
<td>--/ 70</td>
</tr>
<tr>
<td>host HotTemp</td>
<td>--/ 66</td>
<td>--/ 69</td>
<td>--/ --</td>
<td>--/ 75</td>
</tr>
<tr>
<td>host PLIM V3 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V8 1.8V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V7 2.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V6 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 3.4V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host Mbus5V</td>
<td>4700/5300</td>
<td>4600/5400</td>
<td>4500/5500</td>
<td>--/ --</td>
</tr>
<tr>
<td>0/0/7* host InletTemp</td>
<td>--/ 55</td>
<td>--/ 60</td>
<td>--/ --</td>
<td>--/ 70</td>
</tr>
<tr>
<td>host HotTemp</td>
<td>--/ 66</td>
<td>--/ 69</td>
<td>--/ --</td>
<td>--/ 75</td>
</tr>
<tr>
<td>host PLIM V3 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V8 1.8V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V7 2.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host PLIM V6 1.5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 5V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host 3.4V</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
<td>--/ --</td>
</tr>
<tr>
<td>host Mbus5V</td>
<td>4700/5300</td>
<td>4600/5400</td>
<td>4500/5500</td>
<td>--/ --</td>
</tr>
</tbody>
</table>
Displaying RP Redundancy Status

The `show redundancy` command displays the redundancy status of the route processors (RPs). This command also displays the boot and switch-over history for the RPs.

The `show redundancy` operates in EXEC and administration EXEC mode.

In the following example, the `show redundancy` command displays the redundancy status for a redundant RP pair:

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

```
Tue Jan 13 13:57:34.696 PST DST
Redundancy information for node 0/5/CPU0:
```
Displaying Field-Programmable Device Compatibility

The `show hw-module fpd` command displays field-programmable device (FPD) compatibility for all modules or a specific module.

The syntax for the `show hw-module fpd` command is:

```
show hw-module fpd location {all | node-id}
```

The `show hw-module fpd` operates in EXEC and administration EXEC mode.

The following example shows how to display FPD compatibility for all modules in the router:

```
RP/0/0/CPU0# show hw-module fpd location all
```

<table>
<thead>
<tr>
<th>Location</th>
<th>Card Type</th>
<th>HW Version</th>
<th>Type</th>
<th>Subtype</th>
<th>Instance</th>
<th>Current SW Version</th>
<th>Upg/Dng?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/1/0</td>
<td>SPA-4XT3/E3</td>
<td>1.0</td>
<td>spa</td>
<td>fpga</td>
<td>0</td>
<td>0.24</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spa</td>
<td>rommon</td>
<td>0</td>
<td>2.12</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spa</td>
<td>fpga2</td>
<td>0</td>
<td>1.0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spa</td>
<td>fpga3</td>
<td>0</td>
<td>1.0</td>
<td>No</td>
</tr>
<tr>
<td>0/1/1</td>
<td>SPA-4XCT3/DS0</td>
<td>0.253</td>
<td>spa</td>
<td>fpga</td>
<td>1</td>
<td>2.1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spa</td>
<td>rommon</td>
<td>1</td>
<td>2.12</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spa</td>
<td>fpga2</td>
<td>1</td>
<td>0.15</td>
<td>No</td>
</tr>
<tr>
<td>0/3/0</td>
<td>SPA-2XOC48POS/RPR</td>
<td>1.0</td>
<td>spa</td>
<td>fpga</td>
<td>0</td>
<td>1.0</td>
<td>No</td>
</tr>
<tr>
<td>0/3/1</td>
<td>SPA-1XTENGE-XFP</td>
<td>3.2</td>
<td>spa</td>
<td>fpga</td>
<td>1</td>
<td>1.7</td>
<td>No</td>
</tr>
</tbody>
</table>

```
RP/0/0/CPU0# show hw-module fpd location 0/1/0
```

Sun Apr 18 10:51:33.776 DST

<table>
<thead>
<tr>
<th>Location</th>
<th>Card Type</th>
<th>HW Version</th>
<th>Type</th>
<th>Subtype</th>
<th>Instance</th>
<th>Current SW Version</th>
<th>Upg/Dng?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/1/0</td>
<td>SPA-1XTENGE-XFP</td>
<td>3.2</td>
<td>spa</td>
<td>fpga1</td>
<td>0</td>
<td>1.09</td>
<td>No</td>
</tr>
</tbody>
</table>

**Table 3: show hw-module fpd Field Descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Location of the module in the rack/slot/module notation.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Card Type</td>
<td>Module part number.</td>
</tr>
<tr>
<td>HW Version</td>
<td>Hardware model version for the module.</td>
</tr>
<tr>
<td>Type</td>
<td>Hardware type. Can be one of the following types:</td>
</tr>
<tr>
<td></td>
<td>• spa—Shared port adapter</td>
</tr>
<tr>
<td></td>
<td>• lc—Line card</td>
</tr>
<tr>
<td>Subtype</td>
<td>FPD type. Can be one of the following types:</td>
</tr>
<tr>
<td></td>
<td>• fabldr—Fabric downloader</td>
</tr>
<tr>
<td></td>
<td>• fpga1—Field-programmable gate array</td>
</tr>
<tr>
<td></td>
<td>• fpga2—Field-programmable gate array 2</td>
</tr>
<tr>
<td></td>
<td>• fpga3—Field-programmable gate array 3</td>
</tr>
<tr>
<td></td>
<td>• fpga4—Field-programmable gate array 4</td>
</tr>
<tr>
<td></td>
<td>• fpga5—Field-programmable gate array 5</td>
</tr>
<tr>
<td></td>
<td>• rommonA—Read-only memory monitor A</td>
</tr>
<tr>
<td></td>
<td>• rommon—Read-only memory monitor B</td>
</tr>
<tr>
<td>Inst</td>
<td>FPD instance. The FPD instance uniquely identifies an FPD and is used by the FPD process to register an FPD.</td>
</tr>
<tr>
<td>Current SW Version</td>
<td>Currently running FPD image version.</td>
</tr>
<tr>
<td>Upg/Dng?</td>
<td>Specifies whether an FPD upgrade or downgrade is required. A downgrade is required in rare cases when the version of the FPD image has a higher major revision than the version of the FPD image in the current Cisco IOS XR software package.</td>
</tr>
</tbody>
</table>

**Displaying Hardware Image Compatibility**

The `show upgrade` command displays the compatibility of hardware-related images running on various hardware modules and the hardware-related images bundled in the Cisco IOS XR software image currently running on the system. Use the `show upgrade` command to determine if you need to perform an upgrade of any of the following images:

- Fabric downloader
- Mbus ROM
ROM Monitor

The syntax for the show upgrade command is:

```
show upgrade {all | fabric-downloader | mbus-rom | rommon} location {all | node-id}
```

The `show upgrade` command operates in administration EXEC mode.

If the output from the `show upgrade` command indicates that an upgrade is required, use the `upgrade` command in administration EXEC mode to perform the required upgrade.

The following example shows sample output from the `show upgrade` command for all modules in the router:

```
RP/0/0/CPU0:router(admin)# show upgrade all location all
Wed Jan 28 19:59:26.373 UTC
Node Type PLIM Fab-Dwnldr Mbss-Rom Rommon Upgrade Upgrade Upgrade
---------------------------------------------------------------------------------------
0/0/CPU0 PRP(Active) N/A N/A Yes Yes N/A
0/1/CPU0 L3LC Eng 5+ Jacket Card No Yes No
0/2/CPU0 L3LC Eng 5+ Jacket Card Yes Yes No
0/3/CPU0 L3LC Eng 5+ Jacket Card Yes Yes No
0/4/CPU0 L3 Service Eng N/A Yes Yes No
0/5/CPU0 L3LC Eng 5+ Jacket Card No Yes No
0/6/CPU0 L3LC Eng 5 Jacket Card Yes Yes No
0/7/CPU0 L3LC Eng 3 OC12-ATM-4 No Yes No
0/8/CPU0 PRP(Standby) N/A N/A Yes Yes
0/9/CPU0 L3LC Eng 3 OC3-POS-4 No Yes No
0/16/CPU0 CSC10(N) N/A N/A Yes N/A
0/17/CPU0 CSC10(P) N/A N/A Yes N/A
0/18/CPU0 SFC10 N/A N/A N/A N/A
0/19/CPU0 SFC10 N/A N/A Yes N/A
0/20/CPU0 SFC10 N/A N/A Yes N/A
0/21/CPU0 SFC10 N/A N/A Yes N/A
0/22/CPU0 SFC10 N/A N/A Yes N/A
0/24/CPU0 ALARM10 N/A N/A Yes N/A
0/25/CPU0 ALARM10 N/A N/A Yes N/A
0/29/CPU0 GSR16-BLOWER N/A N/A Yes N/A
```

For more information regarding the `show upgrade` command, refer to the Hardware Redundancy and Node Administration Commands on the Cisco IOS XR Software module in Cisco IOS XR System Management Command Reference for the Cisco XR 12000 Series Router.

**RP Redundancy and Switchover**

This section describes RP redundancy and switchover commands and issues.

**Establishing RP Redundancy**

Redundant RPs are formed when you insert two RP cards into paired redundancy slots. Redundancy slots are paired as follows:

- Slot 0 and Slot 1
- Slot 2 and Slot 3
- Slot 4 and Slot 5
- Slot 6 and Slot 7
- Slot 8 and Slot 9
- Slot 10 and Slot 11
- Slot 12 and Slot 13
- Slot 14 and Slot 15

RPs that are seated in paired redundancy slots cannot be assigned to different SDRs. For example, an RP that is installed in Slot 3 can be assigned to one SDR, whereas an RP that is installed in Slot 4 can be assigned to a different SDR because Slot 3 and Slot 4 are not a redundant pair. However, you cannot have the RP in Slot 3 assigned to an SDR other that of the RP in Slot 2 because Slot 2 and Slot 3 are a redundant pair.

RP redundancy is established when the Cisco IOS XR software is brought up on both cards in paired redundancy slots. For example, if you install the Cisco IOS XR software on the DSC, an RP in the paired redundancy slot comes up as the standby DSC after the minimum boot image (MBI) is loaded and the redundant RP synchronizes with the DSC.

**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 alphanumeric LED display on the active Performance Route Processor (PRP) displays: PRI RP.
- The slot of the active RP is indicated in the CLI prompt. For example:

  ```
  RP/0/1/CPU0:router#
  ```

  In this example, the prompt indicates that you are communicating with the active RP in slot RP1. See Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router for a complete description of the CLI prompt.

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

  ```
  RP/0/0/CPU0:router# show redundancy
  Tue Jan 13 13:57:34.696 PST DST
  Redundancy information for node 0/5/CPU0:
  ------------------------------------------
  Node 0/5/CPU0 is in ACTIVE role
  Node 0/5/CPU0 has no valid partner
  Reload and boot info
  ----------------------
  FRP reloaded Mon Jan  5 21:56:06 2009: 1 week, 16 hours, 1 minute ago
  Active node booted Mon Jan  5 21:56:06 2009: 1 week, 16 hours, 1 minute ago
  Active node reload "Cause: Turboboost completed successfully"
  ```

**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 4: RP Redundancy Commands, on page 18 to display the redundancy status of the cards or force a manual switchover.

Table 4: RP Redundancy Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>show redundancy</td>
<td>Displays the redundancy status of the RPs. This command also displays the boot and switch-over history for the RPs.</td>
</tr>
<tr>
<td>redundancy switchover</td>
<td>Forces a manual switchover to the standby RP. This command works only if the standby RP is installed and in the “ready” state.</td>
</tr>
<tr>
<td>show platform</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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.

Caution

You should not use the `reload` command to force an RP switchover because the result could be a significant loss of router operations. Instead, use the `redundancy switchover` command to fail over to the standby RP, then use the `hw-module location node-id reload` command to reload the new standby RP.

Related Topics

- Reloading, Shutting Down, or Power Cycling a Node, on page 20

Manual Switchover

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/0/0/CPU0:router# show redundancy
This node (0/0/CPU0) is in ACTIVE role
Partner node (0/1/CPU0) is in STANDBY role
Standby node in 0/1/CPU0 is ready
RP/0/0/CPU0:router# redundancy switchover
Updating Commit Database. Please wait...[OK]
Proceed with switchover 0/0/CPU0 -> 0/1/CPU0? [confirm]
Initiating switch-over.
RP/0/0/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/0/1/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/0/0/CPU0:router# show redundancy
Redundancy information for node 0/1/CPU0:
-------------------------------------------
Node 0/0/CPU0 is in ACTIVE role
Partner node (0/1/CPU0) is in UNKNOWN role
```
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.

Reloading, Shutting Down, or Power Cycling a Node

Use the commands described in this section to reload the Cisco IOS XR software on the active RP or on any specified node in the system. This section also describes the commands used to administratively shut down a node and power a node on or off.

Table 5: Commands to Reload, Shut Down, or Power Cycle a Node, on page 20 summarizes the commands described in this section.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>hw-module location node-id power disable</code></td>
<td>This command administratively turns the power off for a node. It is entered in administration configuration mode. The changes do not take effect until you enter the <code>commit</code> command. To power on a node, use the <code>no</code> form of this command. <strong>Note</strong> This command cannot be used to disable power on the RP from which the command is entered.</td>
</tr>
</tbody>
</table>
**Command** | **Description**  
---|---  
**hw-module location node-id reload** | This command works in EXEC mode and reloads the Cisco IOS XR software on a specific node or all nodes. To specify all nodes, enter the **all** keyword in place of the **node-id** argument. The node reloads with the current running configuration and active software set for that node.  

**hw-module shutdown location node-id** | This command must be entered in administration configuration mode and administratively shuts down the specified node. Nodes that are shut down still have power but cannot load or operate Cisco IOS XR software.  

To return a node to the up state, use the **no** form of this command.  

**Note** This command cannot be used to shut down the RP from which the command is entered.

---

**Reloading the Active RP**

The **reload** command causes the active RP to reload the Cisco IOS XR software according to the configuration register setting. This setting determines how the active RP acts when reloaded.

This section contains instructions to reload the Cisco IOS XR software and return to EXEC mode. For instructions to use the **reload** command for entering ROM Monitor bootstrap mode, see *Cisco IOS XR ROM Monitor Guide for the Cisco XR 12000 Series Router*.

⚠️ **Caution**  
Because the **reload** command causes the active RP to go off line and either reload the Cisco IOS XR software or enter ROM Monitor mode, the router experiences a loss of service unless a redundant standby RP is installed and in "ready" state. To display the status of the standby RP, use the **show redundancy** command in EXEC mode.

---

**SUMMARY STEPS**

1. **show redundancy**  
2. **admin**  
3. **show variables boot**  
4. (Optional) **config-register 0x2102**  
5. **admin**  
6. **reload**
## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** show redundancy | Displays the RP redundancy status.  
- If a standby RP is in “ready” redundancy state, the `reload` command also causes the router to gracefully fail over to the standby RP. |
| **Example:** RP/0/0/CPU0:router# show redundancy | |
| **Step 2** admin | Enters administration EXEC mode. |
| **Example:** RP/0/0/CPU0:router# admin | |
| **Step 3** show variables boot | Displays the configuration register setting.  
- Enter this command in administration EXEC mode.  
- For normal operations, the configuration register setting is 0x2102, which causes the active RP to reload the Cisco IOS XR software.  
- Verify that the configuration register setting is 0x2102. If it is not, complete Step 4, on page 22 to reset the configuration register to 0x2102. |
| **Example:** RP/0/0/CPU0:router(admin)# show variables boot | |
| **Note** For instructions on how to enter ROM Monitor bootstrap mode, see *Cisco IOS XR ROM Monitor Guide for the Cisco XR 12000 Series Router*. |
| **Step 4** config-register 0x2102 | (Optional) Sets the configuration register to 0x2102. This step is necessary only if the register is not set to 0x2102 in the running configuration. |
| **Example:** RP/0/0/CPU0:router(admin)# config-register 0x2102 | |
| **Step 5** admin | Enters administration EXEC mode. |
| **Example:** RP/0/0/CPU0:router# admin | |
| **Step 6** reload | Reloads the active RP according to the configuration register setting.  
- If the setting is 0x2102, then the RP reloads the Cisco IOS XR software.  
- If the standby RP is in “ready” redundancy state, the router switches over to the standby RP.  
- If a standby RP is not installed or not in a “ready” state, the router experiences a loss of service while the active RP is reloading the Cisco IOS XR software. |
| **Example:** RP/0/0/CPU0:router# reload | |
Administratively Shutting Down or Powering On or Off a Node

A node can be administratively shut down by entering the `hw-module location node-id shutdown` command in administration configuration mode. A node that is shut down still has power, but it cannot load or run the Cisco IOS XR software.

You can also administratively turn power off for a node using the `hw-module location node-id power disable` command in administration configuration mode.

For more information on the use of these commands, see Cisco IOS XR System Management Command Reference for the Cisco XR 12000 Series Router.

Configuring the Power Manager

Cisco IOS XR software manages the power of the chassis by keeping track of the available wattage for use and how much is necessary, in the worst case scenario. The manager prevents newly discovered or inserted modules or line cards from powering up unless there is sufficient surplus power available to operate them. This means that some line cards may be held in the power down or low power state to permit the remaining cards to run. Restricting which cards come up guarantees that the chassis continues to operate if a single power supply (or several power supplies) fail.

The power manager is enabled by default to operate in redundancy mode, which means that the failure of at least one power supply is already assumed in the calculation of the available wattage for the chassis. This means that only those cards that can be powered by the redundant power supplies are allowed to power up. In this way, operation is guaranteed even if one or more power supplies fail.

Alternatively, you can configure the power management to be additive, meaning that the wattage of all power sources is summed together to compute the total available power. The decision of whether to power up a line card is based on whether there is surplus power remaining from the total sum of all the power supplies. This mode cannot guarantee any sort of power redundancy, because no power has been reserved for coping with a power supply failure. However, with sufficient power supplies, the probability of a failure is statistically lower due to the larger number of independent power supplies. The additive mode is best for power-hungry applications where card density is more important than absolute protection from a power supply fault.

SUMMARY STEPS

1. admin
2. configure
3. (Optional) power-mgr additive
4. (Optional) power-mgr disable
5. (Optional) power-mgr scale-factor percentage
6. show power-mgr
7. commit
# Configuring the Power Manager

## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters administration EXEC mode.</td>
</tr>
<tr>
<td>admin</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>RP/0/0/CPU0:router# admin</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters administration configuration mode.</td>
</tr>
<tr>
<td>configure</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>RP/0/0/CPU0:router(admin)# configure</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>(Optional) Configures the power manager in additive mode, where the wattage of all power sources is summed together to compute the total available power. The decision of whether to power up a line card is based on whether there is surplus power available from the total sum of all the power supplies. The default operational mode is redundancy. In this mode, the failure of at least one power supply is already assumed in the calculation of the available power. In redundancy mode, only those cards that can be powered by the redundant power supplies are allowed to power up.</td>
</tr>
<tr>
<td>power-mgr additive</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>power-mgr additive</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>Use the <strong>no power-mgr additive</strong> command to return to the default redundancy mode.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>(Optional) Disables the power manager. The power manager is enabled by default. Disabling the power manager results in a warning message to the SYSLOG indicating that redundancy protection has been disabled.</td>
</tr>
<tr>
<td>power-mgr disable</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>power-mgr disable</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>In Cisco IOS XR Software Release 3.9.0, the power manager is enabled in passive mode. Cards are allowed to come up even if there is insufficient power, and warning messages are displayed indicating low power conditions.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>(Optional) Derates or super-rates the power consumption from 50 percent to 150 percent of the actual power consumption.</td>
</tr>
<tr>
<td>power-mgr scale-factor percentage</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>power-mgr scale-factor 150</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Displays the power manager configuration for the chassis.</td>
</tr>
<tr>
<td>show power-mgr</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td></td>
</tr>
</tbody>
</table>
Managing the Router Hardware

Cisco IOS XR System Management Configuration Guide for the Cisco XR 12000 Series Router, Release 4.3.x

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25
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 12; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 13; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 14; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 15; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 29 found in slot 16, needing 56 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 17; marking phantom
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 30 found in slot 18, needing 45 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 30 found in slot 19, needing 45 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 30 found in slot 20, needing 45 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 30 found in slot 21; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 22; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 23; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 15 found in slot 24, needing 26 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 15 found in slot 25, needing 26 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Cardtype 112 found in slot 28, needing 178 W
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 29; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 30; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 No card present in slot 31; skipping
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Changing phase to INIT_DECISION_PHASE
Jun 12 04:27:36.735 power_manager/debug 0/5/CPU0 t36 Powershelf capacity at 1600 watts
zone1, 0 watts zone2
Jun 12 04:27:36.738 power_manager/debug 0/5/CPU0 t36 Reserved chassis power is 477 W zone1, 0 W zone2
Jun 12 04:27:36.738 power_manager/debug 0/5/CPU0 t36 Available power for chassis is 1123 W
zone1, 0 W zone2,
Jun 12 04:27:36.738 power_manager/debug 0/5/CPU0 t36 Starting power-on decision process with 1123/0 W
Jun 12 04:27:36.738 power_manager/debug 0/5/CPU0 t36 Starting power-on decision process with 5/60 W
Jun 12 04:27:36.738 power_manager/debug 0/5/CPU0 t36 After accounting for RPs, 1063/0 W avail
Jun 12 04:27:36.738 power_manager/debug 0/5/CPU0 t36 After accounting for priority slots, 1063/0 W avail
Jun 12 04:28:46.718 power_manager/debug 0/5/CPU0 t36 slot 0 needs 134 W, 929 avail;
Jun 12 04:28:46.718 power_manager/debug 0/5/CPU0 t36 slot 1 needs 134 W, 795 avail;
Jun 12 04:28:46.718 power_manager/debug 0/5/CPU0 t36 slot 2 needs 240 W, 555 avail;
Jun 12 04:28:46.750 power_manager/debug 0/5/CPU0 t36 slot 3 needs 240 W, 315 avail;
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 slot 4 needs 240 W, 75 avail;
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 After accounting for normal slots, 75/0 W avail
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 RP in-use power is 60 W zone1, 0 W zone2
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 Linecard in-use power is 988 W zone1, 0 W zone2
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 Available power for chassis is 75 W zone1, 0 W zone2,
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 Starting periodic task to monitor FEMs
Jun 12 04:28:46.777 power_manager/debug 0/5/CPU0 t36 Changing phase to RUNNING_PHASE
Jun 12 04:28:47.706 power_manager/debug 0/5/CPU0 t11 Sufficient power available to bringup slot 1
Jun 12 04:28:47.711 power_manager/debug 0/5/CPU0 t10 Sufficient power available to bringup slot 0
Jun 12 04:28:47.713 power_manager/debug 0/5/CPU0 t12 Sufficient power available to bringup slot 2
Jun 12 04:28:47.715 power_manager/debug 0/5/CPU0 t14 Sufficient power available to bringup slot 4
Jun 12 04:28:47.718 power_manager/debug 0/5/CPU0 t13 Sufficient power available to bringup slot 3
Jun 12 04:28:59.467 power_manager/debug 0/5/CPU0 t33 PEM2 busy; skipping polling
Jun 12 04:29:10.161 power_manager/debug 0/5/CPU0 t33 PEM2 no longer busy; resuming polling
Jun 12 04:36:30.950 power_manager/debug 0/5/CPU0 t10 Sufficient power available to bringup slot 0
Jun 12 04:36:54.291 power_manager/debug 0/5/CPU0 t11 Sufficient power available to bringup
Flash Disk Recovery

When an RP is power cycled or experiences an ungraceful reset, the boot disk (PCMCIA flash disk used to boot the card) may experience a file-system corruption. If this occurs, an error message is displayed and the RP fails to boot. The corrupted flash disk is automatically reformatted and the Cisco IOS XR software is restored from the designated system controller (DSC) for the system.

For example, if a flash disk for an RP is corrupted, the RP fails to boot and the following error message is displayed:

```
Unable to mount /disk0:, filesystem is corrupted.
Check fsck log at /tmp/chkfs_fd0.log
init: special_commands:wait for disk0: failed
```

If this occurs, then the flash disk is automatically reformatted and the Cisco IOS XR software is restored to the flash disk.

---

If the flash disk is badly damaged and cannot be reformatted, the disk must be replaced. If the corrupted flash disk is the DSC, then the router fails over to the standby DSC. If no standby DSC is installed, then the system fails to boot.

---

Using Controller Commands to Manage Hardware Components

The `controller`, `controllers`, and `show controllers` commands are used to manage and display settings for various hardware components, including the switch fabric management, Ethernet control plane, and interface manager. These commands are primarily diagnostic and related to driver-level details. The information available with these commands varies widely and is hardware specific.

For information on the use of these commands, see *Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco XR 12000 Series Router*.
Formatting Hard Drives, Flash Drives, and Other Storage Devices

To format a storage device on the router, use the `format` command in EXEC mode.

⚠️ Caution
Formatting a storage device deletes all data on that device.

The following command syntax is used:

```
format filesystem: [options]
```

Table 6: format command Syntax Description, on page 28 describes the `format` command syntax.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filesystem</td>
<td>Specifies the memory device to format. The supported file systems are:</td>
</tr>
<tr>
<td></td>
<td>- bootflash:</td>
</tr>
<tr>
<td></td>
<td>- compactflash:</td>
</tr>
<tr>
<td></td>
<td>- flash:</td>
</tr>
<tr>
<td></td>
<td>- harddisk:</td>
</tr>
<tr>
<td></td>
<td>- harddiska:</td>
</tr>
<tr>
<td></td>
<td>- disk0:</td>
</tr>
<tr>
<td></td>
<td>- disk1:</td>
</tr>
<tr>
<td></td>
<td>Enter <code>format ?</code> to see the devices supported on your router.</td>
</tr>
<tr>
<td>options</td>
<td>Enter <code>format filesystem: ?</code> to see the available options.</td>
</tr>
<tr>
<td></td>
<td>For more information, see Cisco IOS XR System Management Command Reference for the Cisco XR 12000 Series Router.</td>
</tr>
</tbody>
</table>

In the following example, the `format` command is used to format the hard disk:

```
RP/0/0/CPU0:router# format harddisk:
```

Removing and Replacing Cards

This section describes card replacement issues and procedures.
Removing Line Cards

Line cards are designed for online insertion and removal (OIR). A line card is a single card that contains all service processing functions and physical line interfaces.

The OIR feature allows you to remove and replace cards without removing power to the card or chassis. Removing a card interrupts all traffic passing through the card, but it does not remove the card configuration.

When you remove a card, the configuration remains for all interfaces, but the interfaces do not appear in the output of the `show interfaces` command. You can view interface configurations by entering the `show running-config` command. The following example shows how the configuration appears when a card is removed:

```
RP/0/0/CPU0:router# show running-config
Building configuration...
hostname router
router ospf 3269
  area 0
    interface POS0/3/0/0
      cost 20
    interface preconfigure POS0/3/0/0
      ipv4 address 10.10.50.1 255.255.255.0
    interface preconfigure POS0/3/0/1
      description POS0/3/0/1
      shutdown
    interface preconfigure POS0/3/0/2
      description POS0/3/0/2
      shutdown
    interface preconfigure POS0/3/0/3
      description POS0/3/0/3
      shutdown
```

In this example, the line card in slot 3 is removed, and the interface configuration for all four interfaces changes to “interface preconfigure.” However, the “router ospf” reference to a slot 3 interface does not change. If you replace a line card with another line card that uses the same media type and port count, the configuration becomes active on the replacement card.

To remove the configuration for a slot after a card is removed, use the `no interface preconfigure` command to remove all interface configuration statements for that card in the running configuration. In addition, search the configuration for any references to the removed interfaces, such as the “router ospf” reference to slot 3 in the preceding example.

To remove the configuration for a slot when a card is installed, use the `no interface` command to remove all interface configuration statements for that card in the running configuration. In addition, search the configuration for any references to the removed interfaces.

Each line card supports a specific media type (Packet over SONET/SDH [POS] or Ethernet, for example) and port count. If you replace a line card with one that supports a different media type or port count, you should review the configuration and revise it to support the replacement line card.
Replacing a Line Card with the Same Media Type and Port Count

When you replace a line card or PLIM with a card that is of the same media type and has the same port count as the replaced card, the guidelines in the Removing Line Cards, on page 29 apply. Because the replacement card is of the same media type and port count, no special procedures are required for card removal and replacement.

Replacing a Line Card with the Same Media Type and a Different Port Count

When you replace a line card with a card that is of the same media type with a different port count, the guidelines in Removing Line Cards, on page 29 apply.

If the new card has a greater port count than the replaced card, the configuration applies to the corresponding lower port numbers, and the ports that did not exist on the replaced card have no configuration and come up in the shutdown state.

If the new card supports fewer ports, the existing configuration for the corresponding number of ports on the new card set is applied. The previous configuration for the removed ports remains in interface preconfigure state, as shown in the following example:

```
RP/0/0/CPU0:router# show running-config
  Building configuration...
  hostname rtp-gsr1
  interface POS0/3/0/0
    ipv4 address 10.10.50.1 255.255.255.0
  !
  interface preconfigure POS0/3/0/1
    description POS0/3/0/1
    shutdown
  !
  interface preconfigure POS0/3/0/2
    description POS0/3/0/2
    shutdown
  !
  interface preconfigure POS0/3/0/3
    description POS0/3/0/3
    shutdown
  !
```

In the preceding example, a four-port card has been replaced with a single-port card. The configuration from port 1 on the four-port card is applied to the single port on the replacement card, and the remaining port configurations change to “interface preconfigure.” To remove the configuration for the missing interfaces, use the no interface preconfigure command. In addition, search for and remove any configuration references to the removed interfaces.

Whenever you replace a line card with the same media type and a different port count, review the running configuration in the router and revise the configuration as necessary.

Replacing a Line Card or PLIM with a Different Media Type

When you replace a line card or PLIM with a card that is of a different media type (for example, if you replace a POS PLIM with an Ethernet PLIM), the guidelines in Removing Line Cards, on page 29 apply. Review the running configuration in the router and revise the configuration as necessary for the new media type.
Removing and Replacing CSC and SFC Cards

On Cisco XR 12000 Series Routers that use clock and scheduler cards (CSCs) and switch fabric cards (SFCs), the CSCs and SFCs work together to provide the switch fabric for the router. Although some router cards can be removed without software preparation, it is best to shut down and remove the power from a CSC or an SFC slot before removing a card. When the new card is inserted, you can restore the power to the slot and bring up the replacement card. This section describes how to properly remove and replace CSCs and SFCs for repairs.

**Before You Begin**

On Cisco XR 12404 routers, which use consolidated switch fabric cards (CSFCs), you must power off the router before changing a CSFC card.

You should have a working knowledge of Cisco IOS XR software and have sufficient permissions to configure the software.

You must log in as root-system before starting the procedure. To confirm your login status, use the `show user group` command:

```
RP/0/0/CPU0:router# show user group
root-system, cisco-support
```

To confirm your login status including root, use the `show user all | include root` command:

```
RP/0/0/CPU0:router# show user all | include root
Groups: root-system, cisco-support
Task: root-lr : READ WRITE EXECUTE DEBUG (reserved)
Task: root-system : READ WRITE EXECUTE DEBUG (reserved)
```
SUMMARY STEPS

1. admin
2. show platform
3. admin
4. hw-module location slot shutdown
5. hw-module location slot power disable
6. commit
7. end
8. (Optional) show platform
9. Remove and replace the CSC or SFC.
10. admin
11. no hw-module location slot power disable
12. commit
13. end
14. (Optional) show platform
15. admin
16. no hw-module location slot shutdown
17. commit
18. end
19. (Optional) show platform

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>admin</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>RP/0/0/CPU0:router# admin</td>
</tr>
<tr>
<td></td>
<td>Enters administration EXEC mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>show platform</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>RP/0/0/CPU0:router(admin)# show platform</td>
</tr>
<tr>
<td></td>
<td>Displays the state of all cards on the router.</td>
</tr>
<tr>
<td></td>
<td>• Allows you to identify the CSC or SFC you want to replace.</td>
</tr>
<tr>
<td></td>
<td>• Make note of the node ID (in the first column) for the card you want to replace. You need to enter this ID later in this procedure.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>admin</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>RP/0/0/CPU0:router# admin</td>
</tr>
<tr>
<td></td>
<td>Enters administration EXEC mode.</td>
</tr>
<tr>
<td>Step</td>
<td>Command or Action</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Step 4</td>
<td><code>hw-module location slot shutdown</code></td>
</tr>
<tr>
<td>Step 5</td>
<td><code>hw-module location slot power disable</code></td>
</tr>
<tr>
<td>Step 6</td>
<td><code>commit</code></td>
</tr>
<tr>
<td>Step 7</td>
<td><code>end</code></td>
</tr>
<tr>
<td>Step 8</td>
<td><code>show platform</code></td>
</tr>
<tr>
<td>Step 9</td>
<td>Remove and replace the CSC or SFC.</td>
</tr>
<tr>
<td>Step 10</td>
<td><code>admin</code></td>
</tr>
<tr>
<td>Step 11</td>
<td><code>no hw-module location slot power disable</code></td>
</tr>
<tr>
<td>Step 12</td>
<td><code>commit</code></td>
</tr>
<tr>
<td>Step</td>
<td>Command or Action</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>13</td>
<td><code>end</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router(admin-config)# end</code></td>
</tr>
<tr>
<td>14</td>
<td><code>show platform</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router(admin)# show platform</code></td>
</tr>
<tr>
<td>15</td>
<td><code>admin</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router# admin</code></td>
</tr>
<tr>
<td>16</td>
<td><code>no hw-module location slot shutdown</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router(admin-config)# no hw-module location 0/16/CPU0 shutdown</code></td>
</tr>
<tr>
<td>17</td>
<td><code>commit</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router(admin-config)# commit</code></td>
</tr>
<tr>
<td>18</td>
<td><code>end</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router(admin-config)# end</code></td>
</tr>
<tr>
<td>19</td>
<td><code>show platform</code></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td><code>RP/0/0/CPU0:router(admin)# show platform</code></td>
</tr>
</tbody>
</table>

**Related Topics**

 Additional References, on page 39
Examples

The following example shows commands to change a CSC:

RP/0/0/CPU0:router# admin

RP/0/0/CPU0:router(admin)# show platform

<table>
<thead>
<tr>
<th>Node</th>
<th>Type</th>
<th>PLIM</th>
<th>State</th>
<th>Config State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/0/CPU0</td>
<td>PRP(Active)</td>
<td>N/A</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/3/CPU0</td>
<td>L3LC Eng 3</td>
<td>OC3-POS-8</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/5/CPU0</td>
<td>L3LC Eng 3</td>
<td>GE-4</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/6/CPU0</td>
<td>L3LC Eng 3</td>
<td>OC48-POS</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/7/CPU0</td>
<td>L3LC Eng 3</td>
<td>GE-4</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/8/CPU0</td>
<td>L3LC Eng 3</td>
<td>OC12-POS-4</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/16/CPU0</td>
<td>CSC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/17/CPU0</td>
<td>CSC10(P)</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/20/CPU0</td>
<td>SFC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/21/CPU0</td>
<td>SFC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/22/CPU0</td>
<td>SFC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/24/CPU0</td>
<td>ALARM10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/25/CPU0</td>
<td>ALARM10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/29/CPU0</td>
<td>GSR16-BLOWER</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
</tbody>
</table>

RP/0/0/CPU0:router(config)# configure

RP/0/0/CPU0:router(config)# hw-module location 0/16/CPU0 shutdown

RP/0/0/CPU0:router(config)# hw-module location 0/16/CPU0 power disable

RP/0/0/CPU0:router(config)# commit

Primary Clock is CSC_1
Fabric Clock is Non Redundant
Bandwidth Mode : Full Bandwidth

RP/0/0/CPU0:router(config)# end

RP/0/0/CPU0:router(config)# show platform

<table>
<thead>
<tr>
<th>Node</th>
<th>Type</th>
<th>PLIM</th>
<th>State</th>
<th>Config State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/0/CPU0</td>
<td>PRP(Active)</td>
<td>N/A</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/3/CPU0</td>
<td>L3LC Eng 3</td>
<td>OC3-POS-8</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/5/CPU0</td>
<td>L3LC Eng 3</td>
<td>GE-4</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/6/CPU0</td>
<td>L3LC Eng 3</td>
<td>OC48-POS</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/7/CPU0</td>
<td>L3LC Eng 3</td>
<td>GE-4</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/8/CPU0</td>
<td>L3LC Eng 3</td>
<td>OC12-POS-4</td>
<td>IOS XR RUN</td>
<td>PWR,NSHUT,MON</td>
</tr>
<tr>
<td>0/16/CPU0</td>
<td>CSC10</td>
<td>N/A</td>
<td>Admin Down</td>
<td>NPWR,SHUT,MON</td>
</tr>
<tr>
<td>0/17/CPU0</td>
<td>CSC10(P)</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/19/CPU0</td>
<td>SFC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/21/CPU0</td>
<td>SFC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/22/CPU0</td>
<td>SFC10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/24/CPU0</td>
<td>ALARM10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/25/CPU0</td>
<td>ALARM10</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
<tr>
<td>0/29/CPU0</td>
<td>GSR16-BLOWER</td>
<td>N/A</td>
<td>PWR,NSHUT,MON</td>
<td></td>
</tr>
</tbody>
</table>

Replace the CSC or SFC at this point.

RP/0/0/CPU0:router(config)# configure

RP/0/0/CPU0:router(config)# no hw-module location 0/16/CPU0 power disable
Adding a Standby PRP to a Cisco XR 12000 Series Router

A second PRP card can be added to a Cisco XR 12000 Series Router for redundancy. To add a standby PRP, boot the card from ROMMON mode with the minimum boot image (MBI) software package. This will bring
up the PRP so it can be recognized by the DSC. The new standby PRP will download the appropriate software and configurations from the DSC, and reboot.

This section provides instructions to boot the standby RP after it is installed in the chassis.

**Before You Begin**

- The standby Performance Route Processor (PRP) must be installed in a slot next to the active PRP. For example, the PRPs can be installed in slot 0 and slot 1, slot 2 and slot 3, slot 4 and slot 5, slot 6 and slot 7, slot 8 and slot 9, and so on.
- MBI software package mbiprp-rp.vm. This package is used to boot any PRP other than the DSC, including the standby PRP and PRPs in named SDRs.
- ROMMON version bfprp_romupgrade-1.14.0.91 or higher
- Boothelper version c12kprp-boot-mz.120-30.S or higher
- The boothelper must be stored as the first file in the bootflash, or the ROMMON variable must be set to point to the boothelper. To set the ROMMON variable, enter the following command in ROM Monitor mode: 
  ```
  BOOTLDR=bootflash:/c12kprp-boot-mz.120-30.S
  ```
- Each PRP must have at least 1024 MB of memory installed. The PRP-2 ships with 1024 MB of memory. Upgrade the memory in your PRP, if necessary.
- Flash disks:
  - The recommended flash disk setup for all PRPs is two 512-MB Sandisk flash disk in PCMCIA slot 0 and slot 1. The minimum requirement is one 512-MB Sandisk flash disk installed in slot 0 on every physical PRP card in the system. PRP cards use the flash disk to store the Cisco IOS XR software and running configurations.
  - The same flash disk size must be used in all PRPs in the Cisco XR 12000 Series Router.
  - Each flash disk must be formatted by the Cisco IOS XR software before use. To format a disk, insert the disk into a running PRP and enter the command `format filesystem`. Example: `format disk0:`.

**SUMMARY STEPS**

1. Attach a terminal to the standby PRP console port, and place the PRP in ROM Monitor mode.
2. `unset TURBOBOOT`
3. `unset BOOT`
4. `sync`
5. `boot tftp:// server/directory/filename`
6. Wait for boot process to complete.
7. `show platform`
8. `show redundancy`
## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Attach a terminal to the standby PRP console port, and place the PRP in ROM Monitor mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>unset TURBOBOOT</td>
</tr>
<tr>
<td></td>
<td>Example: <code>rommon&gt;# unset turboboot</code></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>unset BOOT</td>
</tr>
<tr>
<td></td>
<td>Example: <code>rommon&gt;# unset BOOT</code></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>sync</td>
</tr>
<tr>
<td></td>
<td>Example: <code>rommon&gt;# sync</code></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>boot tftp:// server/directory/filename</td>
</tr>
<tr>
<td></td>
<td>Example: <code>rommon&gt;# boot tftp://192.168.1.1/dir/mbiprp-rp.vm</code></td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Wait for boot process to complete.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>show platform</td>
</tr>
<tr>
<td></td>
<td>Example: <code>RP/0/0/CPU0:router# show platform</code></td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>show redundancy</td>
</tr>
<tr>
<td></td>
<td>Example: <code>RP/0/0/CPU0:router# show redundancy</code></td>
</tr>
</tbody>
</table>

---

**Related Topics**

**Additional References, on page 39**
Upgrading the CPU Controller Bits

Use this procedure to upgrade the CPU controller bits on all nodes that are installed in the router or on a specific node.

SUMMARY STEPS

1. admin
2. upgrade cpucrtlbits {all | location node-id}

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>admin</strong></td>
<td>Enters administration EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>RP/0/0/CPU0:router# admin</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>**upgrade cpucrtlbits {all</td>
<td>location node-id**}</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>RP/0/0/CPU0:router(admin)# upgrade cpucrtlbits all</td>
<td></td>
</tr>
</tbody>
</table>

Examples

The following example shows how to upgrade the CPU controller bits on all nodes in a router:

RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router (admin)# upgrade cpucrtlbits all

Please do not power cycle, reload the router or reset any nodes until all upgrades are completed. Please check the syslog to make sure that all nodes are upgraded successfully. If you need to perform multiple upgrades, please wait for current upgrade to be completed before proceeding to another upgrade. Failure to do so may render the cards under upgrade to be unusable.

Additional References

The following sections provide references related to hardware management on Cisco IOS XR software.
## Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XR hardware commands</td>
<td>Hardware Redundancy and Node Administration Commands on the Cisco IOS XR Software module of Cisco IOS XR System Management Command Reference for the Cisco XR 12000 Series Router</td>
</tr>
<tr>
<td>Information about getting started with Cisco IOS XR software</td>
<td>Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router</td>
</tr>
<tr>
<td>ROM Monitor</td>
<td>Cisco IOS XR ROM Monitor Guide for the Cisco XR 12000 Series Router</td>
</tr>
<tr>
<td>Cisco IOS XR command master list</td>
<td>Cisco IOS XR Commands Master List for the Cisco XR 12000 Series Router</td>
</tr>
<tr>
<td>Information about user groups and task IDs</td>
<td>Configuring AAA Services on the Cisco IOS XR Software module of Cisco IOS XR System Security Configuration Guide for the Cisco XR 12000 Series Router</td>
</tr>
</tbody>
</table>

## Standards

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.</td>
<td>—</td>
</tr>
</tbody>
</table>

## MIBs

<table>
<thead>
<tr>
<th>MIBs</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: <a href="http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a></td>
</tr>
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</table>
### RFCs

<table>
<thead>
<tr>
<th>RFCs</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.</td>
<td>—</td>
</tr>
</tbody>
</table>

### Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
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