Managing Cisco Enhanced Services and Network Interface Modules

The router supports Cisco Enhanced Services Modules (SMs) and Cisco Network Interface Modules (NIMs). The modules are inserted into the router using an adapter, or carrier card, into various slots. For more information, see the Hardware Installation Guide for the Cisco 4000 Series Integrated Services Routers.

The following sections are included in this chapter:

- Information About Cisco Enhanced Services and Network Interface Modules, on page 1
- Modules Supported, on page 2
- Network Interface Modules, on page 2
- Enhanced Service Modules, on page 4
- Implementing SMs and NIMs on Your Router, on page 6
- Managing Modules and Interfaces, on page 14
- Monitoring and Troubleshooting Modules and Interfaces, on page 17
- Configuration Examples, on page 25

Information About Cisco Enhanced Services and Network Interface Modules

The router configures, manages, and controls the supported Cisco Enhanced Services Modules (SMs) and Network Interface Modules (NIMs) using the module management facility built in its architecture. This new centralized module management facility provides a common way to control and monitor all the modules in the system regardless of their type and application. All Cisco Enhanced Service and Network Interface Modules supported on your router use standard IP protocols to interact with the host router. Cisco IOS software uses alien data path integration to switch between the modules.

- Modules Supported, on page 2
- Network Interface Modules, on page 2
- Enhanced Service Modules, on page 4

Modules Supported

For information about the interfaces and modules supported by the Cisco ISR 4400 series and Cisco ISR 4300 series routers, see http://www.cisco.com/c/en/us/products/routers/4000-series-integrated-services-routers-isr/relevant-interfaces-and-modules.html.

Network Interface Modules

The following Network Interface Modules are supported:

- Cisco Fourth-Generation LTE Network Interface Module, on page 2
- Cisco 4-Port and 8-Port Layer 2 Gigabit EtherSwitch Network Interface Module, on page 2
- Cisco Fourth-Generation T1/E1 Voice and WAN Network Interface Module, on page 2
- Cisco SSD/HDD Carrier Card NIM, on page 3
- Upgrading the SSD or HDD Firmware, on page 3
- Error Monitoring, on page 4

Cisco Fourth-Generation LTE Network Interface Module

Cisco 4G LTE NIM addresses the modular 4G LTE cellular connectivity on the Cisco 4000 Series ISRs. This is the first wireless NIM, though it is not the first wireless module in the ISR product line. The closest modular card to Cisco 4G LTE NIM is the Cisco EHWIC 4G LTE, which accepts a single LTE modem. Cisco 4G LTE NIM is feature-compatible with Cisco EHWIC 4G LTE. For more information, see the Cisco Fourth-Generation LTE Network Interface Module Software Configuration Guide.

Cisco 4-Port and 8-Port Layer 2 Gigabit EtherSwitch Network Interface Module

The Cisco 4-Port and 8-Port Layer 2 Gigabit EtherSwitch Network Interface Module (NIM) integrates the Layer 2 features and provides a 1-Gbps connection to the multigigabit fabric (MGF) for intermodule communication. For more information on configuring the Cisco 4-Port and 8-Port Layer 2 Gigabit EtherSwitch NIM, see http://www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/software/configuration/guide/4_8PortGENIM.html.

Cisco Fourth-Generation T1/E1 Voice and WAN Network Interface Module

The Cisco Fourth-Generation T1/E1 Voice and WAN Network Interface Module (NIM) is inserted into the NIM slot of the router and provides data and voice support on T1/E1 trunks. To support voice-related and other DSP features, the Cisco PVDM4 (Cisco Packet Voice Digital Signal Processor Module) is also required. See the following documents for more information:

- Installing the Cisco Fourth-Generation T1/E1 Voice and WAN Network Interface Module
- Configuring the Cisco Fourth-Generation T1/E1 Voice and WAN Network Interface Module

- Installing the Cisco PVDM4

Cisco SSD/HDD Carrier Card NIM

The router supports a single Cisco SSD and HDD Carrier Card NIM, which must be placed in slot 0 and subslot 1, 2, or 3.

A Cisco SSD/HDD Carrier Card NIM can be one of the following:

- Cisco SSD Carrier Card NIM—Supports one or two Solid-State Drives (SSDs).
- Cisco HDD Carrier Card NIM—Supports one Hard Disk Drive (HDD).

Note When ISR-WAAS is operational, do not perform online insertion or replacement (OIR) of NIM-SSD and NIM-HDD.

For more information on the hardware characteristics of the SSD/HDD Carrier Card NIM, see the Hardware Installation Guide for the Cisco 4000 Series Integrated Services Routers.

For more information on deactivating or reactivating a SSD/HDD Carrier Card NIM, see Deactivating and Reactivating an SSD/HDD Carrier Card NIM, on page 9.

Cisco 1-, 2-, and 4-Port Serial NIM

The Cisco 1-, 2-, and 4-port Serial NIMs are multi-protocol synchronous serial network interface modules (NIMs) supported on the Cisco 4400 Series ISRs. The Cisco 1-, 2-, and 4-port Serial NIMs expand the capabilities of the router to provide connectivity for synchronous interfaces in a wide range of applications including up to 8Mbps data rate for high speed high-level data link control (HDLC). These capabilities can be utilized as Point-to-Point Cisco HDLC WAN interface or frame relay interface. The Cisco 1-, 2-, and 4-port Serial NIMs have their own serial communication controllers (SCC) and they do not rely on the host router for SCCs. For further information on configuring this NIM, see the Configuring the Cisco 1-, 2-, and 4-port Serial Network Interface Modules for the Cisco 4400 Series ISRs document.

Upgrading the SSD or HDD Firmware

You can upgrade the firmware for the SSD or HDD using the **upgrade hw-programmable module filename bootflash:***filename slot/sub-slot* command.

A typical *filename* has the form: *nim_ssd_manufacturer_firmware-version-number.bin*

The firmware file can also be available in other locations other than **bootflash:**

For example, you can provide any one of the following locations in place of **bootflash:***filename*:

- **flash:***filename*
- **harddisk:***filename*
- **usb1:***filename*

Note For a Cisco SSD carrier card NIM or Cisco HDD carrier card NIM, only slot 0 and one of the subslots 1, 2, or 3 must be used.

The following example shows how to upgrade a Micron P400m disk to firmware revision 200 using the **upgrade hw-programmable module filename bootflash:***filename slot/sub-slot* command:

```
Router# upgrade hw-programmable module filename bootflash:nim_ssd_Micr nP400m_E200.bin
Info: Trying to upgrade Module in 0/3 with nim_ssd_MicronP400m_E200.bin
Info: Current NIM-SSD disk config.
Info: Disk1: rev: 0200 model: MicronP400m-MTFDDAK200MAN
Info: Disk2: rev: 0200 model: MicronP400m-MTFDDAK200MAN
/dev/sde:
fwdownload: xfer_mode=3 min=1 max=255 size=512
.....................................................................................................
 Done.
/dev/sdf:
fwdownload: xfer_mode=3 min=1 max=255 size=512
.....................................................................................................
 Done.
Info: Performing post upgrade check ......
Info: Upgrade to Firmware version E200 on disk1 successful.
Info: Upgrade to Firmware version E200 on disk2 successful.
Info: Current NIM-SSD disk config.
Info: Disk1: rev: E200 model: MicronP400m
```

Error Monitoring

The drives in the Cisco SDD/HDD Carrier Card NIM are monitored for SMART errors. If a SMART error occurs, a Cisco IOS error message is displayed, as shown in the following example:

```
%IOSXE-5-PLATFORM:logger: INFO:/dev/sde:SMART error present:please do
'more bootflash:/tracelogs/smart_errors.log'.
```

You can find additional information in the error log at: bootflash:/tracelogs/smart_errors.log

Enhanced Service Modules

The following service modules are supported on the router:

- Cisco SM-1 T3/E3 Service Module, on page 4
- Cisco UCS E-Series Server, on page 5
- Cisco SM-X Layer 2/3 EtherSwitch Service Module, on page 5
- Cisco 6-Port GE SFP Service Module, on page 5

Cisco SM-1 T3/E3 Service Module

For more information, see the Cisco SM-1T3/E3 Enhanced Service Module Configuration Guide.

Cisco UCS E-Series Server

For more information, see the documentation listed in the Cisco UCS E-Series Server Roadmap.

Cisco SM-X Layer 2/3 EtherSwitch Service Module

This module provides the following features:

- Integration of Layer 2 and Layer 3 switching features and the ability of the router to use the Cisco SM-X Layer 2/3 ESM (16-port and 24-port) as an independent Layer 3 switch.
- 1 Gbps connection to the multigigabit fabric (MGF) for intermodule communication without burdening the CPU of the router.
- Up to 30 watts of power per port with the robust Power over Ethernet Plus (PoE+) feature along with IEEE 802.3AE Media Access Control Security (MACSec) port-based, hop-to-hop, encryption, and Cisco TrustSec.

For more information, see the following documents:

- Cisco SM-X Layer 2/3 EtherSwitch Service Module Configuration Guide for Cisco 4451-X ISR
- Connecting Cisco SM-X Layer 2/3 EtherSwitch Service Module to the Network

Cisco 6-Port GE SFP Service Module

The Cisco 6-port GE SFP service module is a Gigabit Ethernet module that can be inserted into the router's SM slot to provide Gigabit Ethernet features on routable external interfaces. For more information about configuring this service module, see the Software Configuration Guide for the Cisco 6-port GE SFP Service Module.

Cisco 4-port GE SFP and 1-port 10 GE SFP Service Module

The Cisco 4-port GE SFP and 1-port 10 GE SFP Service Module (SM-X-4x1GE-1x10GE) is software-configurable high-speed connectivity routing port service module for the Cisco ISR 4400 Series routers. This service module provides increased density of Ethernet interfaces on the Cisco ISR 4400 Series routers. For further information on configuring this service module, see: the Software Configuration Guide for the Cisco 6-port GE SFP Service Module and Cisco 4-port GE SFP and 1-port 10 GE SFP Service Module

Cisco 1GE-CU-SFP and 2GE-CU-SFP Network Interface Modules

The Cisco 1GE-CU-SFP and 2GE-CU-SFP Network Interface Modules (NIMs) are software-configurable high-speed connectivity routing port network interface modules for the Cisco 4000 and Cisco ISR 4300 Series Integrated Services Routers (ISR). These network interface modules provide increased density of Ethernet interfaces on the Cisco 4000 ISR. For further information on configuring this NIM, see the Configuring the Cisco 1GE-CU-SFP and 2GE-CU-SFP Network Interface Modules in Cisco 4000 Series Integrated Services Routers.

Note Cisco 4221 ISR does not support 2GE-CU-SFP Network Interface Module.

Implementing SMs and NIMs on Your Router

- Downloading the Module Firmware, on page 6
- Installing SMs and NIMs, on page 6
- Accessing Your Module Through a Console Connection or Telnet, on page 6
- Online Insertion and Removal, on page 7

Downloading the Module Firmware

Module firmware must be loaded to the router to be able to use a service module. For more information, see Installing a Firmware Subpackage.

The modules connect to the RP via the internal eth0 interface to download the firmware. Initially, the module gets an IP address for itself via BOOTP. The BOOTP also provides the address of the TFTP server used to download the image. After the image is loaded and the module is booted, the module provides an IP address for the running image via DHCP.

Installing SMs and NIMs

For more information, see "Installing and Removing NIMs and SMs" in the Hardware Installation Guide for the Cisco 4000 Series Integrated Services Routers.

Accessing Your Module Through a Console Connection or Telnet

Before you can access the modules, you must connect to the host router through the router console or through Telnet. After you are connected to the router, you must configure an IP address on the Gigabit Ethernet interface connected to your module. Open a session to your module using the **hw-module session** command in privileged EXEC mode on the router.

To establish a connection to the module, connect to the router console using Telnet or Secure Shell (SSH) and open a session to the switch using the **hw-module session** *slot/subslot* command in privileged EXEC mode on the router.

Use the following configuration examples to establish a connection:

- The following example shows how to open a session from the router using the **hw-module session** command:

```
Router# hw-module session slot/card
Router# hw-module session 0/1 endpoint 0

Establishing session connect to subslot 0/1
```

- The following example shows how to exit a session from the router, by pressing **Ctrl-A** followed by **Ctrl-Q** on your keyboard:

```
type ^a^q
picocom v1.4

port is        : /dev/ttyDASH2
flowcontrol    : none
baudrate is    : 9600
parity is      : none
databits are   : 8
escape is      : C-a
noinit is      : no
noreset is     : no
nolock is      : yes
send_cmd is    : ascii_xfr -s -v -l10
receive_cmd is : rz -vv
```

Online Insertion and Removal

The router supports online insertion and removal (OIR) of Cisco Enhanced Services Modules and Cisco Network Interface Modules. You can perform the following tasks using the OIR function:

Note When ISR-WAAS is operational, do not perform online insertion or replacement (OIR).

- Preparing for Online Removal of a Module, on page 7
- Deactivating a Module, on page 7
- Deactivating Modules and Interfaces in Different Command Modes, on page 8
- Deactivating and Reactivating an SSD/HDD Carrier Card NIM, on page 9
- Reactivating a Module, on page 10
- Verifying the Deactivation and Activation of a Module, on page 10

Preparing for Online Removal of a Module

The router supports the OIR of a module, independent of removing another module installed in your router. This means that an active module can remain installed in your router, while you remove another module from one of the subslots. If you are not planning to immediately replace a module, ensure that you install a blank filler plate in the subslot.

Deactivating a Module

A module can be removed from the router without first being deactivated. However, we recommend that you perform a graceful deactivation (or graceful power down) of the module before removing it. To perform a graceful deactivation, use the **hw-module subslot** *slot/subslot* **stop** command in EXEC mode.

Note When you are preparing for an OIR of a module, it is not necessary to independently shut down each of the interfaces before deactivating the module. The **hw-module subslot** *slot/subslot* **stop** command in EXEC mode automatically stops traffic on the interfaces and deactivates them along with the module in preparation for OIR. Similarly, you do not have to independently restart any of the interfaces on a module after OIR.

The following example shows how to use the **show facility-alarm status** command to verify if any critical alarm is generated when a module is removed from the system:

```
Router# show facility-alarm status
System Totals  Critical: 5  Major: 1  Minor: 0

Source                  Severity      Description [Index]
------                  --------      -------------------
Power Supply Bay 1      CRITICAL      Power Supply/FAN Module Missing [0]
GigabitEthernet0/0/0    CRITICAL      Physical Port Link Down [1]
GigabitEthernet0/0/1    CRITICAL      Physical Port Link Down [1]
GigabitEthernet0/0/2    CRITICAL      Physical Port Link Down [1]
GigabitEthernet0/0/3    CRITICAL      Physical Port Link Down [1]
xcvr container 0/0/0    INFO          Transceiver Missing [0]
xcvr container 0/0/1    INFO          Transceiver Missing [0]
xcvr container 0/0/2    INFO          Transceiver Missing [0]
xcvr container 0/0/3    INFO          Transceiver Missing [0]
V: 1.0v PCH R0/18       MAJOR         Volt Above Normal [3]
```

Note A critical alarm (Active Card Removed OIR Alarm) is generated even if a module is removed after performing graceful deactivation.

Deactivating Modules and Interfaces in Different Command Modes

You can deactivate a module and its interfaces using the **hw-module subslot** command in one of the following modes:

- If you choose to deactivate your module and its interfaces by executing the **hw-module subslot** *slot/subslot* **shutdown unpowered** command in global configuration mode, you are able to change the configuration in such a way that no matter how many times the router is rebooted, the module does not boot. This command is useful when you need to shut down a module located in a remote location and ensure that it does not boot automatically when the router is rebooted.
- If you choose to use the **hw-module subslot** *slot/subslot* **stop** command in EXEC mode, you cause the module to gracefully shut down. The module is rebooted when the **hw-module subslot** *slot/subslot* **start** command is executed.

To deactivate a module and all of its interfaces before removing the module, use one of the following commands in global configuration mode.

Procedure

	Command or Action	Purpose
Step 1	**hw-module subslot** *slot/subslot* **shutdown unpowered** **Example:**	Deactivates the module located in the specified slot and subslot of the router, where:

	Command or Action	Purpose
	`Router# hw-module subslot 0/2 shutdown unpowered`	• *slot*—Specifies the chassis slot number where the module is installed. • *subslot*—Specifies the subslot number of the chassis where the module is installed. • **shutdown**—Shuts down the specified module. • **unpowered**—Removes all interfaces on the module from the running configuration and the module is powered off.
Step 2	**hw-module subslot** *slot*/*subslot* [**reload** | **stop** | **start**] **Example:** `Router# hw-module subslot 0/2 stop`	Deactivates the module in the specified slot and subslot, where: • *slot*—Specifies the chassis slot number where the module is installed. • *subslot*—Specifies the subslot number of the chassis where the module is installed. • **reload**—Stops and restarts the specified module. • **stop**—Removes all interfaces from the module and the module is powered off. • **start**—Powers on the module similar to a physically inserted module in the specified slot. The module firmware reboots and the entire module initialization sequence is executed in the IOSd and Input/Output Module daemon (IOMd) processes.

Deactivating and Reactivating an SSD/HDD Carrier Card NIM

The following restrictions apply:

- Deactivating or reactivating an SSD/HDD Carrier Card NIM without an SSD or HDD disk is not supported.
- Only a single (SSD or HDD) Carrier Card NIM can be plugged into a bay. If you plug an additional (SSD or HDD) Carrier Card NIM into another bay, the module powers down and kernel, log, or error messages are displayed on the Cisco IOS console. In rare cases, the file system may get corrupted on the additional drive.

Caution Deactivation of an SSD/HDD Carrier Card NIM may cause loss of data.

To deactivate an SSD/HDD Carrier Card NIM, perform the following steps:

Procedure

	Command or Action	Purpose
Step 1	**virtual-service** *name* **Example:** `Router(config)# virtual-service my-kwaas-instance`	Identifies the kWAAS service (by name), supported on your router, in preparation for the router to be shut down by the **no activate** command. We recommend that you use this command before reseating or replacing an SSD or HDD.
Step 2	**no activate** **Example:** `Router(config-virt-serv)# no activate`	Shuts down the kWAAS instance on your router. kWAAS services remain installed. The service will have to be reactivated after the HDD/SSD NIM (module) is restarted.

Step 3	**hw-module subslot** *slot/subslot* [**reload** | **stop** | **start**]
	Example:
	`Router# hw-module subslot 0/2 stop`
	`Proceed with stop of module? [confirm]`
	`Router#`
	`*Mar 6 15:13:23.997: %SPA_OIR-6-OFFLINECARD: SPA (NIM-SSD) offline in subslot 0/2`
	`...`
		Deactivates or reactivates the module in the specified slot and subslot.
		• *slot*—The chassis slot number where the module is installed.
		• *subslot*—The subslot number of the chassis where the module is installed.
		• **reload**—Deactivates and reactivates (stops and restarts) the specified module.
		• **stop**—Removes all interfaces from the module and the module is powered off.
		• **start**—Powers on the module similar to a physically inserted module in the specified slot. The module firmware reboots and the entire module initialization sequence is executed in the IOSd and IOMd processes.

Step 4	Wait for the EN (Enable) LED to turn off, and then remove the SSD/HDD Carrier Card NIM.	

Reactivating a Module

If, after deactivating a module using the **hw-module subslot** *slot/subslot* **stop** command, you want to reactivate it without performing an OIR, use one of the following commands (in privileged EXEC mode):

- **hw-module subslot** *slot/subslot* **start**
- **hw-module subslot** *slot/subslot* **reload**

Verifying the Deactivation and Activation of a Module

When you deactivate a module, the corresponding interfaces are also deactivated. This means that these interfaces will no longer appear in the output of the **show interface** command.

1. To verify the deactivation of a module, enter the **show hw-module subslot all oir** command in privileged EXEC configuration mode.

   Observe the "Operational Status" field associated with the module that you want to verify. In the following example, the module located in subslot 1 of the router is administratively down.

```
Router# show hw-module subslot all oir

Module         Model              Operational Status

-------------- ------------------ -------------------------

subslot 0/0    ISR4451-4X1GE      ok
subslot 1/0    SM-X-T1/E1         ok
```

2. To verify activation and proper operation of a module, enter the **show hw-module subslot all oir** command and observe "ok" in the **Operational Status** field as shown in the following example:

```
Router# show hw-module subslot all oir

Module         Model               Operational Status

-------------- ------------------  -------------------------

subslot 0/1    NIM-8MFT-T1/E1      ok
subslot 1/0    SM-X T1/E1          ok

Router# show platform hardware backplaneswitch-manager R0 status
slot  bay   port   enable   link status   speed(Mbps)   duplex   autoneg   pause_tx
pause_rx   mtu
-------------------------------------------------------------------------------------------------------
0      0     CP     True      Up           1000          Full    ENABLED    ENABLED
ENABLED   10240
1      0     GE1    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
1      0     GE0    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
2      0     GE1    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
2      0     GE0    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
0      1     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      1     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      2     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      2     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      3     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      3     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      4     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      4     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      0     FFP    True       Up         10000          Full    ENABLED    DISABLED
DISABLED  10240
slot  bay   port            mac    vid   modid     flags - Layer 2
-------------------------------------------------------------------------------
0      0    FFP  2c54.2dd2.661b   2351       1              0x20
0      0    FFP  2c54.2dd2.661b   2352       1              0x20
0      0     CP  2c54.2dd2.661e   2351       0              0xC60
0      0     CP  2c54.2dd2.661e   2352       0              0x20
1      0    GE0  58bf.ea3a.00f6   2350       0              0x460
0      0    FFP  2c54.2dd2.661b   2350       1              0x20
1      0    GE0  58bf.ea3a.00f6   2352       0              0x20
0      0     CP  2c54.2dd2.661e   2350       0              0x20
1      0    GE0  58bf.ea3a.00f6   2351       0              0xC60
```

```
Port block masks: rows=from port, columns=to port, u=unknown unicast, m=unknown multicast,
 b=broadcast, A=all

           CP    FFP  1/0/1  1/0/0  2/0/1  2/0/0  0/1/1  0/1/0  0/2/1  0/2/0  0/3/1
0/3/0  0/4/1 0/4/0 drops
-------------------------------------------------------------------------------------------------
CP          -     A     um     um     um     um     um     um     um     um     um
um     um     um     1
FFP         A     -     -      -      -      -      -      -      -      -      -
 -      -      -     0
1/0/1       um    umb    -     umb    umb    umb    umb    umb    umb    umb    umb
umb    umb    umb     0
1/0/0       um    umb   umb     -     umb    umb    umb    umb    umb    umb    umb
umb    umb    umb     6
2/0/1       um    umb   umb    umb     -     umb    umb    umb    umb    umb    umb
umb    umb    umb     0
2/0/0       um    umb   umb    umb    umb     -     umb    umb    umb    umb    umb
umb    umb    umb     6
0/1/1       um    umb   umb    umb    umb    umb     -     umb    umb    umb    umb
umb    umb    umb     0
0/1/0       um    umb   umb    umb    umb    umb    umb     -     umb    umb    umb
umb    umb    umb     0
0/2/1       um    umb   umb    umb    umb    umb    umb    umb     -     umb    umb
umb    umb    umb     0
0/2/0       um    umb   umb    umb    umb    umb    umb    umb    umb     -     umb
umb    umb    umb     0
0/3/1       um    umb   umb    umb    umb    umb    umb    umb    umb    umb     -
umb    umb    umb     0
0/3/0       um    umb   umb    umb    umb    umb    umb    umb    umb    umb    umb
-     umb    umb     0
0/4/1       um    umb   umb    umb    umb    umb    umb    umb    umb    umb    umb
umb     -     umb     0
0/4/0       um    umb   umb    umb    umb    umb    umb    umb    umb    umb    umb
umb    umb     -      0

Port VLAN membership: [untagged vlan] U=untagged T=tagged <VLAN range begin>-<VLAN range
 end>

   CP [2352] U:0001-0001 T:0002-2351 U:2352-2352 T:2353-4095
  FFP [2352] T:0001-4095
1/0/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
1/0/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
2/0/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
2/0/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/1/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/1/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/2/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/2/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/3/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/3/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/4/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
0/4/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
```

show platform hardware backplaneswitch-manager rp active ffp statistics: Example

```
Router# show platform hardware backplaneswitch-manager rp active ffp statistics
Broadcom 10G port(e.g: FFP) status:
                          Rx pkts          Rx Bytes          Tx Pkts          Tx Bytes
-------------------------------------------------------------------------------------
All                             0                 0                0                 0
  =64                           0                                  0
  65~127                        0                                  0
```

```
  128~255                   0                                   0
  256~511                   0                                   0
  512~1023                  0                                   0
  1024~1518                 0                                   0
  1519~2047                 0                                   0
  2048~4095                 0                                   0
  4096~9216                 0                                   0
  9217~16383                0                                   0
  Max                       0                                   0
Good                        0                                   0
  CoS 0                                                         0                 0
  CoS 1                                                         0                 0
  CoS 2                                                         0                 0
  CoS 3                                                         0                 0
  CoS 4                                                         0                 0
  CoS 5                                                         0                 0
  CoS 6                                                         0                 0
  CoS 7                                                         0                 0
  Unicast                   0                                   0
  Multicast                 0                                   0
  Broadcast                 0                                   0
  Control                   0
Errored
  FCS                       0                                   0
  Undersize                 0
  Ether len                 0
  Fragment                  0                                   0
  Jabber                    0
  MTU ck, good              0
  MTU ck, bad               0
  Tx underflow                                                                  0
  err symbol                0
  frame err                 0
  junk                      0
Drops
  CoS 0                                                         0                 0
  CoS 1                                                         0                 0
  CoS 2                                                         0                 0
  CoS 3                                                         0                 0
  CoS 4                                                         0                 0
  CoS 5                                                         0                 0
  CoS 6                                                         0                 0
  CoS 7                                                         0                 0
  STP                       0
  backpress                 0
  congest                   0                 0
  purge/cell                0
  no destination            0
Pause PFC                   0                                   0
  CoS 0                     0
  CoS 1                     0
  CoS 2                     0
  CoS 3                     0
  CoS 4                     0
  CoS 5                     0
  CoS 6                     0
  CoS 7                     0
```

Managing Modules and Interfaces

The router supports various modules. For a list of supported modules, see Modules Supported, on page 2. The module management process involves bringing up the modules so that their resources can be utilized. This process consists of tasks such as module detection, authentication, configuration by clients, status reporting, and recovery. For detailed information about module configuration, see the module documentation referred to in the Documentation Roadmap for the Cisco 4000 Series Integrated Services Routers.

For a list of small-form-factor pluggable (SFP) modules supported on your router, see the "Installing and Upgrading Internal Modules and FRUs" section in the Hardware Installation Guide for the Cisco 4000 Series Integrated Services Routers.

The following sections provide additional information on managing the modules and interfaces:

- Managing Module Interfaces, on page 14
- Managing Modules and Interfaces Using Backplane Switch, on page 14

Managing Module Interfaces

After a module is in service, you can control and monitor its module interface. Interface management includes configuring clients with **shut** or **no shut** commands and reporting on the state of the interface and the interface-level statistics.

Monitor the module status and other statistical information using the **show** commands listed in Monitoring and Troubleshooting Modules and Interfaces, on page 17.

Managing Modules and Interfaces Using Backplane Switch

- Backplane Ethernet Switch, on page 14
- Viewing Module and Interface Card Status on a Router, on page 15
- Viewing Backplane Switch Statistics, on page 15
- Viewing Backplane Switch Port Statistics, on page 16
- Viewing Slot Assignments, on page 17

Backplane Ethernet Switch

The backplane Ethernet switch on your router provides connectivity to Enhanced Service Modules and Network Interface Modules (NIMs). The backplane Ethernet switch facilitates all packet transfers between the host router and its pluggable modules.

The backplane Ethernet switch act as a manager for the host router and controls the module and exchanges logical flow-control information with the module to ensure accurate feedback to the router features. See Managing Modules and Interfaces, on page 14 for more information. The backplane Ethernet switch also facilitates control plane traffic flow from the host router to the modules. The backplane switch manages modules and interface cards and is used to communicate with the modules. Module drivers integrate with the backplane switch to configure packet flow and control traffic buffering.

You are not required to perform any configuration tasks on the backplane switch; all the configurations are performed from the module, which may or may not lead to changes on the backplane switch. For more information on installing an adapter, see the Hardware Installation Guide for the Cisco ISR 4000 Series Integrated Services Routers.

Note Layer 2 protocols, such as the IEEE 802.1D Spanning Tree Protocol (STP), are not supported in the backplane Ethernet switch.

Viewing Module and Interface Card Status on a Router

You can view the module and interface card details using the **show platform** command in privileged EXEC mode.

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

```
Router# show platform
Chassis type: ISR4451/K9

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
0         ISR4451/K9          ok                    15:57:33
 0/0      ISR4451-4X1GE       ok                    15:55:24
 0/3      NIM-SSD             ok                    15:55:24
1         ISR4451/K9          ok                    15:57:33
 1/0      SM-1T3/E3           ok                    15:55:24
2         ISR4451/K9          ok                    15:57:33
 2/0      SM-1T3/E3           ok                    15:55:24
R0        ISR4451/K9          ok, active            15:57:33
F0        ISR4451-FP          ok, active            15:57:33
P0        Unknown             ps, fail              never
P1        XXX-XXXX-XX         ok                    15:56:58
P2        ACS-4450-ASSY       ok                    15:56:58

Slot      CPLD Version        Firmware Version
--------- ------------------- ----------------------------------------
0         12090323            15.3(01r)S            [ciscouser-ISRRO...
1         12090323            15.3(01r)S            [ciscouser-ISRRO...
2         12090323            15.3(01r)S            [ciscouser-ISRRO...
R0        12090323            15.3(01r)S            [ciscouser-ISRRO...
F0        12090323            15.3(01r)S            [ciscouser-ISRRO...
```

Viewing Backplane Switch Statistics

Statistics reports for each slot show incoming and outgoing packets or bytes. You can use the information to check traffic flow on the various ports of the backplane switch. The following example shows a sample output for the **show platform hardware backplaneswitch-manager rp active summary** command:

```
Router# show platform hardware backplaneswitch-manager rp active summary
slot     bay       port         InBytes          InPkts         OutBytes         OutPkts
-------------------------------------------------------------------------------------------
   0       0         CP            6242         9361008             6241          403209
   1       0        GE1               0               0                0               0
   1       0        GE0            6306          407477             6241         9360934
   2       0        GE1               0               0                0               0
   2       0        GE0               0               0                0               0
   0       1        GE1               0               0                0               0
   0       1        GE0               0               0                0               0
   0       2        GE1               0               0                0               0
```

```
0       2       GE0             0               0               0               0
0       3       GE1             0               0               0               0
0       3       GE0             0               0               0               0
0       4       GE1             0               0               0               0
0       4       GE0             0               0               0               0
0       0       FFP             0               0               0               0
0       0       FFP             0               0               0               0
```

Viewing Backplane Switch Port Statistics

You can view statistical information related to the port connected to the backplane switch using the **show platform hardware backplaneswitch-manager rp active subslot GEO statistics** command. The following example displays statistical information related to the backplane switch and ports connected to it:

```
Router# show platform hardware backplaneswitch-manager rp active subslot 1/0 GE0 statistics
Broadcom 1G port(e.g: NIM, ESM, CP) status:
                          Rx pkts         Rx Bytes          Tx Pkts         Tx Bytes
-------------------------------------------------------------------------------------
All                          6306           407477             6241          9360934
  =64                        6237                              72
  65~127                       66                               3
  128~255                       0                               0
  256~511                       1                               3
  512~1023                      2                               0
  1024~1518                     0                            6163
  1519~2047                     0                               0
  2048~4095                     0                               0
  4096~9216                     0                               0
Good                         6306                            6241
  CoS 0                                                      6171          9356426
  CoS 1                                                         0                0
  CoS 2                                                         0                0
  CoS 3                                                         0                0
  CoS 4                                                         0                0
  CoS 5                                                         0                0
  CoS 6                                                        70             4508
  CoS 7                                                         0                0
  Unicast                    6294                            6241
  Multicast                     6                               0
  Broadcast                     6                               0
  Control                       0                               0
  VLAN                          0                               0
Errored
  FCS                           0                               0
  Runts                         0               0
  Undersize                     0
  Ether len                     0
  Fragment                      0                               0
  Jabber                        0                               0
  MTU                           0
Drops
  CoS 0                                                         0                0
  CoS 1                                                         0                0
  CoS 2                                                         0                0
  CoS 3                                                         0                0
  CoS 4                                                         0                0
  CoS 5                                                         0                0
  CoS 6                                                         0                0
  CoS 7                                                         0                0
  STP                           0
  backpress                     0
```

```
  congest                      0               0
  purge/cell                   0
  no destination              65
Pause                          0                              0
```

Viewing Slot Assignments

Use the **show inventory** command in privileged EXEC mode to view the slot assignments, as shown in the following example:

```
Router# show inventory
NAME: "Chassis", DESCR: "Cisco ISR4451 Chassis"
PID: ISR4451/K9        , VID: V01, SN: FGL163910CM

NAME: "Power Supply Module 1", DESCR: "Cisco 4451-X ISR 450W AC Power Supply"
PID: XXX-XXXX-XX       , VID: XXX, SN: DCA1623X05N

NAME: "Fan Tray", DESCR: "Cisco 4451-X ISR Fan tray"
PID: ACS-4450-FANASSY  , VID:    , SN:

NAME: "module 0", DESCR: "Cisco ISR4451 Built-In NIM controller"
PID: ISR4451/K9        , VID:    , SN:

NAME: "NIM subslot 0/1", DESCR: " NIM-1MFT-T1/E1 - T1/E1 Serial Module"
PID:  NIM-1MFT-T1/E1  , VID: V01, SN: FOC16254E71

NAME: "subslot 0/1 db module 0", DESCR: "PVDM4-TDM-280 Voice DSP Module"
PID: PVDM4-TDM-280     , VID: V01, SN: FOC16290GRT

NAME: "NIM subslot 0/0", DESCR: "Front Panel 4 ports Gigabitethernet Module"
PID: ISR4451-X-4x1GE   , VID: V01, SN: JAB092709EL

NAME: "module 1", DESCR: "Cisco ISR4451 Built-In SM controller"
PID: ISR4451/K9        , VID:    , SN:

NAME: "module 2", DESCR: "Cisco ISR4451 Built-In SM controller"
PID: ISR4451/K9        , VID:    , SN:

NAME: "SM subslot 2/0", DESCR: "SM-X-1T3/E3 - Clear T3/E3 Serial Module"
PID: SM-1T3/E3         , VID: V01, SN: FOC15495HSE

NAME: "module R0", DESCR: "Cisco ISR 4451-X Route Processor"
PID: ISR4451/K9        , VID: V01, SN: FOC163679GH

NAME: "module F0", DESCR: "Cisco ISR4451-X Forwarding Processor"
PID: ISR4451/K9        , VID:    , SN:
```

Note Cisco ISR 4321 does not display the serial numbers of power supply and fan tray with the **show inventory** command.

Monitoring and Troubleshooting Modules and Interfaces

Use the following commands in global configuration mode to monitor and troubleshoot the modules and interfaces:

- **show platform**
- **show platform software backplaneswitch-manager RP [active [detail]]**
- **show platform hardware backplaneswitch-manager RPactive CP statistics**
- **show platform hardware backplaneswitch-manager RP active summary**
- **show platform hardware backplaneswitch-manager [R0 [status] | RP]**
- **show diag all eeprom details**

show platform

```
Router# show platform
Chassis type: ISR4451/K9

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
0         ISR4451/K9          ok                    15:57:33
 0/0      ISR4451-4X1GE       ok                    15:55:24
1         ISR4451/K9          ok                    15:57:33
 1/0      SM-1T3/E3           ok                    15:55:24
2         ISR4451/K9          ok                    15:57:33
 2/0      SM-1T3/E3           ok                    15:55:24
R0        ISR4451/K9          ok, active            15:57:33
F0        ISR4451-FP          ok, active            15:57:33
P0        Unknown             ps, fail              never
P1        XXX-XXXX-XX         ok                    15:56:58
P2        ACS-4450-FANASSY    ok                    15:56:58

Slot      CPLD Version        Firmware Version
--------- ------------------- ---------------------------------------
0         12090323            15.3(01r)S            [ciscouser-ISRRO...
1         12090323            15.3(01r)S            [ciscouser-ISRRO...
2         12090323            15.3(01r)S            [ciscouser-ISRRO...
R0        12090323            15.3(01r)S            [ciscouser-ISRRO...
F0        12090323            15.3(01r)S            [ciscouser-ISRRO...
```

Table 1: show platform Field Descriptions

Field	Description
Slot	Slot number
Type	Type of module
State	Status of module
Insert Time	Time since the module has been up and running

show platform software backplaneswitch-manager RP [active [detail]]

```
Router# show platform software backplaneswitch-manager RP active detail
BSM Software Display

 module port   port type  alien type    traf type
-----------------------------------------------
       0/1/0        NGIO       TRUNK         NGIO
       0/1/1        NGIO       TRUNK         NGIO
```

```
       0/2/0        NGIO       TRUNK         NGIO
       0/2/1        NGIO       TRUNK         NGIO
       0/3/0        NGIO       TRUNK         NGIO
       0/3/1       ALIEN       TRUNK         NGIO
       0/4/0        NGIO       TRUNK         NGIO
       0/4/1        NGIO       TRUNK         NGIO
       1/0/0        NGIO       TRUNK         NGIO
       1/0/1        NGIO       TRUNK         NGIO
       2/0/0        NGIO       TRUNK         NGIO
       2/0/1        NGIO       TRUNK         NGIO
```

show platform hardware backplaneswitch-manager RPactive CP statistics

```
Router# show platform hardware backplaneswitch-manager RP active CP statistics
Broadcom 1G port(e.g:  NIM, NGSM, CP) status:
                         Rx pkts         Rx Bytes          Tx Pkts         Tx Bytes
------------------------------------------------------------------------------------------
All                         6242          9361008             6241           403209
  =64                         72                              6178
  65~127                       4                                60
  128~255                      0                                 0
  256~511                      3                                 1
  512~1023                     0                                 2
  1024~1518                 6163                                 0
  1519~2047                    0                                 0
  2048~4095                    0                                 0
  4096~9216                    0                                 0
Good                        6242                              6241
  CoS 0                                                          0               0
  CoS 1                                                          0               0
  CoS 2                                                          0               0
  CoS 3                                                       6241          403209
  CoS 4                                                          0               0
  CoS 5                                                          0               0
  CoS 6                                                          0               0
  CoS 7                                                          0               0
  Unicast                   6241                              6235
  Multicast                    1                                 0
  Broadcast                    0                                 6
  Control                      0                                 0
  VLAN                         0                                 0
Errored
  FCS                          0                                 0
  Runts                        0               0
  Undersize                    0
  Ether len                    0
  Fragment                     0                                 0
  Jabber                       0                                 0
  MTU                          0
Drops
  CoS 0                                                          0               0
  CoS 1                                                          0               0
  CoS 2                                                          0               0
  CoS 3                                                          0               0
  CoS 4                                                          0               0
  CoS 5                                                          0               0
  CoS 6                                                          0               0
  CoS 7                                                          0               0
  STP                          0
  backpress                    0
  congest                      0               0
  purge/cell                   0
  no destination               1
Pause                          0                                 0
```

show platform hardware backplaneswitch-manager RP active summary

```
Router# show platform hardware backplaneswitch-manager RP active summary
  slot     bay          port           InBytes            InPkts         OutBytes  OutPkts

-------------------------------------------------------------------------------------------
     0       0            CP               242                 0                0   0
     1       0           GE1                 0                 0                0   0
     1       0           GE0                 0                 0                0   0
     2       0           GE1                 0                 0                0   0
     2       0           GE0                 0                 0                0   0
     0       1           GE1                 0                 0                0   0
     0       1           GE0                 0                 0                0   0
     0       2           GE1                 0                 0                0   0
     0       2           GE0                 0                 0                0   0
     0       3           GE1                 0                 0                0   0
     0       3           GE0                 0                 0                0   0
     0       4           GE1                 0                 0                0   0
     0       4           GE0                 0                 0                0   0
     0       0           FFP                 0                 0                0   0
```

show platform hardware backplaneswitch-manager [R0 [status] | RP]

```
Router# show platform hardware backplaneswitch-manager R0 status
slot  bay   port   enable   link status   speed(Mbps)   duplex   autoneg   pause_tx
pause_rx   mtu
-----------------------------------------------------------------------------------------------------
0      0     CP     True      Up           1000          Full    ENABLED    ENABLED
ENABLED   10240
1      0     GE1    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
1      0     GE0    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
2      0     GE1    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
2      0     GE0    True      Up           1000          Full    DISABLED   ENABLED
ENABLED   10240
0      1     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      1     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      2     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      2     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      3     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      3     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      4     GE1    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      4     GE0    True     Down          1000          Full    DISABLED   ENABLED
ENABLED   10240
0      0     FFP    True       Up         10000          Full    ENABLED    DISABLED
DISABLED  10240
slot  bay   port            mac    vid   modid     flags - Layer 2
-------------------------------------------------------------------------
0      0     FFP  2c54.2dd2.661b   2351       1              0x20
0      0     FFP  2c54.2dd2.661b   2352       1              0x20
0      0      CP  2c54.2dd2.661e   2351       0              0xC60
0      0      CP  2c54.2dd2.661e   2352       0              0x20
1      0     GE0  58bf.ea3a.00f6   2350       0              0x460
0      0     FFP  2c54.2dd2.661b   2350       1              0x20
1      0     GE0  58bf.ea3a.00f6   2352       0              0x20
```

```
0       0     CP  2c54.2dd2.661e   2350       0              0x20
1       0    GE0  58bf.ea3a.00f6   2351       0              0xC60
Port block masks: rows=from port, columns=to port, u=unknown unicast, m=unknown multicast,
 b=broadcast, A=all

           CP    FFP  1/0/1  1/0/0  2/0/1  2/0/0  0/1/1  0/1/0  0/2/1  0/2/0  0/3/1  0/3/0
  0/4/1 0/4/0 drops
-------------------------------------------------------------------------------------------------------
CP           -     A     um     um     um     um     um     um     um     um     um     um
    um     um     1
FFP          A     -      -      -      -      -      -      -      -      -      -      -
     -      -     0
1/0/1       um    umb      -    umb    umb    umb    umb    umb    umb    umb    umb    umb
   umb    umb     0
1/0/0       um    umb    umb      -    umb    umb    umb    umb    umb    umb    umb    umb
   umb    umb     6
2/0/1       um    umb    umb    umb      -    umb    umb    umb    umb    umb    umb    umb
   umb    umb     0
2/0/0       um    umb    umb    umb    umb      -    umb    umb    umb    umb    umb    umb
   umb    umb     6
0/1/1       um    umb    umb    umb    umb    umb      -    umb    umb    umb    umb    umb
   umb    umb     0
0/1/0       um    umb    umb    umb    umb    umb    umb      -    umb    umb    umb    umb
   umb    umb     0
0/2/1       um    umb    umb    umb    umb    umb    umb    umb      -    umb    umb    umb
   umb    umb     0
0/2/0       um    umb    umb    umb    umb    umb    umb    umb    umb      -    umb    umb
   umb    umb     0
0/3/1       um    umb    umb    umb    umb    umb    umb    umb    umb    umb      -    umb
   umb    umb     0
0/3/0       um    umb    umb    umb    umb    umb    umb    umb    umb    umb    umb      -
   umb    umb     0
0/4/1       um    umb    umb    umb    umb    umb    umb    umb    umb    umb    umb    umb
    -     umb     0
0/4/0       um    umb    umb    umb    umb    umb    umb    umb    umb    umb    umb    umb
   umb      -     0

Port VLAN membership: [untagged vlan] U=untagged T=tagged <VLAN range begin>-<VLAN range
end>

    CP [2352] U:0001-0001 T:0002-2351 U:2352-2352 T:2353-4095
   FFP [2352] T:0001-4095
 1/0/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 1/0/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 2/0/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 2/0/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/1/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/1/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/2/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/2/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/3/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/3/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/4/1 [2352] T:0002-2351 U:2352-2352 T:2353-4095
 0/4/0 [2352] T:0002-2351 U:2352-2352 T:2353-4095
```

show diag all eeprom details

```
Router# show diag all eeprom details
MIDPLANE EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        PCB Serial Number        : FOC15520B7L
        Controller Type          : 1902
```

```
        Hardware Revision        : 1.0
        PCB Part Number          : 73-13854-02
        Top Assy. Part Number    : 800-36894-01
        Board Revision           : 05
        Deviation Number         : 123968
        Fab Version              : 02
        Product Identifier (PID) : ISR4451/K9
        Version Identifier (VID) : V01
        CLEI Code                : TDBTDBTDBT
        Processor type           : D0
        Chassis Serial Number    : FGL1601129D
        Chassis MAC Address      : 30f7.0d53.c7e0
        MAC Address block size   : 144
        Manufacturing Test Data  : 00 00 00 00 00 00 00 00
        Asset ID                 : P1B-R2C
Power/Fan Module P0 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Controller Type          : 1509
        Unknown Field (type 00DF): 1.85.1.236.1
        Deviation Number         : 0
        PCB Serial Number        : DCA1547X037
        RMA Test History         : 00
        RMA Number               : 0-0-0-0
        RMA History              : 00
        Version Identifier (VID) : XXX
        Product Identifier (PID) : XXX-XXXX-XX
        CLEI Code                : 0000000000
        Environment Monitor Data : 41 01 C2 42 00 05 F8 00
                                   50 01 F4 1B 58 03 E8 1F
                                   4A 05 DC 21 34 07 D0 21
                                   FC 09 C4 22 60 0B B8 22
                                   92 0D AC 22 D8 0F A0 22
                                   F8 11 94 22 F6 13 88 23
                                   3C 15 7C 23 28 17 70 23
                                   00 19 64 22 D8 1B 58 22
                                   C4 1D 4C 22 BA 1F 40 22
                                   A6 21 34 22 9C 23 28 22
                                   92 25 1C 22 88 27 10 22
                                   60
        Board Revision           : P0
Power/Fan Module P1 EEPROM data is not initialized

Power/Fan Module P2 EEPROM data is not initialized

Slot R0 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        PCB Serial Number        : FOC15520B7L
        Controller Type          : 1902
        Hardware Revision        : 1.0
        PCB Part Number          : 73-13854-02
        Top Assy. Part Number    : 800-36894-01
        Board Revision           : 05
        Deviation Number         : 123968
        Fab Version              : 02
        Product Identifier (PID) : ISR4451/K9
        Version Identifier (VID) : V01
        CLEI Code                : TDBTDBTDBT
        Processor type           : D0
        Chassis Serial Number    : FGL1601129D
        Chassis MAC Address      : 30f7.0d53.c7e0
```

```
        MAC Address block size   : 144
        Manufacturing Test Data  : 00 00 00 00 00 00 00 00
        Asset ID                 : P1B-R2C
        Asset ID                 :
Slot F0 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Controller Type          : 3567
        Hardware Revision        : 4.1
        PCB Part Number          : 73-12387-01
        MAC Address block size   : 15
        Chassis MAC Address      : aabb.ccdd.eeff
        Product Identifier (PID) : ISR4451-FP
        Version Identifier (VID) : V00
        PCB Serial Number        : FP123456789
        Asset ID                 :
Slot 0 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Controller Type          : 1612
        Hardware Revision        : 4.1
        PCB Part Number          : 73-12387-01
        MAC Address block size   : 15
        Chassis MAC Address      : aabb.ccdd.eeff
        Product Identifier (PID) : ISR4451-NGSM
        Version Identifier (VID) : V00
        PCB Serial Number        : NGSM1234567
        Asset ID                 :
Slot 1 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Controller Type          : 1612
        Hardware Revision        : 4.1
        PCB Part Number          : 73-12387-01
        MAC Address block size   : 15
        Chassis MAC Address      : aabb.ccdd.eeff
        Product Identifier (PID) : ISR4451-NGSM
        Version Identifier (VID) : V00
        PCB Serial Number        : NGSM1234567
        Asset ID                 :
Slot 2 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Controller Type          : 1612
        Hardware Revision        : 4.1
        PCB Part Number          : 73-12387-01
        MAC Address block size   : 15
        Chassis MAC Address      : aabb.ccdd.eeff
        Product Identifier (PID) : ISR4451-NGSM
        Version Identifier (VID) : V00
        PCB Serial Number        : NGSM1234567
        Asset ID                 :
SPA EEPROM data for subslot 0/0:

        EEPROM version           : 5
        Compatible Type          : 0xFF
        Controller Type          : 1902
        Hardware Revision        : 2.2
        Boot Timeout             : 400 msecs
        PCB Serial Number        : JAB092709EL
```

```
        PCB Part Number          : 73-8700-01
        PCB Revision             : A0
        Fab Version              : 01
        RMA Test History         : 00
        RMA Number               : 0-0-0-0
        RMA History              : 00
        Deviation Number         : 78409
        Product Identifier (PID) : ISR4451-4X1GE
        Version Identifier (VID) : V01
        Top Assy. Part Number    : 68-2236-01
        Top Assy. Revision       : A0
        IDPROM Format Revision   : 36
        System Clock Frequency   : 00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00
        CLEI Code                : CNUIAHSAAA
        Base MAC Address         : 00 00 00 00 00 00
        MAC Address block size   : 0
        Manufacturing Test Data  : 00 00 00 00 00 00 00 00
        Field Diagnostics Data   : 00 00 00 00 00 00 00 00
        Calibration Data         : Minimum: 0 dBmV, Maximum: 0 dBmV
              Calibration values :
        Power Consumption        : 13100 mWatts (Maximum)
        Environment Monitor Data : 03 30 0C E4 46 32 09 C4
                                   46 32 05 DC 46 32 05 DC
                                   46 32 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
                                   00 00 FE 02 F9 6E
        Processor Label          : 00 00 00 00 00 00 00
        Platform features        : 00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00
        Asset ID                 :
        Asset Alias              :
SPA EEPROM data for subslot 0/1 is not available

SPA EEPROM data for subslot 0/2 is not available

SPA EEPROM data for subslot 0/3 is not available

SPA EEPROM data for subslot 0/4 is not available

SPA EEPROM data for subslot 1/0 is not available

SPA EEPROM data for subslot 1/1 is not available

SPA EEPROM data for subslot 1/2 is not available

SPA EEPROM data for subslot 1/3 is not available

SPA EEPROM data for subslot 1/4 is not available

SPA EEPROM data for subslot 2/0 is not available

SPA EEPROM data for subslot 2/1 is not available

SPA EEPROM data for subslot 2/2 is not available

SPA EEPROM data for subslot 2/3 is not available

SPA EEPROM data for subslot 2/4 is not available
```

Configuration Examples

This section provides examples of deactivating and activating modules.

Deactivating a Module Configuration: Example

You can deactivate a module to perform OIR of that module. The following example shows how to deactivate a module (and its interfaces) and remove power to the module. In this example, the module is installed in subslot 0 of the router.

```
Router(config)# hw-module slot 1 subslot 1/0 shutdown unpowered
```

Activating a Module Configuration: Example

You can activate a module if you have previously deactivated it. If you have not deactivated a module and its interfaces during OIR, then the module is automatically reactivated upon reactivation of the router.

The following example shows how to activate a module. In this example, the module is installed in subslot 0, located in slot 1 of the router:

```
Router(config)# hw-module slot 1 subslot 1/0 start
```