Cisco High-Speed Intrachassis Module Interconnect (HIMI) Feature Module

This document describes how to use the Cisco High-Speed Intrachassis Module Interconnect (HIMI) feature. The HIMI feature provides the capability to establish a connection between two enhanced network modules (NME) or between the onboard small-form-factor pluggable (SFP) Gigabit Ethernet module and an NME on the Cisco 3825 and Cisco 3845 routers. Currently, Cisco EtherSwitch service modules are the only NMEs that support HIMI.

Contents

Introduction

The HIMI feature provides a dedicated, point-to-point internal connection from an enhanced network module (NME) to another NME or to the onboard Gigabit Ethernet SFP port on a Cisco router. The HIMI feature is a Layer 2 connection that can scale up to 1 Gbps. The HIMI feature supports a maximum of two NMEs per router chassis.

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HIMI Feature Interconnection Modes

There are two Gigabit Ethernet ports on the Cisco 3800 series routers:

- Port 1 (g0/1) is a fixed 10/100/1000BASE-T RJ-45 port.
- Port 0 (g0/0) can be configured as a 10/100/1000BASE-T RJ-45 or an SFP module slot port.

HIMI features are only supported on Gigabit Ethernet port g0/0. Gigabit Ethernet port g0/0 can operate simultaneously in two physical modes through the HIMI feature: RJ-45 mode or SFP mode. You use the **media-type [rj45 | sfp]** interface configuration command to enable either the RJ-45 or SFP mode on port g0/0. RJ-45 is the default. HIMI features work in the following two modes:

- In RJ-45 mode, port g0/0 can still be used to connect to local LAN traffic. In addition, the SFP module port on the router can be internally connected to a NME through the HIMI connection. For example:
  - SFP port g0/0 on the router can be internally connected to an Cisco EtherSwitch service module in slot 1 or 2 in a Cisco 3825 router.
  - SFP port g0/0 on the router can be internally connected to an Cisco EtherSwitch service module in slot 2 or 4 in a Cisco 3845 router.

  This provides an optical Gigabit Ethernet port to a Cisco EtherSwitch service module.
- In SFP mode, the SFP port g0/0 cannot be used in a HIMI connection, however, NMEs can be internally connected through the HIMI feature. For example:
  - The Cisco EtherSwitch service modules in slot 1 and 2 of a Cisco 3825 router can be interconnected.
  - The Cisco EtherSwitch service modules in slot 2 and 4 of a Cisco 3845 router can be interconnected.

  These internal connections trunk the two Cisco EtherSwitch service modules without requiring an external cable.

Note The Cisco EtherSwitch service modules must be in steady state during the HIMI feature interconnection. For steady state information, see the "Cisco EtherSwitch Service Module Configuration" section on page 4.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco IOS software Release 12.4(2)T running on the Cisco 3825 or Cisco 3845 router
- Cisco IOS software Release 12.2(25)EZ running on the Cisco EtherSwitch service module
- Cisco 3825 and Cisco 3845 integrated services routers
- Cisco EtherSwitch service modules
  - NME-16ES-1G
  - NME-X-23ES-1G
  - NME-16ES-1G-P
  - NME-X-23ES-1G-P

- NME-XD-24ES-1S-P
- NME-XD-48ES-2S-P

Note The information presented in this document resulted from the use of devices in a specific lab setup and environment. If you are working in a live network, ensure that you understand the potential impact of any command before you use it.

Configuration

This section describes how to configure a Cisco 3800 series router and the Cisco EtherSwitch service module to use the HIMI feature:

- Router Configuration, page 3
- Cisco EtherSwitch Service Module Configuration, page 4
- Connect to the HIMI Feature, page 4

Router Configuration

This section describes how to configure a Cisco 3800 series router to use the HIMI feature.

When the onboard Gigabit Ethernet SFP port (port g0/0) is used to connect to a Cisco EtherSwitch service module, the RJ-45 Gigabit Ethernet port 0/0 can still be used for routing traffic to other modules and interfaces in the router.

Note To connect the onboard Gigabit Ethernet SFP port (port g0/0) with a Cisco EtherSwitch service module using the HIMI feature, the Gigabit Ethernet 0/0 interface must be placed in RJ-45 mode. This is not necessary when a HIMI connection is set up between two Cisco EtherSwitch service modules.

When the HIMI connection is not used, the onboard Gigabit Ethernet 0/0 interface supports either RJ-45 or SFP connections with external devices, but not at the same time. The Gigabit Ethernet 0/1 interface does not support SFP mode.

Enable the media type (RJ-45) on the router:

```
Cisco3825 (config)# interface gigabitethernet g0/0
Cisco3825 (config-if)# media-type rj45
```

Note For additional information on the commands used in this document, use the Cisco IOS Command Lookup tool. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Cisco EtherSwitch Service Module Configuration

This section describes how to verify a steady state on the service module. This section also describes which Gigabit Ethernet ports to use on the service modules.

You can use the HIMI feature to connect the onboard Gigabit Ethernet SFP port (port g0/0) on the Cisco 3800 series router to Cisco EtherSwitch service modules.

Note Make sure the Cisco EtherSwitch service modules are installed in the router chassis.

Before a connection is made, an RBCP steady state is used to mark the segment status as up or down and show that the router and the Cisco EtherSwitch service module can successfully communicate. Use the **show service-module status** command to verify that the service module is in steady state:

```
service module# show service-module status
Service Module is in STEADY state
```

Once the steady state is established, connect the Gigabit Ethernet port 0/0 on the router to an internal Gigabit Ethernet port on the service module.

The following list shows which internal Gigabit Ethernet port to use on each model of the Cisco EtherSwitch service modules:

- NME-16ES-1G—Gigabit Ethernet port 1/0/1
- NME-X-23ES-1G—Gigabit Ethernet port 1/0/1
- NME-16ES-1G-P—Gigabit Ethernet port 1/0/1
- NME-X-23ES-1G-P—Gigabit Ethernet port 1/0/1
- NME-XD-24ES-1S-P—Gigabit Ethernet port 1/0/1
- NME-XD-48ES-2S-P—Gigabit Ethernet port 1/0/3

Note If the service module is removed or inserted, the HIMI feature is notified of the removal or insertion, and the HIMI feature sets the associated segment to a changed state. The corresponding partner segment is then notified of the change in segment status.

Connect to the HIMI Feature

This procedure describes how to connect the router with a Cisco EtherSwitch service module through the HIMI feature or to connect a Cisco EtherSwitch service module to another Cisco EtherSwitch service module.

SUMMARY STEPS

1. **connect** *connection-name* **module** *interface-name slot/port Channel-ID* **module** *interface-name slot/port Channel-ID*
2. **end**
3. **show connection all**
4. enable
5. **show service-module status**

6. show interface ***interface-name***
7. **no connect** ***connection-name***

DETAILED STEPS

	Command or Action	Purpose
Step 1	**connect** ***connection-name*** **module** ***interface-name slot/port Channel-ID*** **module** ***interface-name slot/port Channel-ID***	Only one channel ID per module is supported at this point in the configuration, so the channel ID will always be 0. The **connect** command also enters the configuration-module-connect mode. **Note** Use the **connect** command either to connect a Cisco 3800 series router to a service module or to connect two service modules.
	Example: `router(config)# connect himi module g2/0 0 module g0/0 0`	Connects the Gigabit Ethernet port on the router to the service module. From the router, enter the **connect** global configuration command to connect Gigabit Ethernet port 0/0 on the router to the service module in slot 2 or 4 of the Cisco 3845 router.
	or **Example:** `router(config)# connect himi module g1/0 0 module g2/0 0`	Connects a service module in slot 1 to a service module is slot 2. From the router, enter the **connect** global configuration command to connect the service module in slot 1 on the Cisco 3845 router to the service module in slot 2 on the Cisco 3845 router.

Step 2	`end`
	Example:
	`router(config-module-conn)# end`
		Returns you to privileged EXEC mode.

Step 3	`show connection all`
	Example:
	`router# show connection all`
		Displays all connections on the router and allows you to verify the Gigabit Ethernet connection through the HIMI feature.

Step 4	**enable** **Example:** `service module> enable`	Enters privileged EXEC mode on the Cisco EtherSwitch service module.

Step 5	`show service-module status`
	Example:
	`service module# show service-module status`
		Displays the status of the Cisco EtherSwitch service module and allows you to verify the connection of the Cisco EtherSwitch service module Gigabit Ethernet port to another Cisco EtherSwitch service module Gigabit Ethernet port.

	Command or Action	Purpose

Step 6	`show interface interface-name`
	
	Example:
	`router(config)# show interface g0/0`
		Displays the status of the specified interface.

Step 7	`no connect connection-name`
	
	Example:
	`router(config)# no connect himi`
		Disables the HIMI connection between the Cisco EtherSwitch service module and the router.

Examples

This section provides the following examples:

- Sample Output for the show connection all Command on the Router, page 6
- Sample Output for the show service-module status Command on the Cisco EtherSwitch Service Module, page 7
- Sample Output for the show interface Command on the Router, page 7

Sample Output for the show connection all Command on the Router

The following example shows the HIMI connection between the onboard Gigabit Ethernet port 0/0 on the router and the Cisco EtherSwitch service module in slot 2:

```
router# show connection all

ID Name Segment 1 Segment 2 State
================================================================================
5 himi GigabitEthernet2/0 0 GigabitEthernet0/0 0 UP
```

Table 1 describes the fields in the output display for the **show connection all** command.

Table 1 show connection all Command Output Fields

Field	Description
id	Connection identifier that uniquely identifies an established connection.
name	Connection name given by the user that uniquely identifies an established connection.

Table 1 show connection all Command Output Fields (continued)

Field	Description
seg-state **module** *channel-id*	Module Channel-ID is the module + Channel-ID combinations (identified as segments by the HIMI feature) specified by the user. The segment states are: • " " A blank display means the segment is UP. • "-" A dash means the segment is DOWN. • "***Card Removed***" means the segment is DETACHED.
conn-state	The state of the connection: • INVALID means the new and undefined connection is invalid. • ADMIN DOWN means the connection has been torn down by the application. • ADMIN UP means the connection is administratively up. • COMING UP means there is no shutdown on the connection. • OPER DOWN means the segments are physically disconnected. • UP means the connection is up and running. • NOT VERIFIED means any of the segments have been detached. • ERR means the state of the connection is unknown.

Sample Output for the show service-module status Command on the Cisco EtherSwitch Service Module

The following example shows using the **show service-module status** privileged EXEC command from the from the Cisco EtherSwitch service module. In the example, the connection between the Cisco EtherSwitch service module Gigabit Ethernet port 1/0/4 and the internal Gigabit Ethernet port 1/0/3 is verified.

```
service module# show service-module status

Service Module is in STEADY state
Service Module target interface is GigabitEthernet1/0/4
Interface GigabitEthernet1/0/3 is connected to BACKPLANE
```

Sample Output for the show interface Command on the Router

The following example shows what appears when you enter the **show interface** command. In this example, Gigabit Ethernet port 0/0 status is shown as well as SFP status participating in the HIMI connection.

```
GigabitEthernet0/0 is up, line protocol is up
SFP in use with an NME in Module Interconnection
Hardware is BCM1125 Internal MAC, address is 0000.0c00.1111 (bia 0005.9a3d.7440)
```

Note If the speed and duplex setting for g0/0 in SFP mode is *speed=1000* and *duplex=full*, autonegotiation is in forced mode and autonegotation is turned off. For all other mode settings of speed or duplex for SFP, autonegotiation is turned on.

If *speed=1000* and *duplex=full* modes are specified for both g0/0 and g0/1 interfaces in copper mode (RJ-45), autonegotiation is still turned on. This is considered to be in forced mode for *speed=1000*. This occurence is per the Annex 28D.5 extensions required for clause 40 (1000-BASE-T) IEEE 802.3.

When the speed and duplex modes are forced for 10/100, and full or half modes are forced for g0/0 and g0/1 interfaces, autonegotiation is turned off. If the interfaces are not in forced mode for 10/100 speeds, then autonegotation will be turned on.

Related Information

- Connecting Cisco EtherSwitch Service Modules chapter in the *Network Modules Hardware Installation Guide* at the following URL:

  http://www.cisco.com/en/US/docs/routers/access/interfaces/nm/hardware/installation/guide/conneths.html

- *Cisco EtherSwitch Service Modules (NME-16ES-1G-P, NME-X-23ES-1G-P, NME-XD-48ES-2S-P, NME-XD-24ES-1S-P)* feature module at the following URL:

  http://www.cisco.com/en/US/docs/ios/12_4/12_4_mainline/srdescn1.html#wp1066992

- *Cisco 3800 Series Hardware Installation* guides at the following URL:

  http://www.cisco.com/en/US/docs/routers/access/3800/hardware/installation/guide/hw.html

- *Cisco 3800 Series Integrated Services Routers Quick Start Guide* at the following URL:

  http://www.cisco.com/en/US/docs/routers/access/3800/hardware/quick/guide/rb_qsg.html

- *Cisco 3800 Series Integrated Services Routers* FAQs at the following URL:

  http://www.cisco.com/en/US/prod/collateral/routers/ps5854/prod_qas0900aecd8028d16a_ps5855_Products_Q_and_A_Item.html