



# Cisco High-Speed Intrachassis Module Interconnect (HIMI) Configuration Guide

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The Cisco High-Speed Intrachassis Module Interconnect (HIMI) feature provides the capability to establish a connection between two Gigabit Ethernet (GE) enhanced network modules (NMEs) or between an onboard small-form-factor pluggable (SFP) GE module and a GE NME on Cisco 3825 and Cisco 3845 routers.

## History for the Cisco High-Speed Intrachassis Module Interconnect (HIMI) Feature

Release	Modification
12.4(2)T	This feature was introduced.
12.4(8)T	Removed <b>no negotiation auto</b> functionality for Cisco 3800 series routers.

## Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. 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.

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## Restrictions for Cisco High-Speed Intrachassis Module Interconnect (HIMI)

Connections can be only established as follows:

- Between the GE port in an installed small-form-factor pluggable (SFP) module on the Cisco 3825 and Cisco 3845 routers
- Between GE interfaces in NME slots 1 and 2 on the Cisco 3825 router
- Between GE interfaces in NME slots 2 and 4 on the Cisco 3845 router



### Note

A module interconnection between the GE port on an SFP module and an NME slot or an NME-to-NME cross-connection is permitted at any given time, but both types of connections cannot exist at the same time.



### Note

Connections between the onboard RJ-45 GE ports and NME slots are not supported.

## Information About Cisco High-Speed Intrachassis Module Interconnect

To configure HIMI connections, you should understand the following concepts:

- [Connection Configuration Mode, page 2](#)
- [System Error Messages for the connect Command, page 3](#)

## Connection Configuration Mode

Cisco 3825 and Cisco 3845 routers provide support for interconnecting NMEs using the router HIMI. This feature provides the new **connect connection-name module Module1 Channel-id1 module Module2 Channel-id2** command for the Cisco IOS command line interface (CLI) that creates an interconnection between GE modules using the HIMI. Connections can be made between the onboard GE port in an SFP module and an NME or between two NMEs.

If the new **connect** command is successfully executed, the router enters connection configuration mode, which is designated by the “config-module-conn” prompt. Once the router is in connection configuration mode, the commands shown in [Table 1](#) can be issued.

**Table 1** Connection Configuration Mode Commands

Command	Description
<b>default</b>	Sets a command to its default values. Has no effect on the <b>connect</b> command functionality.
<b>exit</b>	Exits connection configuration mode. After you exit connection configuration mode, the actual connection establishment phase starts.

**Table 1** Connection Configuration Mode Commands (continued)

Command	Description
<b>shutdown</b>	Shuts down the connection. This command effectively deactivates the connection.
<b>no</b>	Negates a command or sets it to default. The <b>no shutdown</b> command reactivates a previously shut down connection.

To establish a connection, after entering connection configuration mode, issue the **exit** command to return to configuration mode. The connection will be established after you leave connection configuration mode.

## System Error Messages for the connect Command

The following informational error messages appear on the console when something goes wrong during connection establishment or deletion phases:

**Table 2** connect Command System Error Messages

Message	Message Description
%%CONN MODULE: Slot <slot#> is not supported	The slot number you specified is not supported.
%%CONN MODULE: Interconnect endpoints cannot be on the same slot	The modules you are trying to connect cannot be in the same slot.
%%CONN MODULE: Cannot allocate segment memory	Attempts to allocate segment memory have failed.
%%CONN MODULE: Cannot allocate segment data memory	Attempts to allocate segment data memory has failed.
%%CONN MODULE: Cannot allocate element data memory	Attempts to allocate module list element memory have failed.
%%CONN MODULE: Cannot establish connection between same end-points	You have specified the same module for both segments of the <b>connect</b> command.
%%CONN MODULE: Cannot delete a connection that does not exist	You cannot delete a connection that does not exist.
%%CONN MODULE: At least one of the modules is already in use	You are trying to establish a connection to a module that already has a connection configured.
%%CONN MODULE: Invalid connection found	You are trying to establish a connection between two segments that are not modules.
%%CONN MODULE: Media type for interface <interface-e-name> is sfp	A connection cannot be established to GigabitEthernet0/0 when the mediatype is SFP.
%%CONN MODULE: Interface <interface-name>, Channel <channel-id> already in use	You are trying to establish a connection to GigabitEthernet0/0 when a connection to GigabitEthernet0/0 has already been configured.
%%CONN MODULE: Cannot allocate memory for <interface-name> connection setup	Attempts to allocate control message memory for the connection setup or teardown have failed.
%%CONN MODULE: Cannot find <interface-name> Service Module	The specified interface service module cannot be found in the service module database.

# How to Configure HIMI Connections

This section contains the following procedures:

- [Establishing a Connection Between an SFP GE Port and a GE NME Slot, page 4](#)
- [Establishing a Connection Between Two GE NME Slots, page 6](#)
- [Deactivating a HIMI Connection, page 7](#)

## Establishing a Connection Between an SFP GE Port and a GE NME Slot

Follow these steps to establish a connection between an SFP module GE port and a GE NME.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface gigabitethernet 0/0**
4. **media-type rj45**
5. **exit**
6. **connect connection-name module Module1 Channel-id1 module Module2 Channel-id2**
7. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface gigabitethernet 0/0</b>  <b>Example:</b> Router(config)# interface gigabitethernet 0/0	Enters interface configuration mode on the Gigabit Ethernet 0/0 interface.
Step 4	<b>media-type rj45</b>  <b>Example:</b> Router(config-if)# media-type rj45	Sets the media type on the Gigabit Ethernet 0/0 interface to RJ-45.  <b>Note</b> In order to create a connection to the GE port on the SFP module, the media type on the GE interface must be RJ-45. A connection cannot be established if the media type is SFP.

	Command or Action	Purpose
Step 5	<code>exit</code>	Exits interface configuration mode.
	<b>Example:</b> Router(config-if)# <code>exit</code>	
Step 6	<code>connect connection-name module Module1 Channel-id1 module Module2 Channel-id2</code>	Creates the connection identified as <i>connection-name</i> between the GE module <i>Module1</i> and the GE module <i>Module2</i> .
	<b>Example:</b> Router(config)# <code>connect connection1 module GigabitEthernet0/0 0 module GigabitEthernet4/0 0</code>	<b>Note</b> Since this procedure creates a connection between the SFP GE port and an NME, either <i>Module1</i> or <i>Module2</i> must be GigabitEthernet0/0.
		<b>Note</b> On Cisco 3825 and Cisco 3845 routers, only one channel per slot is defined. Therefore, the <i>Channel-id1</i> and <i>Channel-id2</i> variables must always have a value of 0.
		After this command is issued, the router enters connection configuration mode.
Step 7	<code>exit</code>	Exits module configuration mode. After you exit connection configuration mode, the connection establishment begins.
	<b>Example:</b> Router(config-module-conn)# <code>exit</code>	

## Examples

The example below shows the creation of a connection between the SFP GE port and a GE interface on NME slot 4:

```
Router(config)# interface gigabitethernet 0/0
Router(config-if)# media-type rj45
Router(config)# connect connection1 module GigabitEthernet0/0 0 module
GigabitEthernet4/0 0
Router(config-module-conn)# exit
```

## Troubleshooting Tips

In addition to the system error messages listed in the [“System Error Messages for the connect Command”](#) section on page 3, the following commands can help troubleshoot NME connections:

- **show connection all**
- **show connection id** *connection-id*  
where *connection-id* is in the range of 0 to 10000
- **show connection name** *connection-name*
- **show interfaces gigabitethernet 0/0**—If a connection has successfully been established between the SFP module and an NME slot, this command will display the output “SFP in use with an NME in Module Interconnection.”

## Establishing a Connection Between Two GE NME Slots

Follow these steps to establish a connection between two GE NMEs.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **connect** *connection-name* **module** *Module1* *Channel-id1* **module** *Module2* *Channel-id2*
4. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>connect</b> <i>connection-name</i> <b>module</b> <i>Module1</i> <i>Channel-id1</i> <b>module</b> <i>Module2</i> <i>Channel-id2</i>  <b>Example:</b> Router(config)# connect connection1 module GigabitEthernet2/0 0 module GigabitEthernet4/0 0	Creates the connection identified as <i>connection-name</i> between the GE NME slot <i>Module1</i> the GE NME slot <i>Module2</i> .  <b>Note</b> On Cisco 3825 and Cisco 3845 routers, only one channel per slot is defined. Therefore, the <i>Channel-id1</i> and <i>Channel-id2</i> variables must always have a value of 0.  After this command is issued, the router enters module configuration mode.
Step 4	<b>exit</b>  <b>Example:</b> Router(config-module-conn)# exit	Exits module configuration mode. After exiting module configuration mode, the connection establishment begins.

### Examples

The example below shows the creation of a connection between a GE interface on NME slot 2 and a GE interface on NME slot 4:

```
Router(config)# connect connection1 module GigabitEthernet2/0 0 module
GigabitEthernet4/0 0
Router(config-module-conn)# exit
```

## Troubleshooting Tips

In addition to the system error messages listed in the “[System Error Messages for the connect Command](#)” section on page 3, the following commands can help troubleshoot NME connections:

- **show connection all**
- **show connection id** *connection-id*  
where *connection-id* is in the range of 0 to 10000
- **show connection name** *connection-name*
- **show service-module status**—If a connection has successfully been established to an NME slot, this command will display the output “Interface GigabitEthernet <*port\_number*> is connected to BACKPLANE.”

## Deactivating a HIMI Connection

Follow these steps to deactivate a connection between two GE modules.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **no connect** *connection-name*

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>no connect</b> <i>connection-name</i>  <b>Example:</b> Router(config)# no connect connection1	Removes the connection specified by <i>connection-name</i> .

# Configuration Examples for Cisco High-Speed Intrachassis Module Interconnect

This section contains the following examples:

- [Sample Connection Between an SFP GE Port and a GE NME Slot, page 8](#)
- [Sample Connection Between Two GE NME Slots, page 9](#)

## Sample Connection Between an SFP GE Port and a GE NME Slot

The following sample output from a router configuration file shows a connection between the GE port on an SFP module and a GE slot on an NME:

```
Router# show running-config
.
.
.
interface GigabitEthernet0/0
  mac-address 0002.0022.2222
  ip address 192.168.0.2 255.255.255.0
  load-interval 30
  duplex auto
  speed auto
  media-type rj45
.
.
.
interface GigabitEthernet4/0
  ip address 192.168.4.1 255.255.255.0
  !
  ip classless
  ip route 10.10.0.0 255.255.0.0 1.3.0.1
  !
  ip http server
  !
connect connection-1 module GigabitEthernet0/0 0 module GigabitEthernet4/0 0
.
.
```



**Note** Speed and duplex commands do not have any effect in SFP mode. Autonegotiation can be toggled with the **negotiation auto** command.

If the speed and duplex setting for g0/0 in SFP mode on a Cisco 3825 ISR is *speed=1000* and *duplex=full*, the Gigabit Ethernet interface does not work. When the speed setting or the duplex setting is set to auto, the interface functions properly.

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 occurrence 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 autonegotiation will be turned on.

## Sample Connection Between Two GE NME Slots

The following sample output from a router configuration file shows a connection between two GE slots on an NME:

```
Router# show running-config
.
.

interface GigabitEthernet4/0
ip address 192.168.4.1 255.255.255.0
!
ip classless
ip route 10.10.0.0 255.255.0.0 1.3.0.1
!
ip http server
!
connect connection-1 module GigabitEthernet2/0 0 module GigabitEthernet4/0 0
```

## Additional References

The following sections provide references related to the Cisco High-Speed Intrachassis Module Interconnect (HIMI) feature.

## Related Documents

Related Topic	Document Title
Gigabit Ethernet NME configuration	<a href="#">Connecting Cisco EtherSwitch Service Modules chapter in the Cisco Network Modules Hardware Installation Guide</a>
Gigabit Ethernet NME installation and configuration	<a href="#">Cisco EtherSwitch Service Modules Feature Guide</a>
Cisco 3800 Series Integrated Services router installation	<a href="#">Cisco 3800 Series Hardware Installation documents</a> <a href="#">Cisco 3800 Series Integrated Services Routers Quick Start Guide</a>

## Standards

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

## MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

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

## Technical Assistance

Description	Link
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.	<a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a>

## Command Reference

This section documents new and modified commands only.

### New Commands

- **connect (module)**

### Modified Commands

- **show connection**

## connect (module)

To create a connection between two Gigabit Ethernet (GE) enhanced network modules (ENMs) or between the GE port on an installed small-form-factor-pluggable (SFP) module and a GE ENM on a Cisco 3800 series router, use the **connect** command in global configuration mode. To deactivate a connection between two GE modules on a Cisco 3800 series router, use the **no** form of this command.

```
connect connection-name module module1 channel-id1 module module2 channel-id2
```

```
no connect connection-name
```

Syntax Description	
<i>connection-name</i>	Unique name for this connection.
<b>module</b> <i>module1</i> <i>channel-id1</i>	<p>First of the two GE interfaces on the router between which a connection will be created.</p> <ul style="list-style-type: none"> <li>Use the <i>module1</i> argument to identify the GE port number. Use the syntax <b>GigabitEthernet</b><i>slot/port</i>, where <i>slot</i> is the slot number in which the ENM resides, or 0 for the router onboard SFP GE port, and <i>port</i> is either the ENM port number or 0 for the router onboard SFP GE port.</li> </ul> <p>The following interfaces are valid:</p> <ul style="list-style-type: none"> <li>On the Cisco 3825 and Cisco 3845 routers, the GE port in an installed SFP module</li> <li>On the Cisco 3825 router, GE interfaces in ENM slots 1 and 2</li> <li>On the Cisco 3845 router, GE interfaces in ENM slots 2 and 4</li> </ul> <ul style="list-style-type: none"> <li>Use the <i>channel-id1</i> argument to indicate the channel identifier on the interface slots of <i>module1</i>. On Cisco 3800 series routers, there is only one channel identifier, so this value must be 0.</li> </ul>
<b>module</b> <i>module2</i> <i>channel-id2</i>	<p>Second of the two GE interfaces on the router between which a connection will be created.</p> <ul style="list-style-type: none"> <li>Use the <i>module2</i> argument to identify the GE port number. Use the syntax <b>GigabitEthernet</b><i>slot/port</i>, where <i>slot</i> is the slot number in which the ENM resides, or 0 for the onboard SFP GE port, and <i>port</i> is either the ENM port number or 0 for the onboard SFP GE port.</li> </ul> <p>The following interfaces are valid:</p> <ul style="list-style-type: none"> <li>On the Cisco 3825 and Cisco 3845 routers, the GE port in an installed SFP module</li> <li>On the Cisco 3825 router, GE interfaces in ENM slots 1 and 2</li> <li>On the Cisco 3845 router, GE interfaces in ENM slots 2 and 4</li> </ul> <ul style="list-style-type: none"> <li>Use the <i>channel-id2</i> argument to indicate the channel identifier on the interface slots of <i>module2</i>. On Cisco 3800 series routers, there is only one channel identifier, so this value must be 0.</li> </ul>

**Command Default** None

**Command Modes** Global configuration

Command History	Release	Modification
	12.4(2)T	This command was introduced.

**Usage Guidelines** To create a connection between two GE modules on a Cisco 3800 series router using the High-Speed Intrachassis Module Interconnect (HIMI) feature, use the **connect** *connection-name* **module** module1 channel-id1 module2 channel-id2 command in global configuration mode.

Connections can be established only as follows:

- Between the GE ports in an installed SFP module on the Cisco 3825 and Cisco 3845 routers



**Note** The GE interface on the SFP port must be configured as media type “rj45” to establish a connection.

- Between GE interfaces in ENM slots 1 and 2 on the Cisco 3825 router
- Between GE interfaces in ENM slots 2 and 4 on the Cisco 3845 router



**Note** A module interconnection between the GE port on an SFP module and an ENM slot or an ENM-to-ENM cross-connection is permitted at any given time, but both types of connections cannot exist at the same time.



**Note** Connections between the onboard RJ-45 GE ports and ENM slots are not supported.

If the **connect** command is successfully executed, the router enters connection configuration mode, which is designated by the “config-module-conn” prompt. Once the router is in connection configuration mode, the commands shown in [Table 3](#) can be issued.

**Table 3 Connection Configuration Mode Commands**

Command	Description
<b>default</b>	Sets a command to its default values. Has no effect on the <b>connect</b> command functionality.
<b>exit</b>	Exits connection configuration mode. After you exit connection configuration mode, the actual connection establishment phase starts.
<b>shutdown</b>	Shuts down the connection. This command effectively deactivates the connection.
<b>no</b>	Negates a command or sets it to default. The <b>no shutdown</b> command reactivates a previously shut down connection.

To establish a connection, after entering connection configuration mode, issue the **exit** command to return to configuration mode. The connection will be established after you leave connection configuration mode.

---

**Examples**

The following example illustrates the creation of a connection between the onboard port GigabitEthernet0/0 and port GigabitEthernet4/0, which resides in ENM slot 4:

```
Router(config)# connect connection1 module GigabitEthernet0/0 0 module  
GigabitEthernet4/0 0  
Router(config-module-conn)# exit
```

---

**Related Commands**

Command	Description
<b>show connection</b>	Displays the status of interworking connections.

## show connection

To display the status of interworking connections, use the **show connection** command in privileged EXEC mode.

```
show connection [all | element | id ID | name name | port port]
```

Syntax Description		
<b>all</b>	(Optional)	Displays information about all interworking connections.
<i>element</i>	(Optional)	Displays information about the specified connection element.
<b>id</b> <i>ID</i>	(Optional)	Displays information about the specified connection identifier.
<b>name</b> <i>name</i>	(Optional)	Displays information about the specified connection name.
<b>port</b> <i>port</i>	(Optional)	Displays information about all connections on an interface. (In the 12.0S train, only ATM, Serial, and Fast Ethernet are shown.)

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.1(2)T	This command was introduced as <b>show connect</b> (FR-ATM).
	12.0(27)S	This command was integrated into Cisco IOS Release 12.0(27)S and updated to show all ATM, Serial, and Fast Ethernet interworking connections.
	12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
	12.4(2)T	Added output of Segment 1 and Segment 2 fields for Segment state and channel ID.
	12.0(30)S	This command was integrated into Cisco IOS Release 12.0(30)S.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.4(8)	This command was integrated into Cisco IOS Release 12.4(8).

### Examples

The following example shows the local interworking connections on a router:

```
Router# show connection
```

```

ID   Name           Segment 1           Segment 2           State
=====
1    conn1          ATM 1/0/0 AAL5 0/100  ATM 2/0/0 AAL5 0/100  UP
2    conn2          ATM 2/0/0 AAL5 0/300  Serial0/1 16          UP
3    conn3          ATM 2/0/0 AAL5 0/400  FA 0/0.1 10          UP
4    conn4          ATM 1/0/0 CELL 0/500  ATM 2/0/0 CELL 0/500  UP
5    conn5          ATM 1/0/0 CELL 100    ATM 2/0/0 CELL 100    UP

```

[Table 4](#) describes the significant fields shown in the display.

**Table 4** *show connection Field Descriptions*

Field	Description
ID	Arbitrary connection identifier assigned by the operating system.
Name	Name of the connection.
Segment 1 Segment 2	Information about the interworking segments, including: <ul style="list-style-type: none"> <li>• Interface name and number.</li> <li>• Segment state, interface name and number, and channel ID. Segment state will display nothing if the segment state is UP, “-” if the segment state is DOWN, and “***Card Removed***” if the segment state is DETACHED.</li> <li>• Type of encapsulation (if any) assigned to the interface.</li> <li>• Permanent virtual circuit (PVC) assigned to the ATM interface, DLCI assigned to the serial interface, or VLAN ID assigned to the Ethernet interface.</li> </ul>
State or Status	Status of the connection, including the following states: INVALID, UP, ADMIN UP, ADMIN DOWN, OPER DOWN, COMING UP, NOT VERIFIED, ERR.

**Related Commands**

Command	Description
<b>show atm pvc</b>	Displays the status of ATM PVCs and SVCs.
<b>show frame-relay pvc</b>	Displays the status of Frame Relay interfaces.

