Configuring Multi-Gigabit Fabric Communication

Cisco 3900 series, Cisco 2900 series, and Cisco 1900 series ISRs use a multi-gigabit fabric (MGF) for the new modules and interface cards to inter-communicate on the router. Legacy modules that support Cisco High-Speed Intrachassis Module Interconnect (HIMI) also support the MGF. Next generation module drivers integrate with the MGF to perform port configurations, configure packet flow, and control traffic buffering. On the router-side, there are no user-configurable features on the MGF. All configurations are performed from the module, which may or may not lead to changes on the MGF.

Modules and interface cards inter-communicate using the MGF on the router with or without CPU involvement. Modules and interface cards that communicate without CPU involvement reduce load and increase performance on the router. Modules and interface cards that do not utilize the MGF communicate with the CPU using the PCI Express (PCIe) link.

The following sections describe module and interface card communication through the MGF:

Restrictions for Module and Interface Card Communication

Cisco 1941W

The wireless LAN (WLAN) module is only supported on the Cisco 1941W ISR.

Maximum Number of Legacy Switch Modules

A maximum of two integrated switch modules are supported when a legacy module is present in the system. In this scenario, the two switch modules have to be externally stacked.

Supported Slots, Modules, and Interface Cards

The following slots support communication through the MGF:

- Service module (SM)
- Enhanced high-speed WAN interface card (EHWIC)
- Internal service module (ISM)

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The following modules and interface cards support communication through the MGF:

Cisco 3900 Series, Cisco 2900 Series, and Cisco 1900 Series Integrated Services Routers support legacy interface cards and modules. Some modules will require an adapter. See your router's hardware installation guide at Cisco.com for adapter installation information.

See the routers's Product page at Cisco.com for a complete list of supported new and legacy modules.

Wireless LAN Module in the Cisco 1941W ISR

When configured as an autonomous access point, the wireless LAN (WLAN) device serves as the connection point between wireless and wired networks or as the center point of a stand-alone wireless network. In large installations, wireless users within radio range of a device can roam throughout a facility while maintaining seamless and uninterrupted access to the network.

Cisco 1941W supports ISM-to-EHWIC communication with an integrated switch communicating through the MGF. In this scenario traffic goes from the WLAN, through the Multi-Gigabit Fabric's CPU port, and out through a port on the front panel.

Cisco Etherswitch Service Modules

The following Cisco EtherSwitch service modules provide Cisco modular access routers the ability to stack Cisco EtherSwitch service modules as Layer 2 switches using Cisco StackWise technology.

- NME-16ES-1G
- NME-16ES-1G-P
- NME-X-23ES-1G
- NME-X-23ES-1G-P
- NME-XD-48ES-2S-P
- NME-XD-24ES-1S-P

The Cisco EtherSwitch service modules are supported by either the IP base image (formerly known as standard multilayer image [SMI]) or the IP services image (formerly known as the enhanced multilayer image [EMI]).

The IP base image provides Layer 2+ features, including access control lists, quality of service (QoS), static routing, and the Routing Information Protocol (RIP). The IP services image provides a richer set of enterprise-class features, including Layer 2+ features and full Layer 3 routing (IP unicast routing, IP multicast routing, and fallback bridging). To distinguish it from the Layer 2+ static routing and RIP, the IP services image includes protocols such as the Enhanced Interior Gateway Routing Protocol (EIGRP) and the Open Shortest Path First (OSPF) Protocol.

Cisco 3900 Series, Cisco 2900 Series, and Cisco 1900 Series Integrated Services Routers support the following Cisco EtherSwitch service modules for SM-to-SM or SM-to-ISM communication.

- NME-16ES-1G
- NME-16ES-1G-P
- NME-X-23ES-1G
- NME-X-23ES-1G-P

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

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

See the *Cisco EtherSwitch Feature Guide* documentation at Cisco.com for configuration details, http://www.cisco.com/en/US/docs/ios/12_3t/12_3t14/feature/guide/miragenm.html#wp1787811.

Cisco High-Speed Intrachassis Module Interconnect (HIMI)

Cisco 3900 series and Cisco 2900 series routers use Cisco High-Speed Intrachassis Module Interconnect (HIMI) to support SM-to-SM or SM-to-ISM communication through the MGF.

Use the **connect** *connection-name* **module** *Module1 Channel-id1* **module** *Module2 Channel-id2* command to establish a maximum of two HIMI connections on the Cisco 3900 series ISR routers and one HIMI connection on Cisco 2900 series andCisco 1900 series ISRs. Module 1 and Module 2 are the slot/port of the two modules. The *Channel-id1* and *Channel-id2* variables must always have a value of 0.

When two modules are configured in a HIMI connection, the modules cannot send traffic to any other module except its HIMI-dedicated partner.

See *Cisco High-Speed Intrachassis Module Interconnect (HIMI) Configuration Guide* at Cisco.com for detailed configuration instructions, http://www.cisco.com/en/US/docs/ios/12_4/12_4_mainline/srdesfm1.html.

Note   See the module documentation to validate HIMI support.

Using HIMI for VLAN Traffic Flows

For HIMI configurations, the port-level VLAN memberships are ignored on the Multi-Gigabit Fabric (MGF). Use the **connect** *connection-name* **module** *module1 vlan-id* **module** *module2* command to redirect VLAN traffic flows from SM-to-SM or SM-to-ISM connections on the MGF.

The following two modules, as well as others, support VLAN traffic redirection:

- Cisco Etherswitch service module

- Cisco Services Ready Engine internal service module (ISM-SRE)

Note   See the module documentation to validate HIMI support.

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Viewing Platform Information

The following sections explain how to view VLAN, slot, module, interface card, and MGF statistics on the router.

- Viewing VLAN and Slot Assignments, page 214
- Viewing Module and Interface Card Status on the Router, page 214
- Viewing Multi-Gigabit Fabric Statistics, page 215

Viewing VLAN and Slot Assignments

Slots on the router are optionally assigned to VLANs. From privileged EXEC mode, enter the **show platform mgf** command, then press Enter to display VLAN and slot assignments on the router. An asterisk next to the slot indicates that the vlan is the slot's default VLAN. The following example displays output from a Cisco 3945 ISR.

Note   VLAN1 is the default when no other VLAN are listed.

```
Router# show platform mgf
VLAN    Slots
-------------------------------------------------------------
1       ISM*, EHWIC-0*, EHWIC-1*, EHWIC-2*, EHWIC-3*
        PVDM-0*, PVDM-1*, PVDM-2*, PVDM-3*, SM-1*
        SM-2*, SM-3*, SM-4*
```

Viewing Module and Interface Card Status on the Router

Multi-gigabit Fabric (MGF) displays module and interface card details. To show the details of the MGF, use the **show platform mgf** command in privileged EXEC mode.

The following example displays the output for the **show platform mgf module** command when entered on a Cisco 3945 ISR. Table 1 on page 215 displays the information code that appears in the output.

```
Router# show platform mgf module
Registered Module Information
Code:   NR - Not Registered, TM - Trust Mode, SP - Scheduling Profile
        BL - Buffer Level, TR - Traffic Rate, PT - Pause Threshold

slot    vlan    type/ID         TM      SP      BL      TR      PT
----    ----    ----------      ------- ---     ------  -----   ----
ISM     NR
EHWIC-0 NR
EHWIC-1 NR
EHWIC-2 NR
EHWIC-3 NR
PVDM-0  NR
PVDM-1  NR
PVDM-2  NR
PVDM-3  NR
SM-1    1       SM/6            UP      1       high    1000    high
SM-2    1       SM/6            UP      1       high    1000    high
SM-3    NR
SM-4    NR
```

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Table 1 Show Platform MGF Module Information Code

Code	Description
NR	Not registered
TM	Trust mode (User Priority [UP] or Differentiated Service Code [DSCP])
SP	Scheduling profile
BL	Buffer level
TR	Traffic rate
PT	Pause threshold level

Viewing Multi-Gigabit Fabric Statistics

Statistics reports for each slot show packet performance and packet failures. The following example displays output from the **show platform mgf statistics** command when entered on a Cisco 1941 ISR.

```
Router# show platform mgf statistics

Interface statistics for slot: ISM (port 1)
-------------------------------------------------------
30 second input rate 0 packets/sec
30 second output rate 0 packets/sec
0 packets input, 0 bytes, 0 overruns
Received 0 broadcasts, 0 multicast, 0 unicast 0 runts, 0 giants, 0 jabbers 0 input errors,
0 CRC, 0 fragments, 0 pause input 0 packets output, 0 bytes, 0 underruns 0 broadcast, 0
multicast, 0 unicast 0 late collisions, 0 collisions, 0 deferred 0 bad bytes received, 0
multiple, 0 pause output

Interface statistics for slot: EHWIC-0 (port 2)
-------------------------------------------------------
30 second input rate 13844 packets/sec
30 second output rate 13844 packets/sec
3955600345 packets input, 1596845471340 bytes, 26682 overruns Received 0 broadcasts, 0
multicast, 3955600345 unicast 0 runts, 0 giants, 0 jabbers 0 input errors, 0 CRC, 0
fragments, 0 pause input
3955738564 packets output, 1596886171288 bytes, 0 underruns 0 broadcast, 0 multicast,
3955738564 unicast 0 late collisions, 0 collisions, 0 deferred 0 bad bytes received, 0
multiple, 94883 pause output

Interface statistics for slot: EHWIC-1 (port 3)
-------------------------------------------------------
30 second input rate 13844 packets/sec
30 second output rate 13844 packets/sec
3955973016 packets input, 1598763291608 bytes, 26684 overruns Received 0 broadcasts, 0
multicast, 3955973016 unicast 0 runts, 0 giants, 0 jabbers 0 input errors, 0 CRC, 0
fragments, 0 pause input 3955781430 packets output, 1598708166660 bytes, 0 underruns 0
broadcast, 0 multicast, 3955781430 unicast 0 late collisions, 0 collisions, 0 deferred 0
bad bytes received, 0 multiple, 94987 pause output
```

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Viewing Multi-Gigabit Fabric CPU Port Statistics

Multi-Gigabit Fabric's CPU port statistics display details about the hardware status, data transmission rate, line type, protocols, and packets. The following example displays output for the **show platform mgf statistics cpu** command when entered on a Cisco 3945 ISR.

```
Router# show platform mgf statistics cpu
Backplane-GigabitEthernet0/3 is up, line protocol is up
  Hardware is PQ3_TSEC, address is 001b.5428.d403 (bia 001b.5428.d403)
  MTU 9600 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Full-duplex, 1000Mb/s, media type is internal
  output flow-control is unsupported, input flow-control is unsupported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 0 multicast, 0 pause input
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out Interface statistics for CPU:
(port 0)
----------------------------------------------------
30 second input rate 0 packets/sec
30 second output rate 0 packets/sec
0 packets input, 0 bytes, 0 overruns
Received 0 broadcasts, 0 multicast, 0 unicast 0 runts, 0 giants, 0 jabbers 0 input errors,
0 CRC, 0 fragments, 0 pause input 0 packets output, 0 bytes, 0 underruns 0 broadcast, 0
multicast, 0 unicast 0 late collisions, 0 collisions, 0 deferred 0 bad bytes received, 0
multiple, 0 pause output
```

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