

CHAPTER 43

Configuring IPv4 for Gigabit Ethernet Interfaces

Cisco MDS 9000 Family switches support IP version 4 (IPv4) on Gigabit Ethernet interfaces. This chapter describes how to configure IPv4 addresses and other IPv4 features.

This chapter includes the following topics:

- [Information About IPv4 section, page 43-1](#)
- [Licensing Requirements for IPv4 for Gigabit Ethernet Interfaces section, page 43-3](#)
- [Guidelines and Limitations section, page 43-4](#)
- [Default Settings section, page 43-4](#)
- [Configuring IPv4 section, page 43-4](#)
- [Verifying IPV4 Configuration section, page 43-9](#)
- [Configuration Examples for IPV4 section, page 43-11](#)
- [Additional References section, page 43-12](#)

Information About IPv4

Cisco MDS 9000 Family supports IP version 4 (IPv4) on Gigabit Ethernet interfaces. Both FCIP and iSCSI rely on TCP/IP for network connectivity. On each IPS module or MPS-14/2 module, connectivity is provided in the form of Gigabit Ethernet interfaces that are appropriately configured.

A new port mode, called IPS, is defined for Gigabit Ethernet ports on each IPS module or MPS-14/2 module. IP storage ports are implicitly set to IPS mode, so it can only be used to perform iSCSI and FCIP storage functions. IP storage ports do not bridge Ethernet frames or route other IP packets.

Each IPS port represents a single virtual Fibre Channel host in the Fibre Channel SAN. All the iSCSI hosts connected to this IPS port are merged and multiplexed through the single Fibre Channel host.



Note

The Gigabit Ethernet interfaces on the MPS-14/2 module do not support EtherChannel.

Both FCIP and iSCSI rely on TCP/IP for network connectivity. On each IPS module or MPS-14/2 module, connectivity is provided in the form of Gigabit Ethernet interfaces that are appropriately configured. This section covers the steps required to configure IP for subsequent use by FCIP and iSCSI.



Note

For information about configuring FCIP, see [Chapter 38, “Configuring FCIP.”](#) For information about configuring iSCSI, see [Chapter 40, “Configuring iSCSI.”](#)

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Each IPS port represents a single virtual Fibre Channel host in the Fibre Channel SAN. All the iSCSI hosts connected to this IPS port are merged and multiplexed through the single Fibre Channel host.

In large scale iSCSI deployments where the Fibre Channel storage subsystems do not require explicit LUN access control for every host device, use of proxy-initiator mode simplifies the configuration.

**Note**

The Gigabit Ethernet interfaces on the MPS-14/2 module do not support EtherChannel.

**Note**

To configure IPv6 on a Gigabit Ethernet interface, see the [“Configuring IPv6 Addressing and Enabling IPv6 Routing”](#) section on page 44-14.

**Tip**

Gigabit Ethernet ports on any IPS module or MPS-14/2 module should not be configured in the same Ethernet broadcast domain as the management Ethernet port. They should be configured in a different broadcast domain, either by using separate standalone hubs or switches or by using separate VLANs.

This section includes the following topics:

- [Interface Descriptions](#) section, page 43-2
- [Beacon Mode](#) section, page 43-2
- [About VLANs for Gigabit Ethernet](#) section, page 43-2
- [Interface Subnet Requirements](#) section, page 43-3

Interface Descriptions

See the *Interfaces Configuration Guide, Cisco DCNM for SAN* Cisco MDS 9000 Family NX-OS *Interfaces Configuration Guide* for details on configuring the switch port description for any interface.

Beacon Mode

See the *Interfaces Configuration Guide, Cisco DCNM for SAN* Cisco MDS 9000 Family NX-OS *Interfaces Configuration Guide* for details on configuring the beacon mode for any interface.

About VLANs for Gigabit Ethernet

Virtual LANs (VLANs) create multiple virtual Layer 2 networks over a physical LAN network. VLANs provide traffic isolation, security, and broadcast control.

Gigabit Ethernet ports automatically recognize Ethernet frames with IEEE 802.1Q VLAN encapsulation. If you need to have traffic from multiple VLANs terminated on one Gigabit Ethernet port, configure subinterfaces—one for each VLAN.

**Note**

If the IPS module or MPS-14/2 module is connected to a Cisco Ethernet switch, and you need to have traffic from multiple VLANs coming to one IPS port, verify the following requirements on the Ethernet switch:

- The Ethernet switch port connected to the IPS module or MPS-14/2 module is configured as a trunking port.
- The encapsulation is set to 802.1Q and not ISL, which is the default.

Use the VLAN ID as a subscription to the Gigabit Ethernet interface name to create the subinterface name:

slot-number / port-number.VLAN-ID

Interface Subnet Requirements

Gigabit Ethernet interfaces (major), subinterfaces (VLAN ID), and management interfaces (mgmt 0) can be configured in the same or different subnet depending on the configuration (see [Table 43-1](#)).

Table 43-1 Subnet Requirements for Interfaces

| Interface 1 | Interface 2 | Same Subnet Allowed | Notes |
|--------------------------|--------------------------|---------------------|--|
| Gigabit Ethernet 1/1 | Gigabit Ethernet 1/2 | Yes | Two major interfaces can be configured in the same or different subnets. |
| Gigabit Ethernet 1/1.100 | Gigabit Ethernet 1/2.100 | Yes | Two subinterfaces with the same VLAN ID can be configured in the same or different subnets. |
| Gigabit Ethernet 1/1.100 | Gigabit Ethernet 1/2.200 | No | Two subinterfaces with different VLAN IDs cannot be configured in the same subnet. |
| Gigabit Ethernet 1/1 | Gigabit Ethernet 1/1.100 | No | A subinterface cannot be configured on the same subnet as the major interface. |
| mgmt0 | Gigabit Ethernet 1/1.100 | No | The mgmt0 interface cannot be configured in the same subnet as the Gigabit Ethernet interfaces or subinterfaces. |
| mgmt0 | Gigabit Ethernet 1/1 | No | |

**Note**

The configuration requirements in [Table 43-1](#) also apply to Ethernet PortChannels.

Licensing Requirements for IPv4 for Gigabit Ethernet Interfaces

The following table shows the licensing requirements for this feature:

| License | License Description |
|-------------------------------------|--------------------------------------|
| Enterprise package (ENTERPRISE_PKG) | It comprises IPsec and IKE for IPv4. |

Guidelines and Limitations

Follow these guidelines when configuring IPv4-ACLs for Gigabit Ethernet interfaces:

- Only use Transmission Control Protocol (TCP) or Internet Control Message Protocol (ICMP).



Note

Other protocols such as User Datagram Protocol (UDP) and HTTP are not supported in Gigabit Ethernet interfaces. Applying an ACL that contains rules for these protocols to a Gigabit Ethernet interface is allowed but those rules have no effect.

- Apply IPv4-ACLs to the interface before you enable an interface. This ensures that the filters are in place before traffic starts flowing.
- Be aware of the following conditions:
 - If you use the **log-deny** option, a maximum of 50 messages are logged per second.
 - The **established** option is ignored when you apply IPv4-ACLs containing this option to Gigabit Ethernet interfaces.
 - If an IPv4-ACL rule applies to a pre-existing TCP connection, that rule is ignored. For example if there is an existing TCP connection between A and B and an IPv4-ACL which specifies dropping all packets whose source is A and destination is B is subsequently applied, it will have no effect.



Tip

If IPv4-ACLs are already configured in a Gigabit Ethernet interface, you cannot add this interface to an Ethernet PortChannel group.

Default Settings

Table 43-2 lists the default settings for IPv4 parameters.

Table 43-2 *Default IPv4 Parameters*

| Parameters | Default |
|---------------------|-----------------------------------|
| IPv4 MTU frame size | 1500 bytes for all Ethernet ports |
| Autonegotiation | Enabled |
| Promiscuous mode | Disabled |

Configuring IPv4

This section includes the following topics:

- [Configuring Gigabit Ethernet Interface section, page 43-5](#)
- [Configuring Autonegotiation section, page 43-5](#)
- [Configuring the MTU Frame Size section, page 43-6](#)
- [Configuring Promiscuous Mode section, page 43-7](#)

- [Configuring the VLAN Subinterface section, page 43-7](#)
- [Configuring Static IPv4 Routing section, page 43-8](#)
- [Applying IPv4-ACLs on Gigabit Ethernet Interfaces section, page 43-8](#)
- [Clearing ARP Cache section, page 43-9](#)

Configuring Gigabit Ethernet Interface

To configure the Gigabit Ethernet interface, follow these steps:

-
- Step 1** Expand **Switches > Interfaces > Ethernet > IPS**.
You see the Gigabit Ethernet Configuration in the Information pane.
- Step 2** Click the **IP Addresses** tab.
- Step 3** Click **Create Row**.
You see the Create Gigabit Ethernet Interface dialog box.
- Step 4** Select the switch on which you want to create the Gigabit Ethernet interface.
- Step 5** Enter the interface. For example, 2/2 for slot 2, port 2.
- Step 6** Enter the IPv4 address (10.1.1.100) and subnet mask (255.255.255.0).
- Step 7** Click **Create** to save these changes or click **Close** to discard any unsaved changes.
-

Configuring Autonegotiation

By default, autonegotiation is enabled all Gigabit Ethernet interface. You can enable or disable autonegotiation for a specified Gigabit Ethernet interface. When autonegotiation is enabled, the port automatically detects the speed or pause method, and duplex of incoming signals based on the link partner. You can also detect link up conditions using the autonegotiation feature.

To configure autonegotiation, follow these steps:

| | Command | Purpose |
|---------------|--|---|
| Step 1 | switch# config terminal switch(config)# | Enters configuration mode. |
| Step 2 | switch(config)# interface gigabitethernet 2/2 switch(config-if)# | Enters the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2). |
| Step 3 | switch(config-if)# switchport auto-negotiate | Enables autonegotiation for this Gigabit Ethernet interface (default). |
| | switch(config-if)# no switchport auto-negotiate | Disables autonegotiation for this Gigabit Ethernet interface. |

To configure autonegotiation, follow these steps:

-
- Step 1** Expand **Switches > Interfaces > Ethernet > IPS**.
You see the Gigabit Ethernet Configuration in the Information pane.
- Step 2** In the General tab, you can enable or disable the Auto Negotiate option for a specific switch.
- Step 3** Click **Apply Changes**.
-

Configuring the MTU Frame Size

You can configure the interfaces on a switch to transfer large (or jumbo) frames on a port. The default IP maximum transmission unit (MTU) frame size is 1500 bytes for all Ethernet ports. By configuring jumbo frames on a port, the MTU size can be increased up to 9000 bytes.



Note The minimum MTU size is 576 bytes.



Tip MTU changes are disruptive, all FCIP links and iSCSI sessions flap when the software detects a change in the MTU size.

You do not need to explicitly issue the **shutdown** and **no shutdown** commands.

To configure the MTU frame size, follow these steps:

| | Command | Purpose |
|---------------|--|---|
| Step 1 | switch# config terminal switch(config)# | Enters configuration mode. |
| Step 2 | switch(config)# interface gigabitethernet 2/2 switch(config-if)# | Enters the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2). |
| Step 3 | switch(config-if)# switchport mtu 3000 | Changes the MTU size to 3000 bytes. The default is 1500 bytes. |

To configure the MTU frame size, follow these steps:

-
- Step 1** Expand **Switches > Interfaces > Ethernet > IPS**.
You see the Gigabit Ethernet Configuration in the Information pane.
- Step 2** In the General tab, in the Mtu column, you can enter a new value to configure the MTU Frame Size for a specific switch. For example 3000 bytes. The default is 1500 bytes.
- Step 3** Click **Apply Changes**.
-

Configuring Promiscuous Mode

You can enable or disable promiscuous mode on a specific Gigabit Ethernet interface. By enabling the promiscuous mode, the Gigabit Ethernet interface receives all the packets and the software then filters and discards the packets that are not destined for that Gigabit Ethernet interface.

To configure the promiscuous mode, follow these steps:

| | Command | Purpose |
|--------|--|---|
| Step 1 | switch# config terminal switch(config)# | Enters configuration mode. |
| Step 2 | switch(config)# interface gigabitethernet 2/2 switch(config-if)# | Enters the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2). |
| Step 3 | switch(config-if)# switchport promiscuous-mode on | Enables promiscuous mode for this Gigabit Ethernet interface. The default is off . |
| | switch(config-if)# switchport promiscuous-mode off | Disables (default) promiscuous mode for this Gigabit Ethernet interface. |
| | switch(config-if)# no switchport promiscuous-mode | Disables (default) the promiscuous mode for this Gigabit Ethernet interface. |

To configure the promiscuous mode, follow these steps:

-
- Step 1** Expand **Switches > Interfaces > Ethernet > IPS**.
You see the Gigabit Ethernet Configuration in the Information pane.
 - Step 2** In the General tab, you can enable or disable the Promiscuous Mode option for a specific switch.
 - Step 3** Click **Apply Changes**.
-

Configuring the VLAN Subinterface

To configure a VLAN subinterface (VLAN ID), follow these steps:

| | Command | Purpose |
|--------|--|---|
| Step 1 | switch# config terminal switch(config)# | Enters configuration mode. |
| Step 2 | switch(config)# interface gigabitethernet 2/2.100 switch(config-if)# | Specifies the subinterface on which 802.1Q is used (slot 2, port 2, VLAN ID 100). Note The subinterface number, 100 in this example, is the VLAN ID. The VLAN ID ranges from 1 to 4093. |
| Step 3 | switch(config-if)# ip address 10.1.1.101 255.255.255.0 | Enters the IPv4 address (10.1.1.100) and subnet mask (255.255.255.0) for the Gigabit Ethernet interface. |
| Step 4 | switch(config-if)# no shutdown | Enables the interface. |

To configure a VLAN subinterface (VLAN ID) using Device Manager, follow these steps:

-
- Step 1** Select **Interface > Ethernet and iSCSI**.
 - Step 2** Click the **Sub Interfaces** tab.
 - Step 3** Select the Gigabit Ethernet subinterface on which 802.1Q should be used.
 - Step 4** Click the **Edit IP Address** button.
 - Step 5** Enter the IPv4 address and subnet mask for the Gigabit Ethernet interface.
 - Step 6** Click **Create** to save the changes or you may click **Close**.
-

Configuring Static IPv4 Routing

To configure static IPv4 routing (see [Figure 43-1](#)) through the Gigabit Ethernet interface, follow these steps:

| | Command | Purpose |
|---------------|---|---|
| Step 1 | switch# config terminal switch(config)# | Enters configuration mode. |
| Step 2 | switch(config)# ip route 10.100.1.0 255.255.255.0 10.1.1.1 switch(config-if)# | Enters the IP subnet (10.100.1.0 255.255.255.0) of the IP host and configures the next hop 10.1.1.1, which is the IPv4 address of the router connected to the Gigabit Ethernet interface. |

Applying IPv4-ACLs on Gigabit Ethernet Interfaces

To apply an IPv4-ACL on a Gigabit Ethernet interface, follow these steps:

| | Command | Purpose |
|---------------|--|--|
| Step 1 | switch# config t | Enters configuration mode. |
| Step 2 | switch(config)# interface gigabitethernet 3/1 switch(config-if)# | Configures a Gigabit Ethernet interface (3/1). |
| Step 3 | switch(config-if)# ip access-group SampleName | Applies the IPv4-ACL SampleName on Gigabit Ethernet 3/1 for both ingress and egress traffic (if the association does not exist already). |
| Step 4 | switch(config-if)# ip access-group SampleName1 in | Applies the IPv4-ACL SampleName on Gigabit Ethernet 3/1 for ingress traffic. |
| | switch(config-if)# ip access-group SampleName2 out | Applies the IPv4-ACL SampleName on Gigabit Ethernet 3/1 for egress traffic (if the association does not exist already). |

Clearing ARP Cache

The ARP cache can be cleared in two ways: clearing just one entry or clearing all entries in the ARP cache.

Use the **clear ips arp** command to clear the ARP cache. See [Example 43-1](#) and [Example 43-2](#).

Examples

Example 43-1 Clearing One ARP Cache Entry

```
switch# clear ips arp address 10.2.2.2 interface gigabitethernet 8/7
arp clear successful
```

Example 43-2 Clearing All ARP Cache Entries

```
switch# clear ips arp interface gigabitethernet 8/7
arp clear successful
```

Verifying IPV4 Configuration

To display IPv4 configuration information, perform one of the following tasks:

| Command | Purpose |
|---|---|
| ping 10.100.1.25 | Verifies gigabit ethernet connectivity. |
| show ips ip route interface gig 8/1 | Displays the IP route table. |
| show ips arp interface gigabitethernet 7/1 | Displays ARP caches. |
| clear ips arp address 10.2.2.2 interface gigabitethernet 8/7 | Clears one ARP cache entry. |
| clear ips arp interface gigabitethernet 8/7 | Clears all ARP cache entries. |
| show ips stats ip interface gigabitethernet 4/1 | Displays IPv4 statistics. |

This section includes the following topics:

- [Verifying Gigabit Ethernet Connectivity](#) section, page 43-9
- [Displaying the IPv4 Route Table](#) section, page 43-10
- [Displaying ARP Cache](#) section, page 43-10
- [Displaying IPv4 Statistics](#) section, page 43-11

Verifying Gigabit Ethernet Connectivity

Once the Gigabit Ethernet interfaces are connected with valid IP addresses, verify the interface connectivity on each switch. Ping the IP host using the IP address of the host to verify that the static IP route is configured correctly.

**Note**

If the connection fails, verify the following, and ping the IP host again:

- The IP address for the destination (IP host) is correctly configured.
- The host is active (powered on).
- The IP route is configured correctly.
- The IP host has a route to get to the Gigabit Ethernet interface subnet.
- The Gigabit Ethernet interface is in the up state.

Use the **ping** command to verify the Gigabit Ethernet connectivity (see [Example 43-3](#)). The **ping** command sends echo request packets out to a remote device at an IP address that you specify.

Use the **show interface gigabitethernet** command to verify if the Gigabit Ethernet interface is up.

Example 43-3 Verifying Gigabit Ethernet Connectivity

```
switch# ping 10.100.1.25
PING 10.100.1.25 (10.100.1.25): 56 data bytes
64 bytes from 10.100.1.25: icmp_seq=0 ttl=255 time=0.1 ms
64 bytes from 10.100.1.25: icmp_seq=1 ttl=255 time=0.1 ms
64 bytes from 10.100.1.25: icmp_seq=2 ttl=255 time=0.1 ms
--- 10.100.1.25 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.1/0.1/0.1 ms
```

Displaying the IPv4 Route Table

The **ip route interface** command takes the Gigabit Ethernet interface as a parameter and returns the route table for the interface. See [Example 43-4](#).

Example 43-4 Displays the IP Route Table

```
switch# show ips ip route interface gig 8/1
Codes: C - connected, S - static
No default gateway
C 10.1.3.0/24 is directly connected, GigabitEthernet8/1
```

Connected (C) identifies the subnet in which the interface is configured (directly connected to the interface). Static (S) identifies the static routes that go through the router.

Displaying ARP Cache

You can display the ARP cache on Gigabit Ethernet interfaces.

**Note**

Use the physical interface, not the subinterface, for all ARP cache commands.

Use the **show ips arp interface gigabitethernet** command to display the ARP cache on the Gigabit Ethernet interfaces. This command takes the Ethernet interface as a parameter and returns the ARP cache for that interface. See [Example 43-5](#).

Example 43-5 Displays ARP Caches

```
switch# show ips arp interface gigabitethernet 7/1
Protocol      Address      Age (min)   Hardware Addr  Type   Interface
Internet     20.1.1.5     3           0005.3000.9db6 ARPA   GigabitEthernet7/1
Internet     20.1.1.10    7           0004.76eb.2ff5 ARPA   GigabitEthernet7/1
Internet     20.1.1.11    16          0003.47ad.21c4 ARPA   GigabitEthernet7/1
Internet     20.1.1.12    6           0003.4723.c4a6 ARPA   GigabitEthernet7/1
Internet     20.1.1.13    13          0004.76f0.ef81 ARPA   GigabitEthernet7/1
Internet     20.1.1.14    0           0004.76e0.2f68 ARPA   GigabitEthernet7/1
Internet     20.1.1.15    6           0003.47b2.494b ARPA   GigabitEthernet7/1
Internet     20.1.1.17    2           0003.479a.b7a3 ARPA   GigabitEthernet7/1
...
```

Displaying IPv4 Statistics

Use the **show ips stats ip interface gigabitethernet** to display and verify IP v4 statistics. This command takes the main Ethernet interface as a parameter and returns the IPv4 statistics for that interface. See [Example 43-6](#).

**Note**

Use the physical interface, not the subinterface, to display IPv4 statistics.

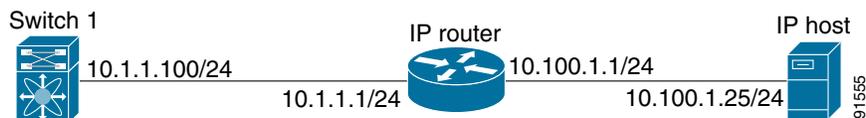
Example 43-6 Displays IPv4 Statistics

```
switch# show ips stats ip interface gigabitethernet 4/1
Internet Protocol Statistics for port GigabitEthernet4/1
 168 total received, 168 good, 0 error
 0 reassembly required, 0 reassembled ok, 0 dropped after timeout
 371 packets sent, 0 outgoing dropped, 0 dropped no route
 0 fragments created, 0 cannot fragment
```

Configuration Examples for IPv4

[Figure 43-1](#) shows an example of a basic Gigabit Ethernet IP version 4 (IPv4) configuration.

Figure 43-1 Gigabit Ethernet IPv4 Configuration Example

**Note**

The port on the Ethernet switch to which the MDS Gigabit Ethernet interface is connected should be configured as a host port (also known as access port) instead of a switch port. Spanning tree configuration for that port (on the Ethernet switch) should be disabled. This helps avoid the delay in the management port coming up due to delay from Ethernet spanning tree processing that the Ethernet switch would run if enabled. For Cisco Ethernet switches, use either the **switchport host** command in Cisco IOS or the **set port host** command in the Catalyst OS.

To configure the Gigabit Ethernet interface for the example in [Figure 43-1](#), follow these steps:

| | Command | Purpose |
|--------|--|--|
| Step 1 | switch# config terminal switch(config)# | Enters configuration mode. |
| Step 2 | switch(config)# interface gigabitethernet 2/2 switch(config-if)# | Enters the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2). |
| Step 3 | switch(config-if)# ip address 10.1.1.100 255.255.255.0 | Enters the IPv4 address (10.1.1.100) and subnet mask (255.255.255.0) for the Gigabit Ethernet interface. |
| Step 4 | switch(config-if)# no shutdown | Enables the interface. |

Additional References

For additional information related to implementing FCIPs, see the following section:

- [Related Document section, page 43-12](#)
- [Standards section, page 43-12](#)
- [RFCs section, page 43-12](#)
- [MIBs section, page 43-13](#)

Related Document

| Related Topic | Document Title |
|---|---|
| Cisco MDS 9000 Family Command Reference | <i>Cisco MDS 9000 Family Command Reference, Release 5.0(1a)</i> |

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. | – |

RFCs

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

MIBs

| MIBs | MIBs Link |
|---------------------|--|
| CISCO-IETF-VRRP-MIB | To locate and download MIBs, go to the following URL: http://www.cisco.com/dc-os/mibs |

