



## Configuring IP Storage Services

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Cisco MDS 9000 Family IP storage (IPS) services extend the reach of Fibre Channel SANs by using open-standard, IP-based technology. The switch connects separated SAN islands using Fibre Channel over IP (FCIP), and it allows IP hosts to access Fibre Channel storage using the iSCSI protocol.



**Note**

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FCIP and iSCSI features are specific to the IPS module and are available in Cisco MDS 9200 Switches or Cisco MDS 9500 Directors.

The Cisco MDS 9222i switch and the 14/2 Multiprotocol Services (MSM-18/4 ) module also allow you to use Fibre Channel, FCIP, and iSCSI features. The MSM-18/4 module is available for use in any switch in the Cisco MDS 9200 Series or Cisco MDS 9500 Series.

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## Feature Information

This section briefly describes the new and updated features for releases, starting from Cisco MDS NX-OS Release 6.2(13).

**Table 6-1** Feature Information Table

Feature	Release	Description
<a href="#">Changing Link Speed on 10 Gbps IP Storage Interfaces, page 6-211</a>	6.2(13)	This feature enables users to change the link speed on 10 Gbps IP Storage interfaces from 10 Gbps to 1 Gbps and vice versa on a Cisco MDS 9250i Multiservice Fabric Switch.

## Services Modules

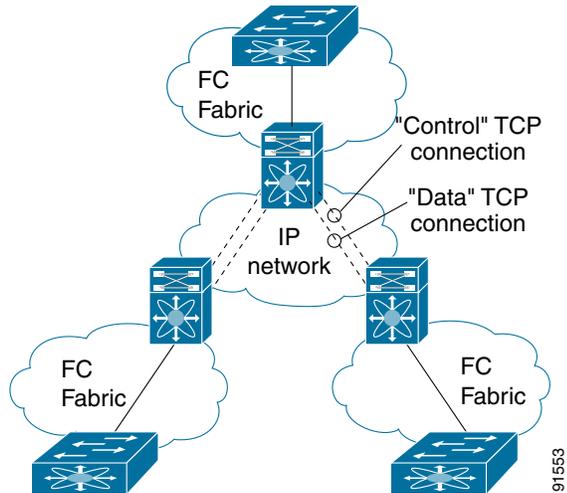
The IP Storage services module (IPS module) and the MSM-18/4 module allow you to use FCIP and iSCSI features. Both modules integrate seamlessly into the Cisco MDS 9000 Family, and support the full range of features available on other switching modules, including VSANs, security, and traffic management. The following types of storage services modules are currently available for use in any switch in the Cisco MDS 9200 Series or in the Cisco MDS 9500 Series:

- The 4-port, hot-swappable IPS module (IPS-4) has four Gigabit Ethernet ports.
- The 8-port, hot-swappable IPS module (IPS-8) has eight Gigabit Ethernet ports.
- The MSM-18/4 module has 14 Fibre Channel ports (numbered 1 through 14) and two Gigabit Ethernet ports (numbered 1 and 2).

Gigabit Ethernet ports in these modules can be configured to support the FCIP protocol, the iSCSI protocol, or both protocols simultaneously:

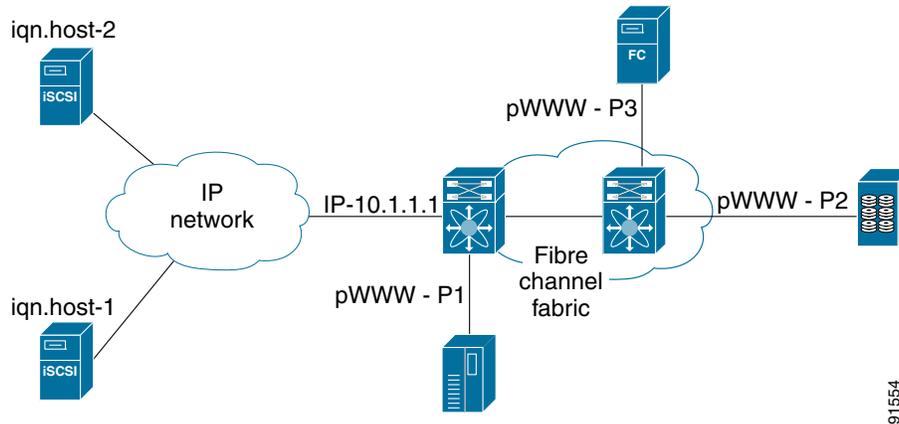
- FCIP—FCIP transports Fibre Channel frames transparently over an IP network between two Cisco MDS 9000 Family switches or other FCIP standards-compliant devices. [Figure 6-1](#) shows how the IPS module is used in different FCIP scenarios.

Figure 6-1 FCIP Scenarios



- iSCSI—The IPS module provides IP hosts access to Fibre Channel storage devices. The IP host sends SCSI commands encapsulated in iSCSI protocol data units (PDUs) to a Cisco MDS 9000 Family switch IPS port over a TCP/IP connection. At this point, the commands are routed from an IP network into a Fibre Channel network and forwarded to the intended target. Figure 6-2 depicts the iSCSI scenarios in which the IPS module is used.

Figure 6-2 iSCSI Scenarios



## Module Status Verification

To verify the status of the module using Fabric Manager, follow these steps:

- 
- Step 1** Select a switch in the Fabric pane.
- Step 2** Open the **Switches** folder and select **Hardware** in the Physical Attributes pane. You see the status for all modules in the switch in the Information pane.
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After inserting the module, verify the status of the module using the **show module** command:

```
switch# show module
Mod  Ports  Module-Type                Model                Status
-----
1    0      Caching Services Module   DS-X9560-SMAP       ok
2    8      IP Storage Services Module DS-X9308-SMIP       ok <-----IPS-8 module
4    16     2x1GE IPS, 14x1/2Gbps FC Module DS-X9222i-K9-SUP   ok <-----MSM-18/4
module
5    0      Supervisor/Fabric-1       DS-X9530-SF1-K9     active *
6    0      Supervisor/Fabric-1       DS-X9530-SF1-K9     ha-standby
9    4      IP Storage Services Module DS-X9304-SMIP       ok <-----IPS-4 module

Mod  Sw          Hw          World-Wide-Name(s) (WWN)
-----
1    2.0(1)      0.201      20:41:00:0b:fd:44:68:c0 to 20:48:00:0b:fd:44:68:c0
2    2.0(1)      0.201      20:41:00:0b:fd:44:68:c0 to 20:48:00:0b:fd:44:68:c0
4    2.0(1)      0.201      20:c1:00:05:30:00:07:1e to 20:d0:00:05:30:00:07:1e
5    2.0(1)      0.0        --
6    2.0(1)      0.0        --
9    2.0(1)      0.1        22:01:00:05:30:00:07:1e to 22:04:00:05:30:00:07:1e

Mod          Application Image Description          Application Image Version
-----
1            svc-node1                            1.3 (5M)
1            svc-node2                            1.3 (5M)

Mod  MAC-Address(es)                Serial-Num
-----
1    00-05-30-01-49-c2 to 00-05-30-01-4a-46  JAB073907EP
2    00-05-30-00-9d-d2 to 00-05-30-00-9d-de  JAB064605a2
4    00-05-30-01-7f-32 to 00-05-30-01-7f-38  JAB081405AM
5    00-05-30-00-2c-4e to 00-05-30-00-2c-52  JAB06350B1M
6    00-05-30-00-19-66 to 00-05-30-00-19-6a  JAB073705GL
9    00-0d-bc-2f-d6-00 to 00-0d-bc-2f-d6-08  JAB080804TN
```

\* this terminal session

## IPS Module Upgrade



### Caution

A software upgrade is only disruptive for the IPS module. The NX-OS software continues to support nondisruptive software upgrades for Fibre Channel modules in the switch and for the switch itself.

IPS modules use a rolling upgrade install mechanism where each module in a given switch can only be upgraded in sequence. To guarantee a stable state, each IPS module in a switch requires a 5-minute delay before the next IPS module is upgraded.

## MSM-18/4 Module Upgrade



### Caution

A software upgrade is only partially disruptive for the MSM-18/4 module. The NX-OS software continues to support nondisruptive software upgrades for Fibre Channel modules in the switch and for the switch itself.

The MSM-18/4 modules have 14 Fibre Channel ports (nondisruptive upgrade) and two Gigabit Ethernet ports (disruptive upgrade). MSM-18/4 modules use a rolling upgrade install mechanism for the two Gigabit Ethernet ports where each module in a given switch can only be upgraded in sequence. To guarantee a stable state, each MSM-18/4 module in a switch requires a 5-minute delay before the next module is upgraded.

## Supported Hardware

You can configure the FCIP and iSCSI features using one or more of the following hardware:

- IPS-4 and IPS-8 modules (refer to the *Cisco MDS 9200 Series Hardware Installation Guide* or the *Cisco MDS 9500 Series Hardware Installation Guide* for more information)
- MSM-18/4 module (refer to the *Cisco MDS 9200 Series Hardware Installation Guide* or the *Cisco MDS 9500 Series Hardware Installation Guide* for more information).

**Note**

In both the MSM-18/4 module and the Cisco MDS 9222i integrated supervisor module, the port numbering differs for the Fibre Channel ports and the Gigabit Ethernet ports. The Fibre Channel ports are numbered from 1 through 14 and the Gigabit Ethernet ports are numbered 1 and 2.

- Cisco MDS 9222i Switch (refer to the *Cisco MDS 9200 Series Hardware Installation Guide*).

## Configuring Gigabit Ethernet Interfaces for IPv4

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 2, “Configuring FCIP.”](#) For information about configuring iSCSI, see [Chapter 4, “Configuring iSCSI.”](#)

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.

In large scale iSCSI deployments where the Fibre Channel storage subsystems 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 *Cisco Fabric Manager Security Configuration Guide*.

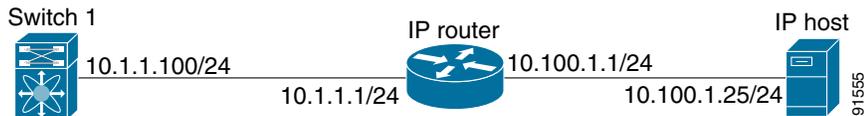
**Tip**

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.

## Basic Gigabit Ethernet Configuration

Figure 6-3 shows an example of a basic Gigabit Ethernet IP version 4 (IPv4) configuration.

**Figure 6-3** Gigabit Ethernet IPv4 Configuration Example

**Note**

The port on the Ethernet switch to which the 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 Catalyst OS.

## IPS Module Core Dumps

IPS core dumps are different from the system's kernel core dumps for other modules. When the IPS module's operating system (OS) unexpectedly resets, it is useful to obtain a copy of the memory image (called a IPS core dump) to identify the cause of the reset. Under that condition, the IPS module sends the core dump to the supervisor module for storage. Cisco MDS switches have two levels of IPS core dumps:

- Partial core dumps (default)—Each partial core dump consists of four parts (four files). All four files are saved in the active supervisor module.  
Use the **show cores** command to list these files.
- Full core dumps—Each full core dump consists of 75 parts (75 files). The IPS core dumps for the MSM-18/4 module and the Cisco MDS 9222i Switch only contains 38 parts. This dump cannot be saved on the supervisor module because of its large space requirement. They are copied directly to an external TFTP server.

Use the **system cores tftp:** command to configure an external TFTP server to copy the IPS core dump (and other core dumps).

To configure IPS core dumps on the IPS module, follow these steps:

	Command	Purpose
Step 1	switch# <b>config terminal</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>ips core dump full</b> ips core dump full' successfully set for module 9	Configures a dump of the full core generation for all IPS modules in the switch.
	switch(config)# <b>no ips core dump full</b> ips core dump partial' successfully set for module 9	Configures a dump of the partial core (default) generation for the IPS module in slot 9.

To configure the Gigabit Ethernet interface for the scenario in [Figure 6-3](#), follow these steps:

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- Step 1** From Fabric Manager, choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane. You see the Gigabit Ethernet configuration in the Information pane.
- From Device Manager, right-click the Gigabit Ethernet port that you want to configure and choose **Configure...**. You see the Gigabit Ethernet configuration dialog box.
- Step 2** Click the **General** tab in Fabric Manager, or click the **GigE** tab in Device Manager to display the general configuration options for the interface.
- Step 3** Set the description and MTU value for the interface. The valid value for the MTU field can be a number in the range from 576 to 9000.
- Step 4** Set **Admin** up or down and check the **CDP** check box if you want this interface to participate in CDP.
- Step 5** Set **IpAddress/Mask** with the IP address and subnet mask for this interface.
- Step 6** From Fabric Manager, click the **Apply Changes** icon to save these changes, or click the **Undo Changes** icon to discard changes.
- From Device Manager, click **Apply** to save these changes, or click **Close** to discard changes and close the Gigabit Ethernet configuration dialog box.
- 

## Configuring Interface Descriptions

See the *Cisco Fabric Manager Interfaces Configuration Guide* for details on configuring the switch port description for any interface.

## Configuring Beacon Mode

See the *Cisco Fabric Manager Interfaces Configuration Guide* for details on configuring the beacon mode for any interface.

## 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.

## 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**

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The minimum MTU size is 576 bytes.

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**Tip**

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

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## 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.

## 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.

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-numberVLAN-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 6-2](#)).

**Table 6-2 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 6-2](#) also apply to Ethernet PortChannels.

## 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.

## Gigabit Ethernet IPv4-ACL Guidelines

**Tip**

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

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**, **precedence**, and **fragments** options are ignored when you apply IPv4-ACLs (containing these options) to Gigabit Ethernet interfaces.
  - If an IPv4-ACL rule applies to a preexisting TCP connection, that rule is ignored. For example if there is an existing TCP connection between A and B, and an IPv4-ACL specifies dropping all packets whose source is A and destination is B is subsequently applied, it will have no effect.

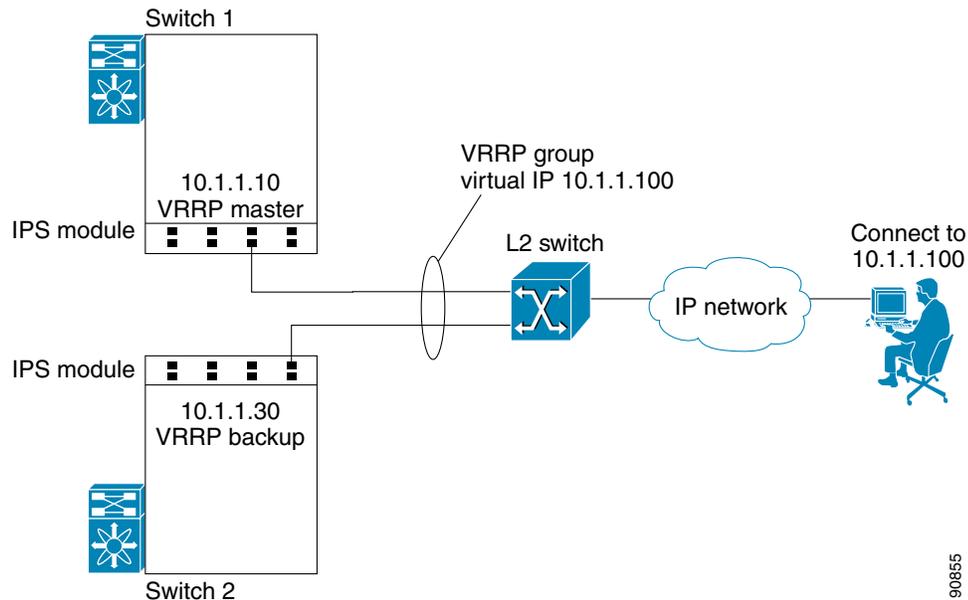
## Configuring Gigabit Ethernet High Availability

Virtual Router Redundancy Protocol (VRRP) and Ethernet PortChannels are two Gigabit Ethernet features that provide high availability for iSCSI and FCIP services.

### VRRP for iSCSI and FCIP Services

VRRP provides a redundant alternate path to the Gigabit Ethernet port for iSCSI and FCIP services. VRRP provides IP address failover protection to an alternate Gigabit Ethernet interface so the IP address is always available (see [Figure 6-4](#)).

Figure 6-4 VRRP Scenario



In Figure 6-4, all members of the VRRP group must be IP storage Gigabit Ethernet ports. VRRP group members can be one or more of the following interfaces:

- One or more interfaces in the same IPS module or MSM-18/4 module
- Interfaces across IPS modules or MSM-18/4 modules in one switch
- Interfaces across IPS modules or MSM-18/4 modules in different switches
- Gigabit Ethernet subinterfaces
- Ethernet PortChannels and PortChannel subinterfaces

**Note**

You can configure no more than seven VRRP groups, both IPv4 and IPv6, on a Gigabit Ethernet interface, including the main interface and all subinterfaces.

## Configuring VRRP for Gigabit Ethernet Interfaces

To configure VRRP for Gigabit Ethernet interfaces using IPv4, follow these steps:

	Command	Purpose
Step 1	switch1# <b>config terminal</b> switch1(config)#	Enters configuration mode.
Step 2	switch(config)# <b>interface</b> <b>gigabitethernet 2/2</b> switch(config-if)#	Enters the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2).
Step 3	switch(config-if)# <b>ip address</b> <b>10.1.1.10 255.255.255.0</b>	Assigns the IPv4 address (10.1.1.10) and subnet mask (255.255.255.0) for the Gigabit Ethernet interface.
Step 4	switch(config-if)# <b>no shutdown</b>	Enables the selected interface.
Step 5	switch(config-if)# <b>vrrp 100</b> switch(config-if-vrrp)	Creates VR ID 100.

	Command	Purpose
Step 6	switch(config-if-vrrp) # <b>address</b> <b>10.1.1.100</b>	Configures the virtual IPv4 address (10.1.1.100) for the selected VRRP group (identified by the VR ID).  <b>Note</b> The virtual IPv4 address must be in the same subnet as the IPv4 address of the Gigabit Ethernet interface. All members of the VRRP group must configure the same virtual IPv4 address.
Step 7	switch(config-if-vrrp) # <b>priority</b> 10	Configures the priority for the selected interface within this VRRP group.  <b>Note</b> The interface with the highest priority is selected as the master.
Step 8	switch(config-if-vrrp) # <b>no shutdown</b>	Enables the VRRP protocol on the selected interface.

To configure VRRP for Gigabit Ethernet interfaces using IPv6, follow these steps:

	Command	Purpose
Step 1	switch1# <b>config terminal</b> switch1(config)#	Enters configuration mode.
Step 2	switch(config)# <b>interface</b> <b>gigabitethernet 2/2</b> switch(config-if)#	Enters the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2).
Step 3	switch(config-if)# <b>ipv6 address</b> <b>2001:0db8:800:200c::417a/64</b>	Assigns the IPv6 address for the Gigabit Ethernet interface.
Step 4	switch(config-if)# <b>no shutdown</b>	Enables the selected interface.
Step 5	switch(config-if)# <b>vrrp ipv6 100</b> switch(config-if-vrrp-ipv6)	Creates VR ID 100.
Step 6	switch(config-if-vrrp-ipv6) # <b>address</b> <b>2001:0db8:800:200c::417a</b>	Assigns single primary link-local IPv6 address or one of the multiple secondary IPv6 addresses.  <b>Note</b> If this IPv6 address is the same as the physical IPv6 address, this switch is automatically the owner of this IPv6 address.
Step 7	switch(config-if-vrrp-ipv6) # <b>priority</b> <b>10</b>	Configures the priority for the selected interface within this VRRP group.  <b>Note</b> The interface with the highest priority is selected as the master.
Step 8	switch(config-if-vrrp-ipv6) # <b>no</b> <b>shutdown</b>	Enables the VRRP protocol on the selected interface.

**Note**

If you configure secondary VRRP IPv6 addresses on an IPFC VSAN interface, before a downgrading to a release prior to Cisco Release 3.0(1), you must remove the secondary VRRP IPv6 addresses. This is required only when you configure IPv6 addresses.

**Note**

The VRRP **preempt** option is not supported on IPS Gigabit Ethernet interfaces. However, if the virtual IPv4 IP address is also the IPv4 IP address for the interface, then preemption is implicitly applied.

**Note**

If you configure secondary VRRP IPv6 addresses on an IPFC VSAN interface, before a downgrading to a release prior to Cisco Release 3.0(1), you must remove the secondary VRRP IPv6 addresses. This is required only when you configure IPv6 addresses.

## About Ethernet PortChannel Aggregation

Ethernet PortChannels refer to the aggregation of multiple physical Gigabit Ethernet interfaces into one logical Ethernet interface to provide link redundancy and, in some cases, higher aggregated bandwidth and load balancing.

An Ethernet switch connecting to the MDS switch Gigabit Ethernet port can implement load balancing based on the IP address, IP address and UDP/TCP port number, or MAC address. Due to the load balancing scheme, the data traffic from one TCP connection is always sent out on the same physical Gigabit Ethernet port of an Ethernet PortChannel. For the traffic coming to the MDS, an Ethernet switch can implement load balancing based on its IP address, its source-destination MAC address, or its IP address and port. The data traffic from one TCP connection always travels on the same physical links. To make use of both ports for the outgoing direction, multiple TCP connections are required.

All FCIP data traffic for one FCIP link is carried on one TCP connection. Consequently, the aggregated bandwidth is 1 Gbps for that FCIP link.

**Note**

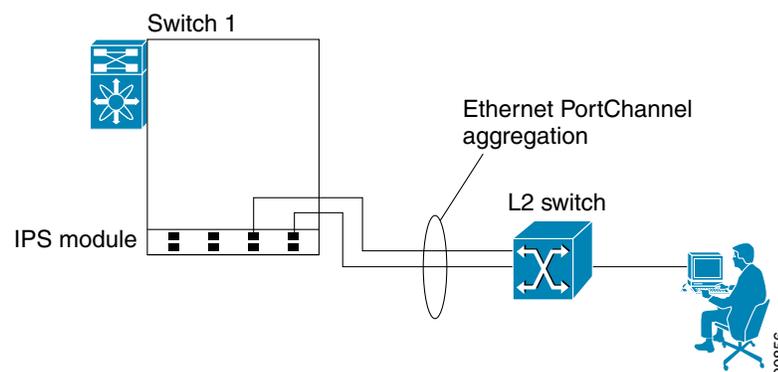
The Cisco Ethernet switch's PortChannel should be configured as a static PortChannel, and not the default 802.3ad protocol.

Ethernet PortChannels can only aggregate two physical interfaces that are adjacent to each other on a given IPS module (see [Figure 6-5](#)).

**Note**

PortChannel members must be one of these combinations: ports 1–2, ports 3–4, ports 5–6, or ports 7–8.

**Figure 6-5** Ethernet PortChannel Scenario



In [Figure 6-5](#), Gigabit Ethernet ports 3 and 4 in slot 9 are aggregated into an Ethernet PortChannel. Ethernet PortChannels are not supported on MSM-18/4 modules and 9222i IPS modules.

**Note**

PortChannel interfaces provide configuration options for both Gigabit Ethernet and Fibre Channel. However, based on the PortChannel membership, only Gigabit Ethernet parameters or Fibre Channel parameters are applicable.

## Configuring Ethernet PortChannels

The PortChannel configuration specified in the *Cisco Fabric Manager Interfaces Configuration Guide* and *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* also applies to Ethernet PortChannel configurations.

To configure Ethernet PortChannels, follow these steps:

	Command	Purpose
<b>Step 1</b>	switch1# <b>config terminal</b> switch1(config)#	Enters configuration mode.
<b>Step 2</b>	switch(config)# <b>interface port-channel 10</b> switch(config-if)#	Configures the specified PortChannel (10).
<b>Step 3</b>	switch(config-if)# <b>ip address 10.1.1.1</b> <b>255.255.255.0</b>	Enters the IPv4 address (10.1.1.1) and subnet mask (255.255.255.0) for the PortChannel.  <b>Note</b> A PortChannel does not have any members when first created.
<b>Step 4</b>	switch(config-if)# <b>no shutdown</b>	Enables the interface.
<b>Step 5</b>	switch(config)# <b>interface gigabitethernet 9/3</b> switch(config-if)#	Configures the specified Gigabit Ethernet interface (slot 9, port 3).
<b>Step 6</b>	switch(config-if)# <b>channel-group 10</b> gigabitethernet 9/3 added to port-channel 10 and disabled please do the same operation on the switch at the other end of the port-channel, then do "no shutdown" at both ends to bring them up switch(config-if)#	Adds Gigabit Ethernet interfaces 9/3 to channel group 10. If channel group 10 does not exist, it is created. The port is shut down.
<b>Step 7</b>	switch(config-if)# <b>no shutdown</b>	Enables the selected interface.
<b>Step 8</b>	switch(config)# <b>interface gigabitethernet 9/4</b> switch(config-if)#	Configures the specified Gigabit Ethernet interface (slot 9, port 4).
<b>Step 9</b>	switch(config-if)# <b>channel-group 10</b> gigabitethernet 9/4 added to port-channel 10 and disabled please do the same operation on the switch at the other end of the port-channel, then do "no shutdown" at both ends to bring them up	Adds Gigabit Ethernet interfaces 9/4 to channel group 10. The port is shut down.
<b>Step 10</b>	switch(config-if)# <b>no shutdown</b>	Enables the selected interface.

**Note**

Gigabit Ethernet interfaces cannot be added to a PortChannel if one of the following cases apply:

- The interface already has an IP address assigned.
- The subinterfaces are configured on that interface.
- The interface already has an associated IPv4-ACL rule and the PortChannel does not.

## Configuring CDP

The Cisco Discovery Protocol (CDP) is supported on the management Ethernet interface on the supervisor module and the Gigabit Ethernet interfaces on the IPS module or MSM-18/4 module.

See the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*.

## Changing Link Speed on 10 Gbps IP Storage Interfaces

The Cisco MDS 9250i Multiservice Fabric Switch has two IP storage ports that support 1 Gbps and 10 Gbps link speeds. By default, IP storage ports are configured at 10 Gbps link speed.

**Note**

Switching between different link speeds is supported on Cisco 10 Gbps IP storage platforms starting from Cisco MDS NX-OS Release 6.2(13). An ISSD to a release earlier than Cisco MDS NX-OS Release 6.2(13) when any of the IP storage ports are configured at 1 Gbps, is disallowed. Reconfigure such ports back to the default link speed of 10 Gbps before attempting such a downgrade.

To configure 1 Gbps link speed on a 10 Gbps IP storage port, follow these steps:

	Command	Purpose
<b>Step 1</b>	switch1# <b>config terminal</b> switch1(config)#	Enters configuration mode.
<b>Step 2</b>	switch(config)# <b>interface IPStorage</b> <i>slot-number/port-number-range</i> switch(config-if)#	Enters IPStorage interface configuration mode.
<b>Step 3</b>	switch(config-if)# <b>shutdown</b>	Administratively disables the interface and stops traffic through the interface.
<b>Step 4</b>	switch(config-if)# <b>switchport speed 1000</b> <sup>1</sup> This speed change will disrupt FCIP/iSCSI traffic for 5 mins on all IPStorage ports. If FCIP tunnels are configured please make sure max-bw <= 1000 Mbps and tcp-connections set to 2. Do you want to continue(y/n) ? [n]	Sets the link speed of the interface and all subinterfaces to 1000 Mbps (1 Gbps).  <b>Note</b> This command causes all IP storage ports on the selected FCIP engine to be reset. This may cause traffic disruption for up to 5 minutes. By default, <i>n</i> is selected. Press <b>Enter</b> to abort the command. Enter <i>y</i> and press <b>Enter</b> to continue. <sup>2</sup>
<b>Step 5</b>	switch(config-if)# <b>no shutdown</b>	Administratively enables the interface.

	Command	Purpose
Step 6	switch(config-if)# <b>end</b> switch#	Exits IPStorage interface configuration mode and returns to privileged EXEC mode.
Step 7	switch# <b>show ips status</b>	Displays the operational speed of the IP storage port.

1. Configuring the link speed of an interface generates the following port software failure syslog message:  
%IF\_DOWN\_SOFTWARE\_FAILURE: %\$VSAN 1%\$ Interface fcip is down (Port software failure)
2. If the conditions specified in the warning message are not met, the configured link speed is still applied. However, issues such as packet drops, retransmissions, and FCIP tunnel flaps may occur.

**Note**

- To configure 10 Gbps link speed on an IP storage port, follow the steps listed in the above table and change the switchport speed to 10000 in **Step 4** by issuing the following command:

```
switch(config-if)# switchport speed 10000
```

When you run this command, the following message is displayed, asking for your confirmation:  
"This speed change will disrupt FCIP/iSCSI traffic for 5 mins on all IPStorage ports.  
Do you want to continue(y/n) ? [n]"

If there is a mismatch between the configured link speed and the small form-factor pluggable (SFP) speed capabilities, the port goes into an Error Disabled state and a corresponding syslog message is logged. In such a scenario, either the configured link speed or the SFP should be changed. If the link speed is changed, even if the port is already enabled, the **shutdown** and **no shutdown** commands must be explicitly issued for the change to be applied.

For more information about supported 1 Gbps SFPs for a Cisco MDS 9250i Multiservice Fabric Switch, see the [Cisco MDS 9000 Family Pluggable Transceivers Data Sheet](#).

For information about configuring FCIP tunnels with IP storage ports at 1 Gbps speed, see the [Configuring FCIP](#) chapter.

## Displaying Statistics

This section provides examples to verify Gigabit Ethernet and TCP/IP statistics on the IP storage ports.

### Displaying Gigabit Ethernet Interface Statistics

Use the **show interface gigabitethernet** command on each switch to verify that the interfaces are up and functioning as desired. See [Example 6-1](#) and [Example 6-2](#).

**Example 6-1** *Displays the Gigabit Ethernet Interface*

```
switch# show interface gigabitethernet 8/1
GigabitEthernet8/1 is up          <-----The interface is in the up state.
  Hardware is GigabitEthernet, address is 0005.3000.a98e
  Internet address is 10.1.3.1/24
  MTU 1500 bytes, BW 1000000 Kbit
  Port mode is IPS
  Speed is 1 Gbps
  Beacon is turned off
```

```

5 minutes input rate 744 bits/sec, 93 bytes/sec, 1 frames/sec
5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
3343 packets input, 406582 bytes
  0 multicast frames, 0 compressed
  0 input errors, 0 frame, 0 overrun 0 fifo
8 packets output, 336 bytes, 0 underruns
  0 output errors, 0 collisions, 0 fifo
  0 carrier errors

```

### Example 6-2 Displays the Gigabit Ethernet Subinterface

```

switch# show interface gigabitethernet 4/2.100
GigabitEthernet4/2.100 is up
  Hardware is GigabitEthernet, address is 0005.3000.abcb
  Internet address is 10.1.2.100/24
  MTU 1500 bytes
  5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  0 packets input, 0 bytes
    0 multicast frames, 0 compressed
    0 input errors, 0 frame, 0 overrun 0 fifo
  1 packets output, 46 bytes, 0 underruns
    0 output errors, 0 collisions, 0 fifo
    0 carrier errors

```

## Displaying Ethernet MAC Statistics

The **show ips stats mac interface gigabitethernet** command takes the main Gigabit Ethernet interface as a parameter and returns Ethernet statistics for that interface. See [Example 6-3](#).



### Note

---

Use the physical interface, not the subinterface, to display Ethernet MAC statistics.

---

### Example 6-3 Displays Ethernet MAC Statistics

```

switch# show ips stats mac interface gigabitethernet 8/1
Ethernet MAC statistics for port GigabitEthernet8/1
  Hardware Transmit Counters
    237 frame 43564 bytes
    0 collisions, 0 late collisions, 0 excess collisions
    0 bad frames, 0 FCS error, 0 abort, 0 runt, 0 oversize
  Hardware Receive Counters
    427916 bytes, 3464 frames, 0 multicasts, 3275 broadcasts
    0 bad, 0 runt, 0 CRC error, 0 length error
    0 code error, 0 align error, 0 oversize error
  Software Counters
    3429 received frames, 237 transmit frames
    0 frames soft queued, 0 current queue, 0 max queue
    0 dropped, 0 low memory

```

## Displaying DMA-Bridge Statistics

You can display direct memory access (DMA) device statistics using the **show ips stats dma-bridge interface gigabitethernet** command. This command takes the main Gigabit Ethernet interface as a parameter and returns DMA bridge statistics for that interface. See [Example 6-4](#).



### Note

Use the physical interface, not the subinterface, to display DMA-bridge statistics.

### Example 6-4 Displays DMA-Bridge Statistics

```
switch# show ips stats dma-bridge interface gigabitethernet 7/1
Dma-bridge ASIC Statistics for port GigabitEthernet7/1
  Hardware Egress Counters
    231117 Good, 0 bad protocol, 0 bad header cksum, 0 bad FC CRC
  Hardware Ingress Counters
    218255 Good, 0 protocol error, 0 header checksum error
    0 FC CRC error, 0 iSCSI CRC error, 0 parity error
  Software Egress Counters
    231117 good frames, 0 bad header cksum, 0 bad FIFO SOP
    0 parity error, 0 FC CRC error, 0 timestamp expired error
    0 unregistered port index, 0 unknown internal type
    0 RDL ok, 0 RDL drop (too big), 0 RDL ttl_1
    3656368645 idle poll count, 0 loopback, 0 FCC PQ, 0 FCC EQ
    Flow Control: 0 [0], 0 [1], 0 [2], 0 [3]
  Software Ingress Counters
    218255 Good frames, 0 header cksum error, 0 FC CRC error
    0 iSCSI CRC error, 0 descriptor SOP error, 0 parity error
    0 frames soft queued, 0 current Q, 0 max Q, 0 low memory
    0 out of memory drop, 0 queue full drop
    0 RDL ok, 0 RDL drop (too big)
    Flow Control: 0 [0], 0 [1], 0 [2], 0 [3]
```

This output shows all Fibre Channel frames that ingress or egress from the Gigabit Ethernet port.

## Displaying TCP Statistics

Use the **show ips stats tcp interface gigabitethernet** to display and verify TCP statistics. This command takes the main Ethernet interface as a parameter, and shows TCP stats along with the connection list and TCP state. The **detail** option shows all information maintained by the interface. See [Example 6-5](#) and [Example 6-6](#).

### Example 6-5 Displays TCP Statistics

```
switch# show ips stats tcp interface gigabitethernet 4/1
TCP Statistics for port GigabitEthernet4/1
  Connection Stats
    0 active openings, 3 accepts
    0 failed attempts, 12 reset received, 3 established
  Segment stats
    163 received, 355 sent, 0 retransmitted
    0 bad segments received, 0 reset sent
  TCP Active Connections
  Local Address      Remote Address      State      Send-Q  Recv-Q
  0.0.0.0:3260      0.0.0.0:0          LISTEN     0       0
```

**Example 6-6 Displays Detailed TCP Statistics**

```

switch# show ips stats tcp interface gigabitethernet 4/1 detail
TCP Statistics for port GigabitEthernet4/1
TCP send stats
  355 segments, 37760 bytes
  222 data, 130 ack only packets
  3 control (SYN/FIN/RST), 0 probes, 0 window updates
  0 segments retransmitted, 0 bytes
  0 retransmitted while on ethernet send queue, 0 packets split
  0 delayed acks sent
TCP receive stats
  163 segments, 114 data packets in sequence, 6512 bytes in sequence
  0 predicted ack, 10 predicted data
  0 bad checksum, 0 multi/broadcast, 0 bad offset
  0 no memory drops, 0 short segments
  0 duplicate bytes, 0 duplicate packets
  0 partial duplicate bytes, 0 partial duplicate packets
  0 out-of-order bytes, 1 out-of-order packets
  0 packet after window, 0 bytes after window
  0 packets after close
  121 acks, 37764 ack bytes, 0 ack toomuch, 4 duplicate acks
  0 ack packets left of snd_una, 0 non-4 byte aligned packets
  8 window updates, 0 window probe
  30 pcb hash miss, 0 no port, 0 bad SYN, 0 paws drops
TCP Connection Stats
  0 attempts, 3 accepts, 3 established
  3 closed, 2 drops, 0 conn drops
  0 drop in retransmit timeout, 1 drop in keepalive timeout
  0 drop in persist drops, 0 connections drained
TCP Miscellaneous Stats
  115 segments timed, 121 rtt updated
  0 retransmit timeout, 0 persist timeout
  12 keepalive timeout, 11 keepalive probes
TCP SACK Stats
  0 recovery episodes, 0 data packets, 0 data bytes
  0 data packets retransmitted, 0 data bytes retransmitted
  0 connections closed, 0 retransmit timeouts
TCP SYN Cache Stats
  15 entries, 3 connections completed, 0 entries timed out
  0 dropped due to overflow, 12 dropped due to RST
  0 dropped due to ICMP unreachable, 0 dropped due to bucket overflow
  0 abort due to no memory, 0 duplicate SYN, 0 no-route SYN drop
  0 hash collisions, 0 retransmitted
TCP Active Connections
  Local Address      Remote Address      State      Send-Q  Recv-Q
  0.0.0.0:3260      0.0.0.0:0          LISTEN     0        0

```

Use the **show ips stats icmp interface gigabitethernet** to display and verify IP statistics. This command takes the main Ethernet interface as a parameter and returns the ICMP statistics for that interface. See [Example 6-7](#).

**Example 6-7 Displays ICMP Statistics**

```

switch# show ips stats icmp interface gigabitethernet 2/1
ICMP Statistics for port GigabitEthernet2/1
  0 ICMP messages received
  0 ICMP messages dropped due to errors
ICMP input histogram
  0 destination unreachable
  0 time exceeded
  0 parameter problem

```

```

0 source quench
0 redirect
0 echo request
0 echo reply
0 timestamp request
0 timestamp reply
0 address mask request
0 address mask reply
ICMP output histogram
0 destination unreachable
0 time exceeded
0 parameter problem
0 source quench
0 redirect
0 echo request
0 echo reply
0 timestamp request
0 timestamp reply
0 address mask request
0 address mask reply

```

## Displaying IP Storage Ports Speed

Use the **show ips status** command to verify the programmed speed of an IP Storage port.

### *Example 6-8* Displays IP Storage Ports Speed

```

switch# show ips status
      Port 1/1 READY 10G
      Port 1/2 READY  1G

```

## Default Settings

[Table 6-3](#) lists the default settings for IP storage services parameters.

**Table 6-3** Default Gigabit Ethernet Parameters

Parameters	Default
IPS core size	Partial