CHAPTER 6

Configuring IP Storage

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 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.

This chapter includes the following sections:

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
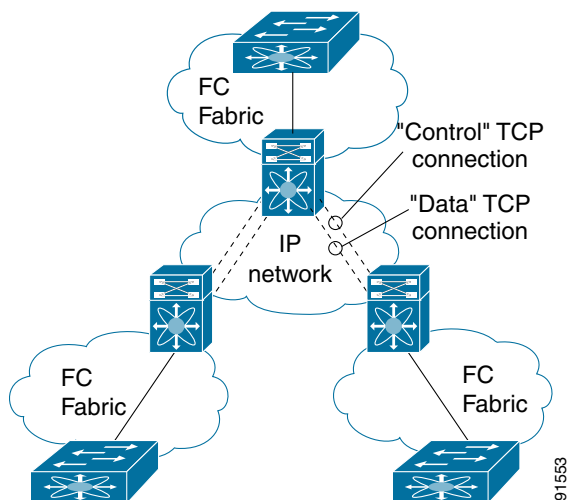
- iSCSI—The IPS module provides IP hosts access to Fibre Channel storage devices. The IP host sends SCSI commands encapsulated in iSCSI protocol data units (PDUs) to a Cisco MDS 9000 Family switch IPS port over a TCP/IP connection. At this point, the commands are routed from an IP network into a Fibre 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
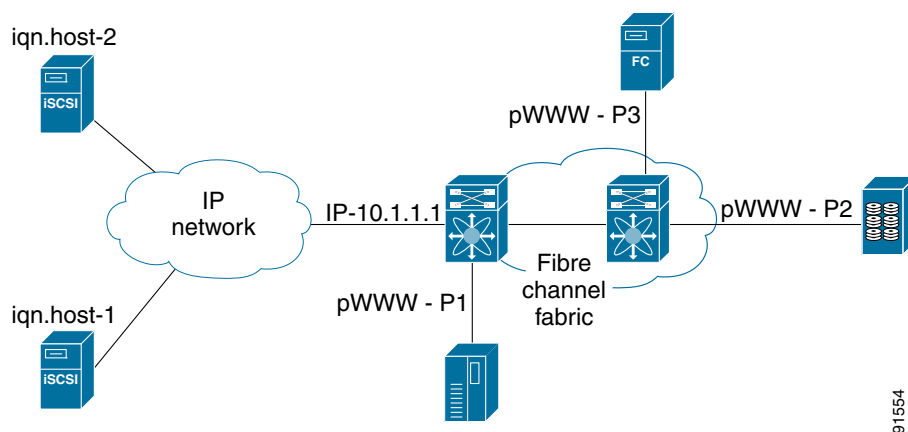
Module Status Verification

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*).

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# **config terminal** switch(config)#	Enters configuration mode.

|	Command	Purpose
Step 2	switch(config)# **ips core dump full** 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)# **no ips core dump full** 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.

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 6-3).

Figure 6-3   VRRP Scenario
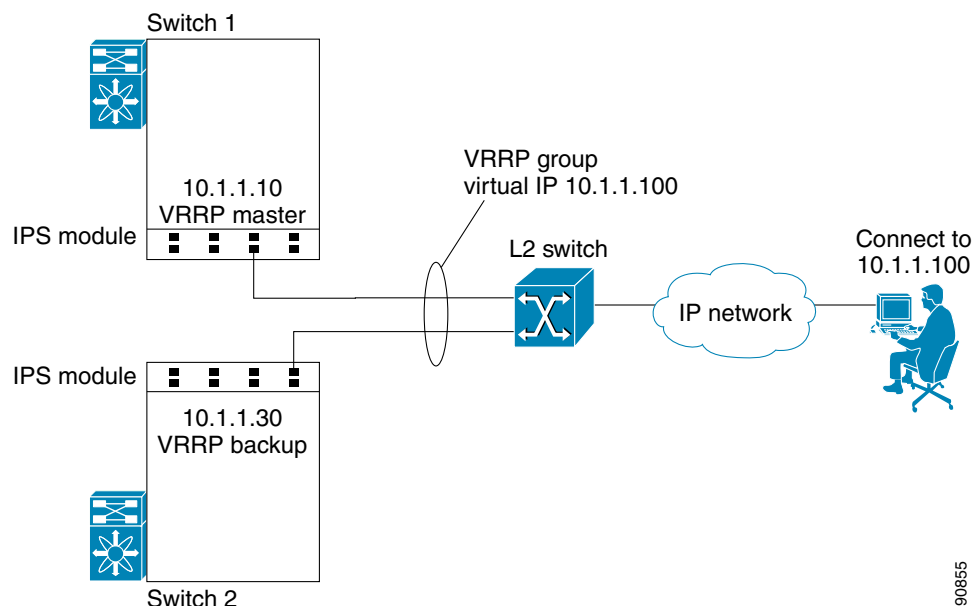
In Figure 6-3, all members of the VRRP group must be IP storage Gigabit Ethernet ports. VRRP group members can be one or more of the following interfaces:

- 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# **config terminal** switch1(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 10.1.1.10 255.255.255.0**	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)# **no shutdown**	Enables the selected interface.
Step 5	switch(config-if)# **vrrp 100** switch(config-if-vrrp)	Creates VR ID 100.
Step 6	switch(config-if-vrrp)# **address 10.1.1.100**	Configures the virtual IPv4 address (10.1.1.100) for the selected VRRP group (identified by the VR ID). **Note** 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)# **priority 10**	Configures the priority for the selected interface within this VRRP group. **Note** The interface with the highest priority is selected as the master.
Step 8	switch(config-if-vrrp)# **no shutdown**	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# **config terminal** switch1(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)# **ipv6 address 2001:0db8:800:200c::417a/64**	Assigns the IPv6 address for the Gigabit Ethernet interface.
Step 4	switch(config-if)# **no shutdown**	Enables the selected interface.
Step 5	switch(config-if)# **vrrp ipv6 100** switch(config-if-vrrp-ipv6)	Creates VR ID 100.

	Command	Purpose
Step 6	switch(config-if-vrrp-ipv6)**# address 2001:0db8:800:200c::417a**	Assigns single primary link-local IPv6 address or one of the multiple secondary IPv6 addresses.
		Note 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)**# priority 10**	Configures the priority for the selected interface within this VRRP group.
		Note The interface with the highest priority is selected as the master.
Step 8	switch(config-if-vrrp-ipv6)**# no shutdown**	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 IP address is also the IP address for the interface, then preemption is implicitly applied.

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.

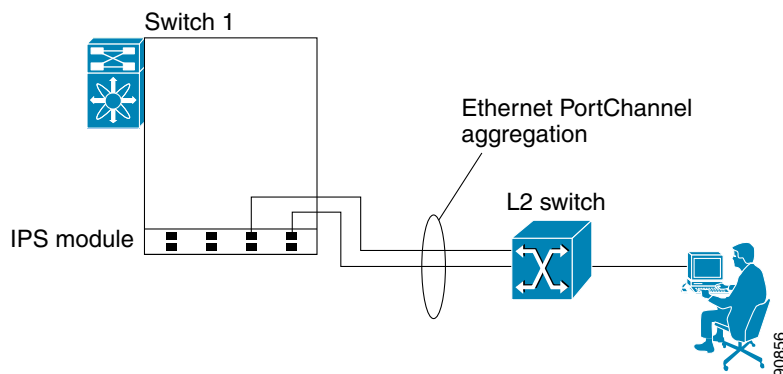Ethernet PortChannels can only aggregate two physical interfaces that are adjacent to each other on a given IPS module (see Figure 6-4).

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

Figure 6-4   **Ethernet PortChannel Scenario**

In Figure 6-4, 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 MDS 9000 Family NX-OS Interfaces Configuration Guide* also applies to Ethernet PortChannel configurations.

To configure Ethernet PortChannels, follow these steps:

	Command	Purpose
Step 1	`switch1# config terminal` `switch1(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface port-channel 10` `switch(config-if)#`	Configures the specified PortChannel (10).
Step 3	`switch(config-if)# ip address 10.1.1.1` `255.255.255.0`	Enters the IPv4 address (10.1.1.1) and subnet mask (255.255.255.0) for the PortChannel. **Note** A PortChannel does not have any members when first created.
Step 4	`switch(config-if)# no shutdown`	Enables the interface.
Step 5	`switch(config)# interface gigabitethernet 9/3` `switch(config-if)#`	Configures the specified Gigabit Ethernet interface (slot 9, port 3).

Step 6	`switch(config-if)# channel-group 10`
	`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.

Step 7	`switch(config-if)# no shutdown`	Enables the selected interface.

	Command	Purpose
Step 8	`switch(config)# interface gigabitethernet 9/4` `switch(config-if)#`	Configures the specified Gigabit Ethernet interface (slot 9, port 4).

Step 9	`switch(config-if)# channel-group 10`
	`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.

Step 10	`switch(config-if)# no shutdown`	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*.

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 unreach, 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
```

Default Settings

Table 6-1 lists the default settings for IP storage services parameters.

Table 6-1   Default Gigabit Ethernet Parameters

Parameters	Default
IPS core size	Partial

■ Default Settings