



## Managing VSANs

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VSANs (virtual SANs) allow you to separate devices that are physically connected to the same fabric, and thus provide higher security and greater scalability in the network fabric. When you create VSANs, you are creating multiple logical SANs over a common physical infrastructure. After creating VSANs, you must establish IP static routes between the network segments if you are using the IP over Fibre Channel (IPFC) protocol to manage your Cisco MDS 9000 Family switches.

The Fabric Manager allows you to configure VSANs on multiple Cisco 9000 switches. The Device Manager allows you to configure VSANs on a single Cisco 9000 switch. This chapter describes how to configure VSANs using the Fabric Manager and the Device Manager.



**Note**

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For information about VSANs and configuring them using the command-line interface (CLI), refer to the *Cisco 9000 Family Configuration Guide*.

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You can manage Cisco MDS 9000 Family switches through Ethernet connections to the management interface (mgmt 0) of each switch or by using the IPFC protocol. To use IPFC, you connect to a switch using the Ethernet management interface and establish routes from that switch to the other switches over the Fibre Channel network. When you segment the Fibre Channel network using VSANs, you must establish static routes between the network segments.

This chapter includes the following sections:

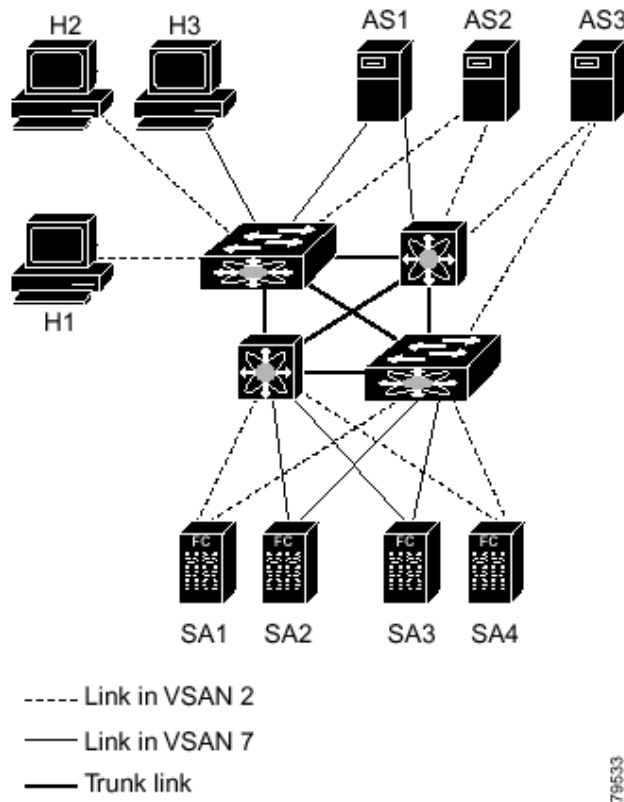
- [Adding and Configuring VSANs, page 4-1](#)
- [Controlling In-Band Management Connectivity, page 4-4](#)

## Adding and Configuring VSANs

[Figure 4-1](#) shows a physical Fibre Channel network with two VSANs. VSAN 2 is connected by dashed lines and VSAN 7 is connected by solid lines.

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Figure 4-1 Configuring VSANs



VSAN 2 includes the H1 and H2 hosts, the AS2 and AS3 application servers, and the SA1 and SA4 storage arrays. VSAN 7 connects H3, AS1, SA2, and SA3. The four switches in this network are interconnected by trunk links that carry both VSAN 2 and VSAN 7 traffic.

VSAN 1 is the default VSAN for Cisco MDS 9000 Family switches. All ports are assigned by default to VSAN 1. VSAN 4094 is called the isolated VSAN. When a VSAN is deleted, any ports in that VSAN are moved to VSAN 4094.



**Note**

We recommend that you delete or move all the ports in a VSAN before deleting the VSAN.

VSANs are enabled through trunking, which enables interconnect ports to transmit and receive frames in more than one VSAN over a single physical link, using the Extended Inter-Switch Link (EISL) protocol. The trunking protocol is enabled by default, and if disabled on a switch, no ports on that switch or directly connected to the switch will support the use of VSANs.

By default, the trunk mode is enabled on all Fibre Channel interfaces, but can be disabled on a port-by-port basis. When connected to a third-party switch, the trunk mode configuration has no effect—the ISL is always in a trunking disabled state.

Each Fibre Channel interface has an associated trunk-allowed VSAN list. This list determines the VSANs that are supported on each interface. By default, the entire range of VSANs from 1 through 4093 are allowed on any interface. You can restrict an interface to the use of a specific set of VSANs, which prevents traffic from any other VSAN being transmitted on the interface.

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To add and configure VSANs from the Fabric Manager, choose **FC > VSAN** from the menu tree. [Figure 4-2](#) shows the **FC > VSAN** dialog box from the Fabric Manager. This view displays VSAN attributes for multiple switches.

**Figure 4-2 FC > VSANs Dialog Box, Fabric Manager**

Switch	Index	Name	Mtu	LoadBalancing	InterOper	State		Membership	
						Admin	Oper	Ports	Channels
switch2	1	VSAN0001	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	up	4/1-4/16	1
switch3	1	VSAN0001	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	up	8/1-8/16	
switch1	1	VSAN0001	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	up	2/1-2/32	1
switch2	2	VSAN	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	down		
switch3	2	VSAN	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	down		
switch2	10	VSAN10	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	down		
switch1	2	VSAN	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	down		
switch3	10	VSAN10	2112	srcIdDestIdOxId	<input type="checkbox"/>	active	down		
switch2	4094	isolated vsan	2112	srcIdDestIdOxId	<input type="checkbox"/>	suspended	down		

To manage VSANs from Device Manager, choose the **VSAN** option from the **FC** menu or click the **VSAN** icon on the toolbar. The dialog box in the Device Manager displays VSAN general attributes for a single switch.

Both dialog boxes show the display-only information described in [Table 4-1](#).

**Table 4-1 FC > VSANs—Display-Only Attributes**

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Index	Displays the VSAN ID.
Mtu	Displays the MTU (maximum transmission unit) of the VSAN. Normally, this attribute is 2112 for all VSANs with a Fibre Channel media type.

[Table 4-2](#) lists the attributes that you can configure for the VSAN.

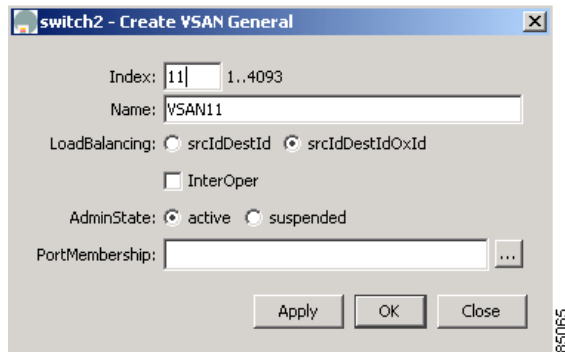
**Table 4-2 FC > VSANs—Configurable Attributes**

Configurable Attribute	Description
Name	Specifies the name of the VSAN.
State	Specifies the state of the VSAN. Valid states are active and suspended.
InorderDelivery	Enables InorderDelivery for the VSAN. Check the checkbox to guarantee that packets are delivered in order.
LoadBalancingType	Specifies the type of load balancing used on this VSAN.
PortMembership	Specifies the ports assigned to this VSAN.

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To add a VSAN from Fabric Manager, click **Create** on the Information pane toolbar. To add a VSAN from Device Manager, click **Create** on the FC > VSAN dialog box. You see the dialog box shown in [Figure 4-3](#).

**Figure 4-3** Create VSANs



Complete the fields on this dialog box and click **OK** to add the VSAN.

## Controlling In-Band Management Connectivity

The Fabric Manager allows you to configure and monitor IP traffic on multiple Cisco MDS 9000 Family switches. The Device Manager allows you to configure and monitor IP traffic on a single Cisco 9000 switch.

Cisco MDS 9000 Family switches support both out-of-band and in-band management schemes. An Ethernet connection provides out-of-band management using Telnet, SSH or SNMP access. In-band IP management is also available using IP over Fibre Channel (IPFC). IPFC encapsulates IP packets into Fibre Channel frames so that management information can cross the Fibre Channel network without requiring a dedicated Ethernet connection to each switch. IP addresses are resolved to the Fibre Channel address through the Address Resolution Protocol (ARP).

This section includes the following topics:

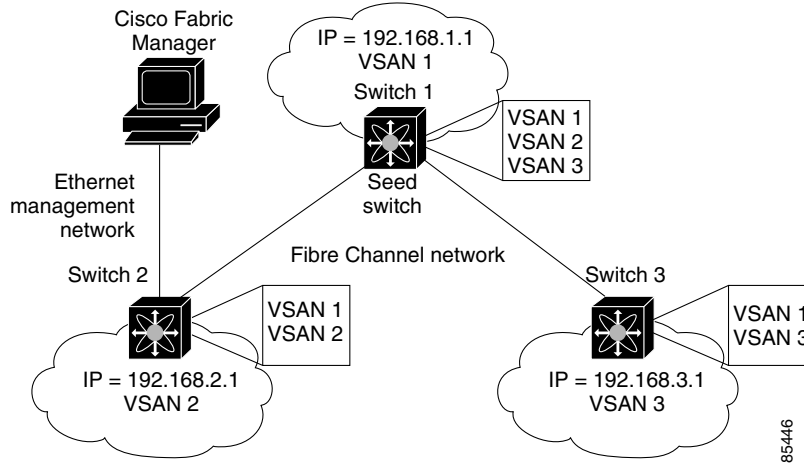
- [Configuring IP Routing for Management Traffic, page 4-4](#)
- [Managing IPFC Connectivity with Multiple VSANs, page 4-6](#)
- [Viewing In-Band Management Information, page 4-7](#)

## Configuring IP Routing for Management Traffic

When using in-band network management over Fibre Channel links, you must ensure that a path exists from the seed switch, connected to the Cisco Fabric Manager over its Ethernet interface (mgmt0), and the other switches in the network fabric. See [Figure 4-4](#).

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**Figure 4-4 IP Routing Between VSANs**



To do this, make sure that the seed switch has a path to each VSAN. Each of the other switches can then be configured to use the seed switch as their default gateway. For example, in Figure 4-4, switch 1 is connected to VSAN 2 and VSAN 3, while switch 2 and switch 3 are configured to use switch 1 as their default gateway.

You can also configure static routes on a point-to-point basis from one switch to another. In this example, you would configure a static route on both switch 2 and switch 3 to switch 1.

To configure an IP route or identify the default gateway, choose **IP Routes** from the Device Manager IP menu. You see the window shown in Figure 4-5.

**Figure 4-5 IP Routes**

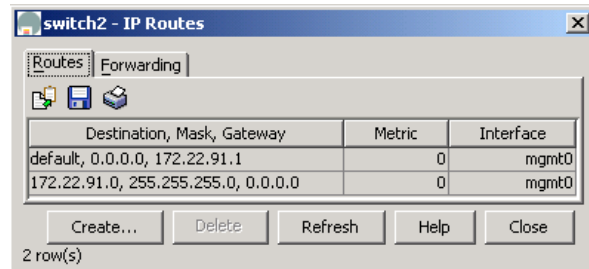


Table 4-3 describes the configurable attributes for IP routes.

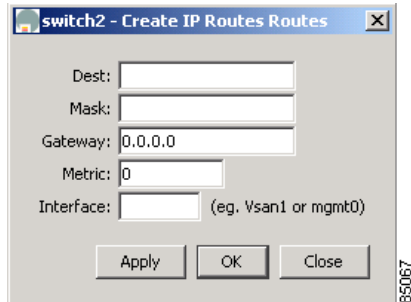
**Table 4-3 IP > IP Routes—Configurable Attributes**

Configurable Attribute	Description
Destination	Specifies the destination for the route.
Mask	Specifies the mask for the interface.
Gateway	Specifies the default gateway for the switch.
Metric	Specifies the primary routing metric for this route.
Interface	Specifies the interface that exchanges management traffic.

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To create a new IP route or identify the default gateway on a switch, click the **Create** button. You see the window shown in [Figure 4-6](#).

**Figure 4-6** Create IP Routes



Complete the fields on this window and click **OK** to add an IP route.

To configure a static route, enter the destination network ID and subnet mask in the **Dest** and **Mask** fields. To configure a default gateway, enter the IP address of the seed switch in the **Gateway** field.

## Managing IPFC Connectivity with Multiple VSANs

To configure IPFC, choose **VSAN** from the Device Manager FC menu and click the **IP FC** tab. The IP > IP FC dialog boxes show the display-only information described in [Table 4-4](#).

**Table 4-4** FC > VSAN > IP FC—Display-Only Attributes

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
VSAN	Displays the VSAN ID.
IpAddress/Mask	Displays the IP address and mask for the interface.
FcId	Displays the Fibre Channel identifier for this interface.
Status—Oper	Displays the current operational status of the interface. Valid values are up, down, and disabled.
Status—Cause	Displays the cause for the current operational status.

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Table 4-5 describes the configurable attributes for IPFC.

**Table 4-5 FC > VSAN > IP FC—Configurable Attributes**

Configurable Attribute	Description
Mtu	Specifies the maximum transmission unit (MTU)-for the interface.
Admin	Specifies the desired state of the interface. Valid values are up and disabled.

## Viewing In-Band Management Information

This section describes how to monitor different types of IP management traffic over the Fibre Channel network. It includes the following topics:

- [Viewing IP Address Information, page 4-7](#)
- [Enabling or Disabling IP Forwarding, page 4-7](#)
- [Viewing TCP Information and Statistics, page 4-8](#)
- [Viewing UDP Information and Statistics, page 4-9](#)
- [Viewing IP Statistics, page 4-10](#)
- [Viewing ICMP Statistics, page 4-12](#)
- [Monitoring SNMP Traffic, page 4-14](#)

## Viewing IP Address Information

To view IP addresses of the switches in the current fabric, choose **IP > Addresses** from the Fabric Manager menu tree. The dialog box from displays IP address information for multiple switches.

**Table 4-6 IP > IP Addresses**

Attribute	Description
Switch	Displays the identity of the switch.
Interface, IpAddress	Displays the interface on the switch and the IP address assigned to it.
MaskLength	Displays the length of the subnet mask assigned to the interface.

## Enabling or Disabling IP Forwarding

To view or change the IP forwarding configuration of the switches in the current fabric, choose **IP > Forwarding** from the Fabric Manager menu tree. The dialog box shows the display-only and configurable attributes described in [Table 4-7](#).

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**Table 4-7** IP > IP Addresses

Attribute	Description
Switch	Displays the identity of the switch.
RoutingEnabled	Determines if IP forwarding is enabled on the switch.

To enable IP forwarding for a specific switch, click the **RoutingEnabled** check box.

## Viewing TCP Information and Statistics

To view TCP information from the Device Manager, choose **TCP/UDP** from the IP menu. The dialog box shows the display-only attributes described in [Table 4-8](#).

**Table 4-8** IP > TCP/UDP > TCP—Display-Only Attributes

Display-Only Attribute	Description
Local IP, Port, Remote IP, Port	Displays the local IP port ID and remote IP port ID.
State	Displays the state of the TCP connection.

To monitor TCP statistics from the Fabric Manager, choose **IP > Statistics > TCP** from the menu tree. To monitor TCP statistics from the Device Manager, choose **Statistics** from the IP menu and view the TCP tab. The dialog boxes in Fabric Manager and Device Manager show the display-only attributes described in [Table 4-9](#).

**Table 4-9** IP > Statistics > TCP—Display-Only Attributes

Display-Only Attribute	Description
Switch	Displays the identity of the switch (Fabric Manager only).
ActiveOpens	Displays the number of times TCP connections have made a direct transition from the CLOSED state to the SYN-SENT state.
PassiveOpens	Displays the number of times TCP connections have made a direct transition from the LISTEN state to the SYN-RCVD state.
AttemptFails	Displays the number of times TCP connections have made a direct transition from either the SYN-SENT state or the SYN-RCVD state to the CLOSED state.  Also displays the number of times TCP connections have made a direct transition from the SYN-RCVD state to the LISTEN state.



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**Table 4-9** *IP > Statistics > TCP—Display-Only Attributes (continued)*

<b>Display-Only Attribute</b>	<b>Description</b>
EstabResets	Displays the number of times TCP connections have made a direct transition from either the ESTABLISHED state or the CLOSE-WAIT state to the CLOSED state.
InSegs	Displays the total number of segments received, including those received in error. This count includes segments received on currently established connections.
OutSegs	Displays the total number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
RetransSegs	Displays the total number of segments retransmitted; that is, the number of TCP segments transmitted containing one or more previously transmitted octets.
InErrs	Displays the total number of segments received in error; for example, bad TCP checksums.
OutRsts	Displays the number of TCP segments sent containing the RST (reset) flag.

## Viewing UDP Information and Statistics

To view User Datagram Protocol (UDP) information from the Device Manager, choose **TCP/UDP** from the IP menu and click the **UDP** tab. The dialog box shows the display-only attributes described in [Table 4-10](#).

**Table 4-10** *IP > TCP/UDP > UDP—Display-Only Attributes*

<b>Display-Only Attribute</b>	<b>Description</b>
IpAddress	Displays the IP address of the UDP listener.
Port	Displays the local port number of the UDP listener.

To monitor UDP traffic from the Fabric Manager, choose **IP > Statistics > UDP** from the menu tree. To monitor UDP statistics from Device Manager, choose **Statistics** from the IP menu and click the **UDP** tab.

The Fabric Manager dialog box displays TCP traffic information for multiple switches. The Device Manager dialog box displays information for a single switch. Both dialog boxes show the display-only attributes described in [Table 4-11](#).

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**Table 4-11** *IP > Statistics > UDP—Display-Only Attributes*

Display-Only Attribute	Description
InDatagrams	Displays the total number of UDP datagrams delivered to UDP users.
NoPorts	Displays the total number of UDP datagrams received for which there was no application at the destination port.
InErrors	Displays the number of UDP datagrams received that could not be delivered for reasons other than the lack of an application at the destination port.
OutDatagrams	Displays the total number of UDP datagrams sent.

## Viewing IP Statistics

To monitor statistics from the Fabric Manager, choose **IP > Statistics > IP**. The Fabric Manager dialog box displays IP statistics for multiple switches.

To monitor IP statistics from Device Manager, select **Statistics** from the IP menu and click the **IP** tab. The Device Manager dialog box displays information for a single switch.

Both dialog boxes show the display-only attributes described in [Table 4-12](#).

**Table 4-12** *IP > Statistics > IP—Display-Only Attributes*

Display-Only Attribute	Description
InReceives	Displays the total number of input datagrams received from interfaces, including those received in error.
InHdrErrors	Displays the number of input datagrams discarded due to errors in their IP headers, including: <ul style="list-style-type: none"> <li>• Bad checksums</li> <li>• Version number mismatch</li> <li>• Format errors</li> <li>• Time-to-live exceeded</li> <li>• Errors discovered in processing their IP options</li> </ul>

**Send documentation comments to****Table 4-12 IP > Statistics > IP—Display-Only Attributes (continued)**

<b>Display-Only Attribute</b>	<b>Description</b>
InAddrErrors	<p>Displays the number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received.</p> <p>This count includes invalid addresses (for example, 0.0.0.0) and addresses of unsupported classes (for example, class E).</p> <p>For devices that are not IP routers and do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.</p>
ForwDatagrams	<p>Displays the number of input datagrams for which this device was not their final IP destination. As a result, an attempt was made to find a route to forward them to that final destination.</p> <p>In devices that do not act as IP routers, this counter includes only those packets that were source-routed through this device and the source-route option processing was successful.</p>
InUnknownProtos	<p>Displays the number of locally addressed datagrams that were received successfully, but were discarded because of an unknown or unsupported protocol.</p>
InDiscards	<p>Displays the number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (for example, for lack of buffer space).</p> <p>This counter does not include any datagrams discarded while awaiting reassembly.</p>
InDelivers	<p>Displays the total number of input datagrams that were delivered successfully to IP user protocols, including Internet Control Message Protocol (ICMP).</p>
OutRequests	<p>Displays the total number of IP datagrams supplied to IP by local IP user protocols (including ICMP), during requests for transmission.</p> <p>This counter does not include any datagrams counted in the ForwDatagrams attribute.</p>

**Send documentation comments to****Table 4-12 IP > Statistics > IP—Display-Only Attributes (continued)**

Display-Only Attribute	Description
OutDiscards	Displays the number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (for example, for lack of buffer space).  This counter includes datagrams counted in the ForwDatagrams attribute, if any of these packets meet the discard criterion.
OutNoRoutes	Displays the number of IP datagrams discarded because no route could be found to transmit them to their destination.  This counter includes any packets counted in the ForwDatagrams attribute, which meet this no-route criterion. This includes any datagrams that a host cannot route because all of its default routers are down.
FragOKs	Displays the number of IP datagrams that have been successfully fragmented.
FragFails	Displays the number of IP datagrams that have been discarded because they needed to be fragmented, but could not be; for example, because their “Don’t Fragment” flag was set.
FragCreates	Displays the number of IP datagram fragments that have been generated as a result of fragmentation.
ReasmReqds	Displays the number of IP fragments received that needed to be reassembled.
ReasmOKs	Displays the number of IP datagrams reassembled successfully.
ReasmFails	Displays the number of failures detected by the IP reassembly algorithm, due to timeout or errors.  This is not necessarily a count of discarded IP fragments, because some algorithms can lose track of the number of fragments by combining them as they are received.

**Viewing ICMP Statistics**

To monitor statistics for ICMP packets received, select **IP > Statistics > ICMP > In** from the Fabric Manager menu tree. To monitor statistics for ICMP packets transmitted from the Fabric Manager, select **IP > Statistics > ICMP > Out** from the Fabric Manager menu tree.

To monitor ICMP statistics from Device Manager, select **Statistics** from the IP menu and click the **ICMP** tab.

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The Fabric Manager dialog box displays information for multiple switches. The Device Manager dialog box displays information for a single switch.

Table 4-13 describes the information displayed by both dialog boxes. In the Device Manager, a prefix (In or Out) identifies whether the packets are received or transmitted. In the Fabric Manager, separate dialog boxes are provided for incoming and outbound ICMP traffic and this prefix is omitted.

**Table 4-13 IP > Statistics > ICMP—Display-Only Attributes**

<b>Display-Only Attribute</b>	<b>Description</b>
InSrcQuenchs	Displays the number of ICMP source quench messages received.
InRedirects	Displays the number of ICMP redirect messages received.
InEchos	Displays the number of ICMP echo request messages received.
InEchoReps	Displays the number of ICMP echo reply messages received.
InTimestamps	Displays the number of ICMP timestamp request messages received.
InTimestampReps	Displays the number of ICMP timestamp reply messages received.
InAddrMasks	Displays the number of ICMP address mask request messages received.
InAddrMaskReps	Displays the number of ICMP address mask reply messages received.
InParmProbs	Displays the number of ICMP parameter problem messages received.
InDestUnreachs	Displays the number of ICMP destination unreachable messages received.
InTimeExcds	Displays the number of ICMP time exceeded messages received.
OutSrcQuenchs	Displays the number of ICMP source quench messages sent.
OutRedirects	Displays the number of ICMP redirect messages sent. For a host, this attribute is always zero (0), because hosts do not send redirects.
OutEchos	Displays the number of ICMP echo request messages sent.
OutEchoReps	Displays the number of ICMP echo reply messages sent.
OutTimestamps	Displays the number of ICMP timestamp request messages sent.
OutTimestampReps	Displays the number of ICMP timestamp reply messages sent.
OutAddrMasks	Displays the number of ICMP address mask request messages sent.

## *Send documentation comments to*

**Table 4-13** *IP > Statistics > ICMP—Display-Only Attributes (continued)*

Display-Only Attribute	Description
OutAddrMaskReps	Displays the number of ICMP address mask reply messages sent.
OutParmProbs	Displays the number of ICMP parameter problem messages sent.
OutDestUnreachs	Displays the number of ICMP destination unreachable messages sent.
OutTimeExcds	Displays the number of ICMP time exceeded messages sent.

## Monitoring SNMP Traffic

To monitor statistics from the Fabric Manager, select **IP > Statistics > SNMP**. To monitor SNMP traffic from Device Manager, select **Statistics** from the IP menu and click the **SNMP** tab.

The Fabric Manager dialog box displays information for multiple switches. The Device Manager dialog box displays information for a single switch. Both dialog boxes show the display-only attributes described in [Table 4-14](#).

**Table 4-14** *IP > Statistics > SNMP—Display-Only Attributes*

Display-Only Attribute	Description
InPkts	Displays the total number of messages delivered by the transport service.
InBadVersions	Displays the total number of SNMP messages for an unsupported version of SNMP that were delivered.
InBadCommunityNames	Displays the total number of SNMP messages delivered that used an unknown SNMP community name.
InBadCommunityUses	Displays the total number of SNMP messages that represented an SNMP operation that was not allowed by the SNMP community named in the message.
InASNParseErrs	Displays the total number of ASN.1 or BER (bit error rate) errors encountered when decoding received SNMP messages.

## *Send documentation comments to*

**Table 4-14** IP > Statistics > SNMP—Display-Only Attributes (continued)

Display-Only Attribute	Description
SilentDrops	<p>Displays the total number of the following protocol data units (PDUs) that were delivered and were dropped silently:</p> <ul style="list-style-type: none"> <li>• GetRequest-PDUs</li> <li>• GetNextRequest-PDUs</li> <li>• GetBulkRequest-PDUs</li> <li>• SetRequest-PDUs</li> <li>• InformRequest-PDUs</li> </ul> <p>These PDUs were dropped because the size of a reply containing an alternate Response-PDU with an empty variable-bindings field was greater than either a local constraint or the maximum message size associated with the originator of the request.</p>
ProxyDrops	<p>Displays the total number of the following PDUs that were delivered and were dropped silently:</p> <ul style="list-style-type: none"> <li>• GetRequest-PDUs</li> <li>• GetNextRequest-PDUs</li> <li>• GetBulkRequest-PDUs</li> <li>• SetRequest-PDUs</li> <li>• InformRequest-PDUs</li> </ul> <p>These PDUs were dropped because the transmission of the (possibly translated) message to a proxy target failed in a manner (other than a timeout), such that no Response-PDU could be returned.</p>

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