



## Managing Fibre Channel Routing and FSPF

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Fabric Shortest Path First (FSPF) is the standard path selection process used by Fibre Channel fabrics. FSPF automatically calculates the best path between any two switches in the fabric. All routes across the fabric are established when switches are powered up. These routes do not change unless there is a failure or unless a new ISL (or EISL) is created that offers a path equal to or better than an existing path.

The Fabric Manager allows you to configure and monitor these routing services on multiple Cisco 9000 switches. The Device Manager allows you to configure and monitor Fibre Channel routing and FSPF on a single Cisco 9000 switch. This chapter describes how to configure Fibre Channel routing and FSPF using the Fabric Manager and Device Manager. For information about Fibre Channel routing and how to configure routing and FSPF using the command line interface (CLI), refer to the *Cisco 9000 Family Configuration Guide*. This chapter includes the following information:

- [Configuring Fibre Channel Routing, page 10-1](#)
- [Configuring FSPF, page 10-5](#)

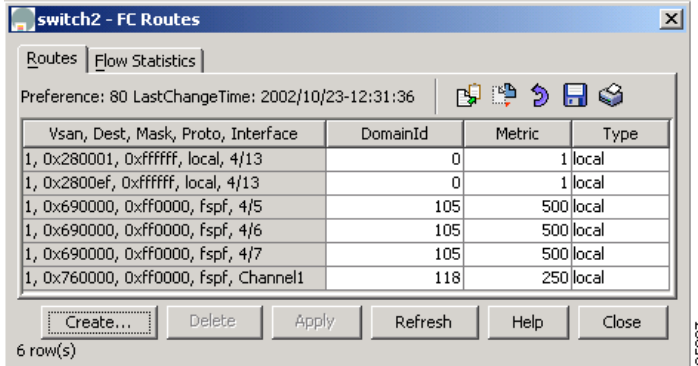
### Configuring Fibre Channel Routing

This section describes how to configure Fibre Channel routing and includes the following topics:

- [Configuring Fibre Channel Routes, page 10-1](#)
- [Configuring Fibre Channel Route Flows, page 10-3](#)

### Configuring Fibre Channel Routes

To configure Fibre Channel routes from the Device Manager, choose **Routes** from the FC menu. The dialog box displays routes for a single switch. [Figure 10-1](#) shows the dialog box.

**Send documentation comments to****Figure 10-1 FC > Routes Dialog Box**

The dialog box shows the display-only information described in [Table 10-1](#).

**Table 10-1 FC > Routes—Display-Only Attributes**

Display-Only Attribute	Description
Vsan, Dest, Mask, Proto, Interface	Displays the VSAN ID, destination Fibre Channel address ID, and the mask for the destination Fibre Channel address ID.

[Table 10-2](#) describes the configurable attributes for the route.

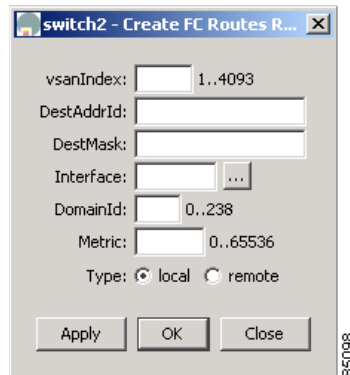
**Table 10-2 FC > Routes—Configurable Attributes**

Configurable Attribute	Description
Interface	Specifies the local interface through which the next hop of this route should be reached. Only Fibre Channel interfaces and PortChannel interfaces are supported.
DomainId	Specifies the domain ID of next hop switch.
Metric	Specifies the routing metric for this route. This attribute is not relevant for multicast route entries.
Type	Specifies the type of route. Valid values are: <ul style="list-style-type: none"> <li>direct—A route for which the next hop is the final destination.</li> <li>remote—A route for which the next hop is not the final destination.</li> </ul> This attribute is not relevant for multicast route entries.
Permanent	Click to select or deselect whether the route is to be removed from the forwarding information base (FIB) if the port is operationally down. <p>This attribute is not relevant for multicast route entries.</p>

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To add a route from Device Manager, click **Create** on the dialog box. You see the dialog box shown in [Figure 10-2](#).

**Figure 10-2** Create FC Route



Click the button to the right of the Interface field and select the interface on which to configure the Fibre Channel route. Complete the other fields on this window and click **OK** to add a route.

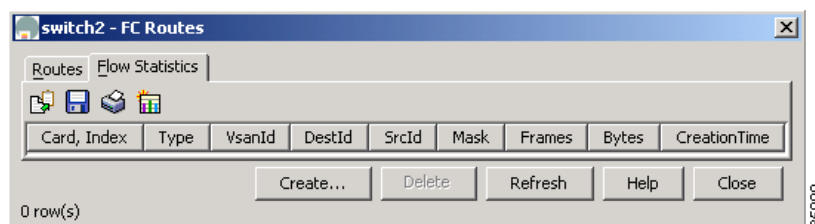
## Configuring Fibre Channel Route Flows

To view Fibre Channel flows from the Fabric Manager, choose **FC > Route Flow Statistics** on the menu tree. To manage Fibre Channel route flows from the Device View, choose **Routes** from the FC menu and click the **Flow Statistics** tab.

The dialog box from Fabric Manager displays flows for multiple switches. The dialog box from the Device Manager displays flows for a single switch.

[Figure 10-3](#) shows the dialog box from Device Manager.

**Figure 10-3** FC > Route Flows Dialog Box



Both dialog boxes show the display-only information described in [Table 10-3](#).

**Table 10-3** The FC > Routes > Flows—Display-Only Attributes

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Card, Index	Displays the card ID.
CreationTime	Displays the time the row was created or modified.

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Table 10-4 describes the configurable flow attributes for the route.

**Table 10-4 FC > Routes > Flows—Configurable Attributes**

Configurable Attribute	Description
Type	<p>Specifies the flow type being used to set up the ingress traffic counters. Valid values are:</p> <ul style="list-style-type: none"> <li>• aggregated—The VSAN ID is required when creating an entry. The following attributes are ignored (even if they are provided): <ul style="list-style-type: none"> <li>– DestId</li> <li>– SrcId</li> <li>– Mask (if not provided, the default value 0xffff is used)</li> <li>– Port</li> </ul> </li> <li>• exact—The following attributes are required when creating an entry: <ul style="list-style-type: none"> <li>– VsanId</li> <li>– DestId</li> <li>– SrcId</li> <li>– Port</li> <li>– Mask (optional)</li> </ul> </li> </ul> <p>This attribute cannot be modified while the corresponding value of fcRouteFlowRowStatus is equal to active.</p>
VsanId	<p>Specifies the VSAN ID.</p> <p>This attribute cannot be modified while the corresponding value of fcRouteFlowRowStatus is equal to active.</p>
DestId	<p>Specifies the destination Fibre Channel address ID.</p> <p>This attribute cannot be modified while the corresponding value of fcRouteFlowRowStatus is equal to active.</p>
SrcId	<p>Specifies the source Fibre Channel address ID.</p> <p>This attribute cannot be modified while the corresponding value of fcRouteFlowRowStatus is equal to active.</p>
Mask	<p>Specifies the mask for source and destination Fibre Channel address ID.</p> <p>This attribute cannot be modified while the flow is active.</p>

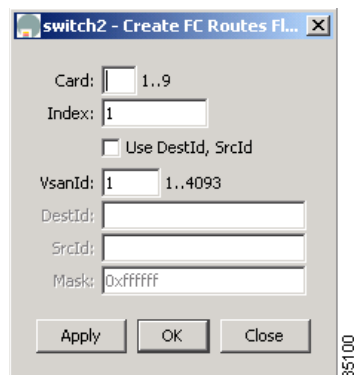
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**Table 10-4** *FC > Routes > Flows—Configurable Attributes (continued)*

Configurable Attribute	Description
Port	Specifies the physical ingress port to which this counter applies.  This attribute cannot be modified while the flow is active.
Frames	Specifies the number of received frames for the flow.
Bytes	Specifies the number of received frame bytes for the flow.

To add a route flow from Fabric Manager, click **Create Row** on the toolbar. To add a route flow from Device Manager, click **Create** on the dialog box. You see the dialog box shown in [Figure 10-4](#).

**Figure 10-4** *Insert Route Flow*



Complete the fields on this window and click **Create** to add a route flow.

## Configuring FSPF

This section describes how to configure FSPF and includes the following topics:

- [Managing FSPF General Attributes, page 10-6](#)
- [Configuring FSPF Interfaces, page 10-7](#)
- [Viewing FSPF Statistics, page 10-8](#)
- [Viewing FSPF Interface Statistics, page 10-9](#)
- [Viewing Link State Records, page 10-10](#)
- [Viewing FSPF Links, page 10-11](#)

*Send documentation comments to***Managing FSPF General Attributes**

To manage FSPF general attributes from the Fabric Manager, choose **FC > FSPF > General** on the menu tree. To manage FSPF general attributes from the Device Manager, choose **FSPF** from the FC menu and click the **General** tab.

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

Figure 10-5 shows the dialog box from Device Manager.

**Figure 10-5** *FC > FSPF > General Dialog Box*

Both dialog boxes show the display-only information described in Table 10-5.

**Table 10-5** *FC > FSPF > General—Display-Only Attributes*

<b>Display-Only Attribute</b>	<b>Description</b>
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Vsan	Displays the VSAN ID.
Status—Oper	Displays the operational state of FSPF on this VSAN. Valid values are up and down.
DomainId	Displays the domain ID of the local switch on this VSAN.
SpfComputation—Delay	Displays the time between when FSPF receives topology updates and when it starts the Shortest Path First (SPF) computation on this VSAN. Displays a smaller value if routing reacts to the changes faster, but CPU usage is greater.
LinkStateRecord—MinArrival	Displays the minimum time between accepting a link state record (LSR) on this VSAN and accepting another update of the same LSR on the same VSAN. An LSR update that is not accepted because of this time interval is discarded.
LinkStateRecord—MinInterval	Displays the minimum time after this switch sends an LSR on this VSAN before it sends another update of the same LSR on the same VSAN.

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**Table 10-5** *FC > FSPF > General—Display-Only Attributes (continued)*

Display-Only Attribute	Description
LinkStateRecord—RefreshTime	Displays the time interval between refreshes of link state records (LSRs) on this VSAN.
LinkStateRecord—MaxAge	Displays the maximum time an LSR is retained in the FSPF database on this VSAN. The LSR is removed from the database after the MaxAge is reached.
CreateTime	Displays the time this entry was last created.

Table 10-6 describes the configurable FSPF general attributes.

**Table 10-6** *FC > FSPF > General—Configurable Attributes*

Configurable Attribute	Description
Status—Admin	Enables or disables FSPF on this VSAN. Valid values are up and down.
RegionId	Specifies the autonomous region of the local switch on this VSAN.
SpfComputation—HoldTime	Specifies the minimum time between two consecutive SPF computations on this VSAN.  The smaller value indicates that routing reacts to the changes faster, but CPU usage is greater.

## Configuring FSPF Interfaces

To configure FSPF interfaces from the Fabric Manager, choose **FC > FSPF > Interfaces** on the menu tree. To configure FSPF interfaces from the Device Manager, choose **FSPF** from the FC menu and click the **Interfaces** tab.

Both dialog boxes show the display-only information described in Table 10-7.

**Table 10-7** *FC > FSPF > Interfaces—Display-Only Attributes*

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Vsan, Port	Displays the VSAN ID and port ID.
Neighbors—State	Displays the state of the FSPF neighbor interface that is connected to this interface.
Neighbors—DomainId	Displays the domain ID of the neighbor on this VSAN.
Neighbors—PortIndex	Displays the port ID of the neighbor interface.
CreateTime	Displays the time this interface was created.

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Table 10-8 describes the configurable attributes for FSPF interfaces.

**Table 10-8 FC > FSPF > Interfaces—Configurable Attributes**

Configurable Attribute	Description
Cost	Specifies the administrative cost of sending a frame on this interface on this VSAN; the lower the cost, the better.
AdminStatus	Enables or disables FSPF on this interface on the VSAN. Valid values are up and down.
Intervals (sec)—Hello	Specifies the interval between the HELLO messages sent on this interface on this VSAN to verify the link health.  <b>Note</b> This value must be same on both of the interfaces on each end of the link on this VSAN.
Intervals (sec)—Dead	Specifies the maximum time for which no HELLO messages can be received on this interface on this VSAN. After this time, the interface is assumed to be broken and removed from the database.  This attribute's value must be greater than the HELLO interval specified on this interface on this VSAN.
Intervals (sec)—Retransmit	Specifies the time after which an unacknowledged link update is retransmitted on this interface on this VSAN.

## Viewing FSPF Statistics

To monitor FSPF statistics from the Fabric Manager, choose **FC > FSPF > Statistics** on the menu tree. To monitor FSPF statistics from the Device Manager, choose **FSPF** from the FC menu and click the **Statistics** tab. Both dialog boxes show the display-only information described in Table 10-9.

**Table 10-9 FC > FSPF > Statistics—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.
SpfComputations	Displays the number of times the SPF computation has been done on this VSAN since the creation of the entry.
ErrorRxPkts	Displays the number of invalid FSPF control packets received on all the interfaces on this VSAN since the creation of the entry.



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**Table 10-9** *FC > FSPF > Statistics—Display-Only Attributes (continued)*

Display-Only Attribute	Description
ChecksumErrors	Displays the number of FSPF checksum errors that occurred on this VSAN since the creation of the entry.
LinkStateUpdates—RxPkts	Displays the total number of link state update (LSU) packets received on all the interfaces on this VSAN since the creation of the entry.
LinkStateUpdates—TxPkts	Displays the total number of LSU packets transmitted on all the interfaces on this VSAN since the creation of the entry.
LinkStateUpdates—RetranTxPkts	Displays the total number of LSU packets retransmitted on all the interfaces on this VSAN since the creation of the entry.
LinkStateAcks—RxPkts	Displays the total number of link state acknowledgment (LSA) packets received on all the interfaces on this VSAN since the creation of the entry.
LinkStateAcks—TxPkts	Displays the total number of LSA packets transmitted on all the interfaces on this VSAN since the creation of the entry.
Hellos—RxPkts	Displays the total number of HELLO packets received on all the interfaces on this VSAN since the creation of the entry.
Hellos—TxPkts	Displays the total number of HELLO packets transmitted on all interfaces on this VSAN since the creation of the entry.
MaxAgeCount	Displays the number of times any LSR reached the maximum age in this VSAN since the creation of the entry.

## Viewing FSPF Interface Statistics

To monitor FSPF interface statistics from the Fabric Manager, choose **FC > FSPF > Statistics > Interface** on the menu tree. To monitor FSPF interface statistics from the Device Manager, choose **FSPF** from the FC menu and click the **Interface Stats** tab. Both dialog boxes show the display-only information described in [Table 10-10](#).

**Table 10-10** *FC > FSPF > Interface Stats—Display-Only Attributes*

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Vsan, Port	Displays the VSAN ID and port ID.
CreateTime	Displays the time this interface was created.

**Send documentation comments to****Table 10-10 FC > FSPF > Interface Stats—Display-Only Attributes (continued)**

Display-Only Attribute	Description
ErrorRxPkts	Displays the number of invalid FSPF control packets received on this interface on this VSAN since the creation of the interface.
InactivityExpirations	Displays the number of times the inactivity timer has expired on this interface on this VSAN since the creation of the interface.
LinkStateUpdates—RxPkts	Displays the number of link state update (LSU) packets received on this interface on this VSAN since the creation of the interface.
LinkStateUpdates—TxPkts	Displays the number of LSU packets transmitted on this interface on this VSAN since the creation of the interface.
LinkStateUpdates—RetranTxPkts	Displays the number of LSU packets retransmitted on this interface on this VSAN since the creation of the interface.
LinkStateAcks—RxPkts	Displays the number of link state acknowledgment (LSA) packets received on this interface on this VSAN since the creation of the interface.
LinkStateAcks—TxPkts	Displays the number of LSA packets transmitted on this interface on this VSAN since the creation of the interface.
Hellos—RxPkts	Displays the number of HELLO packets received on this interface on this VSAN since the creation of the interface.
Hellos—TxPkts	Displays the number of HELLO packets transmitted on this interface on this VSAN since the creation of the interface.

## Viewing Link State Records

To monitor FSPF LSRs from the Device Manager, choose **FSPF** from the FC menu and click the **LSDB LSRs** tab. The dialog box shows the display-only information described in [Table 10-11](#).

**Table 10-11 FC > FSPF > LSDB LSRs—Display-Only Attributes**

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Vsan, DomainId	Displays the VSAN ID and the domain ID of the local switch on this VSAN.
AdvDomainId	Displays the domain ID of the switch that is advertising the LSR on behalf of the switch that owns it.

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**Table 10-11 FC > FSPF > LSDB LSRs—Display-Only Attributes (continued)**

Display-Only Attribute	Description
Age	Displays the time since this LSR was inserted into the database.
IncarnationNumber	Displays the link state incarnation number of this LSR.  This number identifies the most recent instance of an LSR, while updating the topology database when an LSR is received.  Displays when an LSR is updated and increments its incarnation number before the updated LSR is transmitted. The most recent LSR is the one with the larger incarnation number.
Checksum	Displays the checksum of the LSR.
Links	Displays the number of links associated with this LSR.

## Viewing FSPF Links

To view FSPF links from the Device Manager, choose **FSPF** from the FC menu and click the **LSDB Links** tab. The dialog box shows the display-only information described in [Table 10-12](#).

**Table 10-12 FC > FSPF > LSDB Links—Display-Only Attributes**

Display-Only Attribute	Description
Switch	Displays the switch ID. This attribute is only displayed from the Fabric Manager.
Vsan, DomainId	Displays the VSAN ID and the domain ID of the local switch on this VSAN.
NbrDomainId	Displays the domain ID of the neighbor on the other end of this link on this VSAN.
PortIndex	Displays the source E_port of this link.
NbrPortIndex	Displays the destination E_port of this link.
Cost	Displays the cost of sending a frame on this link on this VSAN.

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