



Monitoring Network Traffic Using SPAN

This chapter describes the switched port analyzer (SPAN) features provided in switches in the Cisco MDS 9000 Family. It includes the following sections:

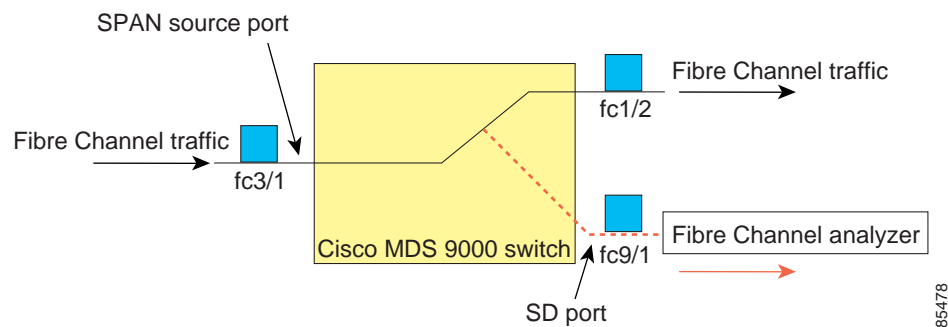
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About SPAN

The switched port analyzer (SPAN) feature is specific to switches in the Cisco MDS 9000 Family. It monitors network traffic through a Fibre Channel interface. Traffic through any Fibre Channel interface can be replicated to a special port called the SPAN destination port (SD port). Any Fibre Channel port in a switch can be configured as an SD port. Once an interface is in SD-port mode, it cannot be used for normal data traffic. You can attach a Fibre Channel Analyzer to the SD port to monitor SPAN traffic (see “Configuring a Fabric Analyzer” section on page 25-6).

SD ports do not receive frames, they merely transmit a copy of the SPAN source traffic. The SPAN feature is non-intrusive and does not affect switching of network traffic for any SPAN source ports (see Figure 24-1).

Figure 24-1 SPAN Transmission

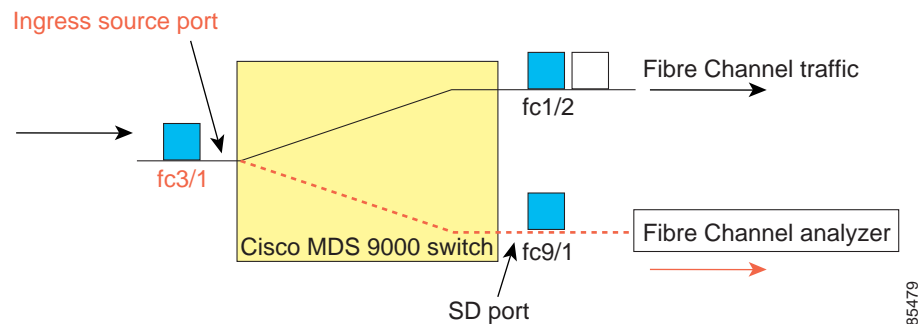


SPAN Sources

SPAN sources refer to the interfaces from which traffic can be monitored. You can also specify VSAN as a SPAN source, in which case, all supported interfaces in the specified VSAN are included as SPAN sources. You can choose the SPAN traffic in the ingress direction, the egress direction, or both directions for any source interface:

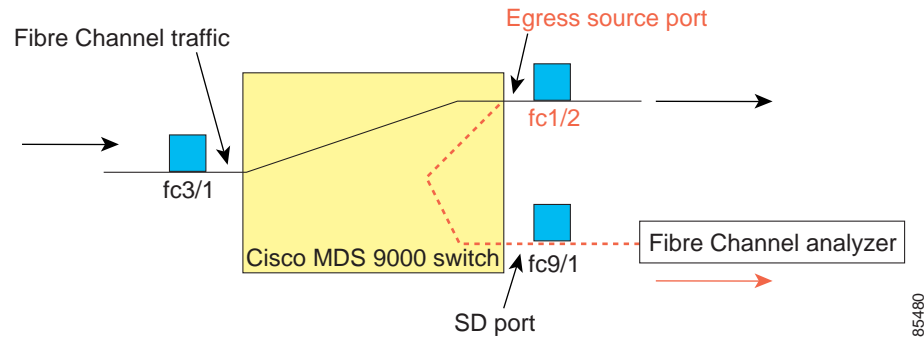
- Ingress source (rx)—Traffic entering the switch fabric through this source interface is *spanned* or copied to the SD port (see Figure 24-2).

Figure 24-2 SPAN Traffic from the Ingress Direction



- Egress source (tx)—Traffic exiting the switch fabric through this source interface is spanned or copied to the SD port (see Figure 24-3).

Figure 24-3 SPAN Traffic from Egress Direction



Allowed Source Interface Types

The SPAN feature is available for the following interface types:

- Physical ports:
 - F ports, FL ports, TE ports, E ports, and TL ports.
- Interface sup-fc0 (traffic to and from the supervisor):
 - The Fibre Channel traffic from the supervisor module to the switch fabric, through the sup-fc0 interface, is called ingress traffic. It is spanned when sup-fc0 is chosen as an ingress source port.
 - The Fibre Channel traffic from the switch fabric to the supervisor module, through the sup-fc0 interface, is called egress traffic. It is spanned when sup-fc0 is chosen as an egress source port.
- PortChannels
 - All ports in the PortChannel are included and spanned as sources.
 - You cannot specify individual ports in a PortChannel as SPAN sources. Previously-configured SPAN-specific interface information is discarded.

VSAN as a SPAN Source

When a VSAN as a source is specified, then all physical ports and PortChannels in that VSAN are included as SPAN sources. A TE port is included only when the port VSAN of the TE port matches the source VSAN. A TE port is excluded even if the configured allowed VSAN list may have the source VSAN, but the port VSAN is different.

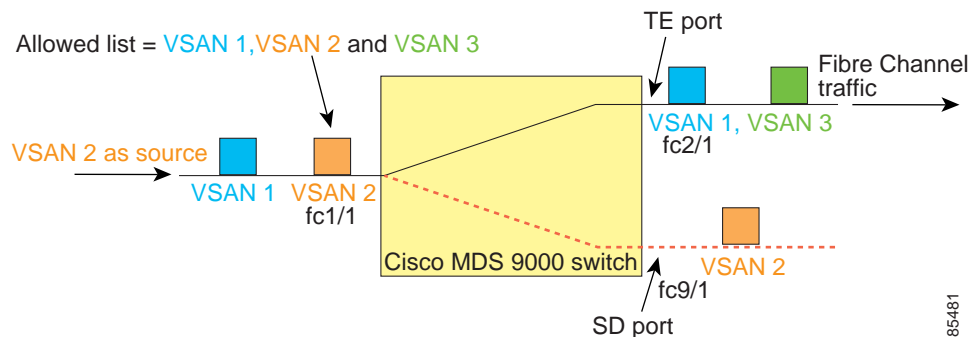
You cannot configure source interfaces (physical interfaces, PortChannels, or sup-fc interfaces) and source VSANs in the same SPAN session.

Guidelines to Configure VSANs as a Source

The following guidelines apply when configuring VSANs as a source:

- Traffic on all interfaces included in a source VSAN is spanned only in the ingress direction.
- When a VSAN is specified as a source, you will not be able to perform interface-level SPAN configuration on the interfaces that are included in the VSAN. Previously-configured SPAN-specific interface information is discarded.
- If an interface in a VSAN is configured as a SPAN source, you will not be able to configure that VSAN as a source. You must first remove the existing SPAN configurations on such interfaces before configuring VSAN as a source.
- Interfaces are only included as sources when the port VSAN matches the source VSAN. [Figure 24-4](#) displays a configuration using VSAN 2 as a SPAN source:
 - All ports in the switch are in VSAN 1 except fc1/1.
 - Interface fc1/1 is the TE port with port VSAN 2. VSANs 1, 2, and 3 are configured in the allowed list.
 - VSAN 1 and VSAN 2 are configured as SPAN sources.

Figure 24-4 VSAN As a SPAN Source



For this configuration, the following apply:

- VSAN 2 as a SPAN source includes only the TE port fc1/1 that has port VSAN 2.
- VSAN 1 as a source does not include the TE port fc1/1 as the port VSAN does not match VSAN 1. See [“Configuring Trunk-Allowed VSAN List”](#) section on page 10-4 or [“VSAN Membership”](#) section on page 8-6.

SPAN Sessions

Each SPAN session represents an association of one destination with a set of source(s) along with various other parameters that you specify to monitor the network traffic. One destination can be used by one or more SPAN sessions. You can configure up to 16 SPAN sessions in a switch. Each session can have several source ports and one destination port.

To activate a SPAN session, at least one source and the SD port must be up and functioning. Otherwise, traffic will not be directed to the SD port.

To temporarily deactivate (suspend) a SPAN session use the **suspend** command in the SPAN submode. The traffic monitoring is stopped during this time. You can reactivate the SPAN session using the **no suspend** command.



Tip

A source can be shared by two sessions, however, each session must be in a different direction—one ingress and one egress.

Specifying Filters

You can perform VSAN-based filtering to selectively monitor network traffic on specified VSANs. You can apply this VSAN filter to all sources in a session (see [Figure 24-4](#)). Only VSANs present in the filter are spanned.

You can specify session VSAN filters which are applied to all sources in the specified session. These filters are bidirectional and apply to all sources configured in the session.

Guidelines to Specifying Filters

The following guidelines apply to SPAN filters:

- PortChannel configurations are applied to all ports in the PortChannel.
- If no filters are specified, the traffic from all active VSANs for that interface is spanned by default.
- While you can specify arbitrary VSAN filters in a session, traffic can only be monitored on the port VSAN or on allowed-active VSANs in that interface.

SD Port Characteristics

An SD port has the following characteristics:

- Ignores buffer-to-buffer credits.
- Allows data traffic only in the egress (tx) direction.
- Does not require a device or an analyzer to be physically connected.
- Supports only 1 Gbps or 2 Gbps speeds. The auto speed option is not allowed.
- Multiple sessions can share the same destination ports.
- If the SD port is shut down, all shared sessions stop generating SPAN traffic.
- The port mode can not be changed if it is being used for a SPAN session.

**Note**

If you need to change a SD-port mode to another port mode, first remove the SD port from all sessions and then change the port mode using the **switchport mode** command.

- The outgoing frames can be encapsulated in extended inter-switch link (EISL) format.
- The SD port does not have a port VSAN.
- SD ports cannot be configured using the Advanced Services Module (ASM).

Guidelines to Configure SPAN

The following guidelines apply for a SPAN configuration:

- You can configure up to 16 SPAN sessions with multiple ingress (rx) sources.
- You can configure a maximum of three SPAN sessions with one egress (tx) port.
- In a 32-port switching module, you must configure the same session in all four ports in one port group (unit). If you wish, you can also configure only two or three ports in this unit (see the [“Configuring 32-port Switching Modules and Oversubscribed Ports”](#) section on page 9-8).
- SPAN frames are dropped if the sum of the bandwidth of the sources exceeds the speed of the destination port.
- Frames dropped by a source port are not spanned.

Configuring SPAN

To monitor network traffic using SD ports, follow these steps:

-
- Step 1** Configure the SD port.
- Step 2** Attach the SD port to a SPAN session.
- Step 3** Monitor network traffic by adding source interfaces to the session.
-

To configure an SD port for SPAN monitoring, follow these steps:

	Command	Purpose
Step 1	switch# config t	Enters configuration mode.
Step 2	switch(config)# interface fc9/1	Configures the specified interface.
Step 3	switch(config-if)# switchport mode SD	Configures the SD port-mode for interface fc2/1.
Step 4	switch(config-if)# switchport speed 1000	Configures the SD port speed to 1000 Mbps.
Step 5	switch(config-if)# no shutdown	Enables traffic flow through this interface.

To configure a SPAN session, follow these steps:

	Command	Purpose
Step 1	switch# config t	Enters configuration mode.
Step 2	switch(config)# span session 1 switch(config-span)#	Configures the specified SPAN session (1). If the session does not exist, it will be created.
	switch(config)# no span session 1	Deletes the specified SPAN session (1).
Step 3	switch(config-span)# destination interface fc9/1	Configures the specified destination interface (fc 9/1) in a session.
	switch(config-span)# no destination interface fc9/1	Removes the specified destination interface (fc 9/1).
Step 4	switch(config-span)# source interface fc7/1	Configures the source (fc7/1) interface in both directions.
	switch(config-span)# no source interface fc7/1	Removes the specified destination interface (fc 7/1) from this session.
Step 5	switch(config-span)# source interface sup-fc0	Configures the source interface (sup-fc0) in the session.
	switch(config-span)# source interface fc1/5 - 6, fc2/1 -3	Configures the specified interface ranges in the session.
	switch(config-span)# source vsan 1-2	Configures source VSANs 1 and 2 in the session.
	switch(config-span)# source interface port-channel 1	Configures the source PortChannel (port-channel 1).
	switch(config-span)# no source interface port-channel 1	Deletes the specified source interface (port-channel 1)
Step 6	switch(config-span)# suspend	Suspends the session.
	switch(config-span)# no suspend	Reactivates the session.

To configure a SPAN filter, follow these steps:

	Command	Purpose
Step 1	switch# config t	Enters configuration mode.
Step 2	switch(config)# span session 1 switch(config-span)#	Configures the specified session (1).
Step 3	switch(config-span)# source interface fc9/1 tx	Configures the source fc9/1 interface in the egress (tx) direction
	switch(config-span)# source filter vsan 1-2	Configures VSANs 1 and 2 as session filters.
	switch(config-span)# source interface fc7/1 rx	Configures the source fc7/1 interface in the ingress (rx) direction.

Encapsulating Frames

The **switchport encap eisl** command only applies to SD port interfaces. This command is disabled by default. If you enable the encapsulation feature, all outgoing frames will be encapsulated. If encapsulation is enabled, you will see a new line (`Encapsulation is eisl`) in the **show interface SD_port_interface** command output.

To encapsulate outgoing frames (optional), follow these steps:

	Command	Purpose
Step 1	<code>switch# config t</code>	Enters configuration mode.
Step 2	<code>switch(config)# interface fc9/32</code>	Configures the specified interface.
Step 3	<code>switch(config-if)# switchport mode SD</code>	Configures the SD port-mode for interface fc2/1.
Step 4	<code>switch(config-if)# switchport encap eisl</code>	Enables the encapsulation option for this SD port.
	<code>switch(config-if)# no switchport encap eisl</code>	Disables the encapsulation option and reverts the switch to factory default.

SPAN Conversion Behavior

Effective Release 1.1(1), SPAN features (configured in any prior release) are converted as stated below:

- If source interfaces and source VSANs are configured in a given session, then all the source VSANs are removed from that session. For example,

Before Release 1.0(4)

```
Session 1 (active)
  Destination is fc1/9
  No session filters configured
  Ingress (rx) sources are
    vsans 10-11
    fc1/3,
  Egress (tx) sources are
    fc1/3,
```

Once upgraded to Release 1.1(1):

```
Session 1 (active)
  Destination is fc1/9
  No session filters configured
  Ingress (rx) sources are
    fc1/3,
  Egress (tx) sources are
    fc1/3,
```

Session 1 had both source interfaces and source VSANs before the upgrade. After the upgrade, the source VSANs were removed (rule 1).

- If interface level VSAN filters are configured in source interfaces, then the source interfaces are also removed from the session. If this interface is configured in both directions, it will be removed from both directions. For example,

Before Release 1.0(4):

```
Session 2 (active)
  Destination is fc1/9
  No session filters configured
  Ingress (rx) sources are
```



```

vsans 12
fc1/6 (vsan 1-20),
Egress (tx) sources are
fc1/6 (vsan 1-20),

```

Once upgraded to Release 1.1(1):

```

Session 2 (inactive as no active sources)
Destination is fc1/9
No session filters configured
No ingress (rx) sources
No egress (tx) sources

```

Session 2 had a source VSAN 12 and a source interface fc1/6 with VSAN filters specified in Release 1.0(4). When upgraded to Release 1.1(1) the following changes are made:

- The source VSAN (VSAN 12) is removed (rule 1)
- The source interface fc1/6 had VSAN filters specified—it is also removed (rule 2).



Note

The deprecated configurations are removed from persistent memory, once a switchover or a new startup configuration is implemented.

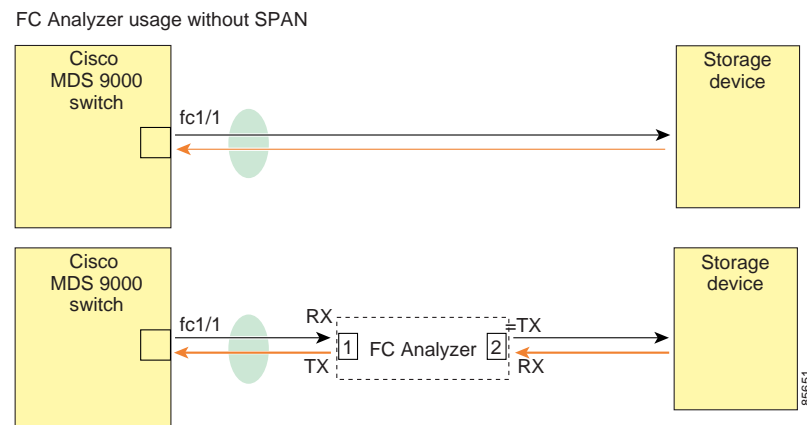
Monitoring Traffic Using Fibre Channel Analyzers

You can use SPAN to monitor traffic on an interface without any traffic disruption. This feature is specially useful in troubleshooting scenarios when traffic disruption changes the problem environment and makes it difficult to reproduce the problem.

Without SPAN

You can monitor traffic using interface fc1/1 in a Cisco MDS 9000 Family switch that is connected to another switch or host. You need to physically connect a Fibre Channel analyzer between the switch and the storage device to analyze the traffic through interface fc1/1 as shown in [Figure 24-5](#).

Figure 24-5 Fibre Channel Analyzer Usage Without SPAN



This type of connection has the following limitations:

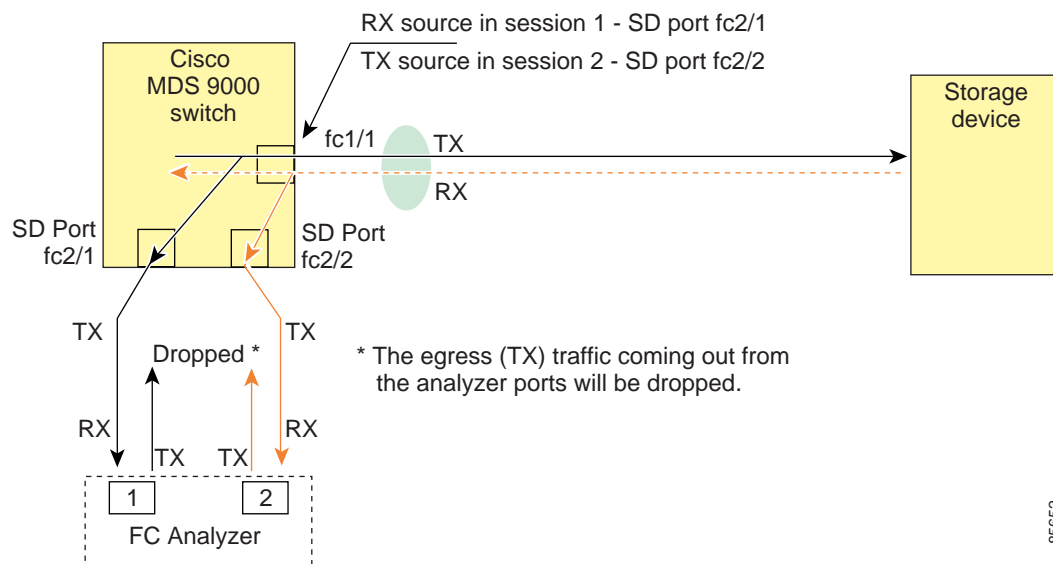
- Requires you to physically insert the FC analyzer between the two network devices.
- It disrupts traffic when the Fibre Channel analyzer is physically connected.
- The analyzer captures data only on the rx links in both port 1 and port 2. Port 1 captures traffic exiting interface fc1/1 and port 2 captures ingress traffic into interface fc1/1.

Using SPAN

Using SPAN you can capture the same traffic scenario shown in [Figure 24-5](#) without any traffic disruption. The Fibre Channel analyzer uses the ingress (rx) link at port 1 to capture all the frames going out of the interface fc1/1. It uses the ingress link at port 2, to capture all the ingress traffic on interface fc1/1.

Using SPAN you can monitor ingress traffic on fc1/1 at SD port fc2/2 and egress traffic on SD port fc2/1. This traffic is seamlessly captured by the FC analyzer as shown in [Figure 24-6](#).

Figure 24-6 Fibre Channel Analyzer Using SPAN



Configuring Analyzers Using SPAN

To configure Fibre Channel Analyzers using SPAN for the example in [Figure 24-6](#), follow these steps:

- Step 1** Configure SPAN on interface fc1/1 in the ingress (rx) direction to send traffic on SD port fc2/1 using session 1.
- Step 2** Configure SPAN on interface fc1/1 in the egress (tx) direction to send traffic on SD port fc2/2 using session 2.
- Step 3** Physically connect fc2/1 to port 1 on the Fibre Channel analyzer.

Step 4 Physically connect fc2/2 to port 2 on the Fibre Channel analyzer.

To configure SPAN on the source and destination interfaces, follow these steps:

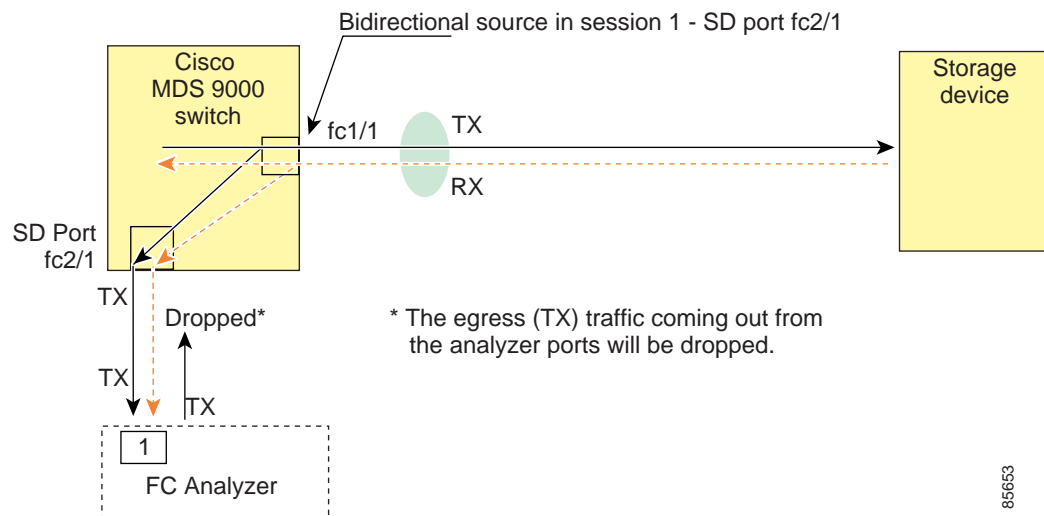
	Command	Purpose
Step 1	switch# config t	Enters configuration mode.
Step 2	switch(config)# span session 1 switch(config-span)#	Creates the SPAN session 1.
Step 3	switch(config-span)## destination interface fc2/1	Configures the destination interface fc2/1.
Step 4	switch(config-span)# source interface fc1/1 rx	Configures the source interface fc1/1 in the ingress direction.
Step 5	switch(config)# span session 2 switch(config-span)#	Creates the SPAN session 2.
Step 6	switch(config-span)## destination interface fc2/2	Configures the destination interface fc2/2.
Step 7	switch(config-span)# source interface fc1/1 tx	Configures the source interface fc1/1 in the egress direction.

Using a Single SD Port to Monitor Traffic

You do not need to use two SD ports to monitor bidirectional traffic on any interface as shown in [Figure 24-6](#). You can use one SD port and one FC analyzer port by monitoring traffic on the interface at the same SD port fc2/1.

[Figure 24-7](#) shows a SPAN setup where one session with destination port fc2/1 and source interface fc1/1 is used to capture traffic in both ingress and egress direction. This setup is more advantageous and cost-effective than the setup shown in [Figure 24-6](#)—it uses one SD port and one port on the analyzer, instead of using a full, two-port analyzer.

Figure 24-7 Fibre Channel Analyzer Using a Single SD Port



To use this setup, the analyzer should have the capability of distinguishing ingress and egress traffic for all captured frames.

To configure SPAN on a single SD port, follow these steps:

	Command	Purpose
Step 1	switch# config t	Enters configuration mode.
Step 2	switch(config)# span session 1 switch(config-span)#	Creates the SPAN session 1.
Step 3	switch(config-span)## destination interface fc2/1	Configures the destination interface fc2/1.
Step 4	switch(config-span)# source interface fc1/1	Configures the source interface fc1/1 on the same SD port.

Displaying SPAN Information

Use the **show span** command to display configured SPAN information. See Examples 24-1 to 24-4.

Example 24-1 Displays SPAN Sessions in a Brief Format

```
switch# show span session brief
-----
Session  Admin      Oper      Destination
         State       State     Interface
-----
 7       no suspend  active    fc2/7
 1       suspend    inactive  not configured
 2       no suspend  inactive  fc3/1
```

Example 24-2 Displays a Specific SPAN Session Details

```
switch# show span session 7
Session 7 (active)
  Destination is fc2/7
  No session filters configured
  No ingress (rx) sources
  Egress (tx) sources are
    port-channel 7,
```

Example 24-3 Displays ALL SPAN Sessions

```
switch# show span session
Session 1 (inactive as no destination)
  Destination is not specified
  Session filter vsans are 1
  No ingress (rx) sources
  No egress (tx) sources
Session 2 (active)
  Destination is fc9/5
  No session filters configured
  Ingress (rx) sources are
    vsans 1
  No egress (tx) sources
Session 3 (admin suspended)
  Destination is not configured
  Session filter vsans are 1-20
  Ingress (rx) sources are
    fc3/2, fc3/3, fc3/4,
    port-channel 2, sup-fc0,
  Egress (tx) sources are
```

```
fc3/2, fc3/3, fc3/4, sup-fc0,
```

Example 24-4 *Displays an SD-port Interface with Encapsulation Enabled*

```
switch# show int fc9/32
fc9/32 is up
  Hardware is Fibre Channel
  Port WWN is 22:20:00:05:30:00:49:5e
  Admin port mode is SD
  Port mode is SD
  Port vsan is 1
  Speed is 1 Gbps
  Receive Buffer Size is 2112
  Encapsulation is eisl <----- Displays the enabled encapsulation status
  Beacon is turned off
  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 frames input, 0 bytes, 0 discards
      0 CRC, 0 unknown class
      0 too long, 0 too short
    0 frames output, 0 bytes, 0 discards
    0 input OLS, 0 LRR, 0 NOS, 0 loop inits
    0 output OLS, 0 LRR, 0 NOS, 0 loop inits
```

Default SPAN Settings

Table 24-1 lists the default settings for SPAN parameters

Table 24-1 *Default SPAN Configuration Parameters*

Parameters	Default
SPAN session	Active.
If filters are not specified	SPAN traffic includes traffic through a specific interface from all active VSANs.
Encapsulation	Disabled.
SD port	Output frame format is Fibre Channel.

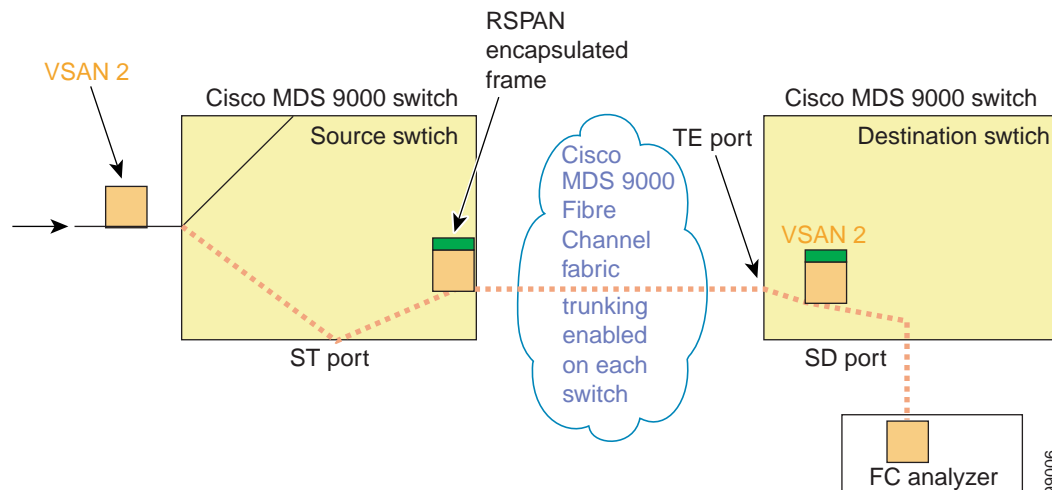
Remote SPAN

The Remote SPAN (RSPAN) feature enables you to remotely monitor traffic for one or more SPAN sources distributed in one or more source switches in a Fibre Channel fabric. The SPAN destination (SD) port is used for remote monitoring in a destination switch. A destination switch is usually different from the source switch(es) but is attached to the same Fibre Channel fabric. You can replicate and monitor traffic in any remote Cisco MDS 9000 Family switch or director, just as you would monitor traffic in a MDS source switch.

The RSPAN feature is nonintrusive and does not affect network traffic switching for any SPAN source ports. Traffic captured on the remote switch is tunneled across a Fibre Channel fabric which has trunking enabled on all switches in the path from the source switch to the destination switch. The Fibre Channel tunnel is structured using trunked ISL (TE) ports. In addition to TE ports, the RSPAN feature uses two other interface types (see [Figure 24-8](#)):

- SD ports—A passive port from which remote SPAN traffic can be obtained by the FC analyzer.
- ST ports—A SPAN tunnel (ST) port is an entry point port in the source switch for the RSPAN Fibre Channel tunnel. ST ports are special RSPAN ports and cannot be used for normal Fibre Channel traffic.

Figure 24-8 RSPAN Transmission



Advantages to Using RSPAN

The RSPAN features has the following advantages:

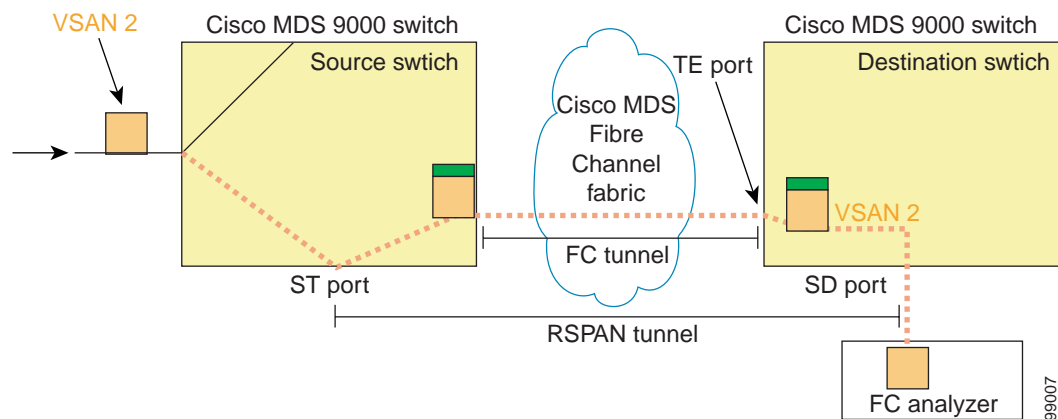
- Enables nondisruptive traffic monitoring at a remote location.
- Provides a cost-effective solution by using one SD port to monitor remote traffic on multiple switches.
- Works with any Fibre Channel analyzer.
- Compatible with the Cisco MDS 9000 Port Analyzer adapters.
- Does not affect traffic in the source switch, but shares the ISL bandwidth with other ports in the fabric.

FC and RSPAN Tunnels

A FC tunnel is a logical data path between a source switch and a destination switch. The FC tunnel originates from the source switch and terminates at the remotely located destination switch.

RSPAN uses a special Fibre Channel tunnel (FC tunnel) that originates at the ST port in the source switch and terminates at the SD port in the destination switch. You must bind the FC tunnel to a ST port in the source switch and map the same FC tunnel to a SD port in the destination switch. Once the mapping and binding is configured, the FC tunnel is referred to as a RSPAN tunnel (see [Figure 24-9](#)).

Figure 24-9 FC and RSPAN Tunnel



Guidelines to Configure RSPAN

The following guidelines apply for a SPAN configuration:

- All switches in the end-to-end path of the RSPAN tunnel must belong to the Cisco MDS 9000 Family.
- All VSANs with RSPAN traffic must be enabled. If a VSAN containing RSPAN traffic is not enabled, it will be dropped.
- The FC tunnel's IP address must reside in the same subnet as the VSAN interface (see [Chapter 17, "Configuring IP Services"](#)).
- The following configurations must be performed on *each* switch in the end-to-end path of the Fibre Channel tunnel in which RSPAN is to be implemented
 - Trunking must be enabled (the **trunk protocol enable** command is enabled by default).
 - VSAN interface must be configured (the **interface vsan** command).
 - The Fibre Channel tunnel feature must be enabled (the **fc-tunnel enable** command is disabled by default).
 - IP routing must be enabled (the **ip routing** command is disabled by default).



Note If the IP address is in the same subnet as the VSAN, the VSAN interface does not have to be configured for all VSANs on which the traffic is spanned.

- A single Fibre Channel switch port must be dedicated for the ST port functionality.
- Do not configure the port to be monitored as the ST port.

ST Port Characteristics

ST port have the following characteristics:

- Any FC port in a switch can be configured as a ST port.
- ST ports perform the RSPAN encapsulation of the FC frame.
- ST ports do not use BB_credits.
- A ST port can only be bound to one FC tunnel.
- ST ports cannot be used for any other purpose other than to carry RSPAN traffic.
- ST Ports cannot be configured using ASM modules.

Configuring RSPAN

The RSPAN tunnel begins in the source switch and terminates in the destination switch. This section assumes Switch S to be the source and Switch D to be the destination.



Note

Besides the source and destination switches, the VSAN must also be configured in each MDS switch in the Fibre Channel fabric, if they exist.

To monitor network traffic using the RSPAN feature, follow these steps:

-
- Step 1** Create VSAN interfaces in destination switch (Switch D) and source switch (Switch S) to facilitate the Fibre Channel tunnel (FC tunnel) creation.
 - Step 2** Enable the FC tunnel in each switch in the end-to-end path of the tunnel.
 - Step 3** Initiate the FC tunnel (in Switch S) and map the tunnel to the VSAN interface's IP address (in Switch D) so all RSPAN traffic from the tunnel is directed to the SD port.
 - Step 4** Configure SD ports for SPAN monitoring in the destination switch (Switch D).
 - Step 5** Configure the ST port in the source switch (Switch S) and bind the ST port to the FC tunnel.
 - Step 6** Create a RSPAN session in the source switch (in Switch S) to monitor network traffic.
-

Configuration in the Source Switch

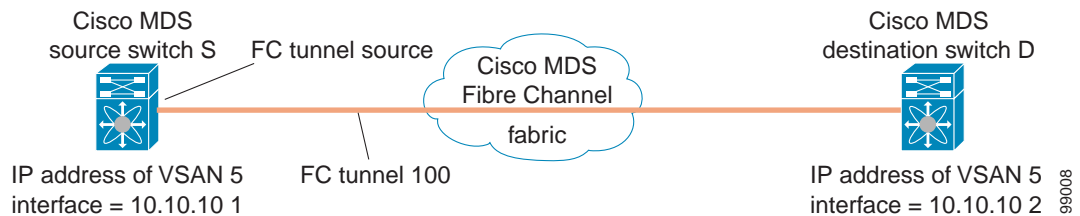
This section identifies the tasks that must be performed in the source switch (Switch D):

- [Creating VSAN Interfaces](#)
- [Enabling FC Tunnels](#)
- [Initiating the FC Tunnel](#)
- [Configuring the ST Port](#)
- [Configure a RSPAN Session](#)

Creating VSAN Interfaces

Figure 24-10 depicts a basic FC tunnel configuration.

Figure 24-10 FC Tunnel Configuration



Note

This example assumes that VSAN 5 is already configured in the VSAN database.

To create a VSAN interfaces in the source switch for the scenario in Figure 24-10, follow these steps:

	Command	Purpose
Step 1	switchS# confi g t	Enters configuration mode.
Step 2	switchS(config)# interface vsan 5 switchS(config-if)#	Configures the specified VSAN interface (VSAN 5) in the source switch (switch S).
Step 3	switchS(config-if)# ip address 10.10.10.1 255.255.255.0	Configures the IP address and subnet for the VSAN interface 5 in the source switch (switch S).
Step 4	switchS(config-if)# no shutdown	Enables traffic flow through this interface.

Enabling FC Tunnels

To enable the FC tunnel feature, follow these steps:

	Command	Purpose
Step 1	switchS# confi g t	Enters configuration mode.
Step 2	switchS(config)# fc-tunnel enable	Enables the FC tunnel feature (disabled by default).



Note

Be sure to enable this feature in each switch in the end-to-end path in the fabric.

Initiating the FC Tunnel

To initiate the FC tunnel in the source switch for the scenario in Figure 24-10, follow these steps:

	Command	Purpose
Step 1	switchS# confi g t	Enters configuration mode.
Step 2	switchS(config)# interface fc-tunnel 100 switchS(config-if)#	Initiates the FC tunnel (100) in the source switch (switch S). The tunnel IDs range from 1 to 255.

	Command	Purpose
Step 3	switchS(config-if)# source 10.10.10.1	Maps the IP address of the source switch (switch S) to the FC tunnel (100).
Step 4	switchS(config-if)# destination 10.10.10.2	Maps the IP address of the destination switch (switch D) to the FC tunnel (100).
Step 5	switchS(config-if)# no shutdown	Enables traffic flow through this interface.

**Tip**

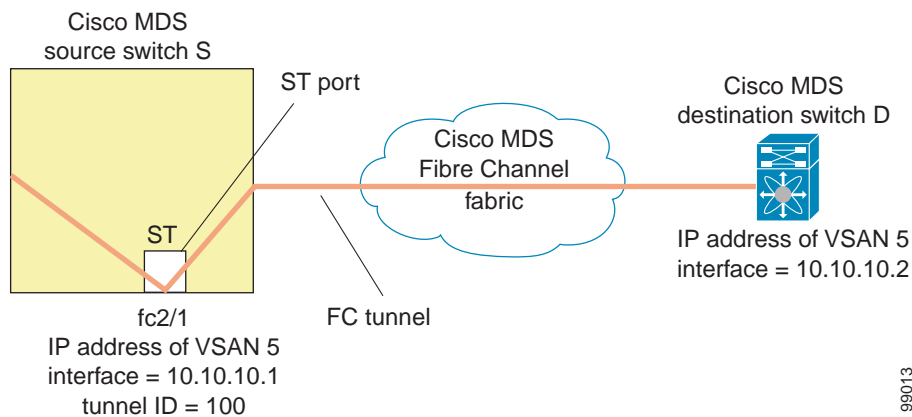
The interface will not be operationally up until the FC tunnel mapping is configured in the destination switch.

Configuring the ST Port

Once the FC tunnel is created, be sure to configure the ST port to bind it to the FC tunnel at the source switch. The FC tunnel becomes a RSPAN tunnel once the binding and mapping is complete.

Figure 24-11 depicts a basic FC tunnel configuration.

Figure 24-11 Binding the FC Tunnel



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To configure an ST port for the scenario in Figure 24-11, follow these steps:

	Command	Purpose
Step 1	switchS# config t	Enters configuration mode.
Step 2	switchS(config)# interface fc2/1	Configures the specified interface.
Step 3	switchS(config-if)# switchport mode ST	Configures the ST port-mode for interface fc2/1.
Step 4	switchS(config-if)# switchport speed 2000	Configures the ST port speed to 2000 Mbps.
Step 5	switchS(config-if)# rspan-tunnel interface fc-tunnel 100	Associates and binds the ST port with the RSPAN tunnel (100).
Step 6	switchS(config-if)# no shutdown	Enables traffic flow through this interface.

**Note**

ST ports cannot be configured using ASMs.

Configure a RSPAN Session

A RSPAN session is similar to a SPAN session, with the destination interface being a RSPAN tunnel.

To configure a RSPAN session in the source switch for the scenario in [Figure 24-11](#), follow these steps:

	Command	Purpose
Step 1	switchS# config t	Enters configuration mode.
Step 2	switchS(config)# span session 2 switchS(config-span)#	Configures the specified SPAN session (2). If the session does not exist, it will be created. The session ID ranges from 1 to 16.
Step 3	switchS(config-span)# destination interface fc-tunnel 100	Configures the specified RSPAN tunnel (100) in a session.
Step 4	switch(config-span)# source interface fc1/1	Configures the source interface (fc1/1) for this session and spans the traffic from interface fc1/1 to RSPAN tunnel 100.

Configuration in All Intermediate Switches

This section identifies the tasks that must be performed in all intermediate switches in the end-to-end path of the RSPAN tunnel:

- [Configuring VSAN Interfaces](#)
- [Enabling FC Tunnels](#)
- [Enabling IP Routing](#)

Configuring VSAN Interfaces

[Figure 24-12](#) depicts a RSPAN tunnel configuration terminating in the destination switch (Switch D).



Note

This example assumes that VSAN 5 is already configured in the VSAN database.

To create a VSAN interface in the destination switch for the scenario in [Figure 24-12](#), follow these steps:

	Command	Purpose
Step 1	switchD# config t	Enters configuration mode.
Step 2	switchD(config)# interface vsan 5 switchD(config-if)#	Configures the specified VSAN interface (VSAN 5) in the destination switch (Switch D).
Step 3	switchD(config-if)# ip address 10.10.10.2 255.255.255.0	Configures the IP address and subnet for the VSAN interface in the destination switch (Switch D).
Step 4	switch(config-if)# no shutdown	Enables traffic flow to administratively allow traffic (provided the operational state is up).

Enabling FC Tunnels

To enable the FC tunnel feature, follow these steps:

	Command	Purpose
Step 1	switchS# config t	Enters configuration mode.
Step 2	switchS(config)# fc-tunnel enable	Initiates the FC tunnel (100) in the source switch (switch S). The tunnel IDs ranges from 1 to 255.



Note

Be sure to enable this feature in each switch in the end-to-end path in the fabric.

Enabling IP Routing

The IP routing feature is disabled by default. Be sure to enable IP routing in each switch (including the source and destination switches) in the end-to-end path in the fabric (see [“Enabling IP Routing” section on page 17-11](#)). This step is required to setup the FC tunnel.

Configuration in the Destination Switch

This section identifies the tasks that must be performed in the destination switch (Switch D):

- [Configuring VSAN Interfaces](#)
- [Mapping the FC Tunnel](#)
- [Configuring the SD Port](#)

Configuring VSAN Interfaces

[Figure 24-12](#) depicts a RSPAN tunnel configuration terminating in the destination switch (Switch D).



Note

This example assumes that VSAN 5 is already configured in the VSAN database.

To create a VSAN interface in the destination switch for the scenario in [Figure 24-12](#), follow these steps:

	Command	Purpose
Step 1	switchD# config t	Enters configuration mode.
Step 2	switchD(config)# interface vsan 5 switchD(config-if)#	Configures the specified VSAN interface (VSAN 5) in the destination switch (Switch D).
Step 3	switchD(config-if)# ip address 10.10.10.2 255.255.255.0	Configures the IP address and subnet for the VSAN interface in the destination switch (Switch D).
Step 4	switch(config-if)# no shutdown	Enables traffic flow to administratively allow traffic (provided the operational state is up).

Enabling FC Tunnels

To enable the FC tunnel feature, follow these steps:

	Command	Purpose
Step 1	switchS# <code>config t</code>	Enters configuration mode.
Step 2	switchS(config)# <code>fc-tunnel enable</code>	Initiates the FC tunnel (100) in the source switch (switch S). The tunnel IDs range from 1 to 255.



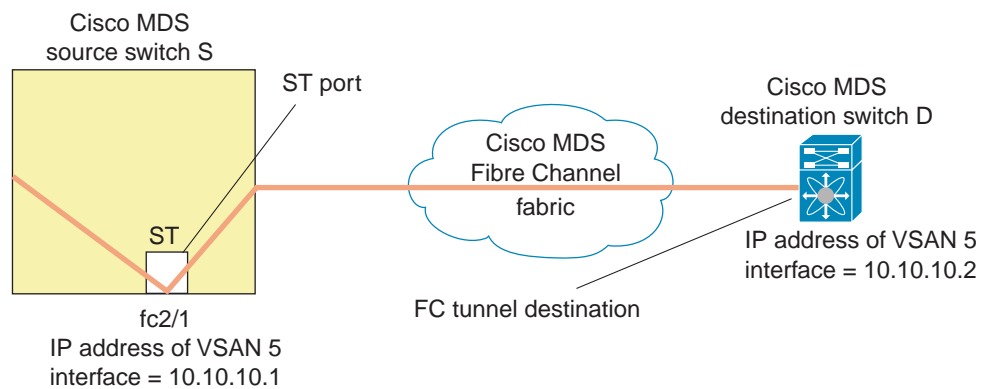
Note

Be sure to enable this feature in each switch in the end-to-end path in the tunnel.

Mapping the FC Tunnel

The **tunnel-id-map** option specifies the egress interface of the tunnel at the destination switch (see [Figure 24-12](#)).

Figure 24-12 FC Tunnel Configuration



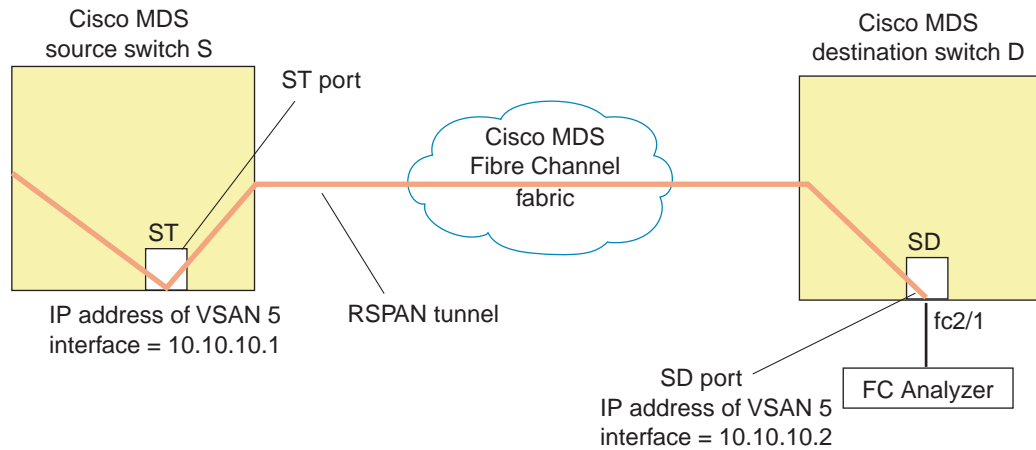
To terminate the FC tunnel in the destination switch for the scenario in [Figure 24-12](#), follow these steps:

	Command	Purpose
Step 1	switchD# <code>config t</code>	Enters configuration mode.
Step 2	switchD(config)# <code>fc-tunnel tunnel-id-map 100 interface fc2/1</code>	Terminates the FC tunnel (100) in the destination switch (switch D). The tunnel ID range is from 1 to 255.

Configuring the SD Port

The SD port in the destination switch enables the FC Analyzer to receive the RSPAN traffic from the Fibre Channel tunnel. [Figure 24-13](#) depicts a RSPAN tunnel configuration, now that tunnel destination is also configured.

Figure 24-13 RSPAN Tunnel Configuration



To configure an SD port for the scenario in [Figure 24-13](#), follow these steps:

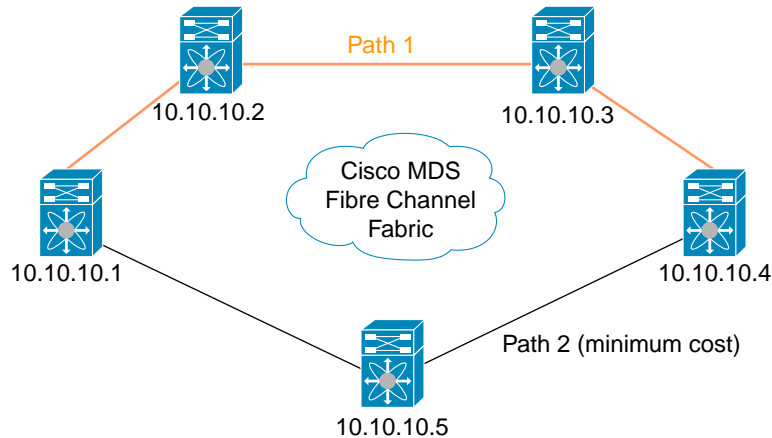
	Command	Purpose
Step 1	switchD# confi t	Enters configuration mode.
Step 2	switchD(config)# interface fc2/1	Configures the specified interface.
Step 3	switchD(config-if)# switchport mode SD	Configures the SD port-mode for interface fc2/1.
Step 4	switchD(config-if)# switchport speed 2000	Configures the SD port speed to 2000 Mbps.
Step 5	switchD(config-if)# no shutdown	Enables traffic flow through this interface.

Configuring An Explicit Path

You can specify an explicit path through the Cisco MDS Fibre channel fabric (source-based routing), use the **explicit-path** option. For example, if you have multiple paths to a tunnel destination, you can use this option to specify the fc-tunnel to always take one path to the destination switch. The software then use this specified path even if other paths are available.

This option is especially useful if you prefer to direct the traffic through a certain path although other paths available. In a RSPAN situation, you can specify the explicit-path so the RSPAN traffic does not interfere with the existing user traffic. You can create any number of explicit paths in a switch (see [Figure 24-14](#)).

Figure 24-14 Explicit Path Configuration



The explicit path must be created in the source switch. To configure an explicit path, you must first create the path and then configure the use of any one path. If an explicit path is not configured, the minimum cost path is used by default. If an explicit path is configured and is functioning, the specified path is used.

To create an explicit path for the scenario in Figure 24-14, follow these steps:

	Command	Purpose
Step 1	switchS# confi g t	Enters configuration mode.
Step 2	switchS(config)# fc-tunnel explicit-path Path1 switch(config-explicit-path)#	Places you at the explicit path prompt for the path named Path 1.
Step 3	switchS(config-explicit-path)# next-address 10.10.10.2 strict switchS(config-explicit-path)# next-address 10.10.10.3 strict switchS(config-explicit-path)# next-address 10.10.10.4 strict	Specifies that the next hop VSAN interface IP addresses and the previous hops specified in the explicit path do not require direct connection.
Step 4	switchS(config)# fc-tunnel explicit-path Path2 switch(config-explicit-path)#	Places you at the explicit path prompt for Path2.
Step 5	switchS(config-explicit-path)# next-address 10.10.10.5 strict switchS(config-explicit-path)# next-address 10.10.10.4 strict	Specifies that the next hop VSAN interface IP addresses and the previous hops specified in the explicit path does not require direct connection.
Step 6	switchS(config)# fc-tunnel explicit-path Path3 switch(config-explicit-path)#	Places you at the explicit path prompt for Path3.
Step 7	switchS(config-explicit-path)# next-address 10.10.10.3 loose	Configures a minimum cost path in which the 10.10.10.3 IP address exists. Note In Figure 24-14, Path3 is the same as Path1—10.10.10.3 exists in Path 1. Using the loose option, you can achieve the same effect with one command instead of issuing three commands (using the strict option) in Step 3.

To reference the explicit path, follow these steps:

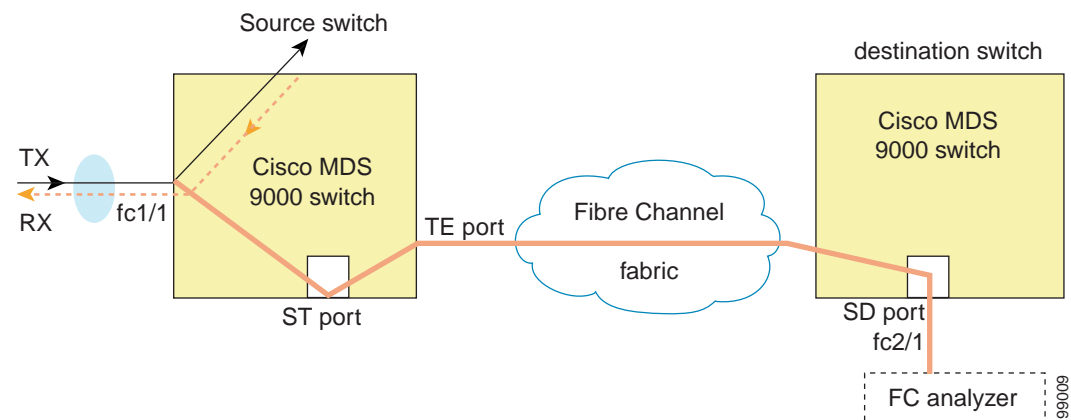
	Command	Purpose
Step 1	switchS# <code>config t</code>	Enters configuration mode.
Step 2	switchS(config)# <code>interface fc-tunnel 100</code>	References the tunnel ID for Path1.
Step 3	switchS(config)# <code>explicit-path Path1</code>	Links Path1 to the tunnel ID.

This configuration explicitly specifies Path 1 to be used for the RSPAN traffic. Refer to RFC 3209 for further details on explicit paths and source based routing.

Monitoring RSPAN Traffic

Once the session is configured, other SPAN sources for this session can also be configured as required. Figure 24-7 shows a RSPAN setup where one session with destination port fc2/1 and source interface fc1/1 is used to capture traffic in both ingress and egress direction.

Figure 24-15 Fibre Channel Analyzer Using a Single SD Port to Monitor RSPAN Traffic



To use this setup, the analyzer should have the capability of distinguishing ingress and egress traffic for all captured frames.

Sample Scenarios



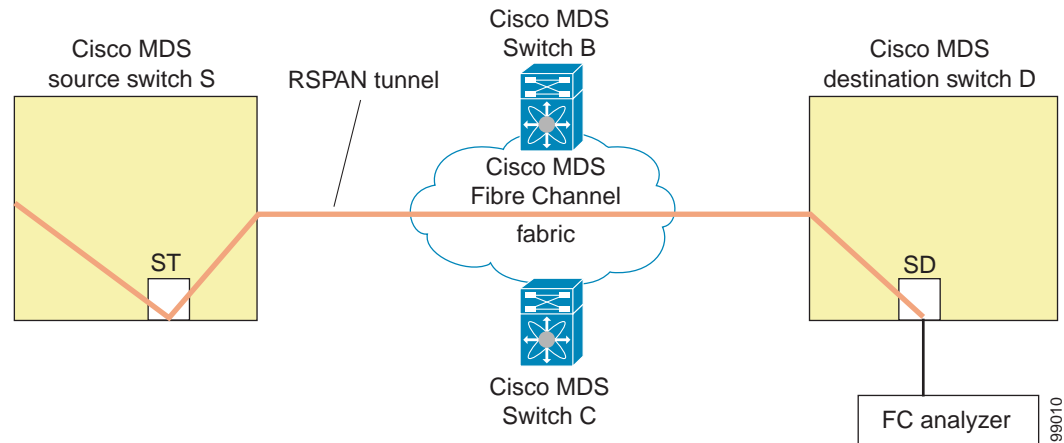
Note

RSPAN can be combined with the local SPAN feature so SD ports forward local SPAN traffic along with remote SPAN traffic. Various SPAN source and tunnel scenarios are described in this section.

Single Source with One RSPAN Tunnel

The source Switch S and the destination Switch D are interconnected through a Fibre Channel fabric. A RSPAN tunnel is configured as a destination interface for SPAN session and the ST port forwards SPAN traffic through the RSPAN tunnel (see [Figure 24-16](#)).

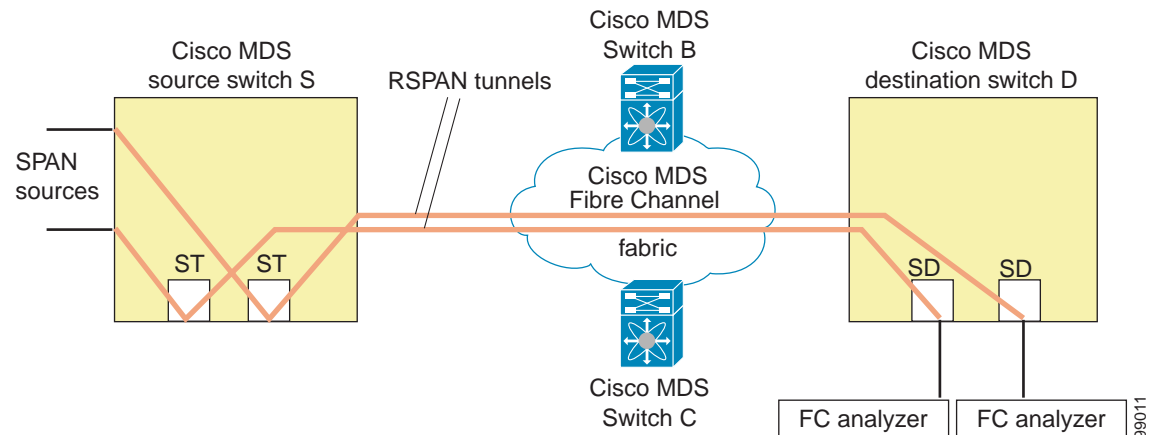
Figure 24-16 RSPAN Scenario with One Source Switch, One Destination Switch, and One Tunnel



Single Source with Multiple RSPAN Tunnels

[Figure 24-17](#) displays two separate RSPAN tunnels configured between Switches S and N. Each tunnel has an associated ST port in the source switch and a separate SD port in the destination switch. This configuration is useful for trouble shooting purposes.

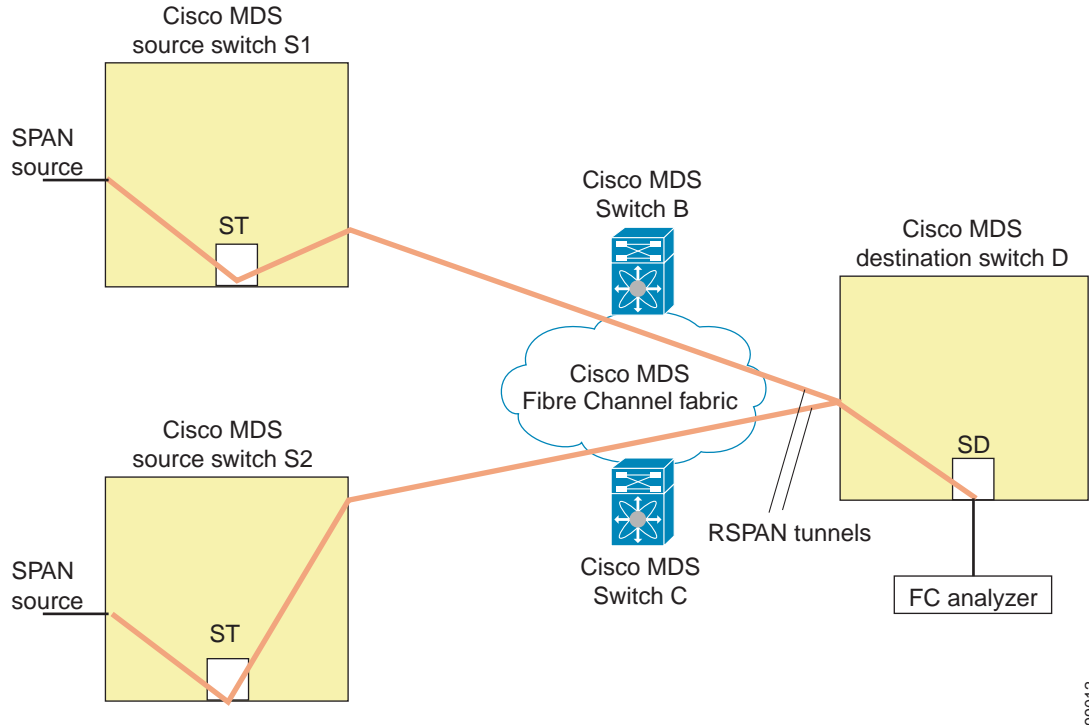
Figure 24-17 RSPAN Scenario with One Source Switch, One Destination Switch, and Multiple Tunnels



Multiple Sources with Multiple RSPAN Tunnels

Figure 24-18 displays two separate RSPAN tunnels configured between Switches S1 and S2. Both tunnels have an associated ST port in their respective source switch and terminate in the same SD port in the destination switch.

Figure 24-18 RSPAN Scenario with Two Source Switches, a Destination Switch, and Multiple Tunnels



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This configuration is useful for remote monitoring purposes. For example, the administrator may be at the destination switch and can remotely monitor the two source switches.

Displaying RSPAN Information

Use the **show** commands to display configured RSPAN information. See Examples 24-1 to 24-4.

Example 24-5 Displays ST Port Interface Information

```
switch# show interface brief
```

Interface	Vsan	Admin Mode	Admin Trunk Mode	Status	Oper Mode	Oper Speed (Gbps)	Port-channel
fc1/1	1	auto	on	trunking	TE	2	--
...							
fc1/14	1	auto	on	trunking	TE	2	--
fc1/15	1	ST	on	up	ST	2	--
...							
fc2/9	1	auto	on	trunking	TE	2	port-channel 21

```

fc2/10    1    auto  on    trunking  TE    2    port-channel 21
...
fc2/13    999  auto  on    up        F     1    --
fc2/14    999  auto  on    up        FL    1    --
fc2/15    1    SD    --    up        SD    2    --
fc2/16    1    auto  on    trunking  TE    2    --

```

```

-----
Interface          Status          Speed
                   (Gbps)
-----

```

```

sup-fc0          up              1

```

```

-----
Interface          Status          IP Address          Speed          MTU
-----
mgmt0              up              172.22.36.175/22   100 Mbps      1500

```

```

-----
Interface          Status          IP Address          Speed          MTU--
-----
vsan5              up              10.10.10.1/24      1 Gbps        1500

```

```

-----
Interface          Vsan           Admin              Status          Oper           Oper
                   Mode           Trunk              Mode            Mode           Speed
                   Mode           Mode               Mode            Mode           (Gbps)
-----

```

```

port-channel 21    1              on                trunking        TE             4

```

```

-----
Interface          Status          Dest IP Addr        Src IP Addr      TID            Explicit Path
-----
fc-tunnel 100      up              10.10.10.2         10.10.10.1      100

```

Example 24-6 Displays Detailed Information for the ST Port Interface

```

switch# show interface fc1/11
fc1/11 is up
  Hardware is Fibre Channel
  Port WWN is 20:0b:00:05:30:00:59:de
  Admin port mode is ST
  Port mode is ST
  Port vsan is 1
  Speed is 1 Gbps
  Rspan tunnel is fc-tunnel 100
  Beacon is turned off
  5 minutes input rate 248 bits/sec, 31 bytes/sec, 0 frames/sec
  5 minutes output rate 176 bits/sec, 22 bytes/sec, 0 frames/sec
  6862 frames input, 444232 bytes
    0 discards, 0 errors
    0 CRC, 0 unknown class
    0 too long, 0 too short
  6862 frames output, 307072 bytes
    0 discards, 0 errors
  0 input OLS, 0 LRR, 0 NOS, 0 loop inits
  0 output OLS, 0 LRR, 0 NOS, 0 loop inits

```

Example 24-7 Displays the FC Tunnel Status

```

switch# show fc-tunnel
fc-tunnel is enabled

```

Example 24-8 Displays FC Tunnel Egress Mapping Information

```
switch# show fc-tunnel tunnel-id-map
tunnel id egress interface
    150    fc3/1
    100    fc3/1
```

**Note**

Multiple tunnel IDs can terminate at the same interface.

Example 24-9 Displays FC Tunnel Explicit Mapping Information

```
switch# show fc-tunnel explicit-path
Explicit path name: Alternatel
    10.20.1.2 loose
    10.20.1.3 strict
Explicit path name: User2
    10.20.50.1 strict
    10.20.50.4 loose
```

Example 24-10 Displays SPAN Mapping Information

```
switch# show span session
Session 2 (active)
  Destination is fc-tunnel 100
  No session filters configured
  Ingress (rx) sources are
    fc2/16,
  Egress (tx) sources are
    fc2/16,
```

Example 24-11 Displays the FC Tunnel Interface

```
switch# show interface fc-tunnel 200
fc-tunnel 200 is up
Dest  IP Addr: 200.200.200.7  Tunnel ID: 200
Source IP Addr: 200.200.200.4  LSP ID: 1
Explicit Path Name:
```