CHAPTER 43

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:

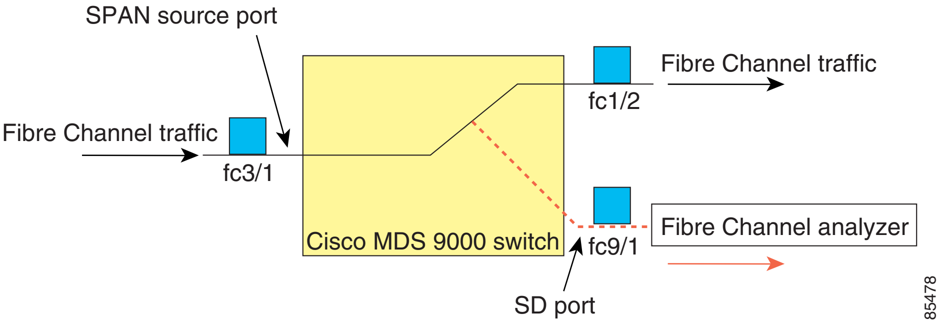
- About SPAN, page 43-2
- SPAN Sources, page 43-3
- SPAN Sessions, page 43-5
- Specifying Filters, page 43-6
- SD Port Characteristics, page 43-6
- Configuring SPAN, page 43-7
- Monitoring Traffic Using Fibre Channel Analyzers, page 43-10
- Displaying SPAN Information, page 43-14
- Remote SPAN, page 43-16
- Default SPAN and RSPAN Settings, page 43-30
- Default RSPAN Settings, page 43-31

About SPAN

The SPAN feature is specific to switches in the Cisco MDS 9000 Family. It monitors network traffic though 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 49-4).

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 43-1).

Figure 43-1 SPAN Transmission

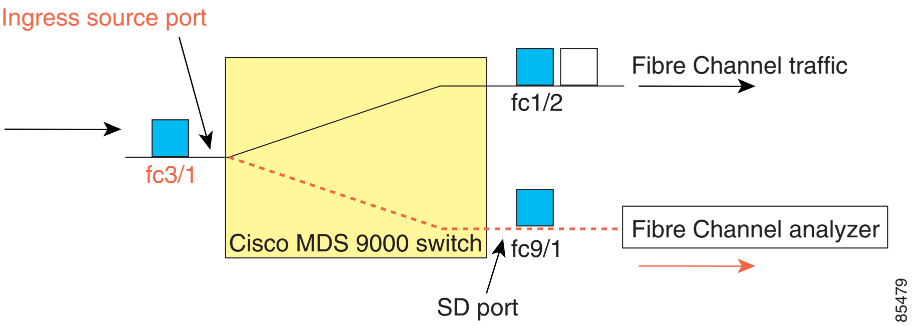


SPAN Sources

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:

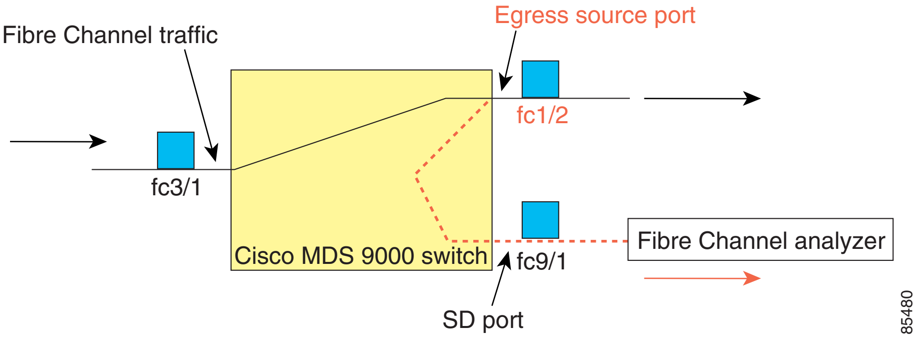
- Ingress source (Rx)—Traffic entering the switch fabric through this source interface is *spanned*

Figure 43-2 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 43-3).

Figure 43-3 SPAN Traffic from Egress Direction



IPS Source Ports

implemented on the FCIP and iSCSI virtual Fibre Channel port interfaces, not the physical Gigabit Ethernet ports. You can configure SPAN for ingress traffic, egress traffic, or traffic in both directions for all eight iSCSI and 24 FCIP interfaces that are available in the IPS module.

Note You can configure SPAN for Ethernet traffic using Cisco switches or routers connected to the Cisco MDS 9000 Family IPS modules.

CSM Source Ports

Cisco MDS 9000 Family SAN Volume Controller Configuration Guide

Allowed Source Interface Types

- Physical ports such as 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.

  IPS module specific Fibre Channel interfaces.
  - iSCSI interfaces
  - FCIP interfaces

VSAN as a 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.

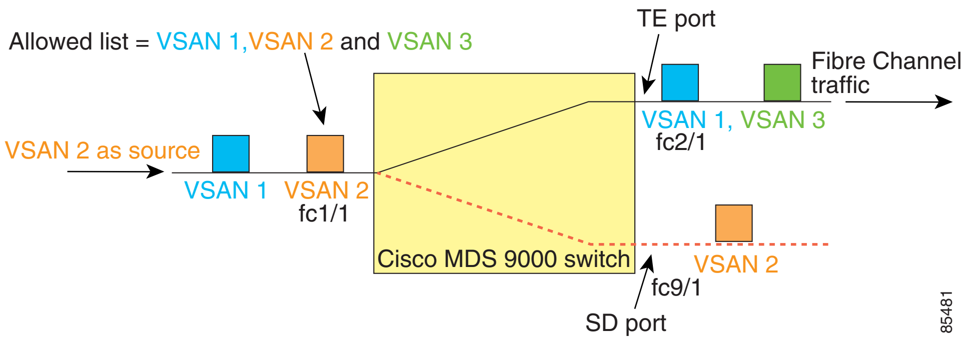
Guidelines to Configure VSANs as a Source

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.
- If a VSAN is specified as a source, you cannot 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 source, you cannot configure that VSAN as a source. You must first remove the existing SPAN configurations on such interfaces before configuring VSAN as a 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.

VSAN As a Source



For this configuration, the following apply:

- VSAN 2 as a 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 the "Configuring an Allowed-Active List of VSANs" section on page 12-5 or the "VSAN Membership" section on page 16-6.

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 any SPAN session, at least one source and the SD port must be up and functioning. Otherwise, traffic is not directed to the SD port.

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

You can temporarily deactivate (suspend) any SPAN session. The traffic monitoring is stopped during this time.

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 43-4). Only VSANs present in the filter are spanned.

You can specify session VSAN filters that 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 BB_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 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 Advanced Services Modules (ASMs) or Storage Services Modules (SSMs).
- The port mode cannot be changed if it is being used for a SPAN session.

Note If you need to change an 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.

Guidelines to Configure SPAN

The following guidelines apply for SPAN configurations:

- 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 "32-Port Configuration Guidelines" section on page 11-8).
- 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 specific 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.
	switch(config)# **interface fc9/1**	Configures the specified interface.
	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	**no shutdown**	Enables traffic flow through this interface.

To configure a SPAN session, follow these steps:

	Command	Purpose
Step 1	**config t**	Enters configuration mode.
Step 2	**span session 1** switch(config-span)#	
	switch(config)# **no span session 1**	
Step 3	switch(config-span)# **destination interface fc9/1**	
	switch(config-span)# **no destination interface fc9/1**	
Step 4	switch(config-span)# **source interface fc7/1**	
	switch(config-span)# **no source interface fc7/1**	

	Command	Purpose
Step 5	switch(config-span)# **source interface sup-fc0**	
	switch(config-span)# **source interface fc1/5 - 6, fc2/1 -3**	
	switch(config-span)# **source vsan 1-2**	
	switch(config-span)# **source interface port-channel 1**	
	switch(config-span)# **source interface fcip 51**	
	switch(config-span)# **source interface iscsi 4/1**	
	switch(config-span)# **source interface svc1/1 tx traffic-type initiator**	
	switch(config-span)# **no source interface port-channel 1**	

	Command	Purpose
Step 1	switch# **config t**	
Step 2	switch(config)# **span session 1** switch(config-span)#	
Step 3	switch(config-span)# **source interface fc9/1 tx**	
	switch(config-span)# **source filter vsan 1-2**	
	switch(config-span)# **source interface fc7/1 rx**	

Suspending and Reactivating SPAN Sessions

	Command	Purpose
Step 1	switch# **config t**	
Step 2	switch(config)# **span session 1** switch(config-span)#	
Step 3	switch(config-span)# **suspend**	
	switch(config-span)# **no suspend**	

Encapsulating Frames

switchport encap eisl

`Encapsulation is eisl` **show interface** *SD_port_interface*

	Command	Purpose
Step 1	switch# **config t**	
Step 2	switch(config)# **interface fc9/32**	
Step 3	switch(config-if)# **switchport mode SD**	
Step 4	switch(config-if)# **switchport encap eisl**	
	switch(config-if)# **no switchport encap eisl**	

SPAN Conversion Behavior

•

```
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,
```

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

•

```
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),



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

Note

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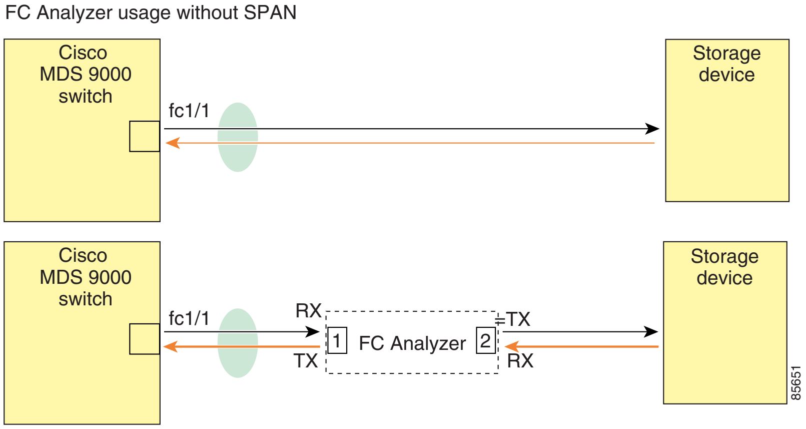
Monitoring Traffic Using Fibre Channel Analyzers

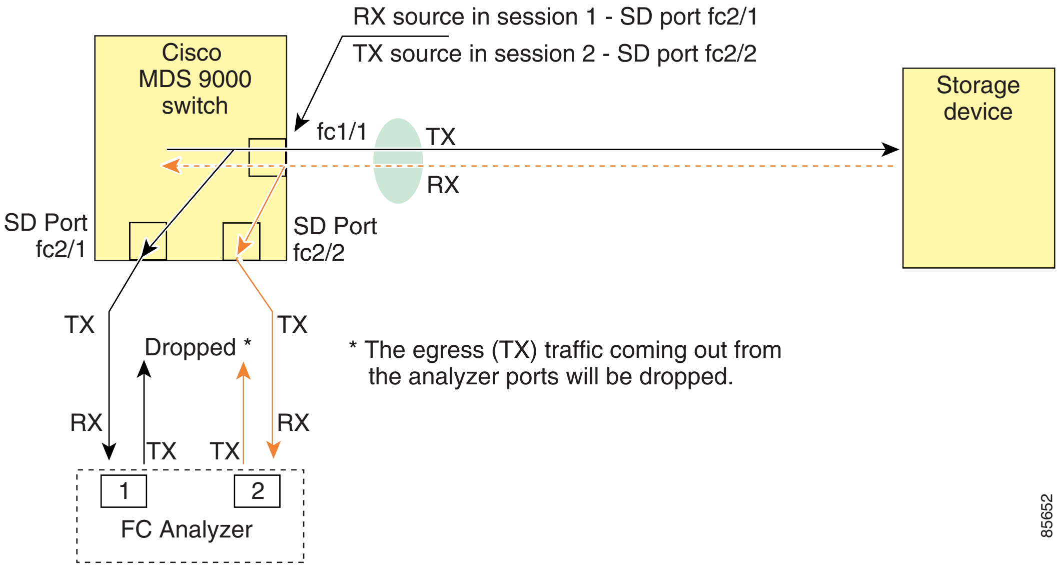
Without SPAN

Figure 43-5 Fibre Channel Analyzer Usage Without SPAN



With SPAN

Figure 43-6 Fibre Channel Analyzer Using SPAN



* The egress (TX) traffic coming out from the analyzer ports will be dropped.

Configuring Analyzers Using SPAN

Step 1

Step 2

Step 3

Step 4

	Command	Purpose
Step 1	`switch# config t`	

Step 2	`switch(config)# span session 1`
	`switch(config-span)#`	

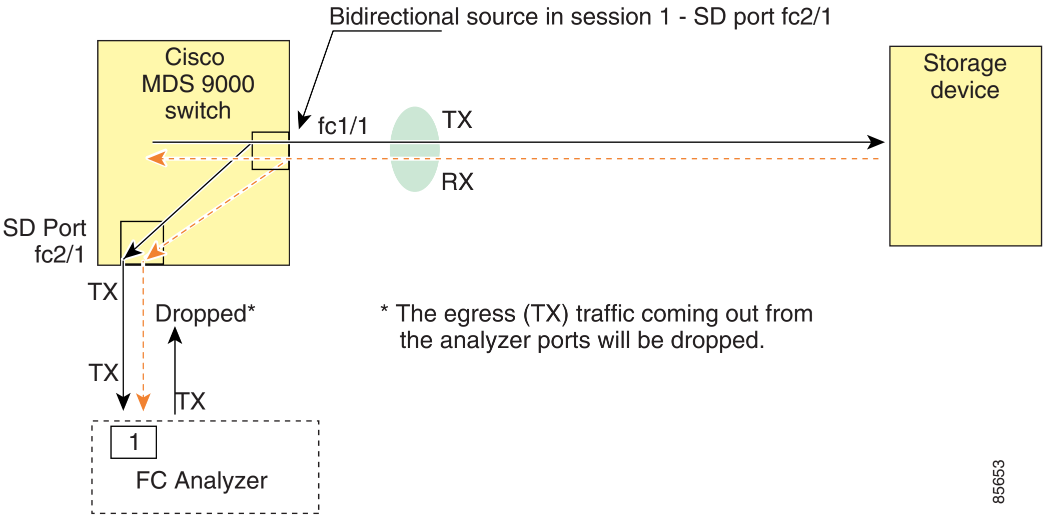
Step 3	`switch(config-span)## destination interface fc2/1`	
Step 4	`switch(config-span)# source interface fc1/1 rx`	

Step 5	`switch(config)# span session 2`
	`switch(config-span)#`	

Step 6	`switch(config-span)## destination interface fc2/2`	
Step 7	`switch(config-span)# source interface fc1/1 tx`	

Single SD Port to Monitor Traffic

Figure 43-7 Fibre Channel Analyzer Using a Single SD Port


Bidirectional source in session 1 - SD port fc2/1
Cisco MDS 9000 switch
Storage device
fc1/1
TX
RX
SD Port fc2/1
TX
Dropped*
TX
TX
1
FC Analyzer
* The egress (TX) traffic coming out from the analyzer ports will be dropped.
85653

	Command	Purpose
Step 1	`switch# config t`	

Step 2	`switch(config)# span session 1`
	`switch(config-span)#`	

Step 3	`switch(config-span)## destination interface fc2/1`	
Step 4	`switch(config-span)# source interface fc1/1`	

Displaying SPAN Information

Example 43-1 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 43-2 Displays a Specific SPAN Session in Detail

```
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 43-3 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, fcip 51,
     port-channel 2, sup-fc0,
   Egress (tx) sources are
     fc3/2, fc3/3, fc3/4, sup-fc0,
```

Example 43-4 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

    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
```

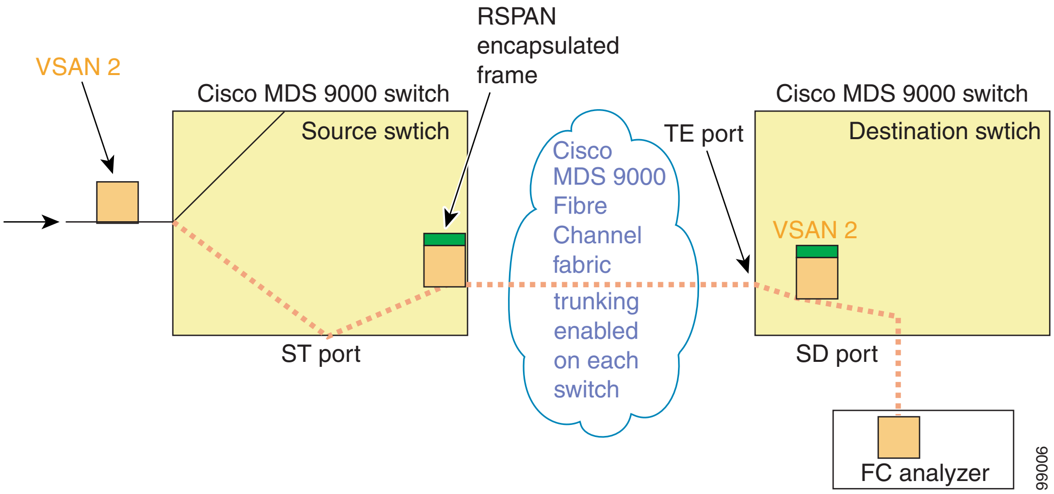
Remote SPAN

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 Cisco MDS source switch.

The RSPAN feature is nonintrusive and does not affect network traffic switching for that 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 43-8):

- 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 43-8 RSPAN Transmission



Advantages to Using RSPAN

The RSPAN features has the following advantages:

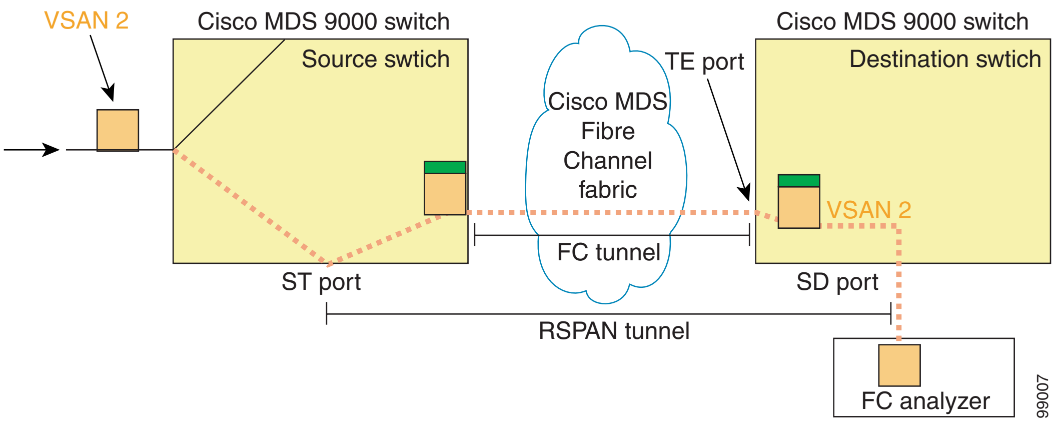
- Enables nondisruptive traffic monitoring at a remote location.
- Provides a cost effective solution by using one SD port to monitor remote traffic on multiple switches.
- Works with any Fibre Channel analyzer.
- Is compatible with the Cisco MDS 9000 Port Analyzer adapters.
- Does not affect traffic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

FC and RSPAN Tunnels

An 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 an ST port in the source switch and map the same FC tunnel to an SD port in the destination switch. Once the mapping and binding is configured, the FC tunnel is referred to as an RSPAN tunnel (see Figure 43-9).

Figure 43-9 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 is dropped.
- The following configurations must be performed on *each*

Note

- The FC tunnel's IP address must reside in the same subnet as the VSAN interface

  See Chapter 36, "Configuring IP Services."

ST Port Characteristics

ST port have the following characteristics:

- ST ports perform the RSPAN encapsulation of the FC frame.
- ST ports do not use BB_credits.
- One ST port can only be bound to one FC tunnel.
- ST ports cannot be used for any purpose other than to carry RSPAN traffic.
- ST Ports cannot be configured using Advanced Services Modules (ASMs) or Storage Services Modules (SSMs).

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 Cisco 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 an RSPAN session in the source switch (in Switch S) to monitor network traffic.

RSPAN Configuration Example

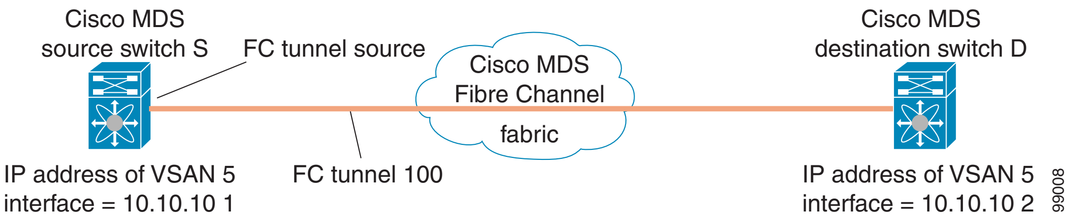
This section provides a RSPAN configuration example using the procedure defined in the previous section.

Configuration in the Source Switch

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

Creating VSAN Interfaces

Figure 43-10 FC Tunnel Configuration



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

To create a VSAN interface in the source switch for the scenario in Figure 43-10, follow these steps:

	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`interface vsan 5`	Configures the specified VSAN interface (VSAN 5) in the source switch (switch S).
Step 3	`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	`no shutdown`	Enables traffic flow through this interface.

Enabling FC Tunnels

To enable the FC tunnel feature, follow these steps:

	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`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 43-10, follow these steps:

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

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

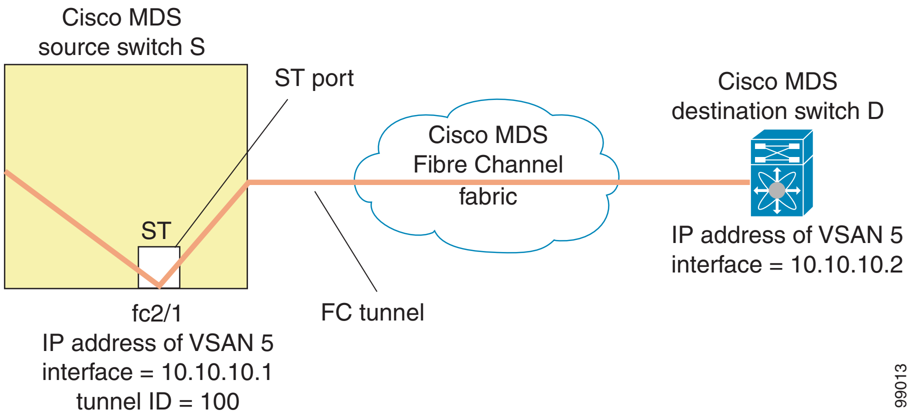
Tip The interface cannot be operationally up until the FC tunnel mapping is configured in the destination switch.

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 an RSPAN tunnel once the binding and mapping is complete.

Figure 43-11 depicts a basic FC tunnel configuration.

Figure 43-11 Binding the FC Tunnel



Note ST ports cannot be configured using Advanced Services Modules (ASMs) or Storage Services Modules (SSMs).

To configure an ST port for the scenario in Figure 43-11, follow these steps:

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

Configure an RSPAN Session

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

To configure an RSPAN session in the source switch for the scenario in Figure 43-11, follow these steps:

	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`span session 2`	Configures the specified SPAN session (2). If the session does not exist, it is created. The session ID ranges from 1 to 16.
Step 3	`destination interface fc-tunnel 100`	Configures the specified RSPAN tunnel (100) in a session.
Step 4	`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, page 43-21
- Enabling FC Tunnels, page 43-22
- Enabling IP Routing, page 43-22

Configuring VSAN Interfaces

Figure 43-13 depicts an 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 43-13, follow these steps:

	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`interface vsan 5`	Configures the specified VSAN interface (VSAN 5) in the destination switch (Switch D).
Step 3	`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	`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	`config t`	Enters configuration mode.
Step 2	`fc-tunnel enable`	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 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 36-5). This step is required to set up 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, page 43-22
- Configuring the SD Port, page 43-23
- Mapping the FC Tunnel, page 43-24

Configuring VSAN Interfaces

Figure 43-12 depicts an 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 43-12, follow these steps:

	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`interface vsan 5`	Configures the specified VSAN interface (VSAN 5) in the destination switch (Switch D).
Step 3	`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	`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:

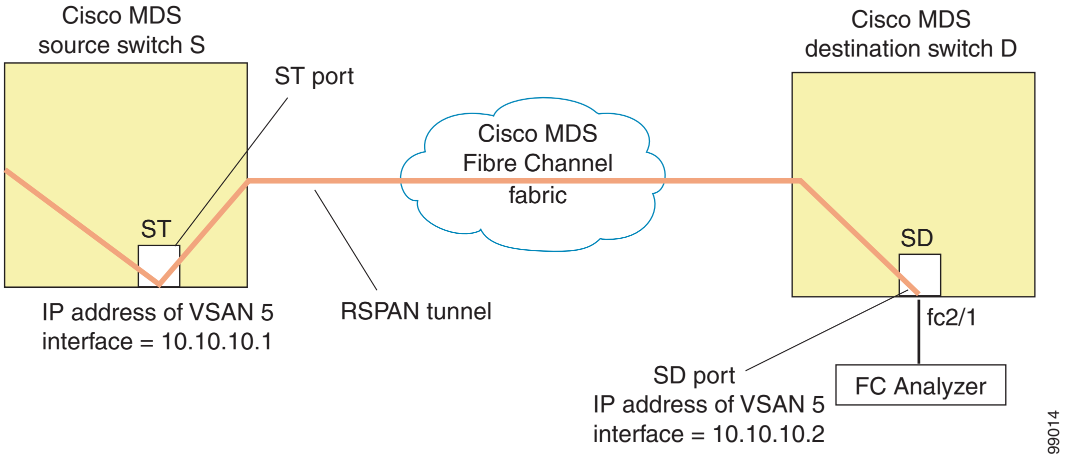
	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`fc-tunnel enable`	Initiates the FC tunnel (100) in the source switch (switch S). The tunnel IDs range from 1 to 255.

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

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 43-12 depicts an RSPAN tunnel configuration, now that tunnel destination is also configured.

Figure 43-12 RSPAN Tunnel Configuration



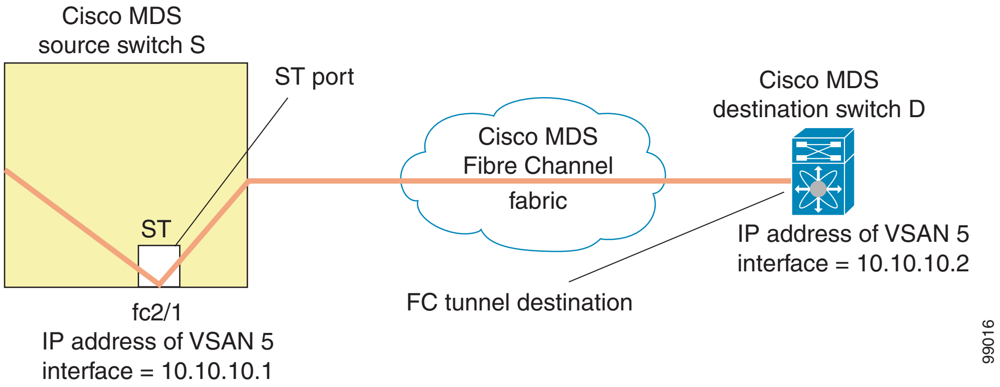
Note SD ports cannot be configured using Advanced Services Modules (ASMs) or Storage Services Modules (SSMs).

To configure an SD port for the scenario in Figure 43-12, follow these steps:

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

Mapping the FC Tunnel

The **tunnel-id-map** option specifies the egress interface of the tunnel at the destination switch (see Figure 43-13).



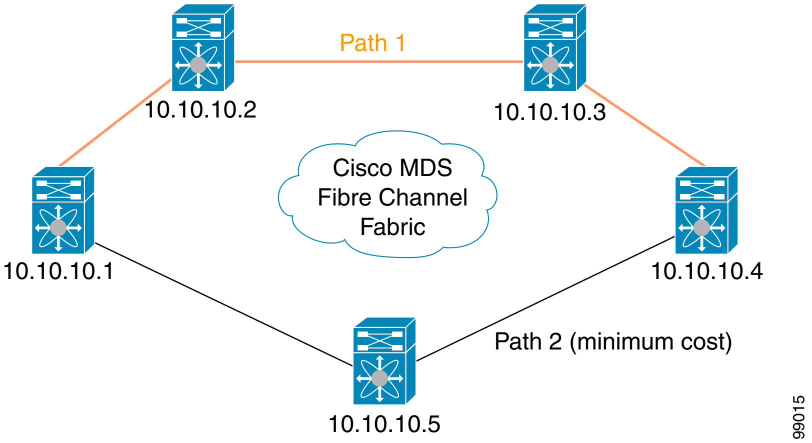
To terminate the FC tunnel in the destination switch for the scenario in Figure 43-13, follow these steps:

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

Explicit Paths

You can specify an explicit path through the Cisco MDS Fibre channel fabric (source-based routing), using 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 uses 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 are available. In an 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 43-14).



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 43-14, follow these steps:

	Command	Purpose
Step 1	`config t`	Enters configuration mode.
Step 2	`fc-tunnel explicit-path Path1`	Places you at the explicit path prompt for the path named Path 1.

Step 3	`next-address 10.10.10.2 strict`
	`next-address 10.10.10.3 strict`
	`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	`fc-tunnel explicit-path Path2`	Places you at the explicit path prompt for Path2.

Step 5	`next-address 10.10.10.5 strict`
	`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	`fc-tunnel explicit-path Path3`	Places you at the explicit path prompt for Path3.
Step 7	`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 43-14, 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:

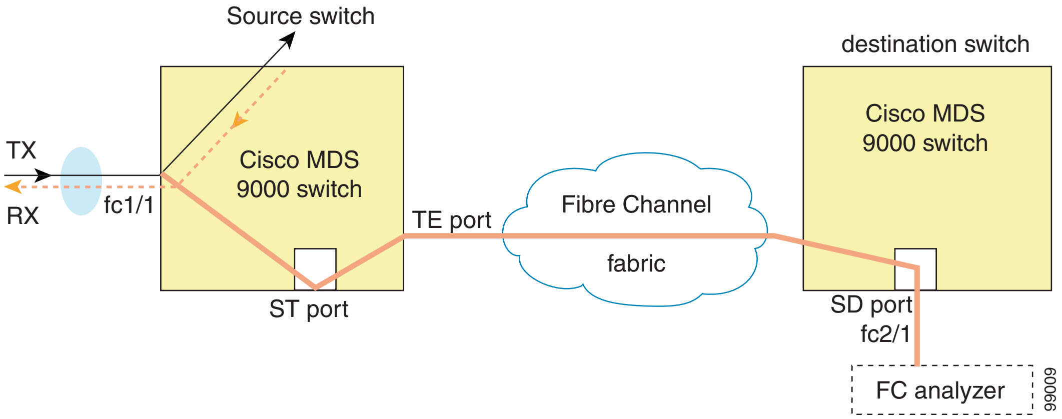
	Command	Purpose
Step 1	`config t`	
Step 2	`interface fc-tunnel 100`	
Step 3	`explicit-path Path1`	

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 43-15 shows an 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 directions.

Fibre Channel Analyzer Using a Single SD Port to Monitor RSPAN Traffic

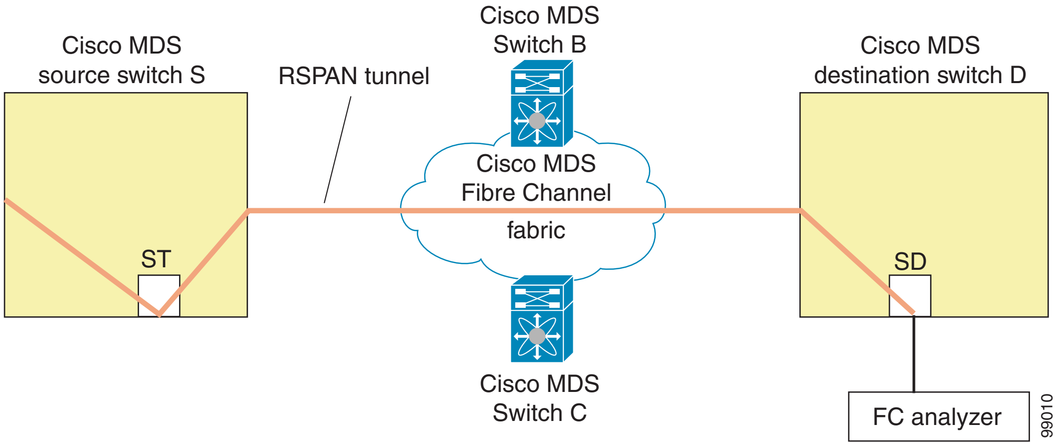


Sample Scenarios

Note

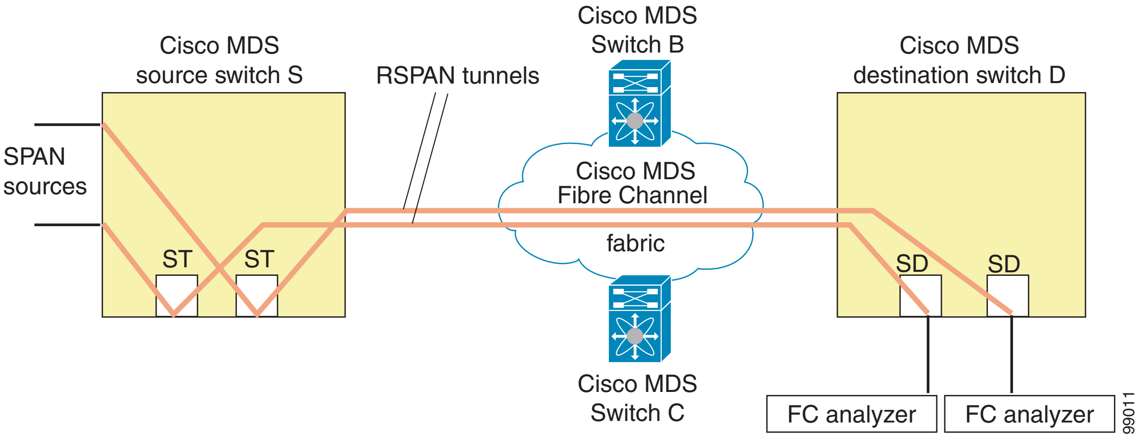
Single Source with One RSPAN Tunnel

Figure 43-16 RSPAN Scenario with One Source Switch, One Destination Switch, and One Tunnel



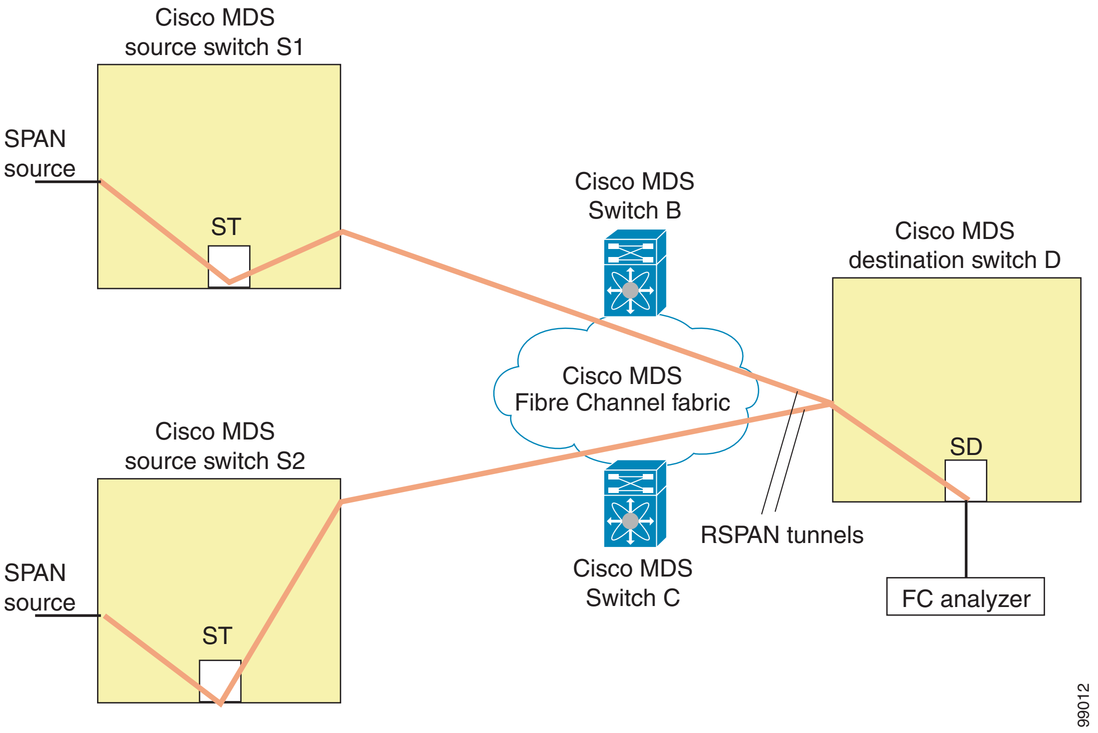
Single Source with Multiple RSPAN Tunnels

Figure 43-17 RSPAN Scenario with One Source Switch, One Destination Switch, and Multiple Tunnels



Multiple Sources with Multiple RSPAN Tunnels

Figure 43-18 RSPAN Scenario with Two Source Switches, a Destination Switch, and Multiple Tunnels


Cisco MDS source switch S1
SPAN source
ST
Cisco MDS Switch B
Cisco MDS destination switch D
Cisco MDS Fibre Channel fabric
SD
Cisco MDS source switch S2
SPAN source
ST
RSPAN tunnels
Cisco MDS Switch C
FC analyzer
99012

Displaying RSPAN Information

show

Example 43-5 Displays ST Port Interface Information

```
        show interface brief

Interface   Vsan    Admin   Admin   Status      Oper    Oper    Port-channel
                    Mode    Trunk               Mode    Speed
                            Mode                        (Gbps)
-------------------------------------------------------------------------------
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
                                 Trunk                       Mode    Speed
                                 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 43-6 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 43-7 Displays the FC Tunnel Status

```
switch# show fc-tunnel
fc-tunnel is enabled
```

Example 43-8 Displays FC Tunnel Egress Mapping Information

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

Note

Example 43-9 Displays FC Tunnel Explicit Mapping Information

```
switch# show fc-tunnel explicit-path
Explicit path name: Alternate1
       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 43-10 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 43-11 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:
```

Default SPAN and RSPAN Settings

Table 43-1 Default SPAN Configuration Parameters

Parameters	Default

Table 43-2 Default SPAN Configuration Parameters

Parameters	Default

Default RSPAN Settings

Table 43-3 Default RSPAN Configuration Parameters

Parameters	Default