CHAPTER 34

Configuring the SAN Extension Tuner

The SAN extension tuner (SET) feature is unique to the Cisco MDS 9000 Family of switches. This feature helps you optimize FCIP performance by generating SCSI I/O commands and directing such traffic to a specific virtual target. You can specify the size of the test I/O transfers and how many concurrent I/Os to generate while testing. The SET reports the resulting I/Os per second (IOPS) and I/O latency, which helps you determine the number of concurrent I/Os needed to maximize FCIP throughput.

This chapter includes the following sections:

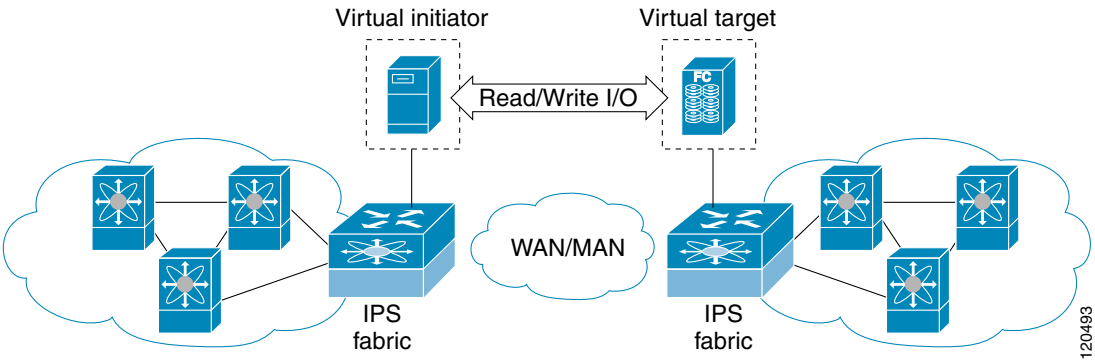
About SET

Applications such as remote copy and data backup use FCIP over an IP network to connect across geographically distributed SANs. To achieve maximum throughput performance across the fabric, you can tune the following configuration parameters:

- The TCP parameters for the FCIP profile' (see the "Window Management" section on page 33-9).
- The number of concurrent SCSI I/Os generated by the application.
- The transfer size used by the application over an FCIP link.

SET is implemented in IPS ports. When enabled, this feature can be used to generate SCSI I/O commands (read and write) to the virtual target based on your configured options (see Figure 34-1).

Figure 34-1 SCSI Command Generation to the Virtual Target



The SET feature assist with tuning by generating varying SCSI traffic workloads. It also measures throughput and response time per I/ O over FCIP link.

License Prerequisites

To use the SET, you need to obtain the SAN_EXTN_OVER_IP license (see Chapter 3, "Obtaining and Installing Licenses").

Tuner Guidelines

Before tuning the SAN fabric, be aware of the following guidelines:

- Be aware of the following implementation details:
  - The tuned configuration is not persistent.
  - The virtual N ports created do not register FC4 features supported with the name server. This is to avoid the hosts in the SAN from discovering these N ports as regular initiators or targets.
  - Login requests from other initiators in the SAN are rejected.
  - The virtual N ports do not implement the entire SCSI suite, it only implements the SCSI read and write commands.
  - Tuner initiators can only communicate with tuner targets.
- Verify that the Gigabit Ethernet interface is up at the physical layer (GBIC and Cable connected—an IP address is not required).
- Enable iSCSI on the switch (no other iSCSI configuration is required).
- Create an iSCSI interface on the Gigabit Ethernet interface and enable the interface (no other iSCSI interface configuration is required) (see the "Creating iSCSI Interfaces" section on page 35-4).
- Configure the virtual N ports in a separate VSAN or zone as required by your network.
- Be aware that a separate VSAN with only virtual N ports is not required, but is recommended as some legacy HBAs may fail if logins to targets are rejected.
- Do not use same Gigabit Ethernet interface to configure virtual N ports and FCIP links—use different Gigabit Ethernet interfaces. While this is not a requirement, it is recommended as the traffic generated by the virtual N ports may interfere with the performance of the FCIP link.

Tuner Initialization

The tuning feature is disabled by default in all switches in the Cisco 9000 Family. When you enable this feature, tuning is globally enabled for the entire switch.

To enable the tuning feature, follow these steps:

	Command	Purpose
Step 1	`switch# config t`	Enters configuration mode.
Step 2	`switch(config)# san-ext-tuner enable`	Enables tuning.
	`switch(config)# no san-ext-tuner enable`	Removes the currently applied tuning configuration and disables tuning (default).

Tuner Configuration

Figure 34-2 provides a sample physical setup in which the virtual N ports are created on ports that are not a part of the FCIP link for which the throughput and latency is measured.

Figure 34-2 N Port Tuning Configuration Physical Example

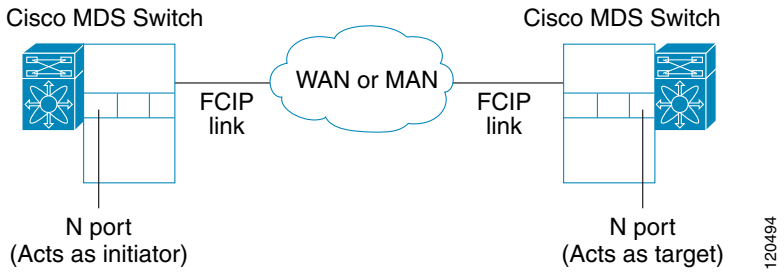
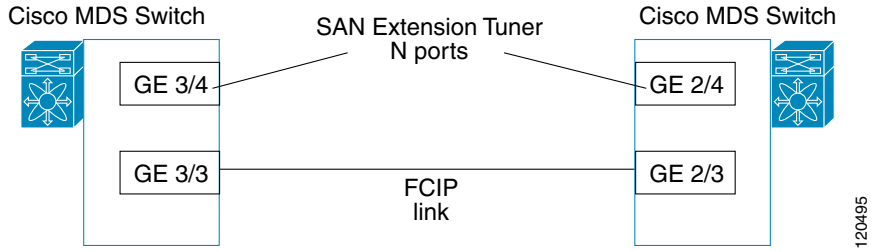


Figure 34-2 provides an sample logical setup in which the virtual N ports are created on ports that are not a part of the FCIP link for which the throughput and latency is measured.

Figure 34-3 Logical Example of N Port Tuning for a FCIP Link



To tune the required FCIP link, follow these steps:

Step 1 Configure the nWWN for the virtual N ports on the switch.

Step 2 Enable iSCSI on the interfaces on which you want to create the N ports.

Step 3 Configure the virtual N ports on either side of the FCIP link.

Step 4 Ensure that the virtual N ports are not visible to real initiators in the SAN. You can use zoning (see Chapter 19, “Configuring and Managing Zones”) or VSANs (see Chapter 16, “Configuring and Managing VSANs”) to segregate the real initiators. Ensure that the zoning configuration is setup to allow the virtual N-ports to communicate with each other.

Step 5 Start the SCSI read and write I/Os.

Step 6 Add more N ports (as required) to other Gigabit Ethernet ports in the switch to obtain maximum throughput. One scenario that may require additional N ports is if you use FCIP PortChannels.

nWWN Configuration

To configure the nWWNs for the tuner in this switch, follow these steps:

	Command	Purpose
Step 1	`switch# san-ext-tuner` `switch(san-ext)#`	Enters the SET configuration submode.
Step 2	`switch(san-ext)# nWWN 10:00:00:00:00:00:00:00`	Configures the nWWN for the SAN extension tuner.

Virtual N Port Configuration

To configure the virtual N port for tuning, follow these steps:

	Command	Purpose
Step 1	`switch# config t` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi enable`	Enables iSCSI.
Step 3	`switch(config)# interface iscsi 3/4` `switch(config-if)#`	Creates an iSCSI interface and enters interface configuration submode.
Step 4	`switch(config-if)# no shutdown`	Enables the iSCSI interface.
Step 5	`switch(config-if)# end` `switch#`	Returns to EXEC mode.
Step 6	`switch# san-ext-tuner` `switch(san-ext)#`	Enters the SET configuration submode.
Step 7	`switch(san-ext)# nWWN 10:00:00:00:00:00:00:00`	Configures the nWWN for the SAN extension tuner.
Step 8	`switch(san-ext)# nport pWWN 12:00:00:00:00:00:00:56 vsan 200 interface gigabitethernet 3/4` `switch(san-ext-nport)#`	Creates a virtual N port on the specified Gigabit Ethernet port and VSAN. This N port can act as a initiator or a target.
	`switch(san-ext)# no nport pWWN 22:34:56:78:90:12:34:56 vsan 200 interface gigabitethernet 3/4`	Removes a virtual N port on the specified Gigabit Ethernet port and VSAN.

SCSI Read/Write Assignment

You can assign SCSI read and write commands on a one-time basis or on a continuous basis.

To assign SCSI read and (or) write commands on a one-time basis, follow these steps:

	Command	Purpose
Step 1	`switch# san-ext-tuner` `switch(san-ext)#`	Enters the SET configuration submode.
Step 2	`switch(san-ext)# nWWN 10:00:00:00:00:00:00:00`	Configures the nWWN for the SAN extension tuner.

	Command	Purpose
Step 3	`switch(san-ext)# nport pWWN 12:00:00:00:00:00:00:56 vsan 200 interface gigabitethernet 3/4` `switch(san-ext-nport)#`	Creates a virtual N port on the specified Gigabit Ethernet port and VSAN. This N port can act as a initiator or a target.
Step 4	`switch(san-ext-nport)# read command-id 100 target 22:22:22:22:22:22:22:22 transfer-size 512000 outstanding-ios 2 num-transactions 5000000`	Specifies a transfer size of 512,000 bytes with two outstanding I/Os in the **read** command. The total number of I/Os is 5,000,000 bytes.
Step 5	`switch(san-ext-nport)# write command-id 100 target 22:22:22:22:22:22:22:22 transfer-size 512000 outstanding-ios 2 num-transactions 5000000`	Specifies a transfer size of 512,000 bytes with two outstanding I/Os in the **write** command received by the target. The total number of I/Os is 5,000,000 bytes.
Step 6	`switch(san-ext-nport)# stop command-id 100`	Stops the command with the specified ID.
	`switch(san-ext-nport)# stop all`	Stops all outstanding commands.
Step 7	`switch(san-ext-nport)# clear counters`	Clears the counters associated with this N port.
Step 8	`switch(san-ext-nport)# end` `switch#`	Exits the SAN extension tuner submode.

To generate SCSI read or write commands continuously, follow these steps:

	Command	Purpose
Step 1	`switch# san-ext-tuner` `switch(san-ext)#`	Enters the SET configuration submode.
Step 2	`switch(san-ext)# nWWN 10:00:00:00:00:00:00:00`	Configures the nWWN for the SAN extension tuner.
Step 3	`switch(san-ext)# nport pWWN 12:00:00:00:00:00:00:56 vsan 200 interface gigabitethernet 3/4` `switch(san-ext-nport)#`	Creates a virtual N port on the specified Gigabit Ethernet port and VSAN. This N port can act as a initiator or a target.
Step 4	`switch(san-ext-nport)# read command-id 100 target 22:22:22:22:22:22:22:22 transfer-size 512000 outstanding-ios 2 continuous`	Configures SCSI commands to be read continuously. **Tip** Use the **stop command-id** command to stop the outstanding configuration.
Step 5	`switch(san-ext-nport)# write command-id 100 target 22:22:22:22:22:22:22:22 transfer-size 512000 outstanding-ios 2 continuous`	Configures SCSI commands to be written continuously.
Step 6	`switch(san-ext-nport)# stop command-id 100`	Stops the command with the specified ID.
	`switch(san-ext-nport)# stop command-id all`	Stops all outstanding commands.
Step 7	`switch(san-ext-nport)# clear counters`	Clears the counters associated with this N port.
Step 8	`switch(san-ext-nport)# end` `switch#`	Exits the SAN extension tuner submode.

To specify a transfer ready size for a SCSI write command, follow these steps:

	Command	Purpose
Step 1	`switch# san-ext-tuner` `switch(san-ext)#`	Enters the SET configuration submode.
Step 2	`switch(san-ext)# nWWN 10:00:00:00:00:00:00:00`	Configures the nWWN for the SAN extension tuner.
Step 3	`switch(san-ext)# nport pWWN 12:00:00:00:00:00:00:56 vsan 200 interface gigabitethernet 3/4` `switch(san-ext-nport)#`	Creates a virtual N port on the specified Gigabit Ethernet port and VSAN. This N port can act as a initiator or a target.
Step 4	`switch(san-ext-nport)# write command-id 100 target 22:22:22:22:22:22:22:22 transfer-size 512000 outstanding-ios 2 num-transactions 5000000`	Specifies a transfer size of 512,000 bytes with two outstanding I/Os in the **write** command received by the target. The total number of I/Os is 5,000,000 bytes.
Step 5	`switch(san-ext-nport)# transfer-ready-size 512000`	Specifies the maximum transfer ready size of 512,000 bytes as a target for SCSI write commands. For a SCSI **write** command with a larger size, the target performs multiple transfers based on the specified transfer size.
	`switch(san-ext-nport)# no transfer-ready-size 512000`	Removes the specified transfer ready size configuration for SCSI write commands.
Step 6	`switch(san-ext-nport)# stop command-id 100`	Stops the command with the specified ID.
Step 7	`switch(san-ext-nport)# end` `switch#`	Exits the SAN extension tuner submode.

Data Pattern

By default, an all-zero pattern is used as the pattern for data generated by the virtual N ports. You can optionally specify a file as the data pattern to be generated by selecting a data pattern file from one of three locations: the bootflash: directory, the volatile: directory, or the slot0: directory. This option is especially useful when testing compression over FCIP links. You can also use Canterbury corpus or artificial corpus files for benchmarking purposes.

To optionally configure a data pattern for SCSI commands, follow these steps:

	Command	Purpose
Step 1	`switch# san-ext-tuner` `switch(san-ext)#`	Enters the SET configuration submode.
Step 2	`switch(san-ext)# nport pWWN 12:00:00:00:00:00:00:56 vsan 200 interface gigabitethernet 3/4` `switch(san-ext-nport)#`	Creates a virtual N port on the specified Gigabit Ethernet port and VSAN. This N port can act as a initiator or a target.
Step 3	`switch(san-ext-nport)# data-pattern-file bootflash://DataPatternFile`	Specifies the data pattern used by the N port to generate data as a target for **read** commands and initiator for **write** commands.
	`switch(san-ext-nport)# no data-pattern-file`	Removes the specified transfer ready size configuration for SCSI write commands and defaults to using the all-zero pattern.

	Command	Purpose
Step 4	`switch(san-ext-nport)# write command-id 100 target 22:22:22:22:22:22:22:22 transfer-size 512000 outstanding-ios 2 num-transactions 5000000`	Specifies a transfer size of 512,000 bytes with two outstanding I/Os. The total number of I/Os is 5,000,000 bytes.
Step 5	`switch(san-ext-nport)# stop command-id 100`	Stops the command with the specified ID.
Step 6	`switch(san-ext-nport)# clear counters`	Clears the counters associated with this N port.
Step 7	`switch(san-ext-nport)# end` `switch#`	Exits the SAN extension tuner submode.

Tuning Configuration Verification

The **show** commands display the current tuning settings for the Cisco MDS switch (see Examples 34-1 to 34-6).

Example 34-1 Displays Entries in the FLOGI Database

```
switch# show flogi database
--------------------------------------------------------------------------------
INTERFACE    VSAN    FCID        PORT NAME                 NODE NAME
--------------------------------------------------------------------------------
iscsi3/4     200     0x050000    12:00:00:00:00:00:00:56     10:00:00:00:00:00:00:00
```

Example 34-2 Displays Detail s for a VSAN Entry in the FLOGI Database

```
switch# show fcns database vsan 200
VSAN 200
---------------------------------------------------------------------------
FCID          TYPE    PWWN (VENDOR)             FC4-TYPE:FEATURE
---------------------------------------------------------------------------
0x020000      N       22:22:22:22:22:22:22:22    scsi-fcp
0x050000      N       12:00:00:00:00:00:00:56    scsi-fcp
```

Example 34-3 Displays All Virtual N Ports Configured on the Specified Interface

```
switch# show san-ext-tuner interface gigabitethernet 3/4 nport pWWN
12:00:00:00:00:00:00:56 vsan 200 counters
Statistics for nport
Node name 10:00:00:00:00:00:00:00 Port name 12:00:00:00:00:00:00:56
I/Os per second               : 148
   Read                       : 0%
   Write                      : 100%
Ingress MB per second         : 0.02 MBs/sec (Max -0.02 MBs/sec)
Egress  MB per second         : 73.97 MBs/sec (Max -75.47 MBs/sec))
Average Response time per I/O : Read - 0 us, Write - 13432 us
Maximum Response time per I/O : Read - 0 us, Write - 6953 us
Minimum Response time per I/O : Read - 0 us, Write - 19752 us
Errors                        : 0
```

Example 34-4 Displays N ports Configured on a Specified Gigabit Ethernet Interface.

```
switch# show san-ext-tuner interface gigabitethernet 3/1
--------------------------------------------------------------------------------
Interface           NODE NAME                PORT NAME                VSAN
--------------------------------------------------------------------------------
GigabitEthernet3/1  10:00:00:00:00:00:00:00  10:00:00:00:00:00:00:01  91
```

Example 34-5 Displays the Transfer Ready Size Configured for a Specified N Port

```
switch# show san-ext-tuner interface gigabitethernet 3/1 nport pWWN 10:0:0:0:0:0:0:1 vsan
91
Node name            : 10:00:00:00:00:00:00:00
Port name            : 10:00:00:00:00:00:00:01
Transfer ready size  : all
```

Example 34-6 Displays All Virtual N Ports Configured in This Switch

```
switch# show san-ext-tuner nports
--------------------------------------------------------------------------------
Interface           NODE NAME                PORT NAME                VSAN
--------------------------------------------------------------------------------
GigabitEthernet3/1  10:00:00:00:00:00:00:00  10:00:00:00:00:00:00:01  91
```

Default Settings

Table 34-1 lists the default settings for tuning parameters.

Table 34-1 Default Tuning Parameters

Parameters	Default
Tuning	Disabled.
Transfer ready size	Same as the transfer size in the SCSI **write** command.
Outstanding I/Os	1.
Number of transactions	1.
Data generation format	All-zero format.