



# Sun StorEdge™ SAN Foundation Software 4.2 Configuration Guide

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# Contents

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## **Preface xi**

- 1. Features and Guidelines 1**
  - Fabric Bootability 1
  - SNIA and FCSM Packages 2
  - Zones and Ports 5
    - Zone Types 5
    - Port Types 6
  - Guidelines 7
    - Cascading Guidelines 7
    - FCIP Guidelines 8
    - Multipathing Guidelines 8
- 2. Adding and Removing SAN Devices 11**
  - Special Considerations 12
    - Port Choices 12
    - Multipathing 12
  - Adding and Removing Devices 13
    - Adding a Storage Device 13
      - ▼ To Add a Storage Device 13

Removing a Storage Device 16

- ▼ To Remove a Storage Device 16

### **3. Public Device Node Recognition 17**

Creating and Removing Individual Device Nodes Without Multipathing Enabled 18

- ▼ To Detect Fabric Devices Visible on a Host 18

Ensuring LUN Level Information Is Visible 20

- ▼ To Configure a Fabric Device Without Multipathing Enabled On the Host 20

- ▼ To Unconfigure a Fabric Device 24

Creating and Removing Multiple Device Nodes Without Multipathing Enabled 25

- ▼ To Configure All Fabric Devices on a Fabric-Connected Host Port 25

- ▼ To Unconfigure All Fabric Devices on a Fabric-Connected Host Port 27

Creating and Removing Individual Device Nodes With Multipathing Enabled 29

- ▼ To Detect Fabric Devices Visible to a Host 30

Ensuring LUN Level Information Is Visible 31

- ▼ To Configure Fabric-Connected Device Nodes With Multipathing Enabled Devices 32

- ▼ To Unconfigure a Fabric Device Associated With Multipathing Enabled Devices 35

- ▼ To Unconfigure One Path to a Multipathed Device 37

Creating and Removing Multiple Device Nodes With Multipathing Enabled 41

- ▼ To Configure All Fabric-Connected Devices With Multipathing Enabled 41

- ▼ To Unconfigure All Fabric-Connected Devices With Multipathing Enabled 46

### **4. FCIP Management 49**

Loading FCIP 49

Determining Fibre Channel Adapter Port Instances 49

▼ To Plumb an FCIP Instance 52

FCIP Invocation, Configuration and Usage 54

▼ To Start a Network Interface Manually 54

▼ To Configure the Host for Automatic Plumbing Upon Reboot 55

FCIP Usage 55

## **5. Dynamic Reconfiguration On the SAN 57**

DR and Fabric Devices 57

▼ To Remove a Fabric Device Before DR 58

▼ To Maintain a Fabric Device Configuration With DR 58

▼ To Reconfigure Fabric Devices With DR 58

▼ To Reconfigure the Sun Enterprise 10000 Server With a Fabric  
Connection 58

**Glossary 61**

**Index 67**



# Figures

---

- FIGURE 2-1    Decision Tree For Adding Public Devices    15
- FIGURE 2-2    Decision Tree For Removing Public Devices    16





# Tables

---

TABLE 1-1	Supported and Unsupported SNIA Interfaces	2
TABLE 1-2	Switch Port Types	6
TABLE 1-3	FCIP (NFS/NAS and Sندر)	8
TABLE 2-1	Port Types and For Storage Devices	12
TABLE 4-1	PCI Single Fibre Channel Network Adapter <code>/etc/path_to_inst</code> Device Path Entry	52



# Preface

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The *Sun StorEdge SAN Foundation Software 4.2 Configuration Guide* is for system administrators who need instructions for configuring the Sun StorEdge™ SAN Foundation software (SFS) in a storage area network (SAN) or direct-attach environment.

By the time you read this book, you should have already completed the hardware and software installation for your SAN with the help of the *Sun StorEdge SAN Foundation Software 4.2 Installation Guide*.

## Using UNIX Commands

This document may not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook2™ online documentation for the Solaris™ operating environment
- Other software documentation that you received with your system

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# Typographic Conventions

TABLE P-1

Typeface	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
<b>AaBbCc123</b>	What you type, when contrasted with on-screen computer output	% <b>su</b> Password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type <code>rm filename</code> .

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## Shell Prompts

TABLE P-2

Shell	Prompt
C shell	<i>machine_name%</i>
C shell superuser	<i>machine_name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

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## Related Documentation

**TABLE P-3** Sun StorEdge SAN Foundation Release Related Documentation

Product	Application	Title	Part Number
Sun StorEdge SAN 4.2 Foundation Release	Documentation information	<i>Sun StorEdge SAN Foundation Software 4.2 Guide to Documentation</i>	817-1576

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## Getting Help

If you need help installing or using this product, contact your service provider. If you have a support contract with Sun, call 1-800-USA-4SUN, or go to:

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A complete set of Solaris documentation and many other titles are located at:

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## Features and Guidelines

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By now, you should have completed the SFS hardware and software installation. The *Sun StorEdge SAN Foundation Software 4.2 Release Notes* identifies hardware on the Sun price list that you can include in your network and lists features and functionality that Sun supports. This section gives related guidelines for creating a SAN with the SFS and contains the following topics:

- “Fabric Bootability” on page 1
  - “SNIA and FCSM Packages” on page 2
  - “Zones and Ports” on page 5
  - “Guidelines” on page 7
- 

## Fabric Bootability

The 2 Gb HBAs that support the SFS can now boot from fabric devices as well as non-fabric devices. Fabric topologies with Fibre Channel switches provide higher speed, more connections, and port isolation. A Fibre Channel port can be configured in a loop or fabric topology.

As Sun deprecates loop support with its Fibre Channel switches, some current bootable configurations will not work in the future. With support for fabric bootability, however, you can still boot off devices on your SAN as you use the new switches. For fabric bootability instructions, see the Dump and Restore section of the chapter on bootability in the *Sun StorEdge SAN Foundation Software 4.2 Installation Guide*.

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# SNIA and FCSM Packages

The SAN Foundation release includes the Storage Networking Industry Association (SNIA) Fibre Channel host bus adapter (HBA) library. Some of these interfaces are provided through the Fibre Channel Switch Management (FCSM) driver. The SNIA library uses the FCSM driver to send Fibre Channel Common Transport (CT) requests to Fibre Channel switches. This allows client applications to get detailed information about the SAN topology and switch configurations.

The SNIA HBA application programming interfaces (APIs) enable you to manage Fibre Channel HBAs in your SAN. You can use the interfaces to access detailed information about the HBAs on a host and switches and storage devices connected to the SAN to comply with industry standards. Specifically, SNIA and FCSM enable you to integrate the Sun StorEdge Enterprise Storage Manager Topology Reporter (ESM) and other third-party SAN management tools with the Sun StorEdge SAN Foundation software required for devices that Sun supports.

The SNIA HBA API is divided into two functional components. The first is a Common Library, to which applications are linked. The second is one or more Vendor Specific Libraries (VSLs), which the Common Library dynamically loads to manage individual vendor HBAs.

Man pages for the common SNIA API are included in the Sun StorEdge SAN Foundation software. The formal specification (FC-MI) is available at <http://www.t11.org>. TABLE 1-1 outlines which APIs are included in the vendor library for this release:

**TABLE 1-1** Supported and Unsupported SNIA Interfaces

SNIA API	Sun StorEdge SAN Foundation Software Support
HBA_GetVersion	Yes
HBA_LoadLibrary	Yes
HBA_FreeLibrary	Yes
HBA_GetNumberOfAdapters	Yes
HBA_GetAdapterName	Yes
HBA_OpenAdapter	Yes
HBA_CloseAdapter	Yes
HBA_GetAdapterAttributes	Yes
HBA_GetAdapterPortAttributes	Yes
HBA_GetDiscoveredPortAttributes	Yes



**TABLE 1-1** Supported and Unsupported SNIA Interfaces *(Continued)*

<b>SNIA API</b>	<b>Sun StorEdge SAN Foundation Software Support</b>
HBA_GetPortAttributesbyWWN	Yes
HBA_SendCTPassThru	Yes
HBA_SendCTPassThruV2	No
HBA_RefreshInformation	Yes
HBA_GetFcpTargetMapping	Yes
HBA_SendScsiInquiry	Yes
HBA_SendReportLuns	Yes
HBA_SendReadCapacity	Yes
HBA_GetPortStatistics	Yes
HBA_ResetStatistics	No
HBA_GetFcpPersistentBinding	No
HBA_GetEventBuffer	No
HBA_SetRNIDMgmtInfo	Yes
HBA_GetRNIDMgmtInfo	Yes
HBA_SendRNID	Yes
HBA_SendRNIDV2	Yes
HBA_ScsiInquiryV2	Yes
HBA_ScsiReportLUNsV2	Yes
HBA_ScsiReadCapacityV2	Yes
HBA_OpenAdapterByWWN	Yes
HBA_RefreshAdapterConfiguration	Yes
HBA_GetVendorLibraryAttributes	Yes
HBA_GetFcpTargetMappingV2	Yes
HBA_SendRPL	No
HBA_SendRPS	No
HBA_SendSRL	No
HBA_SendLIRR	No
HBA_SendRLS	Yes
HBA_RemoveCallback	No
HBA_RegisterForAdapterEvents	No

**TABLE 1-1** Supported and Unsupported SNIA Interfaces *(Continued)*

SNIA API	Sun StorEdge SAN Foundation Software Support
HBA_RegisterForAdapterAddEvents	No
HBA_RegisterForAdapterPortEvents	No
HBA_RegisterForAdapterPortStatEvents	No
HBA_RegisterForTargetEvents	No
HBA_RegisterForAdapterLinkEvents	No
HBA_RegisterForAdapterTargetEvents	No
HBA_GetFC4Statistics	No
HBA_GetFCPStatistics	No
HBA_GetBindingCapability	No
HBA_GetBindingSupport	No
HBA_SetBindingSupport	No
HBA_SetPersistentBindingV2	No
HBA_GetPersistentBindingV2	No
HBA_RemovePersistentBinding	No
HBA_RemoveAllPersistentBindings	No

SNIA packages are now part of the Sun StorEdge SAN Foundation software stack. See the *Sun StorEdge SAN Foundation Software 4.2 Installation Guide* and *Sun StorEdge SAN Foundation Software 4.2 Release Notes* for more information on the location of the packages and how to install them. The package names are:

- SNIA common library: SUNWcfclr, SUNWcfcl, SUNWcfclx
- SAN Foundation Vendor Library: SUNWfchbr, SUNWfchba, SUNWfchbx
- FCSM driver: SUNWfcsml, SUNWfcsmx
- SAN Foundation software: SUNWsan, SUNWcfpl, SUNWcfplx

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# Zones and Ports

Understanding zoning and port usage is fundamental to understanding the use of configuration rules with the supported hardware. This section explains the use of zones and ports in preparation of the next section, which covers the configuration rules. Topics covered include:

- “Zone Types” on page 5
- “Port Types” on page 6

## Zone Types

Zoning is a function of the switch that allows segregation of devices by ports or World Wide Names (WWNs). You can create zones for a variety of reasons, such as security, simplicity, performance, or dedication of resources. Previous releases supported hard zones, segmented loop (SL) zones and name server (NS) zones. The current release now supports industry-standard port-based and WWN-based NS zones. See your third-party vendor documentation for more information. The two types of NS zones discussed most frequently in this documentation include:

- Port-based NS zones
- WWN-based NS zones

## Name Server Zones

NS zones use fabric protocols to communicate with Fibre Channel devices. NS zones contain F, FL, G, GL, and E ports for fabric devices. Each NS zone defines which ports or devices receive NS information. GL ports are not supported for Sun devices in this release. The Sun StorEdge T3 and T3+ arrays with firmware levels 1.18.01 and 2.0.03 support loop (TL) port connections. The Sun StorEdge T3+ array with firmware levels 2.0.03 supports fabric connections. FL ports are supported for Sun StorEdge L180/L700 tape libraries.

## Segmented Loop Zones

The current SAN 4.0 release does not support Segmented Loop (SL) zones or ports. If you have a SAN that requires SL connectivity to private loop devices, you can connect a new switch from the SAN 4.x release to the same host as an old switch from previous releases. The two SANs must, however, each have separate directories on the host for their respective management tools.

# Port Types

**TABLE 1-2** Switch Port Types

Port Type	Description	Supported Devices
TL Ports	Translated loop	storage devices connected to the Sun switch only
FL Ports	Public loop	Sun StorEdge L180/L700 tape libraries
F Ports	Point-to-point fabric	host bus adapters, storage devices
E Ports	Inter-switch port	cascaded switches acting as ISLs, which are configured initially in fabric port mode
G Ports	General ports	automatically configure to F or E ports to support hosts or switches
GL Ports	General loop ports	N/A

---

# Guidelines

This section covers guidelines for the following topics:

- “Cascading Guidelines” on page 7
- “FCIP Guidelines” on page 8
- “Multipathing Guidelines” on page 8

## Cascading Guidelines

- Hub-to-switch connectivity is not supported in a fabric.
- Cascading requires connection of E ports from switch to switch with either a shortwave or longwave Gigabit Interface Converter (GBIC) or Small Form Factor Pluggable (SFP) 2-Gbit transceiver. The use of shortwave SFPs allows a higher port count in a local configuration. The use of longwave SFPs and long haul fiber optics allows users to reach geographically separated storage and servers, perhaps for disaster recovery purposes.
- You can have a maximum of eight switches cascaded in a linear series. In other words, you can have seven inter-switch links between switches. Two of the ISLs can be long-wave connections. Check with your switch vendor for specific ISL count limitations because not all switches support a cascade of eight.
- Long-wave and short-wave ISLs can be used to cascade switches. The maximum distance for a single ISL hop is 10 km. Check with your third-party vendor documentation for details.
- If 1- and 2-Gbit switches are used together, a maximum of 16 switches can be connected together.
- If only 2-Gbit switches are used, a maximum of 64 switches can be connected together.
- Any number of ISL hops can be used between two switches. ISL hops do not include the connections between hosts and switches or between switches and storage.

## FCIP Guidelines

FCIP devices are supported for use with Network File System (NFS) software, Network Attached Storage (NAS) devices and Sun StorEdge Network Data Replicator (SNDR), or Sun StorEdge Availability Suite 3.1 remote mirror software.

**TABLE 1-3** FCIP (NFS/NAS and SNDR)

Feature	Supported
Cascading	Yes, with Fabric NS zones only
Zone type	Fabric NS zone (with the HBA configured as an F port point-to-point connection)
Maximum number of device ports per zone	4*

\* With the Sun StorEdge PCI Dual Fibre Channel Network Adapter+, only physical port 2 can be used for FCIP.  
With the Sun StorEdge cPCI Dual Fibre Channel Network Adapter, only physical port 1 can be used for FCIP.

The following restrictions apply:

- Promiscuous mode is not supported. The `snoop (1M)` utility cannot be used.
- Multicasting is supported through broadcasting only.
- Assign the IP address of the FCIP port to a subnet different from that of the Ethernets on the same system.
- Network cards using FCIP can not be used as routers. The `/etc/notrouter` file must be present on the host.
- When using FCIP, storage devices and hosts should be in separate zones. The storage device should have one path to one zone and another path to another zone for failover and redundancy. The host can have more than one path to a specified zone, and it should have at least one path to each zone so that it can see the respective storage.
- Failover is not possible with FCIP or FC tape.

## Multipathing Guidelines

Before you configure port-based zones to storage devices, you might want to set up volumes, or LUNs, for those devices. If you want high availability, you should also enable multipathing capability for load balancing of I/O traffic between hosts and arrays in the SAN. The multipathing driver described in this section is called the STMS and runs in the Solaris operating environment. See the *Sun StorEdge Traffic Manager Software Installation and Configuration Guide* for details about the component. If you are using another multipathing application, see the documentation for it.

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**Note** – STMS is disabled on SCSI devices but not boot devices. Multipathing is not supported on tape drives or tape libraries

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## Adding and Removing SAN Devices

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By now, you should have identified features and guidelines for connecting devices and hosts to the switches. This chapter helps you with setting up the devices in the zones on your switches. If you have not already done so, configure your ports and zones according to the instructions in your vendor-specific documentation.

This section covers addition of the supported storage devices, such as the Sun StorEdge T3+ array and Sun StorEdge 39x0, 69x0, and 99x0 series, to a SAN. Topics include:

- “Special Considerations” on page 12
- “Adding and Removing Devices” on page 13

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# Special Considerations

This section covers:

- “Port Choices” on page 12
- “Multipathing” on page 12

## Port Choices

When configuring an array, the host port is connected to an F port and the array is connected to an F or TL port on the switch. The TL port, or translation loop port, represents eight-bit addressing devices as 24-bit addressing devices and vice versa.

**TABLE 2-1** Port Types and For Storage Devices

Port Type	Storage Device
loop	Sun StorEdge T3 array
loop or fabric	Sun StorEdge t3+ array
fabric	Sun StorEdge 69x0 array
loop or fabric	Sun StorEdge 99x0 array
loop	STK 9840b tape drive
loop or fabric	STK 9940b tape drive
loop	STK 9840 tape drive
loop, public loop	Sun StorEdge L180/L700 tape libraries

Although you may connect a Sun StorEdge T3 array with a TL port, the host bus adapter recognizes it as a fabric device. Sun StorEdge T3+ arrays and the Sun StorEdge 39x0, 69x0, and 99x0 series should be connected with F ports as a 24-bit addressing device for fabric connectivity. The STK 9840b tape drive require F ports when connected to 2 Gbit switches. Sun StorEdge L5500/L6000 libraries are not connected to the SAN.

## Multipathing

You can connect arrays and other storage devices to the SAN with or without multipathing capability. The multipathing driver discussed in this book is called the Sun StorEdge Traffic Manager software (STMS) and runs on the Solaris operating

environment. The Sun StorEdge Traffic Manager software (STMS) is an associated application that is bundled with the SFS. For detailed information about the STMS or other multipathing utilities, see the *Sun StorEdge Traffic Manager Software Installation and Configuration Guide* or other third-party manuals.

---

## Adding and Removing Devices

This section covers:

- “Adding a Storage Device” on page 13
- “Removing a Storage Device” on page 16

### Adding a Storage Device

- If the STMS is not enabled, read the section “Creating and Removing Individual Device Nodes Without Multipathing Enabled” on page 18. See “Creating and Removing Multiple Device Nodes Without Multipathing Enabled” on page 25 for specific information.
- If the STMS is enabled, read the section “Creating and Removing Individual Device Nodes With Multipathing Enabled” on page 29. See “Creating and Removing Multiple Device Nodes With Multipathing Enabled” on page 41 for specific information.

---

**Note** – If you use the `format` command when the STMS is enabled, as shown in FIGURE 2-1, you see only one instance of a device identifier for each LUN. Without the STMS, you see one identifier for each path. The `format` command is shown in FIGURE 2-1 but is not further described in the manual because it is an established utility.

---

### ▼ To Add a Storage Device

1. **Plug the storage device into the system.**
2. **Create the LUN or LUNs desired.**
3. **Apply LUN masking for HBA control.**
4. **Create port-based or WWN zones on the switch.**

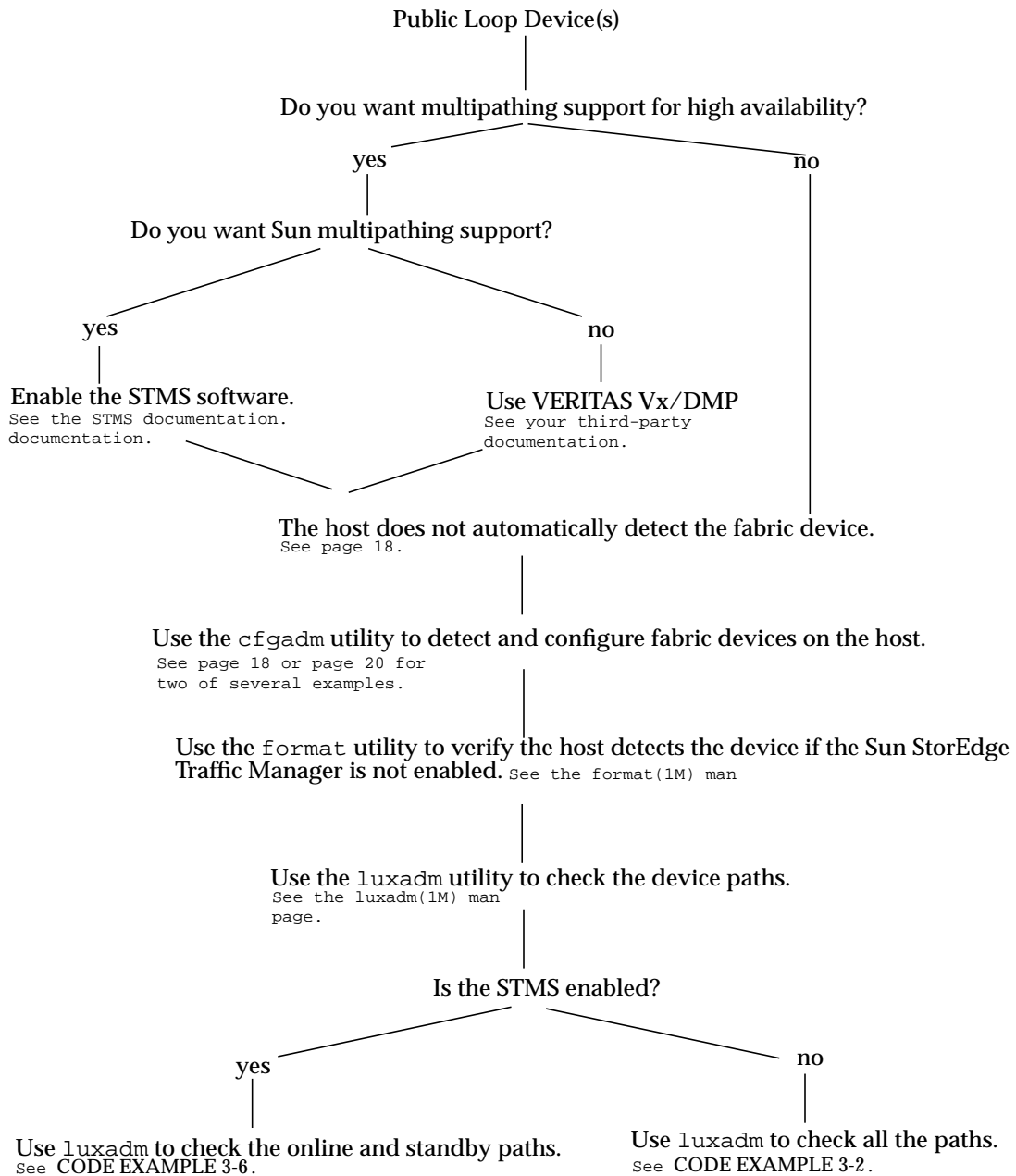
- 5. If necessary, configure all paths to the storage device using the `cfgadm -c configure` command on all the host bus adapters that have a path to the storage device.**

The `cfgadm -c configure` command creates device nodes. This step is necessary if the storage device is connected in an NS zone and is accessed by a host port connected to a switch F port.

- 6. Run the `fsck` or `newfs` commands on the device.**

- 7. Mount any existing file systems available on the storage device's LUNs or disk groups.**

You might need to run the `fsck` command to repair any errors in the LUNs listed in the `/etc/vfstab` file.



**FIGURE 2-1** Decision Tree For Adding Public Devices

## Removing a Storage Device

- If the STMS is not enabled, read the section “Creating and Removing Individual Device Nodes With Multipathing Enabled” on page 29. See “To Unconfigure a Fabric Device” on page 24 for specific information.
- If the STMS is enabled, read the section “Creating and Removing Individual Device Nodes With Multipathing Enabled” on page 29. See “To Unconfigure a Fabric Device Associated With Multipathing Enabled Devices” on page 35 for specific information.

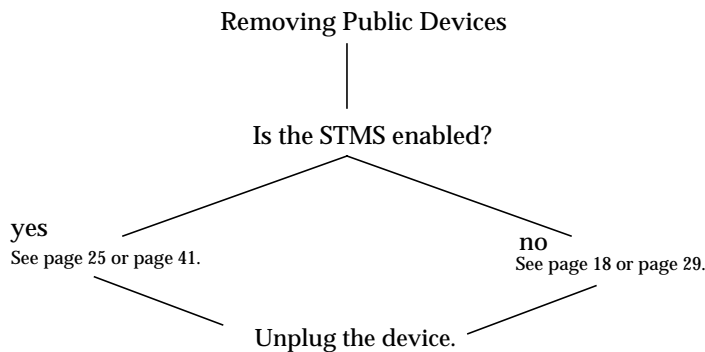


FIGURE 2-2 Decision Tree For Removing Public Devices

## ▼ To Remove a Storage Device

1. **Stop all LUN activity to the storage device.**
2. **Unmount any file systems currently using the storage device's LUNs.**
3. **Deport any volume manager disk groups.**
4. **Unconfigure paths to the storage device using the `cfgadm -c unconfigure` command.**

This step is necessary if the storage device is connected in an NS zone and is accessed by a host port connected to an F port on the switch.

## Public Device Node Recognition

---

After you configure the hardware in your direct-attach system or SAN, you must ensure the hosts recognize the switches and devices. This chapter explains host recognition of fabric devices, also known as 24-bit Fibre Channel addressing devices on the SAN. After configuring the devices, ports and zones in your SAN, you need to make sure that the host is aware of the devices and their switch connections. You can have up to 16 million fabric devices connected together on a SAN with Fibre Channel support.

This chapter provides generic instructions for adding and removing all supported devices in this release. This chapter includes:

- “Creating and Removing Individual Device Nodes Without Multipathing Enabled” on page 18
- “Creating and Removing Multiple Device Nodes Without Multipathing Enabled” on page 25
- “Creating and Removing Individual Device Nodes With Multipathing Enabled” on page 29
- “Creating and Removing Multiple Device Nodes With Multipathing Enabled” on page 41

There are a variety of ways in which you can ensure the host recognizes storage devices you add on your SAN. The decision trees in FIGURE 2-1 and FIGURE 2-2 help guide you through the process.

---

**Note** – You can connect a Sun StorEdge T3 array as an FC-AL device to a switch, but the Sun StorEdge host bus adapters supported in the SAN Foundation release recognize the array as a fabric device.

---

The scope of this chapter is limited to the operations required from the perspective of the Solaris operating environment. It does *not* cover other aspects, such as device availability and device-specific management. If devices are managed by other software, such as a volume manager, refer to the volume manager product documentation for additional instructions.

---

# Creating and Removing Individual Device Nodes Without Multipathing Enabled

This section describes fabric device configuration tasks on a host that does not have the STMS enabled.

The procedures in this section use specific devices as examples to illustrate how to use the `cfgadm(1M)` command to detect and configure fabric devices.

The devices attached to the fabric-connected host port are not configured by default, thus those devices are not available to the host using the Solaris operating environment. Use the `cfgadm(1M)` `configure` and `unconfigure` commands to manage device node creation for fabric devices. See the `cfgadm_fp(1M)` man page for additional information.

The procedures in this section illustrate how to detect fabric devices that are visible on a host and to configure and make them available to a host using the Solaris operating environment.

The device information that you supply and that is displayed by the `cfgadm(1M)` command depends on your system configuration.

This section contains the following topics:

- “To Detect Fabric Devices Visible on a Host” on page 18
- “Ensuring LUN Level Information Is Visible” on page 20
- “To Configure a Fabric Device Without Multipathing Enabled On the Host” on page 20
- “To Unconfigure a Fabric Device” on page 24
- “To Configure All Fabric Devices on a Fabric-Connected Host Port” on page 25
- “To Unconfigure All Fabric Devices on a Fabric-Connected Host Port” on page 27

## ▼ To Detect Fabric Devices Visible on a Host

This procedure uses Fibre Channel host ports `c0` and `c1`, and the devices attached to them, to provide an example of detecting fabric devices. This procedure also shows the device configuration information that is displayed with the `cfgadm(1M)` command.



---

**Note** – If you do not install the proper software patches and packages for this release, Fibre Channel devices do not display in the `cfgadm(1M)` command output. In the following examples, only failover path attachment point IDs (Ap\_Ids) are listed. The Ap\_Ids displayed on your system depend on your system configuration.

---

1. **Become superuser.**
2. **Display the information about the attachment points on the system.**

# <b>cfgadm -l</b>				
Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown

In this example, `c0` represents a fabric-connected host port, and `c1` represents a private, loop-connected host port. Use the `cfgadm(1M)` command to manage the device configuration on fabric-connected host ports.

By default, the device configuration on private, loop-connected host ports is managed by a host using the Solaris operating environment.

3. **Display information about the host ports and their attached devices.**

# <b>cfgadm -al</b>				
Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	unconfigured	unknown
c0::50020f2300006077	disk	connected	unconfigured	unknown
c0::50020f23000063a9	disk	connected	unconfigured	unknown
c0::50020f2300005f24	disk	connected	unconfigured	unknown
c0::50020f2300006107	disk	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown

---

**Note** – The `cfgadm -l` command displays information about Fibre Channel host ports. Also use the `cfgadm -al` command to display information about Fibre Channel devices. The lines that include a port World Wide Name (WWN) in the `Ap_Id` field associated with `c0` represent a fabric device. Use the `cfgadm configure` and `unconfigure` commands to manage those devices and make them available to hosts using the Solaris operating environment. The `Ap_Id` devices with port WWNs under `c1` represent private-loop devices that are configured through the `c1` host port.

---

To identify which device nodes represent the same storage device on your own system, log in to your Sun StorEdge T3 array and use `port list` to list the WWNs of the array controllers attached to your SAN.

## Ensuring LUN Level Information Is Visible

If you issue the `cfgadm -al -o show_FCP_dev <controller_id>` command immediately after a system boots up, the output might not show the Fibre Channel Protocol (FCP) SCSI LUN level information. The information does not appear because the storage device drivers, such as the `ssd` and `st` driver, are not loaded on the running system. Use the `modinfo` command to check if the drivers are loaded. After you load the drivers, the LUN level information is visible in the `cfgadm` output. Also, issue the `format` command to confirm the disks and LUNs are visible.

### ▼ To Configure a Fabric Device Without Multipathing Enabled On the Host

This procedure describes how to configure a fabric device that is attached to the fabric-connected host port `c0`.

1. **Become superuser.**
2. **Identify the device to be configured.**

Only devices on a fabric-connected host port can be configured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	unconfigured	unknown
c0::50020f2300006077	disk	connected	unconfigured	unknown
c0::50020f23000063a9	disk	connected	unconfigured	unknown
c0::50020f2300005f24	disk	connected	unconfigured	unknown
c0::50020f2300006107	disk	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown

### 3. Configure the fabric device.

```
# cfgadm -c configure c0::50020f2300006077
```

### 4. Verify that the selected fabric device is configured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	configured	unknown
c0::50020f23000063a9	disk	connected	unconfigured	unknown
c0::50020f2300005f24	disk	connected	unconfigured	unknown
c0::50020f2300006107	disk	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown

Notice that the Occupant column for both c0 and c0::50020f2300006077 displays as configured, indicating that the c0 port has a configured occupant and that the c0::50020f2300006077 device is configured.

Use the `show_FCP_dev` option to display FCP SCSI LUN information for multi-LUN SCSI devices. From CODE EXAMPLE 3-1, the physical devices connected through `ap_id c2::50020f2300006107` and `ap_id c2::50020f2300005f24` have two LUNs configured respectively.

**CODE EXAMPLE 3-1** `show_FCP_dev` Output Showing Two LUNs

# <code>cfgadm -al -o show_FCP_dev c2</code>				
Ap_Id	Type	Receptacle	Occupant	Condition
c2	fc-fabric	connected	configured	unknown
c2::50020f2300005f24,0	disk	connected	configured	unknown
c2::50020f2300005f24,1	disk	connected	configured	unknown
c2::50020f2300006107,0	disk	connected	configured	unknown
c2::50020f2300006107,1	disk	connected	configured	unknown

The device is now available on the host using the Solaris operating environment. CODE EXAMPLE 3-2 is an example of the `luxadm(1M)` output. Notice that four devices are listed under Paths:

```
/dev/rdisk/c0t50020F2300006077d3s2
/dev/rdisk/c0t50020F2300006077d2s2
/dev/rdisk/c0t50020F2300006077d1s2
/dev/rdisk/c0t50020F2300006077d0s2
```

The paths represent each SCSI LUN in the physical device represented by `c0::50020f2300006077`.

**CODE EXAMPLE 3-2** `luxadm` Output For Four Devices and a Single Array

# <code>luxadm display 50020f2300006077</code>	
<b>DEVICE PROPERTIES for disk: 50020f2300006077</b>	
Status(Port A):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c0t50020F2300006077d3s2	

**CODE EXAMPLE 3-2 luxadm Output For Four Devices and a Single Array (Continued)**

/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f2300006077,3:c,raw	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c0t50020F2300006077d2s2	
/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f2300006077,2:c,raw	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c0t50020F2300006077d1s2	
/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f2300006077,1:c,raw	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port B):	50020f2300006077

### CODE EXAMPLE 3-2 luxadm Output For Four Devices and a Single Array (Continued)

Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c0t50020F2300006077d0s2	
/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f2300006077,0:c,raw	

## ▼ To Unconfigure a Fabric Device

This procedure describes how to unconfigure a fabric device that is attached to the fabric-connected host port c0.

---

**Note** – Before you unconfigure a fabric device, stop all activity to the device and unmount any file systems on the fabric device. See the administration documentation for the Solaris operating environment for unmounting instructions. If the device is under any volume manager's control, see the documentation for your volume manager for maintaining the fabric device

---

### 1. Become superuser.

### 2. Identify the device to be unconfigured.

Only devices on a fabric-connected host port can be unconfigured.

# cfgadm -al					
Ap_Id	Type	Receptacle	Occupant	Condition	
c0	fc-fabric	connected	configured	unknown	
c0::50020f2300006077	disk	connected	configured	unknown	
c0::50020f23000063a9	disk	connected	configured	unknown	
c0::50020f2300005f24	disk	connected	configured	unknown	
c0::50020f2300006107	disk	connected	configured	unknown	
c1	fc-private	connected	configured	unknown	
c1::220203708b69c32b	disk	connected	configured	unknown	
c1::220203708ba7d832	disk	connected	configured	unknown	
c1::220203708b8d45f2	disk	connected	configured	unknown	
c1::220203708b9b20b2	disk	connected	configured	unknown	

### 3. Unconfigure the fabric device.

```
# cfgadm -c unconfigure c0::50020f2300006077
```

### 4. Verify that the selected fabric device is unconfigured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	unconfigured	unknown
c0::50020f23000063a9	disk	connected	configured	unknown
c0::50020f2300005f24	disk	connected	configured	unknown
c0::50020f2300006107	disk	connected	configured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown

---

## Creating and Removing Multiple Device Nodes Without Multipathing Enabled

Procedures for creating and removing multiple devices are similar to those described in “Creating and Removing Individual Device Nodes Without Multipathing Enabled” on page 18. This section explains the finer differences. Make sure you first identify the devices visible to the host with the procedure “To Detect Fabric Devices Visible on a Host” on page 18. This section covers:

- “To Configure All Fabric Devices on a Fabric-Connected Host Port” on page 25
- “To Unconfigure All Fabric Devices on a Fabric-Connected Host Port” on page 27

### ▼ To Configure All Fabric Devices on a Fabric-Connected Host Port

This procedure describes how to configure all unconfigured fabric devices that are attached to a fabric-connected host port. The port used as an example is `c0`.

#### 1. Become superuser.

## 2. Identify the devices to be configured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	unconfigured	unknown
c0::50020f2300006077	disk	connected	unconfigured	unknown
c0::50020f23000063a9	disk	connected	unconfigured	unknown
c0::50020f2300005f24	disk	connected	unconfigured	unknown
c0::50020f2300006107	disk	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown

## 3. Configure all of the unconfigured devices on the selected port.

```
# cfgadm -c configure c0
```

---

**Note** – This operation repeats the configure operation of an individual device for all the devices on c0, and can be time consuming if the number of devices on c0 is large.

---

## 4. Verify that all devices on c0 are configured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	configured	unknown
c0::50020f23000063a9	disk	connected	configured	unknown
c0::50020f2300005f24	disk	connected	configured	unknown
c0::50020f2300006107	disk	connected	configured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown



The `show_FCP_dev` option displays FCP SCSI LUN information for multiple LUN SCSI devices. From the example in CODE EXAMPLE 3-3, the physical devices represented by `c0::50020f2300006077` and `c0::50020f2300006107` have four LUNs configured respectively. The physical devices represented by `c0::50020f23000063a9` and `c0::50020f2300005f24` have two LUNs configured respectively.

**CODE EXAMPLE 3-3** `show_FCP_dev` Output For Multiple LUNs and Two Devices

```
# cfigadm -al -o show_FCP_dev c0
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077,0	disk	connected	configured	unknown
c0::50020f2300006077,1	disk	connected	configured	unknown
c0::50020f2300006077,2	disk	connected	configured	unknown
c0::50020f2300006077,3	disk	connected	configured	unknown
c0::50020f23000063a9,0	disk	connected	configured	unknown
c0::50020f23000063a9,1	disk	connected	configured	unknown
c0::50020f2300005f24,0	disk	connected	configured	unknown
c0::50020f2300005f24,1	disk	connected	configured	unknown
c0::50020f2300006107,0	disk	connected	configured	unknown
c0::50020f2300006107,1	disk	connected	configured	unknown
c0::50020f2300006107,2	disk	connected	configured	unknown
c0::50020f2300006107,3	disk	connected	configured	unknown

## ▼ To Unconfigure All Fabric Devices on a Fabric-Connected Host Port

This procedure describes how to unconfigure all configured fabric devices that are attached to a fabric-connected host port.

### 1. Become superuser.

## 2. Identify the fabric devices to be unconfigured.

Only devices on a fabric-connected host port can be unconfigured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	configured	unknown
c0::50020f23000063a9	disk	connected	configured	unknown
c0::50020f2300005f24	disk	connected	configured	unknown
c0::50020f2300006107	disk	connected	configured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown

## 3. Unconfigure all of the configured fabric devices on a selected port.

---

**Note** – Stop all activity to each fabric device on the selected port and unmount any file systems on each fabric device. If the device is under any volume manager's control, see the documentation for your volume manager for maintaining the fabric device.

---

```
# cfgadm -c unconfigure c0
```

---

**Note** – This operation repeats the `unconfigure` operation of an individual device for all the devices on `c0` and it can be time-consuming if the number of devices on `c0` is large.

---

#### 4. Verify that all the devices on c0 are unconfigured.

```
# cfgadm -al
Ap_Id          Type          Receptacle  Occupant    Condition
c0             fc-fabric     connected   unconfigured unknown
c0::50020f2300006077 disk         connected   unconfigured unknown
c0::50020f23000063a9 disk         connected   unconfigured unknown
c0::50020f2300005f24 disk         connected   unconfigured unknown
c0::50020f2300006107 disk         connected   unconfigured unknown
c1             fc-private    connected   configured   unknown
c1::220203708b69c32b disk         connected   configured   unknown
c1::220203708ba7d832 disk         connected   configured   unknown
c1::220203708b8d45f2 disk         connected   configured   unknown
c1::220203708b9b20b2 disk         connected   configured   unknown
```

Notice that the Occupant column of c0 and all the fabric devices attached to it are displayed as unconfigured.

---

## Creating and Removing Individual Device Nodes With Multipathing Enabled

This section describes how to perform fabric device configuration steps on a host that has the Sun StorEdge Traffic Manager multipathing software enabled.

The devices that are attached to fabric-connected HBA ports are not configured by default. These devices are thus not available to the host using the Solaris operating environment when a host port is initially connected to a fabric. The procedures in this section illustrate steps to detect fabric devices that are visible on a host and to configure them as Sun StorEdge Traffic Manager devices to make them available to the host using the Solaris operating environment.

The device information that you supply, and that which is displayed by the `cfgadm(1M)` command, depends on your system configuration. (For more information on the `cfgadm` command, see the `cfgadm_fp(1M)` and `cfgadm(1M)` man pages.)

This section contains the following procedures:

- “To Detect Fabric Devices Visible to a Host” on page 30
- “Ensuring LUN Level Information Is Visible” on page 31

- “To Configure Fabric-Connected Device Nodes With Multipathing Enabled Devices” on page 32
- “To Unconfigure a Fabric Device Associated With Multipathing Enabled Devices” on page 35
- “To Unconfigure One Path to a Multipathed Device” on page 37
- “To Configure All Fabric-Connected Devices With Multipathing Enabled” on page 41
- “To Unconfigure All Fabric-Connected Devices With Multipathing Enabled” on page 46

## ▼ To Detect Fabric Devices Visible to a Host

This procedure shows Fibre Channel host ports `c0`, `c1`, and `c2` and the devices attached to them. It illustrates fabric device detection and device configuration using the `cfgadm(1M)` command.

---

**Note** – If the proper `cfgadm` support for Fibre Channel devices is not installed, Fibre Channel devices do not display in the `cfgadm(1M)` command output. In the following examples, only failover path attachment points (`Ap_Ids`) are listed. The `Ap_Ids` displayed on your system depend on your system configuration.

---

1. Become superuser.
2. Display information about the attachment points on the system.

```
# cfgadm -l
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown
c2	fc-fabric	connected	unconfigured	unknown

An `Ap_Id` on a fabric-connected host port is a path to a Sun StorEdge Traffic Manager device. In this example, `c0` and `c2` represent fabric-connected host ports. Also, `c1` represents a private, loop-connected host port. Use the `cfgadm(1M)` command to manage the device configuration on fabric-connected host ports.

By default, the device configuration on private, loop-connected host ports are managed by a host using the Solaris operating environment.

3. Display information about the host ports and their attached devices.

# <code>cfgadm -al</code>					
Ap_Id	Type	Receptacle	Occupant	Condition	
c0	fc-fabric	connected	unconfigured	unknown	
c0::50020f2300006077	disk	connected	unconfigured	unknown	
c0::50020f23000063a9	disk	connected	unconfigured	unknown	
c1	fc-private	connected	configured	unknown	
c1::220203708b69c32b	disk	connected	configured	unknown	
c1::220203708ba7d832	disk	connected	configured	unknown	
c1::220203708b8d45f2	disk	connected	configured	unknown	
c1::220203708b9b20b2	disk	connected	configured	unknown	
c2	fc-fabric	connected	unconfigured	unknown	
c2::50020f2300005f24	disk	connected	unconfigured	unknown	
c2::50020f2300006107	disk	connected	unconfigured	unknown	

**Note** – The `cfgadm -l` command displays information about Fibre Channel host ports. Also use the `cfgadm -al` command to display information about Fibre Channel devices. The lines that include a port World Wide Name (WWN) in the `Ap_Id` field associated with `c0` represent a fabric device. Use the `cfgadm configure` and `unconfigure` commands to manage those devices and make available to hosts using the Solaris operating environment. The `Ap_Id` devices with port WWNs under `c1` represent private-loop devices that are configured through the `c1` host port.

In the previous example, host ports `c0` and `c2` are connected to the two ports of a Sun StorEdge T3 enterprise array that has two port WWNs associated with it: `Ap_Ids` `50020f2300006077` and `50020f2300006107`.

If your storage device is a Sun StorEdge T3 array and you want to identify which device nodes represent the same storage device on your own system, log in to the array and use `port list` to list the WWNs of the array controllers attached to your SAN.

## Ensuring LUN Level Information Is Visible

If you issue the `cfgadm -al -o show_FCP_dev <controller_id>` command immediately after a system boots up, the output might not show the Fibre Channel Protocol (FCP) SCSI LUN level information. The information does not appear because the storage device drivers, such as the `ssd` and `st` driver, are not loaded on the running system. Use the `modinfo` command to check if the drivers are loaded. After you load the drivers, the LUN level information is visible in the `cfgadm` output.

## ▼ To Configure Fabric-Connected Device Nodes With Multipathing Enabled Devices

This procedure uses fabric-connected host ports `c0` and `c2` to configure fabric devices as Sun StorEdge Traffic Manager devices on a host that has the STMS enabled.

---

**Note** – Whether the STMS is enabled or not, the `cfgadm -c unconfigure` command for Fabric devices is identical, but the result is different. When the Sun Storage Traffic Manager software is enabled, the host using the Solaris operating environment creates device-node and path information that includes STMS information. The devices are still listed as `fc-fabric` devices, but the specific `Ap_Ids` are marked as `unconfigured` in the `Occupant` column.

---

1. Become superuser.
2. Identify the port WWN of the device to be configured as a Sun StorEdge Traffic Manager device.

Look for devices on a fabric-connected host port, marked as `fc-fabric`. These are the devices you can configure with the `cfgadm -c configure` command.

**CODE EXAMPLE 3-4** `cfgadm` Listing of fabric and Private-Loop Devices

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	unconfigured	unknown
c0::50020f2300006077	disk	connected	unconfigured	unknown
c0::50020f23000063a9	disk	connected	unconfigured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown
c2	fc-fabric	connected	unconfigured	unknown
c2::50020f23000005f24	disk	connected	unconfigured	unknown
c2::50020f2300006107	disk	connected	unconfigured	unknown

In CODE EXAMPLE 3-4, the `c0::50020f2300006077` and `c2::50020f2300006107` `Ap_Ids` represent the same storage device with different port WWNs for the storage device controllers. The `c0` and `c2` host ports are enabled for use by the STMS.

### 3. Configure the fabric device and make Sun StorEdge Traffic Manager devices available to the host.

```
# cfgadm -c configure c0::50020f2300006077 c2::50020f2300006107
```

### 4. Verify that the selected devices are configured.

```
# cfgadm -al
Ap_Id                Type          Receptacle  Occupant    Condition
c0                   fc-fabric    connected   configured  unknown
c0::50020f2300006077 disk         connected   configured  unknown
c0::50020f23000063a9 disk         connected   unconfigured unknown
c1                   fc-private   connected   configured  unknown
c1::220203708b69c32b disk         connected   configured  unknown
c1::220203708ba7d832 disk         connected   configured  unknown
c1::220203708b8d45f2 disk         connected   configured  unknown
c1::220203708b9b20b2 disk         connected   configured  unknown
c2                   fc-fabric    connected   configured  unknown
c2::50020f2300005f24 disk         connected   unconfigured unknown
c2::50020f2300006107 disk         connected   configured  unknown
```

Notice that the Occupant column of c0 and c0::50020f2300006077 specifies configured, which indicates that the c0 port has at least one configured occupant and that the c0::50020f2300006077 device is configured. The same change has been made in c2 and c2::50020f2300006107.

After completing the configure operation without an error, STMS enabled devices are created on the host using the Solaris operating environment. If the physical device represented by c0::50020f2300006077 and c2::50020f2300006107 has multiple SCSI LUNs configured, each LUN is configured as a Sun StorEdge Traffic Manager device. CODE EXAMPLE 3-5 shows that two LUNs are configured through c0::50020f2300006077 and c2::50020f2300006107. Each ap\_id is associated with a path to those Sun StorEdge Traffic Manager devices.

#### CODE EXAMPLE 3-5 show\_FCP\_dev Output For Two LUNs On a Device

```
# cfgadm -al -o show_FCP_dev c0::50020f2300006077
c2::50020f2300006107
Ap_Id                Type          Receptacle  Occupant    Condition
c0::50020f2300006077,0 disk         connected   configured  unknown
c0::50020f2300006077,1 disk         connected   configured  unknown
c2::50020f2300006107,0 disk         connected   configured  unknown
c2::50020f2300006107,1 disk         connected   configured  unknown
```

In CODE EXAMPLE 3-6, notice that two STMS enabled devices

```
/dev/rdsd/c6t60020F20000061073AC8B52D000B74A3d0s2
/dev/rdsd/c6t60020F20000061073AC8B4C50004ED3Ad0s2
```

are created for the device represented by c0::50020f2300006077 and c2::50020f2300006107.

**CODE EXAMPLE 3-6** luxadm(1M) Output For Multiple Device Nodes With the STMS Enabled

# luxadm display 50020f2300006077	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
WWN(Port B):	50020f2300006107
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdsd/c6t60020F20000061073AC8B52D000B74A3d0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b52d000b74a3:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0
Device Address	50020f2300006107,1
Class	secondary
State	STANDBY
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,1
Class	primary
State	ONLINE
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006107



**CODE EXAMPLE 3-6** luxadm(1M) Output For Multiple Device Nodes With the STMS Enabled (Continued)

WWN(Port A):	50020f2300006107
WWN(Port B):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c6t60020F20000061073AC8B4C50004ED3Ad0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b4c50004ed3a:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0
Device Address	50020f2300006107,0
Class	primary
State	ONLINE
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,0
Class	secondary
State	STANDBY

**Note** – The luxadm (1M) output on device 50020f2300006107 shows the same information as the previous display.

▼ **To Unconfigure a Fabric Device Associated With Multipathing Enabled Devices**

This procedure shows fabric-connected host ports c0 and c2 to illustrate how to unconfigure fabric devices associated with Sun StorEdge Traffic Manager devices.

**Note** – Whether the STMS is enabled or not, the cfgadm -c unconfigure command for Fabric devices is identical, but the result is different. When the Sun Storage Traffic Manager software is enabled, the host using the Solaris operating environment creates device-node and path information that includes STMS information. The devices are still listed as fc-fabric devices, but the specific Ap\_Ids are marked as unconfigured in the Occupant column.

### 1. Become superuser.

### 2. Identify the port WWN of the fabric device to be unconfigured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	configured	unknown
c0::50020f23000063a9	disk	connected	configured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown
c2	fc-fabric	connected	configured	unknown
c2::50020f2300005f24	disk	connected	configured	unknown
c2::50020f2300006107	disk	connected	configured	unknown

In this example, the `c0::50020f2300006077` and `c2::50020f2300006107` Ap\_Ids represent different port WWNs for the same device associated with a Sun StorEdge Traffic Manager device. The `c0` and `c2` host ports are enabled for use by the STMS.

---

**Note** – Stop all device activity to each fabric device on the selected port and unmount any file systems on each fabric device. If the device is under any volume manager's control, see the documentation for your volume manager for maintaining the fabric device.

---

### 3. Unconfigure fabric devices associated with the Sun StorEdge Traffic Manager device.

Only devices on a fabric-connected host port can be unconfigured through the `cfgadm -c unconfigure` command.

```
# cfgadm -c unconfigure c0::50020f2300006077 c2::50020f2300006107
```

---

**Note** – You can remove a device from up to eight paths individually, as in the example command `cfgadm -c unconfigure c0::1111, c1::2222, c3::3333`, etc. As an alternative, you can remove an entire set of paths from the host, as in the example `cfgadm -c unconfigure c0`.

---

#### 4. Verify that the selected devices are unconfigured.

```
# cfmadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	unconfigured	unknown
c0::50020f23000063a9	disk	connected	configured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown
c2	fc-fabric	connected	configured	unknown
c2::50020f2300005f24	disk	connected	configured	unknown
c2::50020f2300006107	disk	connected	unconfigured	unknown

Notice that the Ap\_Ids `c0::50020f2300006077` and `c2::50020f2300006107` are unconfigured. The Occupant column of `c0` and `c2` still displays those ports as configured because they have other configured occupants.

The Sun StorEdge Traffic Manager devices associated with the Ap\_Ids `c0::50020f2300006077` and `c2::50020f2300006107` are no longer available to the host using the Solaris operating environment. The two Sun StorEdge Traffic Manager devices,

```
/dev/rdisk/c6t60020F20000061073AC8B52D000B74A3d0s2
```

and

```
/dev/rdisk/c6t60020F20000061073AC8B4C50004ED3Ad0s2
```

are removed from the host.

## ▼ To Unconfigure One Path to a Multipathed Device

In “To Unconfigure a Fabric Device Associated With Multipathing Enabled Devices” on page 35, a storage device is connected to the host using the Solaris operating environment by two Ap\_Ids, `c0::50020f2300006077` and `c2::50020f2300006107`. For the STMS enabled host, each Ap\_Id is associated with the path to a Sun StorEdge Traffic Manager device that represents the physical storage device. This procedure shows how to unconfigure a device associated with `c2::50020f2300006107` and leave the other Ap\_Id, `50020f2300006077`, configured.

### 1. Become superuser.

### 2. Identify the Ap\_Id of the Sun StorEdge Traffic Manager device to be unconfigured.

An Ap\_Id on a fabric-connected host port is a path to a Sun StorEdge Traffic Manager device. Only devices on a fabric-connected host port can be unconfigured through the `cfgadm unconfigure` command.

**CODE EXAMPLE 3-7** `cfgadm` Listing of Port WWNs For Physical Devices To Unconfigure

```
# cfgadm -al
Ap_Id          Type          Receptacle  Occupant    Condition
c0              fc-fabric    connected   configured  unknown
c0::50020f2300006077 disk         connected   configured  unknown
c0::50020f23000063a9 disk         connected   configured  unknown
c1              fc-private   connected   configured  unknown
c1::220203708b69c32b disk         connected   configured  unknown
c1::220203708ba7d832 disk         connected   configured  unknown
c1::220203708b8d45f2 disk         connected   configured  unknown
c1::220203708b9b20b2 disk         connected   configured  unknown
c2              fc-fabric    connected   configured  unknown
c2::50020f2300005f24 disk         connected   configured  unknown
c2::50020f2300006107 disk         connected   configured  unknown
```

In CODE EXAMPLE 3-7, `c0::50020f2300006077` and `c2::50020f2300006107` Ap\_Id's represent different port WWNs for the same device.

### 3. Unconfigure the Ap\_Id associated with Sun StorEdge Traffic Manager device.

---

**Note** – If the Ap\_Id represents the last configured path to the Sun StorEdge Traffic Manager device, stop all activity to the path and unmount any file systems on it. If the multipathed device is under any volume manager's control, see the documentation for your volume manager for maintaining the fabric device

---

In the example that follows, the path represented as `c2::50020f2300006107` is unconfigured, and `c0::50020f2300006077` remains configured to show how you can unconfigure just one of multiple paths for a multipathed device.

```
# cfgadm -c unconfigure c2::50020f2300006107
```

4. Verify that the selected path `c2::50020f2300006107` is unconfigured.

# cfgadm -al					
Ap_Id	Type	Receptacle	Occupant	Condition	
c0	fc-fabric	connected	configured	unknown	
c0::50020f2300006077	disk	connected	configured	unknown	
c0::50020f23000063a9	disk	connected	configured	unknown	
c1	fc-private	connected	configured	unknown	
c1::220203708b69c32b	disk	connected	configured	unknown	
c1::220203708ba7d832	disk	connected	configured	unknown	
c1::220203708b8d45f2	disk	connected	configured	unknown	
c1::220203708b9b20b2	disk	connected	configured	unknown	
c2	fc-fabric	connected	configured	unknown	
c2::50020f2300005f24	disk	connected	configured	unknown	
c2::50020f2300006107	disk	connected	unconfigured	unknown	

The Sun StorEdge Traffic Manager devices associated with that Ap\_Id are still available to a host using the Solaris operating environment through the other path, represented by `c0::50020f2300006077`. A device can be connected to multiple Ap\_Ids and an Ap\_Id can be connected to multiple devices.

CODE EXAMPLE 3-8 shows example output you would see for the Sun StorEdge Traffic Manager devices if you use the `luxadm (1M)` command after performing this procedure. Although the path represented by `c2::50020f2300006107` is no longer listed, the path represented by `c0::50020f2300006077` is displayed for Sun StorEdge Traffic Manager devices

`/dev/rdisk/c6t60020F20000061073AC8B52D000B74A3d0s2`

and

`/dev/rdisk/c6t60020F20000061073AC8B4C50004ED3Ad0s2.`

**CODE EXAMPLE 3-8** luxadm (1M) Output For Two Device Nodes With a Single Path Available With the Sun StorEdge Traffic Manager Software Enabled

# luxadm display 50020f2300006077	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled

**CODE EXAMPLE 3-8** luxadm (1M) Output For Two Device Nodes With a Single Path Available With the Sun StorEdge Traffic Manager Software Enabled

Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c6t60020F20000061073AC8B52D000B74A3d0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b52d000b74a3:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,1
Class	primary
State	ONLINE
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port B):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c6t60020F20000061073AC8B4C50004ED3Ad0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b4c50004ed3a:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,0
Class	secondary
State	ONLINE

---

# Creating and Removing Multiple Device Nodes With Multipathing Enabled

The procedures for creating and removing multiple device nodes is similar to those in the section “Creating and Removing Individual Device Nodes With Multipathing Enabled” on page 29. This section explains the finer differences. Make sure you have first identified the the fabric devices by using the procedure “To Detect Fabric Devices Visible to a Host” on page 30 before you configure or remove device nodes. This section covers:

- “To Configure All Fabric-Connected Devices With Multipathing Enabled” on page 41
- “To Unconfigure All Fabric-Connected Devices With Multipathing Enabled” on page 46

## ▼ To Configure All Fabric-Connected Devices With Multipathing Enabled

In this example, an Ap\_Id on a fabric-connected host port is a path to a Sun StorEdge Traffic Manager device. For example, all devices with a path through `c2` are to be configured, but none through `c0` are to be configured. `c2` is an attachment point from the host to the fabric, whereas `c2: : 50020f2300006107` is an attachment point from the storage to the fabric. A host detects all the storage devices in a fabric for which it is configured.

Configuring an Ap\_Id on a Sun StorEdge Traffic Manager device that has already been configured through another Ap\_Id results in an additional path to the previously configured device. Note that a new Solaris device is not created in this case. A Solaris device is created only the first time an Ap\_Id to a corresponding Sun StorEdge Traffic Manager device is configured.

### 1. Become superuser.

## 2. Identify the fabric-connected host port to be configured.

```
# cfgadm -al
Ap_Id                Type          Receptacle  Occupant    Condition
c0                   fc-fabric    connected   configured  unknown
c0::50020f2300006077 disk          connected   configured  unknown
c0::50020f23000063a9 disk          connected   configured  unknown
c1                   fc-private   connected   configured  unknown
c1::220203708b69c32b disk          connected   configured  unknown
c1::220203708ba7d832 disk          connected   configured  unknown
c1::220203708b8d45f2 disk          connected   configured  unknown
c1::220203708b9b20b2 disk          connected   configured  unknown
c2                   fc-fabric    connected   unconfigured unknown
c2::50020f2300005f24 disk          connected   unconfigured unknown
c2::50020f2300006107 disk          connected   unconfigured unknown
```

Devices represented by Ap\_Ids `c0::50020f2300006077` and `c2::50020f2300006107` are two paths to the same physical device, with `c0::50020f2300006077` already configured. The `luxadm` output in CODE EXAMPLE 3-9 shows the Solaris device associated with this path. One path is configured.

**CODE EXAMPLE 3-9** `luxadm (1M)` Output for Multiple Device Nodes Associated With One Device Path and STMS Enabled

# luxadm display 50020f2300006077	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
	/dev/rdisk/c6t60020F20000061073AC8B52D000B74A3d0s2
	/devices/scsi_vhci/ssd@g60020f20000061073ac8b52d000b74a3:c,raw
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,1



**CODE EXAMPLE 3-9** luxadm (1M) Output for Multiple Device Nodes Associated With One Device Path and STMS Enabled *(Continued)*

Class	primary
State	ONLINE
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port B):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c6t60020F20000061073AC8B4C50004ED3Ad0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b4c50004ed3a:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,0
Class	secondary
State	ONLINE

**3. Configure the unconfigured devices on the selected port.**

```
# cfgadm -c configure c2
```

**Note** – This operation repeats the `configure` command of an individual device for all the devices on `c2` and it can be time-consuming if the number of devices on `c2` is large.

#### 4. Verify that all devices on c2 are configured.

```
# cfgadm -al
```

Ap_Id	Type	Receptacle	Occupant	Condition
c0	fc-fabric	connected	configured	unknown
c0::50020f2300006077	disk	connected	configured	unknown
c0::50020f23000063a9	disk	connected	configured	unknown
c1	fc-private	connected	configured	unknown
c1::220203708b69c32b	disk	connected	configured	unknown
c1::220203708ba7d832	disk	connected	configured	unknown
c1::220203708b8d45f2	disk	connected	configured	unknown
c1::220203708b9b20b2	disk	connected	configured	unknown
c2	fc-fabric	connected	configured	unknown
c2::50020f2300005f24	disk	connected	configured	unknown
c2::50020f2300006107	disk	connected	configured	unknown

Notice that the Occupant column of c2 and all of the devices under c2 is marked as configured.

The show\_FCP\_dev option displays FCP SCSI LUN information for multiple LUN SCSI devices. In CODE EXAMPLE 3-10, the physical devices connected through by c2::50020f2300006107 and c2::50020f2300005f24 have two LUNs configured respectively.

**CODE EXAMPLE 3-10** show\_FCP\_dev Output For Multiple LUNs and Multiple Physical Devices

```
# cfgadm -al -o show_FCP_dev c2
```

Ap_Id	Type	Receptacle	Occupant	Condition
c2	fc-fabric	connected	configured	unknown
c2::50020f2300005f24,0	disk	connected	configured	unknown
c2::50020f2300005f24,1	disk	connected	configured	unknown
c2::50020f2300006107,0	disk	connected	configured	unknown
c2::50020f2300006107,1	disk	connected	configured	unknown

In CODE EXAMPLE 3-11, notice that two STMS enabled devices

```
/dev/rdisk/c6t60020F20000061073AC8B52D000B74A3d0s2
/dev/rdisk/c6t60020F20000061073AC8B4C50004ED3Ad0s2
```

are created for the device represented by c0::50020f2300006077 and c2::50020f2300006107.

**CODE EXAMPLE 3-11 luxadm(1M) Output For Multiple Device Nodes With the STMS Enabled**

# luxadm display 50020f2300006077	
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006077
WWN(Port A):	50020f2300006077
WWN(Port B):	50020f2300006107
Revision:	0117
Serial Num:	Unsupported
Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdisk/c6t60020F20000061073AC8B52D000B74A3d0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b52d000b74a3:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0
Device Address	50020f2300006107,1
Class	secondary
State	STANDBY
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,1
Class	primary
State	ONLINE
DEVICE PROPERTIES for disk: 50020f2300006077	
Status(Port A):	O.K.
Status(Port B):	O.K.
Vendor:	SUN
Product ID:	T300
WWN(Node):	50020f2000006107
WWN(Port A):	50020f2300006107
WWN(Port B):	50020f2300006077
Revision:	0117
Serial Num:	Unsupported

**CODE EXAMPLE 3-11** luxadm(1M) Output For Multiple Device Nodes With the STMS Enabled *(Continued)*

Unformatted capacity:	558448.000 MBytes
Write Cache:	Enabled
Read Cache:	Enabled
Minimum prefetch:	0x0
Maximum prefetch:	0x0
Device Type:	Disk device
Path(s):	
/dev/rdsk/c6t60020F20000061073AC8B4C50004ED3Ad0s2	
/devices/scsi_vhci/ssd@g60020f20000061073ac8b4c50004ed3a:c,raw	
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0
Device Address	50020f2300006107,0
Class	primary
State	ONLINE
Controller	/devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
Device Address	50020f2300006077,0
Class	secondary
State	STANDBY

---

**Note** – The luxadm (1M) output on device 50020f2300006107 shows the same information as the previous display.

---

## ▼ To Unconfigure All Fabric-Connected Devices With Multipathing Enabled

---

**Note** – Whether or not the Sun StorEdge Traffic Manager multipathing software is enabled, the `cfgadm -c unconfigure` command for fabric devices is identical, but the result of the operation is different. When the STMS is enabled, the host using the Solaris operating environment removes Sun StorEdge Traffic Manager-related path or device-node information.

---

An Ap\_Id on a fabric-connected host port is a path to a Sun StorEdge Traffic Manager device.

When a Sun StorEdge Traffic Manager device has multiple Ap\_Ids connected to it, the device is still available to the host using the Solaris operating environment after you unconfigure an Ap\_Id. After you unconfigure the last Ap\_Id, no additional paths remain and the Sun StorEdge Manager device is unavailable to the host using the Solaris operating environment.

1. Become superuser.

2. Identify the devices to be unconfigured.

Only devices on a fabric-connected host port can be unconfigured.

# cfmadm -al					
Ap_Id	Type	Receptacle	Occupant	Condition	
c0	fc-fabric	connected	configured	unknown	
c0::50020f2300006077	disk	connected	configured	unknown	
c0::50020f23000063a9	disk	connected	configured	unknown	
c1	fc-private	connected	configured	unknown	
c1::220203708b69c32b	disk	connected	configured	unknown	
c1::220203708ba7d832	disk	connected	configured	unknown	
c1::220203708b8d45f2	disk	connected	configured	unknown	
c1::220203708b9b20b2	disk	connected	configured	unknown	
c2	fc-fabric	connected	configured	unknown	
c2::50020f2300005f24	disk	connected	configured	unknown	
c2::50020f2300006107	disk	connected	configured	unknown	

3. Unconfigure all of the configured devices on the selected port.

```
# cfmadm -c unconfigure c2
```

**Note** – This operation repeats the unconfigure command of an individual device for all devices on c2 and it can be time-consuming if the number of devices on c2 is large.

#### 4. Verify that all devices on c2 are unconfigured.

Notice that the Occupant column lists c2 and all the devices attached to c2 as unconfigured.

```
# cfmadm -al
Ap_Id          Type          Receptacle  Occupant  Condition
c0              fc-fabric    connected   configured unknown
c0::50020f2300006077 disk         connected   configured unknown
c0::50020f23000063a9 disk         connected   configured unknown
c1              fc-private   connected   configured unknown
c1::220203708b69c32b disk         connected   configured unknown
c1::220203708ba7d832 disk         connected   configured unknown
c1::220203708b8d45f2 disk         connected   configured unknown
c1::220203708b9b20b2 disk         connected   configured unknown
c2              fc-fabric    connected   unconfigured unknown
c2::50020f23000005f24 disk         connected   unconfigured unknown
c2::50020f23000006107 disk         connected   unconfigured unknown
```

## FCIP Management

---

In order to configure FCIP, you should have already ensured the hosts recognize the switch and all attached devices. This chapter covers host recognition of FCIP devices and implementation of IP over Fibre Channel in a SAN. The FCIP driver is based on RFC 2625 and it allows IP traffic to run over Fibre Channel. Configuration of FCIP depends on the instance of the fabric port (fp) driver for the Fibre Channel adapter ports. This chapter contains the following topics:

- “Loading FCIP” on page 49
- “FCIP Invocation, Configuration and Usage” on page 54

---

### Loading FCIP

Configuration of FCIP depends on the instance of fp, or host bus adapter ports. If multiple host bus adapters are present, plumb manually after identifying the fp instance on which IP should be plumbed. The following two procedures determine fp instances.

- “Determining Fibre Channel Adapter Port Instances” on page 49
- “To Plumb an FCIP Instance” on page 52

### Determining Fibre Channel Adapter Port Instances

There are two basic ways to determine Fibre Channel adapter port instances to which IP can be plumbed. The first way, which is a short procedure, requires that you know the WWN of the card. In the second way, which is a longer procedure, you do not know the WWN but you do know the physical location of the card. The procedures include:

- “To Determine All Fibre Channel Adapter Port Instances To Which IP Can Be Plumbed With a WWN” on page 50
- “To Determine an FP Instance for a Known HBA Port Physical Device Path” on page 51

## ▼ To Determine All Fibre Channel Adapter Port Instances To Which IP Can Be Plumbed With a WWN

### 1. Become superuser.

### 2. Determine the fp driver instances in your system.

In the example below, there are four instances (0-3) of fp present in the system.

```
# prtconf -v | grep fp

fp (driver not attached)
fp, instance #0
fp (driver not attached)
fp, instance #1
fp (driver not attached)
fp, instance #2
fp (driver not attached)
fp, instance #3
```

### 3. Manually load FCIP to the desired fp instances.

Use the `ifconfig fcip $interface$  plumb` command, where *interface* is a variable for the desired fp instance number. For example:

```
# ifconfig fcip0 plumb
```

If the command succeeds, the following message appears on the console and messages file:

```
Sep 13 15:52:30 bytownite ip: ip: joining multicasts failed (7) on
fcip1 - will use link layer broadcasts for multicast
```

If no other error message is displayed, manual plumbing has succeeded. Repeat this step for the other fp instances identified in Step 2.



---

**Note** – Additional options can be provided to the `ifconfig` command too. See `ifconfig(1M)` for more information. Currently, FCIP can be plumbed on only one port on Fibre Channel adapters with multiple ports. See “FCIP Guidelines” on page 8 for details. An error occurs if a plumb operation is attempted on other ports.

---

## ▼ To Determine an FP Instance for a Known HBA Port Physical Device Path

Use this procedure when there is no cable connected to the HBA port. Otherwise, you can use the shorter procedure “To Plumb an FCIP Instance” on page 52.

### 1. Determine the HBA PCI adapter slot and the I/O board PCI slot.

You need this information to perform the calculation in Step 2.

For example, assume you have an array with an HBA card located in PCI adapter slot 5, and the PCI adapter is in slot one of the I/O board.

### 2. Determine the `fp` instance number.

#### a. Use an editor to search for the `fp` driver binding name in the `/etc/path_to_inst` file.

Entries have `fp` on the line.

#### b. Narrow the search by using the I/O board and slot information from Step 1.

##### i. Multiply the PCI adapter slot number by the number of adapter ports.

For example, if the HBA has two ports, multiply by two. Using the array with an HBA in the PCI adapter slot five, multiply five by two to get 10.

##### ii. Add the PCI adapter I/O board slot number to the number derived in Step i.

Using the array with an HBA in PCI adapter slot five and PCI slot one of the I/O board, add one to 10 for a sum of 11.

##### iii. Convert the number derived in Step ii to hexadecimal.

The number 11 converts to `b` in hexadecimal.

##### iv. Search for the `fp` entry with `pci@hex` where *hex* is the number you derived in Step iii.

CODE EXAMPLE 4-1 shows a single Fibre Channel network adapter device path. TABLE 4-1 defines the significance of the device path. The instance number for this device path is 7.

#### CODE EXAMPLE 4-1 PCI Single Fibre Channel Network Adapter Device Path

```
"/pci@b,2000/SUNW,q1c@2/fp@0,0" 7 "fp"
```

**TABLE 4-1** PCI Single Fibre Channel Network Adapter /etc/path\_to\_inst Device Path Entry

Entry Item	Entry Value
Physical Name	pci@b,2000/SUNW,qlc@2/fp@0.0
Instance Number	7
Driver Binding Name	fp

### 3. Manually plumb the fp instance.

Use the `ifconfig <interface> plumb` command. In this example, *interface* is `fcip7`.

```
# ifconfig fcip7 plumb
```

If no error message is displayed, manual plumbing has succeeded. Repeat this step for the other `fp` instances identified in Step 2.

## ▼ To Plumb an FCIP Instance

Use this procedure to load and plumb FCIP.

### 1. Each FP instance on the system has an entry in `/dev/fc`. If HBAs have been removed, some stale links might exist.

For each entry in `/dev/fc`, issue a `luxadm -e dump_map` command to view all the devices that are visible through that HBA:

```
# luxadm -e dump_map /dev/fc/fp0
Pos  Port_ID Hard_Addr Port WWN          Node WWN          Type
0    610100 0          210000e08b049f53 200000e08b049f53 0x1f
(Unknown Type)
1    620d02 0          210000e08b02c32a 200000e08b02c32a 0x1f
(Unknown Type)
2    620f00 0          210000e08b03eb4b 200000e08b03eb4b 0x1f
(Unknown Type)
3    620e00 0          210100e08b220713 200100e08b220713 0x1f
(Unknown Type,Host Bus Adapter)
# luxadm -e dump_map /dev/fc/fp1
No FC devices found. - /dev/fc/fp1
```

2. Based on the list of devices, determine which destination HBAs are visible to the remote host with which you want to establish FCIP communications.

In the example for this procedure, the destination HBAs have port IDs 610100 and 620d02. The originating HBA's port ID is 62e00.

3. List the physical path of the originating HBA port from which you can see the destination HBA port, where *originating-hba-link* is a variable for the link determined in Step 1:

```
# ls -l /dev/fc/fporiginating-hba-link
```

For example, 0 is the number for the *originating-hba-link*:

```
# ls -l /dev/fc/fp0
lrwxrwxrwx 1 root root          51 Sep  4 08:23 /dev/fc/fp0 ->
../../devices/pci@8,600000/SUNW,qlc@1/fp@0,0:devctl
```

4. Search the physical path identified in Step 3.

You must remove the leading ../../devices from the pathname output. For example

```
# grep pci@8,600000/SUNW,qlc@1/fp@0,0 /etc/path_to_inst
"/pci@8,600000/SUNW,qlc@1/fp@0,0" 0 "fp"
```

5. Determine the *fp* instance for the originating HBA port from the output of the command in Step 4.

The instance number precedes “*fp*” in the output. In the following example output, the instance number is 0.

```
"/pci@8,600000/SUNW,qlc@1/fp@0,0" 0 "fp"
```

6. Use the instance number from Step 5 to load FCIP and plumb the FCIP interface.

In this example, the instance is 0.

```
# ifconfig fcip0 plumb
```

---

# FCIP Invocation, Configuration and Usage

Immediately after installation, start FCIP manually with the `ifconfig` command. On subsequent reboots, the FCIP network interface starts automatically. This section covers:

- “To Start a Network Interface Manually” on page 54
- “To Configure the Host for Automatic Plumbing Upon Reboot” on page 55
- “FCIP Usage” on page 55

## ▼ To Start a Network Interface Manually

Use this procedure when you want to plumb FCIP with specific netmask values and get the FCIP interface up and running.

### 1. Use the `ifconfig` command with the appropriate interface.

For example, to enable an FCIP interface associated with `fp` instance 0 and an IP address of 192.9.201.10, enter:

```
# touch /etc/notrouter
# ifconfig fcip0 inet 192.9.201.10 netmask 255.255.255.0 up
```

The `ifconfig` command is described in more detail in the `ifconfig(1M)` manpage. Ask your network administrator for an appropriate IP address and netmask information.

### 2. Use the command `ifconfig -a` to verify the network is functioning.

The output of `ifconfig -a` should look like this:

```
lo0: flags=1000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232 index 1
inet 127.0.0.1 netmask ff000000
fcip0: flags=1001843<UP,BROADCAST,RUNNING,MULTICAST,MULTI_BCAST,IPv4> mtu 1500
index 2
inet 192.9.201.10 netmask ffffffff broadcast 192.9.201.255 ether 0:e0:8b:1:3c:f7
hme0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
inet 192.9.200.70 netmask ffffffff broadcast 192.9.200.255
ether 8:0:20:fc:e9:49
```

## ▼ To Configure the Host for Automatic Plumbing Upon Reboot

Each network interface must have an `/etc/hostname.interface` file defining the name of the IP address associated with it. For example, FCIP network *interface* `fcip0` has a file named `/etc/hostname.fcip0`.

1. **Manually create a `/etc/hostname.interface` file with a text editor so it contains a single line that identifies the host name or interface IP address.**
2. **Use a text editor to make any additional entries to the `/etc/inet/hosts` file.**

The Solaris installation program creates the `/etc/inet/hosts` file with minimum entries. You must manually make additional entries with a text editor. (See the `hosts(4)` man page for additional information.)

The `/etc/inet/hosts` file contains the hosts database. This file contains the host names and the primary network interface IP addresses, other network interfaces attached to the system, and any other network interface that the machine must know about.

**CODE EXAMPLE 4-2** sun1 machine `/etc/inet/hosts`

```
127.0.0.1      localhost      loghost
192.9.200.70   sun1          #This is the local host name
192.9.201.10   fcip0        #Interface to network 192.9.201.10
```

3. **Edit the `/etc/nsswitch.conf` file so that all the uncommented entries has the word `files` before any other nameservice.**

The `/etc/nsswitch.conf` specifies which name service to use for a particular machine.

**CODE EXAMPLE 4-3** sun1 machine `/etc/nsswitch.conf` File

```
hosts:      files nis
```

## FCIP Usage

Any standard network commands can be used after FCIP is attached. There are not any usage differences when these commands (`telnet`, `ping`, or `ftp`) are used in an Ethernet setup.



## Dynamic Reconfiguration On the SAN

---

When you want to change an existing SAN configuration, Dynamic Reconfiguration (DR) adjusts your system configuration. DR is straight forward with FC-AL devices, and only slightly more complicated for fabric devices.

With previously configured FC-AL devices, DR happens automatically upon addition or removal of devices to a host I/O port. With the STMS enabled, the Solaris operating environment host configures the devices as Sun StorEdge Traffic Manager devices. However, DR is more complex with fabric devices. This section covers:

- “DR and Fabric Devices” on page 57
- “To Remove a Fabric Device Before DR” on page 58
- “To Maintain a Fabric Device Configuration With DR” on page 58
- “To Reconfigure Fabric Devices With DR” on page 58
- “To Reconfigure the Sun Enterprise 10000 Server With a Fabric Connection” on page 58

### DR and Fabric Devices

Previously configured fabric devices are not automatically reconfigured. Fabric device configurations are not persistent when you remove a system component on which switch-connected host ports reside, and then add that system component back to a host through DR operations. The discussion of on-demand node creation in these sections applies to fabric devices, such as a host port connected to an F port on a switch and an array connected to an F port or TL port on a switch.

## ▼ To Remove a Fabric Device Before DR

- **Unconfigure the fabric devices that were configured through host ports on the system component with on-demand node creation.**
  - If the STMS is not enabled, see “To Unconfigure a Fabric Device” on page 24.
  - If the STMS is enabled, see “To Unconfigure a Fabric Device Associated With Multipathing Enabled Devices” on page 35.

## ▼ To Maintain a Fabric Device Configuration With DR

1. **Reconfigure the device through on-demand node creation.**
2. **Perform DR operations according to the instructions in the documentation for the host.**

## ▼ To Reconfigure Fabric Devices With DR

1. **Add the system component and make it available to the host.**
2. **Reconfigure the device(s) through on-demand node creation.**
  - If the STMS is not enabled, see “To Configure a Fabric Device Without Multipathing Enabled On the Host” on page 20.
  - If the STMS is enabled, see “To Configure Fabric-Connected Device Nodes With Multipathing Enabled Devices” on page 32.

## ▼ To Reconfigure the Sun Enterprise 10000 Server With a Fabric Connection

The following procedure gives the sequence of operations for a Sun Enterprise 10000 server board with a fabric connection.

1. **Unconfigure the fabric devices on fabric-connected host ports on the board to be detached.**
2. **Start the DR detach operations for the board.**

See the *Sun Enterprise 10000 Dynamic Reconfiguration Configuration Guide*.
3. **Start the DR attach operations when the board is ready.**

See the *Sun Enterprise 10000 Dynamic Reconfiguration Configuration Guide*.



#### **4. Configure any fabric devices on the attached boards.**

See the sections in Chapter 3 that explain how to recognize the storage devices on the host. On the newly attached board, the devices could be the same or completely new devices.



# Glossary

---

This glossary defines SAN terminology used in this book.

---

## A

- AL\_PA** Arbitrated Loop Physical Address. An AL\_PA is an eight-bit value used to identify a device attached to a Fibre Channel arbitrated loop.
- Ap\_Id** Attachment Point Identifier. The port identifier for either a host or a storage device connected to a switch. For example, `c0` identifies the host port and `c0::50020f23000063a9` identifies an array.

---

## B

**Bridge ports  
(B port)**

When a G port (generic port) is attached to some switches, it is a bridge port (B port). The B port connects an arbitrated loop device (switch) to a multiswitch fabric. Director B ports are not assigned a domain ID and do not participate in fabric path selection processes.

---

## C

### Cascade

**Broadcast Zone** Zone type used to filter broadcast traffic away from end nodes that cannot use or interpret it. A port will broadcast to all ports in the same Broadcast Zone(s) in which the port is defined. Broadcast zoning is primarily used for doing IP over Fibre Channel or when mixing IP and SCSI traffic on the switch.

**Cascade** Connection of two or more switches together to increase the number of available ports or to allow for increased distances between components of the SAN.

---

## E

**Expansion ports (E port)** Port used to connect FC-SW2 compliant switches to one another.

---

## F

**Fabric ports (F port)** Fabric port on a Fibre Channel switch. Switch ports used to connect to the fabric capable storage devices, such as the Sun StorEdge T3+ array or Sun StorEdge 39x0, 69x0 and 99x0 series, tape drives and host bus adapters.

**Fabric** One or more switches in a Fibre Channel network. It is also common to refer to something as a "fabric device" or being in "fabric mode."

**Fabric Loop ports (FL port)** A port that is able to transmit under fabric protocol and also has arbitrated loop capabilities.

**FC-SW-2** The second generation of the Fibre Channel Switch Fabric Standard defined by ANSI.

---

## G

**Generic port (G port)** A port that can operate as either an E port or F port. A port is defined as a G port when it is not yet connected or has not yet assumed a specific function in the fabric.

---

## I

**Initiator** Each host bus adapter port connection that provides a path to a storage device.

**Interswitch Link (ISL)** A segment or cable connecting two cascaded switches. Does not include cables from host to the switch or from storage devices to the switch.

---

## N

**N port** A Fibre Channel port that supports point-to-point or fabric connections.

**Name Server Zones (NS zones)** A set of name server (NS) ports that can contain F , FL , G , GL and E ports. The ports receive name server information (port number, type, address, WWN, etc). NS zones can be port-based or WWN-based.

---

## P

**Private Loop** Fibre Channel Arbitrated Loop (FC-AL) with 8-bit addressing that supports up to 126 device connections with no fabric attachment (F and FL ports). Private loops are closed systems incapable of seeing outside the loop.

**Public Loop** Arbitrated loop that supports fabric login and services. Provides 24-bit Fibre Channel addressing and up to 16 million node connections fabric wide. Uses name server (NS) ports.

---

## S

### **Segmented Loop ports (SL ports)**

A port connected to a private loop device. SL ports make a switch behave like a hub, but with the advantage of better performance and the ability to segment the private loop into SL Zones for ease of administration and isolation of resources. Ports in SL zones do not communicate with ports in NS zones. Supports the Sun StorEdge A5200, A3500FC arrays and FC tape devices. SL zones contain SL ports only. SL ports are not supported in the SAN 4.x release but were in earlier releases.

### **Segmented Loop Zones (SL zones)**

A set of SL ports on the switch that behave as a single private loop. This grouping behaves like a hub, but with the advantage of better performance and the ability to segment the private loop into SL zones for ease of administration and isolation of resources. SL zones are not supported in the SAN 4.x release but were in earlier releases.

---

## T

### **Transfer or Trunk ports (T ports)**

Switch ports from the SAN 3.0 release used to connect to other switches in a cascade. T ports are used to attach a port on one switch to a port on another switch. Replaced by E ports in SAN 4.0 release.

### **Translative Loop ports (TL ports)**

Ports on the switch that allow private-to-public and public-to-private loop connectivity. TL ports present private devices to a fabric as if they were public so they can communicate with the off-loop devices, such as public devices connected to F ports and FL ports and private devices on other TL port loops. Supports the Sun StorEdge T3 arrays. Hosts recognize arrays that use TL ports as fabric devices.

---

## Z

**Zone** A set of ports or WWNs and their connected devices that have been grouped together to control information exchange.

**Zoning** Function of the switch that allows segregation of devices. Zoning is done for a variety of reasons, such as security, simplicity, performance, or dedication of resources.





# Index

---

## NUMERICS

24-bit addressing devices, 12

24-bit Fibre Channel addressing devices, 17

## A

Ap\_Id, 38

array port, 12

## B

broadcasting, 8

## C

cascading  
  guidelines, 7

cfgadm

  -al, 19

  -al -o show\_FCP\_dev, 20

  -c configure, 14

  -c unconfigure, 16

  -fp, 29

  -l, 19

cfgadm -al, 26, 39

cfgadm -al -o show\_FCP\_dev, 27

cfgadm -c configure, 26

cfgadm(1M), 18

configuration

  fabric devices, 18

## D

device

  activity, 36

  configuration, 18

  node creation, 14

  node discovery, 25

  node identification, 20

  node removal, 18

  removal, 36

  storage, 17

device node

  creation, 18

  removal, 25

device node creation, 25, 29

device node removal, 29

drivers, 20

## E

E\_port, 64

eight-bit addressing devices, 12

## F

F\_port, 12

fabric connectivity, 12

fabric-connected host ports, 19

- FC-AL, 63
  - devices, 17
- fc-fabric, 32
- FCIP
  - guidelines, 8
  - SCSI LUN level information, 20
- Fibre Channel
  - Fibre Channel Arbitrated Loop, 63
  - Protocol, 20

## **G**

- guidelines
  - cascading, 7

## **H**

- high availability, 8
- host bus adapter, 17
- host port, 12
- hub-to-switch connectivity, 7

## **I**

- initiator, 63
  - active, 63
  - inactive, 63
- inter-switch link, 63
- ISL, 63

## **L**

- load balancing, 8
- loading drivers, 20
- long-wave
  - GBIC, 7
- LUN, 8
  - level information, 20
  - recognition, 14
- luxadm, 22, 39

## **M**

- modinfo, 20
- multicasting, 8
- multipathing, 8, 29
  - devices and configuration, 32
  - utilities, 13
- multiple device node, 34, 45
  - creation, 41
  - removal, 41

## **N**

- name server
  - zones, 63
- NAS, 8
- NFS, 8
- NS
  - zones, 63

## **P**

- physical device representation, 33
- port, 12
  - N\_Port, 63
  - segmented loop, 64
  - transfer, 64
  - trunk, 64
  - WWN listing, 38
- port list, 31
- port-based zones, 8, 63
- private loop, 63
  - devices, 17
- promiscuous mode, 8
- public loop, 63

## **S**

- Segmented Loop
  - zones, 64
- short-wave
  - GBIC, 7
  - tranceiver, 7
- show\_FCP\_dev, 22, 27
- SL

- zones, 64
- SL\_Ports, 64
- SNDR, 8
- snoop, 8
- ssd driver, 20
- st driver, 20
- storage devices, 16
- StorEdge T3+ array, 11
- StorEdge Traffic Manager tool, 8
- Sun StorEdge 39x0 series, 11, 12
- Sun StorEdge 69x0 series, 11, 12
- Sun StorEdge 99x0 series, 11, 12
- Sun StorEdge T3 device nodes, 31
- Sun StorEdge Traffic Manager tool, 30
- support contact, xiii
- switch
  - switch-to-switch connection, 7

## T

- T\_Ports, 64
- TL
  - port, 12, 64
- transfer ports, 64
- translation loop
  - port, 12
- translative
  - loop port, 64
- trunk ports, 64

## U

- unconfiguring
  - a single path, 38
  - devices, 24
  - multipathed devices, 37
  - multiple devices, 46
- unconfiguring devices, 36

## V

- volumes, 8

## W

- WWN-based zones, 63
- WWNs, 64

## Z

- zone, 64
  - name server, 63
  - segmented loop, 64
- zoning, 5, 65

