Sun StorEdge SAN 4.0 Release Configuration Guide

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Part No. 806-5513-11
August 2002, Revision A

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Preface

The *Sun StorEdge SAN 4.0 Release Configuration Guide* is for system administrators who need instructions for configuring the switch for Sun StorEdge™ SAN 4.0 release.

Setting up a SAN is a linear process. To set up a SAN, you must follow these basic steps:

1. **Physically install all the switches, hosts, storage devices and cables.**
2. **Identify the configuration requirements for hooking up all the devices and host(s) to the switches.**
3. **Configure the switch ports and configure the switch to your zoning requirements.**
4. **Ensure all the hosts recognize all the switches and attached storage devices.**

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 4.0 Release Installation Guide*. This book helps you with the last three steps.

This guide explains initial configuration of a switch, identifying hosts and storage and handling multiple paths to storage using Sun StorEdge Traffic Manager and working with volume managers.

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

Typographic Conventions

TABLE P-1

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

Shell Prompts

TABLE P-2

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

TABLE P-3 Sun StorEdge SAN 4.0 Release Related Documentation

Product	Application	Title	Part Number
Sun StorEdge Network SAN 4.0 Release	Documentation information	*Sun StorEdge SAN 4.0 Release Guide to Documentation*	816-4470
	Latest information	*Sun StorEdge SAN 4.0 Release Notes*	816-4472
		Brocade Fabric OS v 3.0 Release Notes	
	Installation	*Sun StorEdge SAN 4.0 Release Installation Guide*	816-4469
	Configurations	*Sun StorEdge SAN 4.0 Release Configuration Guide*	806-5513
	Safety and Compliance	*Sun StorEdge SAN 4.0 Release Regulatory and Safety Compliance Manual*	816-5246
	Installer / user information—1 Gbyte switch	*Sun StorEdge Network Switch-16 (SANbox-16) with E_Ports Installer's/User Manual*	N / A*
		Sun StorEdge Network Switch with E_Ports Management Manual	N / A[1]
		Sun StorEdge Network FC Switch-8 and Switch-16 Release Notes	816-0842
	Installer / user information—2 Gbyte switch	*Sun StorEdge Network 2Gb Switch-16 (SANbox2) Management Manual*	875-3264[1]
		Sun StorEdge Network 2 Gb FC Switch-16 FRU Installation	816-5285
		Sun StorEdge Network 2Gb Switch-16 (SANbox2) Installer's/User's Manual	875-3263[1]
	Reference information	*Brocade Fabric OS Reference Manual Version 3.0*	53-0000127-03
		Brocade SilkWork®3800 Hardware Reference Guide	53-0001576-03
	User's information	*Brocade ZONING User's Guide Version 3.0*	53-0000135-03
		Brocade WEB TOOLs User's Guide Version 3.0	53-0000130-03

TABLE P-3 Sun StorEdge SAN 4.0 Release Related Documentation *(Continued)*

Arrays	Latest information	*Sun StorEdge T3+ Array 2.1 Firmware Release Notes*	816-4771
	Safety information	*Sun StorEdge T3+ Array Regulatory, Safety Compliance Manual*	816-4773
	Documentation information	*Sun StorEdge T3+ Array Start Here*	816-4768
	Installation	*Sun StorEdge T3 and T3+ Array Site Preparation Guide*	816-0778
		Sun StorEdge T3+ Array Disk Tray Installation Task Map	816-4775
		Sun StorEdge T3+ Array Installation and Configuration Manual	816-4769
	User information	*Sun StorEdge T3+ Array Administrator's Manual*	816-4770
Host Bus Adapters	Installation	*Sun StorEdge PCI Single Fibre Channel Network Adapter Installation Guide*	806-7532
		Sun StorEdge PCI Dual Fibre Channel Host Adapter Installation Guide	806-4199
		Sun StorEdge CompactPCI Dual Fibre Channel Network Adapter Installation and User's Guide	806-6991
		Sun StorEdge SBus Dual Fibre Channel Host Adapter Release Notes	816-2490
		Sun StorEdge 2G FC PCI Single Channel Network Adapter Installation Guide	816-4999
		Sun StorEdge 2G FC PCI Double Channel Network Adapter Installation Guide	816-5001
Tools	Sun StorEdge Traffic Manager	*Sun StorEdge Traffic Manager Software Installation and Configuration Guide*	816-1420
	Diagnostics	*Storage Automated Diagnostic Environment User's Guide, Version 2.1*	816-5324
	Sun Cluster	*Sun Cluster 3.0 Installation Guide*	806-1419
	Solaris Volume Manager installation	*VERITAS Volume Manager 3.2 Installation Guide*	875-3165
Storage Cabinet	Rackmount information	*Rackmount Placement Matrix*	805-4748
man pages	cfgadm utility	cfgadm_fp (1M)	n/a
	format utility	format (1M)	n/a
	luxadm utility	luxadm (1M)	n/a

* Find these documents at:
  `http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/SAN/index.html`
  → Other Documentation.

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CHAPTER 1

New In This Release

To set up a storage area network (SAN), you must follow these basic steps:

1. **Physically install all the switches, hosts, storage devices and cables.**
2. **Identify the zone and port requirements for hooking up all the devices and hosts to the switches.**
3. **Configure the switch ports and switch to your zoning requirements.**
4. **Ensure that all the hosts recognize the switch and all attached devices.**

Before you actually complete these steps, however, read this chapter to learn how the Sun StorEdge SAN 4.0 Release compares with the previous release. One of the biggest changes in this release is that more complex configurations are supported.

This chapter covers:

- "New In This Release" on page 2
- "Supported Hardware" on page 8
- "Zones and Ports" on page 10

New In This Release

The Sun StorEdge SAN 4.0 Release supports many new features, which are summarized in TABLE 1-1. Several features of the SAN 3.x releases were not included in the SAN 4.0 release, and many features were carried forward. Additionally, the SAN 4.0 offers many new features. Explanations of the features follow the table.

TABLE 1-1 Comparison of the SAN 3.0 and SAN 4.0 Releases

Feature	SAN 3.*x* Features Not Supported in SAN 4.*x*	SAN 3.x Features Included In SAN 4.*x*	SAN 4.*x* New Features
Supported Configurations	Cascaded configurations limited to three linear connected switches, or two ISL links between switches.	N / A	Cascaded configuration limit increased to eight linear connected switches, or seven ISL links between switches. Two of the ISL links can use long-wave tranceivers and cables. Configurations support up to 239 switches. Check with the vendor-specific switch documentation for details
	SAN configurations limited to single-switch or simple cascades.	Support for local host and storage device attachment with short- or long-wave cables and tranceivers for disaster tolerant configurations.	SAN configuration restrictions lifted. Meshes and other configurations are now possible.
	Limited partial fabric supported for connections between hosts and switches.	N / A	Full fabric support for connections between storage devices, hosts and switches.

TABLE 1-1 Comparison of the SAN 3.0 and SAN 4.0 Releases *(Continued)*

Feature	SAN 3.*x* Features Not Supported in SAN 4.*x*	SAN 3.x Features Included In SAN 4.*x*	SAN 4.*x* New Features
Ports and Zones	Configurations limited to use of Segmented Loop (SL) or Name Server (NS) port-based zoning.	NS port-based zoning supported for fabric capability.	WWN-based zoning supported for interoperability mode among FC-SW2 standard compliant switches.
	N/A	Overlapping port-based NS zones supported.	WWN-based zones supported on all switches.
	Nested port-based zoning supported.	N/A	Nested zoning supported but not required.
	Hard zones supported.	N/A	N/A
	SL_port connections to arrays supported.	TL_port connections to the Sun StorEdge T3 and T3+ arrays supported for fibre channel-arbitrated loop and fabric configurations.	G_ and GL_ports supported for connections to arrays. (G_ and GL_ports automatically negotiate in inter-switch connections to E_ports. TL_ports should be manually configured for loop connections to storage devices.)
ISLs	N/A	Short- and long-wave cables and tranceivers supported.	Same.
	Long-wave only 1-Gbit GBICs supported for connectivity.	N/A	Long-wave and short-wave Small Form-factor Pluggable (SFP) 2-Gbit tranceivers replace GBICs.
	Long-wave only SC-SC cables supported.	Long-wave and short-wave SC cables supported.	Long-wave and short-wave SC-SC, SC-LC, and LC-LC cables supported.

TABLE 1-1 Comparison of the SAN 3.0 and SAN 4.0 Releases *(Continued)*

Feature	SAN 3.*x* Features Not Supported in SAN 4.*x*	SAN 3.x Features Included In SAN 4.*x*	SAN 4.*x* New Features
Supported Switches	Switch hardware limited to Sun 1-Gbit 8- and 16-port switches.	SAN 3.0 switches can be upgraded with the SAN 4.0 firmware. If you do not upgrade the firmware, the 1-Gbit switches can exist on the same host as the 2-Gbit switches, but they can not connect to each other.	New 2-Gbit switches introduced.
Tools	SANbox switch management application manages the 1-Gbit switches with old firmware only.	N/A	New switch management tools are available. See the vendor-specific documentation for details.
	N/A	Multipathing and load balancing supported with the Sun StorEdge Traffic Manager application.	Multipathing and load balancing through the Sun StorEdge Traffic Manager application with SunCluster 3.0 or VERITAS Cluster Server.

TABLE 1-1 Comparison of the SAN 3.0 and SAN 4.0 Releases *(Continued)*

Feature	SAN 3.*x* Features Not Supported in SAN 4.*x*	SAN 3.*x* Features Included In SAN 4.*x*	SAN 4.*x* New Features
Host Bus Adapters (HBAs)	N/A	1-Gbit host bus adapters supported include: • Sun StorEdge PCI Dual Fibre Channel Network Adapter • Sun StorEdge PCI Single Fibre Channel Network Adapter, • Sun StorEdge CPCI Dual Fibre Channel Network Adapter • Sun StorEdge SBus Dual Fibre Channel Network Adapter	Newly supported host bus adapters include: • Sun Sun StorEdge 2G FC PCI Single Channel Network Adapter card • Sun StorEdge 2G FC PCI Dual Channel Network Adapter card
Supported Storage Devices	Sun StorEdge A5200 and A3500FC arrays supported.	Sun StorEdge T3 and T3+ arrays supported.	New Sun StorEdge T3+ array firmware is supported. The Sun StorEdge 39x0, 69x0 and 99x0 series are also supported.
Third-party Compatability	N/A	N/A	Interoperability compliance with FC-SW2 mode on the new switches.

The following bulleted paragraphs explain in greater detail the information presented in TABLE 1-1.

- **Switches and ISLs**: All of the switches introduced in this release support 2-Gbit port connectivity. The new switches use 2-Gbit Small Form Factor Pluggable tranceivers, rather than the 1-Gbit GBICs, and LC-LC cables for interswitch links (ISLs) between connected 2-Gbit switches.

  You can upgrade old 1-Gbit Sun switches from previous releases to the new firmware for this release if you want to use old switches with new ones in the same SAN. When connecting 1-Gbit switches to each other, use GBICs and SC-SC cables. To connect a 1-Gbit and 2-Gbit switch, use a GBIC, SFP, and SC-LC cable. To downgrade a 1-Gbit switch after you have upgraded it with the firmware for the 2-Gbit switch, you can use the `sb1_downgrade` script available at the Sun Download Center at `http://www.sun.com/software/download`.

- **Host Bus Adapters:** The SAN 4.0 release supports new 2-Gbit host bus adapters -- the Sun StorEdge 2G FC PCI Single Channel Network Adapter card and the Sun StorEdge 2G FC PCI Dual Channel Network Adapter card.
- **Greater ISL Hop Count:** The previous release supported only three cascaded switches with two ISL links, or cable connections between switches. Now, you can have as many as eight cascaded switches, or seven ISL links. If you use seven ISL links, two can be long-wave.
- **Complex Configurations:** Your SAN configurations can have multiple switches. Previous releases limited the size of the SAN to three switches. Now, you can have hundreds in some cases. Check the vendor-specific switch documentation for complete details on SAN size limitations.

  In a single switch configuration, the switch is connected to the host. Specifically, the connection is through a fiber-optic cable to the supported Sun StorEdge host bus adapters. The other ports of the switch are connected to supported devices through a fiber-optic cable.

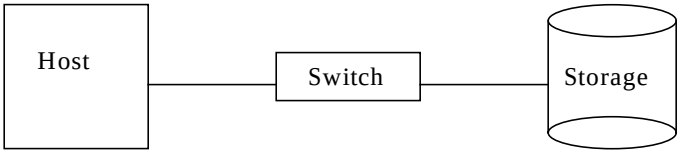

FIGURE 1-1 Single switch configuration

In a cascaded configuration, two or more switches are connected together by means of Inter-switch Links (ISLs). Zones span both switches. Servers and storage can be in the same name server zone across ISLs on separate switches. Cascaded switches support long-wave and short-wave Gigabit Interface Converters (GBICs) between switches.

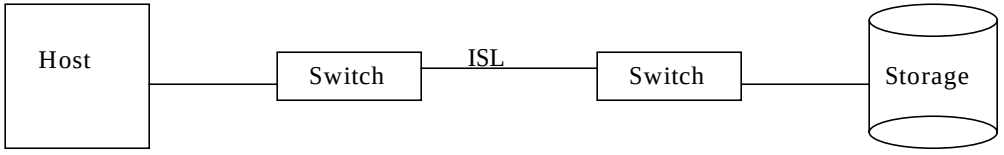

FIGURE 1-2 Cascaded switch configuration with ISL

The switch now supports much more complex configurations, such as meshes, than it did in previous releases. However, these complex architectures are based on the foundation of the simple cascade configuration.

As in the SAN 3.1 and SAN 3.2 releases, switches can attach with short-wave or long-wave ISLs to each other.

- **Disaster Tolerance:** The ability to build disaster-tolerant configurations allows you to replicate storage and server configurations in separate locations to ensure data availability in case of failure at the primary site. Check the vendor-specific switch documentation for distance capabilities. The maximum supported distance between switches is 10 km. You can cascade two switches with long-wave cables for a total distance of 20 km or, with modification of port buffer credits, up to 40 km. Check your vendor specific documentation for specifics.
- **Storage Devices:** The SAN 4.0 release supports the Sun StorEdge T3+ array with the latest firmware updates and also the Sun StorEdge 39*x*0, 69*x*0, and 99x0 series. The Sun StorEdge 69x0 series requires a switch hardware or firmware upgrade to use the SAN 4.0 capabilities. The Sun StorEdge A3500FC and A5200 arrays are supported in SAN 3.0 compatability mode only and are not part of the SAN 4.0 release.
- **New Zone and Port Types:** The new SAN 4.0 release now supports WWN-based zones, as well as port-based zones. The port types now follow industry standards. E_ports replace T_ports for switch-to-switch connections. G_ and GL_ports, or general ports, automatically configure to F_, FL_ or E_port upon device detection.

  Segmented Loop (SL) and Quick Loop (QL) zones and ports, which were included in previous releases, are no longer required. Sun StorEdge A5200 and A3500 FC arrays are supported in the SAN 3.0 release compatability mode only, not in the SAN 4.0 release. Private loop devices that require SL ports can not connect to the new switches.

  The 2-Gbit Sun StorEdge network adapters in this release recognize the private loop arrays as fabric devices when they are connected with TL_ports or L_ports.
- **Overlapping Zones:** Port-based and WWN-based zones can overlap. When creating overlapping NS zones, one or more switch ports are in at least two zones. When a port is in multiple zone, one host or storage device attached to a switch port is a member of many zones and resources and can thus be shared. If a resource is shared in multiple zones, it can be made available to multiple zones by using overlapping zones.

  When connecting multiple switches, zones can help manage the complexity of sharing resources. For example, you could use port zoning to make all the (logical unit numbers (LUNs) of a Sun StorEdge T3 array belong to the same zone in a SAN. Alternately, you could share the resources of the array among several NS zones.

  Check with the vendor-specific switch documentation to determine the maximum number of zones you can have in a configuration.

  Zone nesting, where zones exist inside of other zones, is possible but not required.
- **New Tools:** The SAN 4.0 release supports several new tools for managing, operating and troubleshooting your SAN. See the vendor-specific documentation for details.

If you are using switches and applications from a previous SAN release, the old applications must be installed in separate directories or hosts apart from the new tools.

Sun Cluster 3.0 and VERITAS Cluster Server are available for use with the SAN 4.0 release. They were available before this release but not documented. The Sun StorEdge Traffic Manager application continues to provide multipathing and load balacing capabilities for devices in port-based and WWN-based zones.

- **Sun Cluster 3.0 Support:** Sun Cluster 3.0 uses SCSI-3 Persistent Group Reservation (PGR) so that a SAN can attach to storage devices and host applications in a cluster environement. Using Sun Cluster 3.0 with a SAN enables greater scalability of the system.
- **More Initiators Per Zone:** A SAN can have up to 251 host bus adapter ports for each NS zone. This number includes all standby and backup initiators. The number depends on the use of the Sun StorEdge Fibre Channel host bus adapters supported in this release.

  The ability to create larger SANs depends on having more initiators per zone, more targets per zone, and more inter-switch links (ISLs) between switches. With fabric capabilities (16 million addressable devices), you expect to be able to build larger SANs. However, if a low number of initiators are allowed in a zone, that limits the number of servers and thus storage devices in that zone, and the size of the entire SAN.

Supported Hardware

The switches and drivers in the Sun StorEdge SAN 4.0 Release function with the following fabric capable storage devices:

- Sun StorEdge T3 and T3+ arrays
- Sun StorEdge 39*x*0 series
- Sun StorEdge 69*x*0 series
- Sun StorEdge 99x0 series

Additional hardware components from Sun that the switch supports listed in TABLE 1-2. Check with your service representative for updates to this list.

TABLE 1-2 Supported Hardware

Model, Part Number or System Code	Description
T3BES-RR-22-655R5 T3BWG-RR-11-327R5	Sun StorEdge T3 and T3+ arrays
3910, 3960	Sun StorEdge 39x0 storage series
6910, 6960	Sun StorEdge 69x0 storage series
9910, 9960	Sun StorEdge 99x0 storage series
X6799A	Sun StorEdge PCI Single Fibre Channel Network Adapter
X6727A	Sun StorEdge PCI Dual Fibre Channel Network Adapter+
X6748A	Sun StorEdge CPCI Dual Fibre Channel Network Adapter
X6757A	Sun StorEdge SBus Dual Fibre Channel Host Bus adapter
X6767A	Sun StorEdge 2G FC PCI Single Channel Network Adapter
X6768A	Sun StorEdge 2G FC PCI Dual Channel Network Adapter
XSFP-SW-2Gb	Short-wave SFP
XSFP-LW-2Gb	Long-wave SFP (up to 10 km with no modifications to the switch or up to 40 km with modifications to the switch port buffer credits)
x973A	Two-meter fiber-optic cable (SC-SC)
x9715A	Five-meter fiber-optic cable (SC-SC)
X978A	15-meter fiber-optic cable (SC-SC)
X9720A	SC-SC cable coupler
X9721A	0.4 meter fiber cable (LC-SC)
X9722A	two-meter fiber cable (LC-SC)
X9723A	five-meter fiber cable (LC-SC)
X9724A	15-meter fiber cable (LC-SC)
X9732a	two-meter fiber cable (LC-LC)
X9733a	five-meter fiber cable (LC-LC)
X9734a	15-meter fiber cable (LC-LC)

1. Use long-wave SFPs and fibre cables to cascade more than 500 meters in 1-Gbyte mode or 300 meters in 2-Gbyte mode.

Zones and Ports

Understanding zoning and use of ports is fundamental to understanding the use of configuration rules with 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:

- "Zones Types" on page 10
- "Ports Types" on page 11

Zones Types

Zoning is a function of the switch that allows segregation of devices by ports or WWNs. You can create zones for a variety of reasons, such as security, simplicity, performance, or dedication of resources. Previous releases supported hard zones, segemented 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_ and FL_ ports are not supported for Sun devices in this release. You can use F_ports instead of FL_ports for the hardware supported in this release. The Sun StorEdge T3 and T3+ arrays with firmware levels 1.18 and 2.0 support TL_port connections.

Segmented Loop Zones

The current SAN 4.0 release does not support Segmented Loop (SL) zones or ports. If you currently have a SAN that requires SL connectivity to private loop devices, connect a new switch from SAN 4.0 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.

Ports Types

TABLE 1-3 Switch Port Types

Port Type	Description	Supported Devices
TL_Ports	Translated loop	storage devices
FL_Ports	Public loop	storage devices
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	automatically configure to F_, FL_ or E_ports to support hosts or switches

CHAPTER 2

Guidelines

To set up a SAN, you must follow these basic steps:

1. **Physically install all the switches, hosts, storage devices and cables.**
2. **Identify the zone and port requirements for hooking up all the devices and hosts to the switches.**
3. **Configure the switch ports and switch to your zoning requirements.**
4. **Ensure that all the hosts recognize the switch and all attached devices.**

By now, you should have completed the hardware installation with the help of the *Sun StorEdge SAN 4.0 Release Installation Guide*. This chapter helps you with the second step, identifying the configuration requirements. It contains guidelines for configuring your Sun StorEdge SAN 4.0 Release with one or more hosts and storage. At this stage, you can also configure your ports and zones, according to the instructions in your vendor-specific documentation.

The following topics are covered:

- "Cascading" on page 13
- "Host and Operating Environment Guidelines" on page 14
- "FCIP Guidelines" on page 14
- "Multipathing" on page 15
- "Adding and Removing a Storage Device In the SAN" on page 15

Cascading

- Hub-to-switch connectivity is not supported in a fabric.
- You can have a maximum of eight switches cascaded in a series. In other words, you can have seven ISLs between switches. Two of the ISLs can be long-wave connections.

- Long-wave and short-wave ISLs can be used to cascade switches. The maximum distance for an ISL hop is 10 km. Multiple hops and switch port buffer credits might allow distances up to 40 km. Check with your third-party vendor documentation for details.

Host and Operating Environment Guidelines

- All Solaris hosts in a zone must be running the Solaris 8 Release update 4 or later operating environment with all appropriate patches installed.

  You can download the patches from the following web site:
  `http://sunsolve.Sun.COM/pub-cgi/show.pl?target=patches/patch-access`

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 2-1 FCIP (NFS/NAS and SNDR)

Feature	Supported
Cascading	Yes, with Fabric NS zones only
Zone type	Fabric NS zone (with the host bus adapter configured as an F_Port point-to-point connection)
Maximum number of device ports per zone	4

The following restrictions apply:

- Use only physical port 0 on a network adapter for FCIP
- Promiscuous mode is not supported. The `snoop` (1M) utility cannot be used.
- Multicasting is supported for broadcasting.
- Assign the IP address of the FCIP port to a subnet different from that of the Ethernets on the same system.

- Unplumb all `FCIP` streams on the host before performing a dynamic reconfiguration (DR) operation.

Multipathing

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 Sun StorEdge Traffic Manager and runs in the Solaris operating environment. See the *Sun StorEdge Traffic Manager Installation and Configuration Guide* for details about the component. If you are using another multipathing application, see the documentation for it.

Adding and Removing a Storage Device In the SAN

This section covers addition of the Sun StorEdge 39x0, 69x0, 99x0 series and Sun StorEdge T3 and T3+ arrays to a SAN. Topics include:

- "Adding a Storage Device" on page 16
- "To Add a Storage Device" on page 16
- "Removing a Storage Device" on page 18
- "To Remove a Storage Device" on page 18

When configuring a Sun StorEdge T3 or T3+ 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. Although you may connect a Sun StorEdge T3 array with a TL_port, the host bus adapter recognizes the 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.

You can connect the Sun StorEdge T3 or T3+ array to the SAN with or without multipathing capability. The multipathing driver discussed in this book is called the Sun StorEdge Traffic Manager and runs on the Solaris platform. For detailed information about the Sun StorEdge Traffic Manager or other multipathing utilities, see the Sun StorEdge Traffic Manager documentation or other third-party manuals.

You can add a Sun StorEdge T3 or T3+ array to another Virtual Private Fabric (VPF) zone on the original host or to a new zone on a new host. To do so, you must first remove the storage unit from the original zone and then add it back to the new zone. The following procedures explain how to do this when you have volume manager disk groups on your system.

Note – The follwoing procedures are not necessary when you are using soft zones.

Adding a Storage Device

- If the Sun StorEdge Traffic Manager software is not enabled, read the section "Creating and Removing Individual Device Nodes Without Multipathing Enabled" on page 20. See "Creating and Removing Multiple Device Nodes Without Multipathing Enabled" on page 27 for specific information.
- If the Sun StorEdge Traffic Manager software is enabled, read the section "Creating and Removing Individual Device Nodes With Multipathing Enabled" on page 31. See "Creating and Removing Multiple Device Nodes With Multipathing Enabled" on page 43 for specific information.

Note – If you use the `format` command when the Sun StorEdge Traffic Manager is enabled, as shown in FIGURE 2-1, you see only one instance of a device identifier for each LUN. Without the Sun StorEdge Traffic Manager, you see on 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. **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.

2. **Import any volume manager disk groups.**

3. **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.

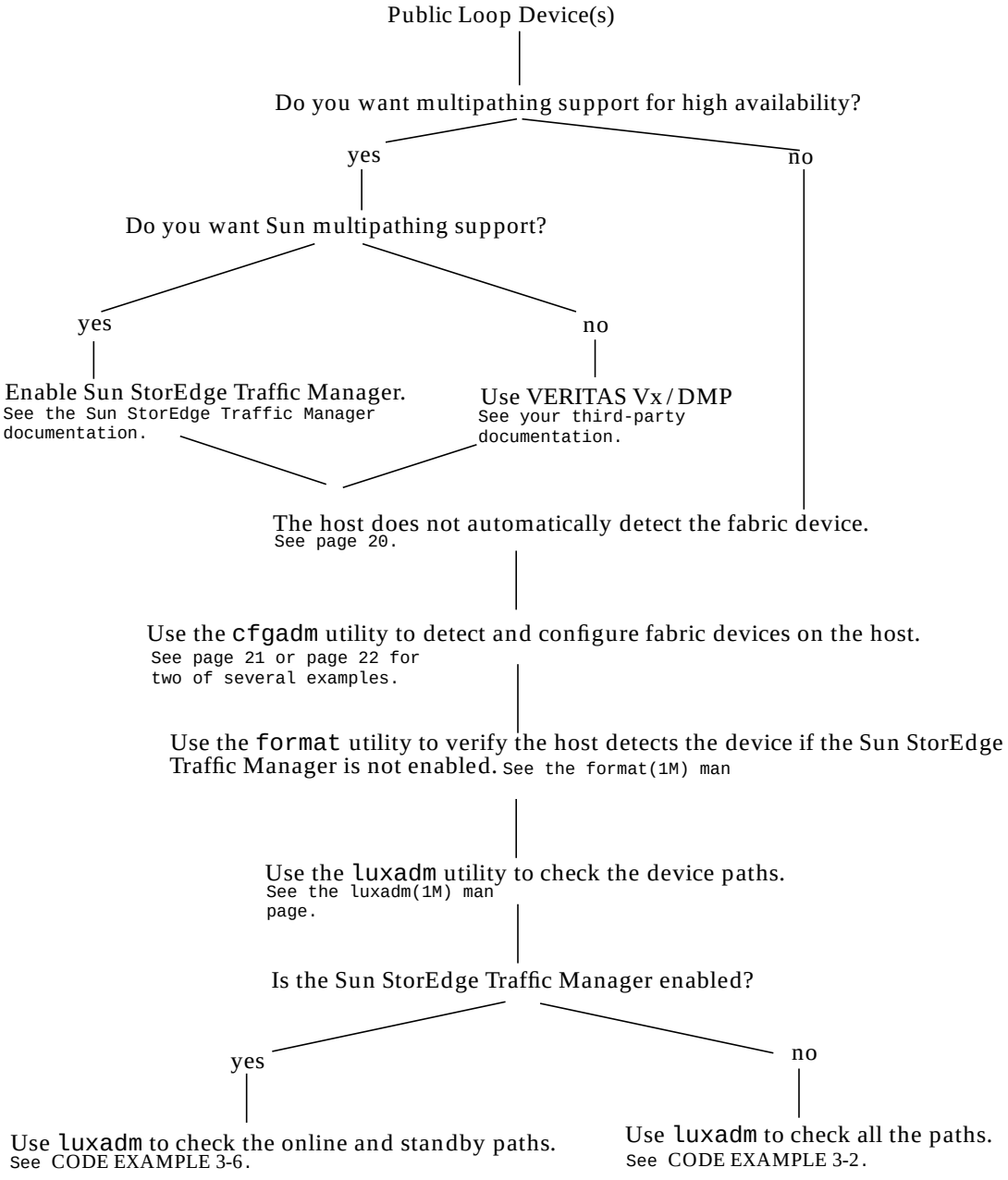

FIGURE 2-1 Decision Tree For Adding Public Devices

Removing a Storage Device

- If the Sun StorEdge Traffic Manager software is not enabled, read the section "Creating and Removing Individual Device Nodes Without Multipathing Enabled" on page 20. See "To Unconfigure a Fabric Device" on page 26 for specific information.
- If the Sun StorEdge Traffic Manager software is enabled, read the section "Creating and Removing Individual Device Nodes With Multipathing Enabled" on page 31. See "To Unconfigure a Fabric Device Associated With Multipathing Arrays" on page 37 for specific information.

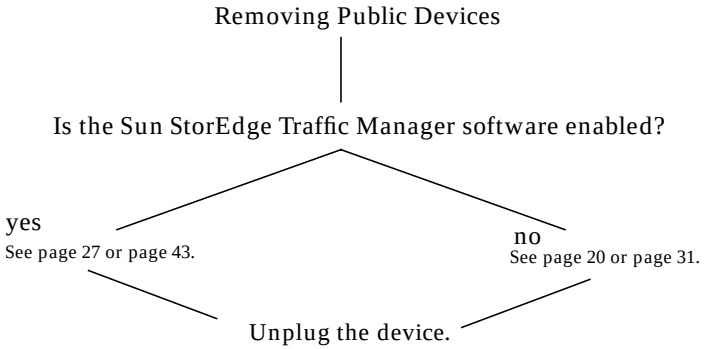

FIGURE 2-2 Decision Tree For Removing Public Devices

▼ 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.

CHAPTER 3

Public Device Node Recognition

To set up a SAN, you must follow these basic steps:

1. **Physically install all the switches, hosts, storage devices and cables.**
2. **Identify the zone and port requirements for hooking up all the devices and hosts to the switches.**
3. **Configure the switch ports and switch to your zoning requirements.**
4. **Ensure that all the hosts recognize the switch and all attached devices.**

This chapter helps you complete the fourth step. It 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. For example output of a Sun StorEdge 99x0 series device configuration, see Appendix A. This chapter includes:

- "Creating and Removing Individual Device Nodes Without Multipathing Enabled" on page 20
- "Creating and Removing Multiple Device Nodes Without Multipathing Enabled" on page 27
- "Creating and Removing Individual Device Nodes With Multipathing Enabled" on page 31
- "Creating and Removing Multiple Device Nodes With Multipathing Enabled" on page 43

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 that is an FC-AL device to a switch, but the Sun StorEdge host bus adapters supported in the SAN 4.0 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 respective 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 Sun StorEdge Traffic Manager software 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 21
- "Ensuring LUN Level Information Is Visible" on page 22
- "To Configure a Fabric Device Without Multipathing Enabled On the Host" on page 22
- "To Unconfigure a Fabric Device" on page 26
- "To Configure All Fabric Devices on a Fabric-Connected Host Port" on page 27
- "To Unconfigure All Fabric Devices on a Fabric-Connected Host Port" on page 29

▼ To Detect Fabric Devices Visible on a Host

In this procedure, Fibre Channel host ports `c0` and `c1`, and the devices attached to them, 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.**

```
# cfgadm -l
Ap_Id              Type        Receptacle   Occupant     Condition
c0                 fc-private  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.**

```
# 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
```

Note – The `cfgadm -l` command displays information about Fibre Channel host ports. Use the `cfgadm -al` command to also 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.

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.

▼ 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

```
# 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
```

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

```
/dev/rdsk/c0t50020F2300005f24d0s2
/dev/rdsk/c0t50020F2300005f24d1s2
/dev/rdsk/c0t50020F2300006107d0s2
/dev/rdsk/c0t50020F2300006107d0s2
```

The paths represent each SCSI LUN in the physical device represented by c0::50020f2300006107.

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

```
# 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/rdsk/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@w50020f23000060
77,3: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/rdsk/c0t50020F2300006077d2s2
/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f23000060
77,2: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/rdsk/c0t50020F2300006077d1s2
/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f23000060
77,1: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/rdsk/c0t50020F2300006077d0s2
/devices/pci@1f,2000/pci@1/SUNW,qlc@4/fp@0,0/ssd@w50020f23000060
77,0: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 20. 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 21. This section covers:

- “To Configure All Fabric Devices on a Fabric-Connected Host Port” on page 27
- “To Unconfigure All Fabric Devices on a Fabric-Connected Host Port” on page 29

▼ 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

```
# cfgadm -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 32
- "Ensuring LUN Level Information Is Visible" on page 33

- "To Configure Fabric-Connected Device Nodes As Multipathing Devices" on page 34
- "To Unconfigure a Fabric Device Associated With Multipathing Arrays" on page 37
- "To Unconfigure One Path to a Multipathed Device" on page 39
- "To Configure All Fabric-Connected Devices With Multipathing Enabled" on page 43
- "To Unconfigure All Fabric-Connected Devices With Multipathing Enabled" on page 48

▼ 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 detecty 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.**

```
# 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::50020f2300005f24 disk         connected    unconfigured unknown
c2::50020f2300006107 disk         connected    unconfigured unknown
```

Note – The `cfgadm -l` command displays information about Fibre Channel host ports. Use the `cfgadm -al` command to also 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 As Multipathing 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 Sun StorEdge Traffic Manager software enabled.

Note – Whether the Sun StorEdge Traffic Manager software 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 Sun StorEdge Traffic Manager 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::50020f2300005f24 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 Sun StorEdge Traffic Manager software.

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, Sun StorEdge Traffic Manager 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 Sun StorEdge Traffic Manager enabled devices

`/dev/rdsk/c6t60020F20000061073AC8B52D000B74A3d0s2`
`/dev/rdsk/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 Sun StorEdge Traffic Manager Software 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/rdsk/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 Sun StorEdge Traffic Manager Software 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/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 a Fabric Device Associated With Multipathing Arrays

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 Sun StorEdge Traffic Manager software 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 Sun StorEdge Traffic Manager 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 Sun StorEdge Traffic Manager software.

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. Alternately, 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.**

```
# 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
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/rdsk/c6t60020F20000061073AC8B52D000B74A3d0s2`

and

`/dev/rdsk/c6t60020F20000061073AC8B4C50004ED3Ad0s2`

are removed from the host.

▼ To Unconfigure One Path to a Multipathed Device

In “To Unconfigure a Fabric Device Associated With Multipathing Arrays” on page 37, a storage device is connected to the host using the Solaris operating environment by two Ap_Ids, `c0::50020f2300006077` and `c2::50020f2300006107`. For the Sun StorEdge Traffic Manager 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_Ids 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/rdsk/c6t60020F20000061073AC8B52D000B74A3d0s2`

and

`/dev/rdsk/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/rdsk/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/rdsk/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 31. 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 32 before you configure or remove device nodes. This section covers:

- “To Configure All Fabric-Connected Devices With Multipathing Enabled” on page 43
- “To Unconfigure All Fabric-Connected Devices With Multipathing Enabled” on page 48

▼ 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 3-6 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 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
  Read Cache:           Enabled
    Minimum prefetch:   0x0
    Maximum prefetch:   0x0
  Device Type:          Disk device
  Path(s):
  /dev/rdsk/c6t60020F20000061073AC8B52D000B74A3d0s2
  /devices/scsi_vhci/ssd@g60020f20000061073ac8b52d000b74a3:c,raw
   Controller         /devices/pci@1f,2000/pci@1/SUNW,qlc@5/fp@0,0
```

CODE EXAMPLE 3-9 `luxadm` (1M) Output for Multiple Device Nodes Associated With One Device Path and Sun StorEdge Traffic Manager Software Enabled *(Continued)*

```
      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/rdsk/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
```

CODE EXAMPLE 3-11 luxadm Output For Host Device Associated With Two Paths

```
# luxadm display 50020f2300006077
DEVICE PROPERTIES for disk: 50020f2300006077
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SUN
```

CODE EXAMPLE 3-11 luxadm Output For Host Device Associated With Two Paths

```
   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/rdsk/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
   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
```

CODE EXAMPLE 3-11 luxadm Output For Host Device Associated With Two Paths

```
   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
```

▼ 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 Sun StorEdge Traffic Manager software 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.

```
# 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
```

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

```
# cfgadm -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.**

```
# 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
```

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

CHAPTER 4

FCIP Management

To set up a SAN, you must follow these basic steps:

1. **Physically install all the switches, hosts, storage devices and cables.**
2. **Identify the zone and port requirements for hooking up all the devices and hosts to the switches.**
3. **Configure the switch ports and switch to your zoning requirements.**
4. **Ensure that all the hosts recognize the switch and all attached devices.**

This chapter helps you with the fourth step. It covers host recognition of FCIP devices.

FCIP Management In a SAN

This section covers the implementation of Fibre Channel over IP broadcasting devices in a SAN and contains the following topics:

- "Installation" on page 51
- "Configuration" on page 55
- "Invocation" on page 56
- "Usage" on page 57

Installation

The FCIP depends on the instance of fabric ports (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.

- "To Determine All Fibre Channel Adapter Port Instances to Which IP Can Be Plumbed" on page 52
- "To Determine an FP Instance for a Known HBA Port Physical Device Path" on page 53

▼ To Determine All Fibre Channel Adapter Port Instances to Which IP Can Be Plumbed

1. **Become superuser.**

2. **Determine fabric port instances.**

   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 plumb fabric port instances.**

   Use the `ifconfig` <*interface*> `plumb` command. For example:

```
# ifconfig fcip0 plumb
```

   If no 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 only to port 0 of Fibre Channel adapters with multiple ports. An error will occur 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 Determine an FP Instance Quickly” on page 54.

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 1 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 2.**

         Using the array with an HBA in the PCI adapter slot 5, multiply 5 by 2 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 5 and PCI slot 1 of the I/O board, add 1 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,qlc@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 Determine an FP Instance Quickly

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.

2. **Based on the list of devices, determine which HBA is visible to the remote host with which you established FCIP communications.**

```
# 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
```

3. **Use the same instance number following the fp to plumb the FCIP interface.**

```
# ifconfig fcip0 plumb
```

Other /etc/path_to_inst Device Path Entries

The procedure in "To Determine an FP Instance for a Known HBA Port Physical Device Path" on page 53 uses a Sun StorEdge PCI Single Fibre Channel Network Adapter device path entry from the `/etc/path_to_inst` file. CODE EXAMPLE 4-2 shows a device path entry for a Sun StorEdge CPCI Dual Fibre Channel Network Adapter. CODE EXAMPLE 4-3 shows a device path entry for a Sun StorEdge PCI Dual Fibre Channel Network Adapter+.

CODE EXAMPLE 4-2 Sun StorEdge CPCI Dual Fibre Channel Network Adapter Device Path

```
"/ssm@0,0/pci@19,700000/pci@2/SUNW,qlc@4/fp@0,0" 6 "fp"
```

CODE EXAMPLE 4-3 Sun StorEdge PCI Dual Fibre Channel Network Adapter+ Device Path

```
"/pci@1f,4000/pci@4/SUNW,qlc@5/fp@0,0" 3 "fp"
```

Configuration

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 4-4 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 4-5 sun1 machine /etc/nsswitch.conf File

```
hosts:     files nis
```

Invocation

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

▼ To Start a Network Interface Manually

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:

```
# ifconfig fcip0 plumb 192.9.201.10 netmask 255.255.255.0
```

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 ffffff00 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 ffffff00 broadcast 192.9.200.255
ether 8:0:20:fc:e9:49
```

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.

CHAPTER 5

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 Sun StorEdge Traffic Manager software enabled, the Solaris 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 59
- "To Remove a Fabric Device Before DR" on page 60
- "To Maintain a Fabric Device Configuration With DR" on page 60
- "To Reconfigure Fabric Devices With DR" on page 60
- "To Reconfigure the Sun Enterprise 10000 Server With a Fabric Connection" on page 60

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 Sun StorEdge Traffic Manager software is not enabled, see “To Unconfigure a Fabric Device” on page 26.
  - If the Sun StorEdge Traffic Manager software is enabled, see “To Unconfigure a Fabric Device Associated With Multipathing Arrays” on page 37.

▼ 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 Sun StorEdge Traffic Manager software is not enabled, see “To Configure a Fabric Device Without Multipathing Enabled On the Host” on page 22.
   - If the Sun StorEdge Traffic Manager software is enabled, see“To Configure Fabric-Connected Device Nodes As Multipathing Devices” on page 34.

▼ 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 this chapter 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.

APPENDIX **A**

Sun StorEdge 99x0 Series Configuration

This appendix provides an example of how to use the `cfgadm` (1M), `luxadm` (1M) and Sun StorEdge Traffic Manager tools with the Sun StorEdge 99x0 series. The procedure is similar for the Sun StorEdge 69x0 series. This section covers:

- "Assumptions" on page 63
- "To Recognize a Sun StorEdge 99x0 Series Device On a Host" on page 64

Assumptions

The following are assumptions for making a Sun StorEdge 99x0 storage device in a fabric visible to a host with the `cfgadm` (1M), `luxadm` (1M) and Sun StorEdge Traffic Manager tools according to the instructions in this appendix.

The storage device:

- presents the same LUN through at least two Channel Host Adaptors to at least two host bus adapter ports on each host as ACTIVE/ACTIVE or symmetric data paths.
- uses microcode, or firmware, at level 01-16-60/00 or later level.
- has Channel Host Adaptors set for point-to-point fabric with `fabric=on`
- is configured with the LUN types Open-3, 8, 9, E or L
- has its host mode set to 09 for systems that use the Solaris operating environment

The `/kernel/drv/scsi_vhci.conf` file on the host:

- enables multipathing with the setting `mpxio-disable = "no"`
- enables load balacing with the setting `load-balancing = "round-robin"`

The switch:

- is configured for fabric mode
- connects to the storage device and host with F_ports
- has zones configured as required for your SAN

▼ To Recognize a Sun StorEdge 99x0 Series Device On a Host

1. **Run the `format` command to view the disks visible to the host.**

   You should see only the internal disks if the host has not detected any devices nodes:

```
# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f391ab,0
       1. c1t1d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w21000004cf2023ad,0
       2. c1t2d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f3923e,0
       3. c1t3d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f39968,0
       4. c1t4d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037e37b3e,0
       5. c1t5d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f3955d,0
Specify disk (enter its number):
```

2. **Run `cfgadm -al` command to view the controllers of the devices.**

   In this example, c4 and c5 are controllers on the storage device and are currently unconfigured. Channels 1A and 2A present the same LUNs to the two host bus adapter ports.

```
# cfgadm -al
Ap_Id                          Type         Receptacle   Occupant     Condition
c4                             fc-fabric    connected    unconfigured unknown
c4::210000e08b069b3c           unknown      connected    unconfigured unknown
c4::50060e8003277010           disk         connected    unconfigured unknown
c5                             fc-fabric    connected    unconfigured unknown
c5::210000e08b069a3c           unknown      connected    unconfigured unknown
c5::50060e8003277000           disk         connected    unconfigured unknown
```

3. Configure the devices on the host and verify the configuration:

```
# cfgadm -c configure c4 c5
# cfgadm -la
Ap_Id                          Type         Receptacle   Occupant     Condition
c4                              fc-fabric    connected    configured   unknown
c4::210000e08b069b3c            unknown      connected    unconfigured unknown
c4::50060e8003277010            disk         connected    configured   unknown
c5                              fc-fabric    connected    configured   unknown
c5::210000e08b069a3c            unknown      connected    unconfigured unknown
c5::50060e8003277000            disk         connected    configured   unknown
```

LUNs are not labled, but they do appear when you run the `format` command::

```
# format

Searching for disks...

c2t50060E80000000000000027700000000AAd0: configured with capacity of 6.88GB
c2t50060E80000000000000027700000001AEd0: configured with capacity of 6.88GB
c2t50060E80000000000000027700000001AFd0: configured with capacity of 6.88GB
c2t50060E80000000000000027700000027Ad0: configured with capacity of 6.88GB
c2t50060E80000000000000027700000001Ad0: configured with capacity of 6.88GB
c2t50060E80000000000000027700000002B4d0: configured with capacity of 6.88GB
...
c2t50060E8000000000000002770000000174d0: configured with capacity of 6.88GB
```

```
AVAILABLE DISK SELECTIONS:
       0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f391ab,0
       1. c1t1d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w21000004cf2023ad,0
       2. c1t2d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f3923e,0
       3. c1t3d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f39968,0
       4. c1t4d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037e37b3e,0
       5. c1t5d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f3955d,0
       6. c2t50060E80000000000000027700000000AAd0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000000aa
       7. c2t50060E80000000000000027700000001AEd0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000001ae
       8. c2t50060E80000000000000027700000001AFd0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000001af
       9. c2t50060E80000000000000027700000027Ad0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000027a
      10. c2t50060E80000000000000027700000001Ad0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000001a
      11. c2t50060E80000000000000027700000002B4d0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000002b4
...
       55. c2t50060E800000000000000277000000191d0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e800000000000000277000000191

              Specify disk (enter its number):
```

4. **Lable the LUNs.**

   Repleat the labling process for all the LUNs:

```
# format c2t50060E8000000000000027700000019d0

/dev/rdsk/c2t50060E8000000000000027700000019d0s2: configured with capacity of
6.88GB
selecting /dev/rdsk/c2t50060E8000000000000027700000019d0s2
[disk formatted]


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> l

format> q
```

```
# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
       0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f391ab,0
       1. c1t1d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w21000004cf2023ad,0
       2. c1t2d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f3923e,0
       3. c1t3d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f39968,0
       4. c1t4d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037e37b3e,0
       5. c1t5d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@8,600000/SUNW,qlc@2/fp@0,0/ssd@w2100002037f3955d,0
       6. c2t50060E80000000000000027700000000AAd0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000000aa
       7. c2t50060E80000000000000027700000001AEd0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000001ae
       8. c2t50060E80000000000000027700000001AFd0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000001af
       9. c2t50060E80000000000000027700000027Ad0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000027a
      10. c2t50060E80000000000000027700000001Ad0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000001a
      11. c2t50060E80000000000000027700000002B4d0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e80000000000000027700000002b4
...
       53. c2t50060E800000000000000277000000191d0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e800000000000000277000000191
...
       55. c2t50060E800000000000000277000000174d0 <HITACHI-OPEN-9-SUN-2101 cyl
10014 alt 2 hd 15 sec 96>
          /scsi_vhci/ssd@g50060e800000000000000277000000174
Specify disk (enter its number):
```

5. **Verify the Sun StorEdge Traffic Manager tool is configured with two primary and ONLINE paths to each LUN.**

   Repeat this step for all the LUNs and then configure them as needed.

```
# luxadm display /dev/rdsk/c2t50060E80000000000000277000000174d0s2
DEVICE PROPERTIES for disk: /dev/rdsk/c2t50060E80000000000000277000000174d0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               HITACHI
  Product ID:           OPEN-9      -SUN
  WWN(Node):            50060e8003277010
  WWN(Port A):          50060e8003277010
  WWN(Port B):          50060e8003277000
  Revision:             2101
  Serial Num:           045027700174
  Unformatted capacity: 7042.500 MBytes
  Write Cache:          Enabled
  Read Cache:           Enabled
    Minimum prefetch:   0x0
    Maximum prefetch:   0x0
  Device Type:          Disk device
  Path(s):
  /dev/rdsk/c2t50060E80000000000000277000000174d0s2
  /devices/scsi_vhci/ssd@g50060e80000000000000277000000174:c,raw
   Controller           /devices/pci@9,700000/SUNW,qlc@2/fp@0,0
     Device Address     50060e8003277010,8c
     Class              primary
     State              ONLINE
   Controller           /devices/pci@9,600000/SUNW,qlc@1/fp@0,0
     Device Address     50060e8003277000,8c
     Class              primary
     State              ONLINE
```

Glossary

This glossary defines SAN teminology 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.

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, 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.

Inter-Switch 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 are not supported in the SAN 4.0 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 are not supported in the SAN 4.0 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.

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