Sun StorEdge™ SAN Customer Troubleshooting Guide

Release 3.1

Sun Microsystems, Inc.
4150 Network Circle
Santa Clara, CA 95054
U.S.A. 650-960-1300

Part No. 816-2953-11
May, 2002 Revision A

Send comments about this document to: docfeedback@sun.com

Contents

Preface

This document provides guidance for locating and troubleshooting problems for the Sun StorEdge network FC switches and Brocade Silkworm Fibre Channel switches.

Refer to the Sun Network Storage Product Page at `http://www.sun.com/storage/san/` for the most recent product information and recent product patches. News about changes to SAN-supported configurations and product update patches are available at this site. Copies of product documentation are also available here.

The Sun StorEdge network FC switches operate with three Sun StorEdge storage platforms: the Sun StorEdge A3500FC array, the Sun StorEdge A5200 array, and the Sun StorEdge T3 array. Check `SunSolve.sun.com` for current patch levels on your storage platforms.

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

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

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

Useful Websites

`http://cpre-amer.west/nws/`

Customer Problem Resolution Engineering site for the Sun StorEdge T3 Array

`http://sse.ebay.sun.com/interop`

SAN Interoperability Homepage and Interoperability Support Matrix

`http://www.sun.com/storage/san`

External Sun SAN program website

Useful Email Aliases

- t3mps@east - Sun StorEdge T3 Array Multiplatform support
- purple-support@west - General Sun StorEdge T3 Array support
- switch-support@west - Sun StorEdge Fibre Channel Switch support

Links to Sun Download Center for software packages

`http://www.sun.com/storage/t3/nonsun_support.html`

For Multiplatform Failover Drivers

`http://www.sun.com/storage/san`

For SAN packages and documentation

Related Sun Documentation

Product	Application	Title	Part Number
SANbox	Installer / User's information	*SANbox-16STD Fibre Channel Switch Installer's/User's Manual*	875-3141-10
		SANbox-8 Fibre Channel Switch Installer's/User's Manual	875-3142-10
		SANbox 8/16 Switch Management User's Manual	875-3060-10
		SANbox 8/16 Switch Management User's Manual	875-3143-10
	Latest Information Software	*Sun StorEdge Network FC Switch-8 and Switch-16 Release Notes*[1]	816-0842-10
Arrays	Latest Information	*Sun StorEdge A5000 Product Notes*[1]	805-1018-13
		Sun StorEdge T3 Disk Tray Release1 Notes	806-1497-12
	Late news - Best Practices	*Sun StorEdge A3x00/A3500 FC Best Practices Guide*	806-6419-10
	Latest Information	*Sun StorEdge A3500FC Release Notes*[1]	805-7758-11
Other Components	Sun StorEdge T3 Array / Switch	*Sun StorEdge T3Array to Sun StorEdge Network FC Switch Configuration Guide*	816-2096-10
	Traffic Management	*Sun StorEdge Traffic Manager Installation and Configuration Guide*	816-1420-10
	Hub information	*Sun StorEdge FC-100 Hub Installation and Service Manual*	805-0315-12
Storage Cabinet	Rackmount information Online	*Rackmount Placement Matrix*	805-4748-xx
Software	RAID software	*RAID Manager 6.22 User's Guide*	806-0478-10
manpage	cfgadm utility	*cfgadm_fp*	

1. Check for the latest updates at http://sunsolve.sun.com.

Accessing Sun Documentation Online

A broad selection of Sun system documentation is located at:

`http://www.sun.com/products-n-solutions/hardware/docs`

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

`http://docs.sun.com`

Sun Welcomes Your Comments

Sun is interested in improving its documentation and welcomes your comments and suggestions. You can email your comments to Sun at:

`docfeedback@sun.com`

Please include the part number (for example, *816-2953-10*) of your document in the subject line of your email.

CHAPTER 1

Introduction

Scope

The scope of this document includes the switch and interconnections (HBA, GBIC, cables) on either side of the switch, as shown in the following diagram.

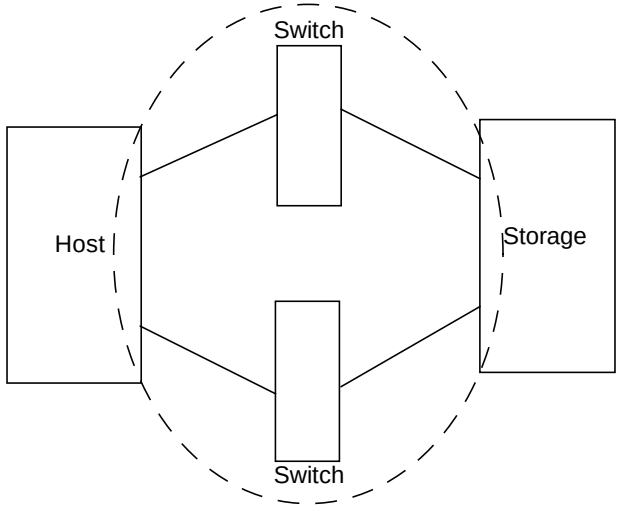


FIGURE 1-1 Switch and Interconnections

This troubleshooting guide is intended to provide basic guidelines that can be used for isolating problems for supported configurations identified in the *Sun StorEdge SAN release 3.1 Installation and Configuration guide.* T

The Storage Automated Diagnostic Environment software package is required to support the configurations in this document.

Additional information and resources are available at `http://www.sun.com/storage/san` or `http://sunsolve.sun.com`. These websites contain information on software versions and provide necessary patches.

Features

This release of the Sun StorEdge SAN has many new features. This section lists the major changes and gives a brief description of each.

Fabric Ports

All ports on the switch are capable of being configured as fabric ports. This allows public devices to connect to the switch. Currently, Sun supports only the host bus adapters, running the correct version of FCODE and Leadville driver stack, to be configured as F Ports. No storage can be configured on a fabric port. Also, the switch will handle host bus adapters being connected via FL-Ports (Public Loop), which is currently not supported. The only supported configuration is F Ports (point-to-point) for public host bus adapters. It should be noted that the switch default setting is FL-Port and therefore must be changed at the time of installation to the supported F-Port for HBAs.

Fabric ports register with the name server on the switch.

You can still configure the host bus adapters as private loop devices. By placing the switch port into SL-Port mode, the host bus adapter will configure itself as a private loop device, able to be zoned with other private loop only devices; for example, Sun StorEdge A5200 arrays or Sun StorEdge A3500FC arrays.

Translative Loop

Translative Loop Ports (TL Ports) allow private loop devices to communicate to off-loop devices, such as host bus adapters connected to F Ports and private devices on other TL Ports. You can achieve this connectivity by having a translation function at each TL Port, which translates private frames to public frames and vice versa.

- Devices connected to TL Ports are registered with the name server on the switch.
- Devices connected to TL Ports cannot communicate with devices on SL Ports.

In the current phase, only the Sun StorEdge T3 array is supported on TL Ports.

Refer to the *SANbox-8 Fibre Channel Switch Installer's and User's Manual*, rev. 5 for more information.

Name Server Zoning

Name server zones allow the division of the fabric (one or more switch chassis) into as many as 256 fabric-wide zones that define which ports or devices receive name server information. If hard zones are enabled, name server zones will not communicate across hard zone boundaries.

- A name server zone is only valid if enabled.
- Only ports that register with the name server can be in a name server zone (that is, F/FL Ports and TL Ports).
- If name server zones are used on a switch in which hard zones are defined, the name server zones must not overlap hard zone boundaries.
- Name server zones operate fabric-wide (regardless of fabric configuration, but within hard zone boundaries).
- There is a maximum of 256 name server zones with a maximum of 16 name server zones per hard zone.
- The switch allows ports to be in more than one name server zone; however, this is not supported in this phase.
- When a port receives name server information, it will receive information about all ports in the name server zone in which the port is assigned.
- All ports not defined as being part of any enabled name server zone are name server zone *orphans*. Name server zone orphans are all listed in the Name Server Orphan Zone.

Cascading (T Ports)

In the Sun StorEdge SAN release 3.1, switches are allowed to be cascaded together. Cascading is allowed with either shortwave or longwave GBICs. Use of shortwave GBICs allows a higher port count in a local configuration. The use of longwave GBICs and long haul fiber optics allows users to reach geographically separated storage and servers, perhaps for disaster recovery purposes.

T Ports (Trunking Ports) provide the switch-to-switch connections. Any F or FL port is capable of being configured as a T Port, once the physical connection is made. No user intervention is required, other than ensuring the port type is either F or FL before connecting the switches.

You can cascade a maximum of two switches with one ISL hop between the initiator and target, with distances of 10 meters and 10 kilometers. ISL hops do not include the connections between hosts and switches or between switches and storage.

For further information, please refer to the *Sun StorEdge Network FC Switch-8 and Switch-16 Configuration Supplement—Disaster Tolerant Configurations, 816-3652-10*.

`cfgadm_fp`

In order to have fabric devices seen by the operating system, they must be configured through the `cfgadm` framework. A fabric plug-in to `cfgadm` is used to attach fabric (public) devices. Private loop devices are still configured by the Leadville driver and require no user intervention.

Examples

```
# cfgadm -al

Ap_Id                          Type         Receptacle   Occupant     Condition
c0                             scsi-bus     connected    configured   unknown
c0::dsk/c0t0d0                 disk         connected    configured   unknown
c0::dsk/c0t1d0                 disk         connected    configured   unknown
c1                             scsi-bus     connected    configured   unknown
c1::dsk/c1t6d0                 CD-ROM       connected    configured   unknown
c2                             fc-fabric    connected    unconfigured unknown
c2::210000e08b030926           unknown      connected    unconfigured unknown
c2::50020f23000003d5           disk         connected    unconfigured unknown
c3                             fc-fabric    connected    unconfigured unknown
c3::210000e08b032901           unknown      connected    unconfigured unknown
c3::50020f23000003c5           disk         connected    unconfigured unknown
```

A Sun StorEdge T3 array partner pair is connected and showing up on c2 and c3. Currently, the Sun StorEdge T3 arrays are unconfigured, and not available to Solaris.

```
# cfgadm -c configure c2::50020f23000003d5
# cfgadm -al

Ap_Id                          Type         Receptacle   Occupant     Condition
c0                             scsi-bus     connected    configured   unknown
c0::dsk/c0t0d0                 disk         connected    configured   unknown
c0::dsk/c0t1d0                 disk         connected    configured   unknown
c1                             scsi-bus     connected    configured   unknown
c1::dsk/c1t6d0                 CD-ROM       connected    configured   unknown
c2                             fc-fabric    connected    configured   unknown
c2::210000e08b030926           unknown      connected    unconfigured unknown
c2::50020f23000003d5           disk         connected    configured   unknown
c3                             fc-fabric    connected    unconfigured unknown
c3::210000e08b032901           unknown      connected    unconfigured unknown
c3::50020f23000003c5           disk         connected    unconfigured unknown
```

Multiple controllers can be configured in the same command line to save time.

```
# cfgadm -c configure c2 c3
```

Unconfiguring devices is similar.

```
# cfgadm -c unconfigure c2 c3
```

See the *Sun StorEdge SAN release 3.1 Installation and Configuration Guide* or the `cfgadm_fp`(1M) manpage for further details.

Sun StorEdge Traffic Manager

Sun StorEdge Traffic Manager provides N-way multipath access to I/O devices, as well as path management capabilities. Sun StorEdge Traffic Manager is released as a component of Solaris. The fundamental change that Sun StorEdge Traffic Manager delivers is to restructure the device tree to permit a multipath device to be represented as a single device instance in Solaris.

Sun StorEdge Traffic Manager has various path states to show how the system is currently running.

- Primary Path: Path to LUN/disk through controller that it resides on.
- Secondary Path: Path to LUN/disk through alternate controller

Path States

ONLINE	Path is available and will be used for I/O
STANDBY	Path is available, but will not be used for I/O
OFFLINE	Path is unavailable

Note – Currently, only the Sun StorEdge array uses the ONLINE/STANDBY convention. The Sun StorEdge A5200 array has an ONLINE/ONLINE state.

Both paths in a dual connected Sun StorEdge A5200 array will be used for I/O. However, there is currently no way to manually failover a Sun StorEdge A5200 array to use another path. Sun StorEdge Traffic Manager is currently not supported for the Sun StorEdge A3500FC array.

Sun StorEdge SAN release 3.1 Features for Sun StorEdge Traffic Manager

- Dynamic N-Path multipathing with automatic discovery of new paths
- Support for Sun StorEdge T3 arrays and Sun StorEdge A5200 arrays (no Sun StorEdge A3500FC support)
- Automatic failover
- Enable/Disable globally, or per HBA
- `luxadm` changes to display multipathing information and manual failover/failback
- `cfgadm`(1M) support
- Dynamic reconfiguration

Sun StorEdge Traffic Manager may be enabled/disabled globally, through the `/kernel/drv/scsi_vhci.conf` file, or on a per host bus adapter port basis, through the `/kernel/drv/qlc.conf` file.

CODE EXAMPLE 1-1 /kernel/drv/scsi_vhci.conf

```
Copyright (c) 2001 by Sun Microsystems, Inc.
All rights reserved.#
pragma ident   "@(#)scsi_vhci.conf     1.2     01/03/19 SMI"

name="scsi_vhci" class="root";

Sun StorEdge Traffic Manager Global enable/disable configuration
possible values are Sun StorEdge Traffic Manager-disable="no" or Sun StorEdge Traffic
Manager-disable="yes"

Sun StorEdge Traffic Manager-disable="no";

Load Balancing global configuration
possible values are load-balance="none" or load-balance="round-robin"

load-balance="round-robin";
```

For individual host bus adapter control, first retrieve a list of Fibre Channel adapters on the host.

```
# ls -l /dev/fc

total 12
lrwxrwxrwx   1 root     root          49 May  3 15:43 fp0 ->
../../devices/pci@6,4000/SUNW,qlc@2/fp@0,0:devctl
lrwxrwxrwx   1 root     root          49 May  3 15:43 fp1 ->
../../devices/pci@6,4000/SUNW,qlc@3/fp@0,0:devctl
lrwxrwxrwx   1 root     root          55 May  3 15:43 fp2 ->
../../devices/pci@6,4000/pci@4/SUNW,qlc@4/fp@0,0:devctl
lrwxrwxrwx   1 root     root          55 May  3 15:43 fp3 ->
../../devices/pci@6,4000/pci@4/SUNW,qlc@5/fp@0,0:devctl
lrwxrwxrwx   1 root     other         55 May 10 11:56 fp4 ->
../../devices/pci@6,2000/pci@1/SUNW,qlc@4/fp@0,0:devctl
lrwxrwxrwx   1 root     other         55 May 10 11:56 fp5 ->
../../devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0:devctl
```

Then modify the `/kernel/drv/qlc.conf` file as shown in the example.

```
name="qlc" parent="/pci@6,4000" unit-addres="2" Sun StorEdge Traffic Manager-disable=
"yes"
```

This would disable the single port HBA denoted (in this example) by `fp0`.

To disable one port on a dual port card (denoted by `fp2-fp5`):

```
name="qlc" parent="/pci@6,2000/pci@1" unit-address="5" Sun StorEdge Traffic Manager-
disable="yes"
```

This would disable the HBA port denoted by `fp5`.

A T3 lun with Sun StorEdge Traffic Manager enabled would look similar to this:

CODE EXAMPLE 1-2 ls -l

```
/dev/rdskc6t60020F20000003C53ABF4A1C000915F4d0s2 ->
../../devices/scsi_vhci/ssd@g60020f20000003c53abf4a1c000915f4:c,raw
```

```
# luxadm display /dev/rdsk/c6t60020F20000003C53ABF4A1C000915F4d0s2

DEVICE PROPERTIES for disk:

/dev/rdsk/c6t60020F20000003C53ABF4A1C000915F4d0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SUN
  Product ID:           T300
  WWN(Node):            50020f20000003c5
  WWN(Port A):          50020f23000003c5
  WWN(Port B):          50020f23000003d5
  Revision:             0117
  Serial Num:           096510
  Unformatted capacity: 119514.500 MBytes
  Write Cache:          Enabled
  Read Cache:           Enabled
    Minimum prefetch:   0x0
    Maximum prefetch:   0x0
  Device Type:          Disk device
  Path(s):
  /dev/rdsk/c6t60020F20000003C53ABF4A1C000915F4d0s2
  /devices/scsi_vhci/ssd@g60020f20000003c53abf4a1c000915f4:c,raw
   Controller           /devices/pci@6,4000/SUNW,qlc@2/fp@0,0
     Device Address     50020f23000003d5,0
     Class              secondary
     State              STANDBY
   Controller           /devices/pci@6,4000/SUNW,qlc@3/fp@0,0
     Device Address     50020f23000003c5,0
     Class              primary
     State              ONLINE
```

It would have two physical paths associated with it as well. Note the `Controller` lines. Also note the primary/secondary paths, as well as the STANDBY/ONLINE states.

A Sun StorEdge A5200 array disk would look similar to the following example. In the case of A5200s, both paths are primary and ONLINE.

```
# luxadm display /dev/rdsk/c6t200000203719EB58d0s2

DEVICE PROPERTIES for disk: /dev/rdsk/c6t200000203719EB58d0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SEAGATE
  Product ID:           ST39103FCSUN9.0G
  WWN(Node):            200000203719eb58
  WWN(Port A):          210000203719eb58
  WWN(Port B):          220000203719eb58
  Revision:             034A
  Serial Num:           LS4563930000
  Unformatted capacity: 8637.338 MBytes
  Read Cache:           Enabled
    Minimum prefetch:   0x0
    Maximum prefetch:   0xffff
  Location:             In the enclosure named: DPL4
  Device Type:          Disk device
  Path(s):
  /dev/rdsk/c6t200000203719EB58d0s2
  /devices/scsi_vhci/ssd@g200000203719eb58:c,raw
   Controller           /devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0
     Device Address     220000203719eb58,0
     Class              primary
     State              ONLINE
   Controller           /devices/pci@6,2000/pci@1/SUNW,qlc@4/fp@0,0
     Device Address     210000203719eb58,0
     Class              primary
     State              ONLINE
```

Refer to the *Sun StorEdge Traffic Manager Installation and Configuration Guide* for further details on installing and administering Sun StorEdge Traffic Manager.

CHAPTER 2

Configurations

This chapter contains information and instructions for configuring your Sun StorEdge or Brocade Silkworm switches with one or more hosts and storage.

Sun StorEdge Network FC Switch-8 and Switch-16 Supported Configurations

To support a high-availability environment, use these configurations to ensure switch redundancy. See the example diagrams later in this chapter for more information on the supported configurations.

Hosts

- Sun Enterprise™ E220R, E250, E420R, and E450 server hosts
- Sun Enterprise E10000 server host
- Sun Enterprise E3000-E6000 server hosts
- Sun Enterprise E3500-E6500 server hosts
- Sun Enterprise F3800 server host (only with the Sun StorEdge CPCI Dual Fibre Channel Adapter)
- Sun Enterprise F4810 server host
- Sun Enterprise F6800 server host

Host/Operating Envrironment Rules

- All hosts in a zone must be running Solaris 8 , upgrade 6, Release 10/01 operating environment with all appropriate patches installed.

  You can download the patches from Sunsolve.
- Mixing PCI Dual Fibre Channel Network Adapter and PCI single Fibre Channel Network Adapter HBAs in the same switch zone is supported.
- Mixing an Sbus host (with a PCI card) and PCI hosts within the same zone is supported. You must be using PCI dual Fibre Channel Network Adapter and PCI single Fibre Channel Network Adapter HBAs.

Arrays

- Sun StorEdge A5200 array
- Sun StorEdge T3 array
- Sun StorEdge A3500FC array

Supported Host Bus Adapters

- PCI Single Fibre Channel network adapter
- PCI Dual Fibre Channel network adapter
- CPCI Dual Fibre Channel network adapter

Supported Hardware

In a single switch configuration, the switch is connected to the host through a fiber optic cable to a Sun StorEdge PCI Fibre Channel Network Adapter. The other ports of the switch are connected to storage devices through a fiber optic cable. In a cascaded configuration, two switches are connected together by way of InterSwitchLinks (ISL). A hard zone and a name server zone span both switches.

TABLE 2-1 Supported Hardware

Part Number	Description
540-4026	Sun StorEdge A3500FC FC-AL controller for Sun StorEdge A3500FC Array (with Sun StorEdge D1000 tray)
540-4027	Sun StorEdge A3500FC FC-AL controller for Sun StorEdge A3000 array (with Sun StorEdge RSM tray)
950-3475	Sun StorEdge T3 Array
X4748A	Sun StorEdge PCI Dual Fibre Channel Network Adapter
X6727A	Sun StorEdge PCI Dual Fibre Channel Network Adapter+
x6799A	Sun StorEdge PCI Single Fibre Channel Network Adapter
	Sun StorEdge CPCI Dual Fibre Channel Network Adapter
X6731A	Gigabit Interface Converter (GBIC)
X7637A	Long Wave (LW) GBIC
X978A	15m fiber optic cable
X6746A	Sun StorEdge FC switch-8 Switch
SG-XSW16-32P	Sun StorEdge network FC switch-16 Switch
	Sun StorEdge L180 Tape Library with StorageTek 9840 tape drives
	Sun StorEdge L700 Tape Library with StorageTek 9840 tape drives

Brocade Supported Configurations

The Brocade Silkworm switch configurations and the Sun switch configurations follow the same rules for maximum number of initiators, supported number of arrays per zone, and other hardware-specific information.

Brocade Silkworm switch configurations and Sun switch configurations have different minimum operating system (OS) and patch requirements, shown in TABLE 2-2.

TABLE 2-2 SAN Supportability Matrix

Host OS	OS Level	Patches or Service Pack	Server Type	HBAs	HBA Firmware	Sun Multipath Driver Patches
Solaris	8 u6 (10/01)	Patches: Recommended security patches. Leadville unbundled packages: SUNWsan SUNWcfpl SUNWcfplx	Sun: Ex20 Ex50 Ex80R Ex500 Fx800 F4810 E10000	Amber x6799A	1.13	Leadville 5C 111095-07 111096-03 111097-07 111412-07 111413-07 111846-03 111847-01
				Crystal+ x6727A	1.13	
				Diamond x6748A	1.13	
				Ivory x6757A	1.13.06	
		Volume Manager 3.2				111904-04 111909-04

TABLE 2-3 Disk Array Supportability Matrix

Host	Disk Arrays	Disk Firmware	Dynamic addition of target to a zone. Add First/Additional	Max targets per zone
Solaris 8	T3A WG/ES	1.18	Yes/Yes	8/4
	T3B WG/ES	2.01	Yes/Yes	8/4
	A3500FC	03.01.03.54 or later	No/Yes	4
	FC Tape L180	Drive Firmware StorageTek 9840: Rev. 28.127	No/Yes	4

TABLE 2-4 Fibre Channel Switch Supportability Matrix

Host	FC Switches	Firmware	Switch Software	Licenses
Solaris 8	Brocade Silkworm 2400	v2.6.0a	Fabric OS v2.6.0a	Zoning Quickloop Webtools
	Brocade Silkworm 2800	v2.6.0a	Fabric OS v2.6.0a	Zoning Quickloop Webtools
	Brocade Silkworm 3800	v3.0.2a	Fabric OS v3.0.2a	Zoning Quickloop Webtools

Notes:

1. Brocade Silkworm 3800 FC Switches are supported in 1 GB mode only.
2. Brocade Silkworm 2400, 2800, and 3800 FC Switches may be intermixed. Interoperability with other vendor switches is not supported at this time.

TABLE 2-5 Applications/Utilities Supportability Matrix

Name	Version	Patches
VERITAS Volume Manager	3.2 GA	111413-05, 111904-04, 111909-04
SUNWstade	2.0	112580-01

QuickLoop

QuickLoop (QL) is a feature of the Brocade Silkworm switches that allows hosts with host bus adapters (HBAs) that are not fully Fabric-aware to communicate with other devices attached to the switch. In addition, QL allows switches to replace hubs in a private loop environment. QL is a separately licensed product.

Note – For the Brocade Sun StorEdge SAN 3.1 phase, Sun StorEdge A5200 arrays and Sun StorEdge A3500FC arrays still need to be configured as a Quickloop port. Sun StorEdge T3 arrays do not need Quickloop, nor do Host Bus Adapters. Sun StorEdge T3 arrays will autoconfigure as L Ports and HBAs will autoconfigure as F Ports.

Features

- A maximum of 126 devices are allowed within a single QL.
- Ports (looplets) of up to two switches can be included in a QL.
- Each looplet supports transfer rates of up to 100 MB/sec and multiple, concurrent transfers can occur in multiple looplets.
- Hosts that are attached to QL can communicate to all devices in the same QL.
- Other public hosts can communicate to all devices in QL.
- Individual QL ports can be converted to a Fabric Loop Attach (FLA) compliant FL_Ports by disabling the QL mode on that port

Packages and Patches

The packages and patches found in TABLE 2-6 **are mandatory and must be installed in the order listed.** The assumption is that you are starting from an updated Solaris 8 (update 6, 10/01) installation.

Refer to the most current *Sun StorEdge SAN release 3.1 Release Notes* and *Sunsolve* for the most recent patches and packages beyond the levels listed below.

TABLE 2-6 Solaris 8 6/01 Minimum Required Packages and Patches

Patch or Package	Solaris 8 Recommended and Security Patches
SUNWsan	SAN Foundation package
SUNWcfpl	cfgadm plug-in 32-bit package
SUNWcfplx	cfgadm plug-in 64-bit package
111412-07	Sun StorEdge Traffic Manager patch
111095-07	fcp/fp/fc1t/usoc drivers patch
111096-03	fcip driver patch
111097-07	qlc driver patch
111413-07	luxadm/libg_fc/liba5k patch
111846-03	cfgadm_fp plugin patch
111847-01	SANWsan patch; SAN Foundation Kit patch
SUNWstade 112580-01	Storage Automated Diagnostic Environment package Brocade patch
SUNWsmgr	SANsurfer Switch Manager 2.08.22 package (Sun switches only)
111096-03	SANsurfer patch (Sun switches only)

Unbundled Software

For a list of unbundled software, refer to TABLE 2-7.

TABLE 2-7 Unbundled Software

Package	Minimum Revision	Minimum Patch (if any)
RAID Manager RM6	6.22	108553-09
Solstice Disk Suite	4.2.1	108693-04
Component Manager	2.2	
T3 Firmware	1.17b	See Early Notifier #14838
Switch Firmware	3.04.60	111096-03
SANsurfer GUI	2.08.30	111096-03
JAVA SDK/JDK	1.3.02	
PCI Single FC Host Adapter Fcode (x6799a)	1.12	See Early Notifier #14838
PCI Dual FC Host Adapter Fcode (x6727a)	1.12	See Early Notifier #14838
StorageTek 9840	1.28.126	
T3 Firmware	1.17b	
VERITAS Volume Manager	3.1.1 (SL Zones Only) 3.2 (Fabric)	111118-02
VERITAS File System	3.4	
Instant Image	3.0	
SNDR	3.0	
Alternate Pathing	2.3.1	110722-01 110432-04
Storage Automated Diagnostic Environment	2.0	T112580-01 (Brocade support)
VERITAS Netbackup	3.4	110539-04
Solstice Backup	6.0	
Sun Enterprise 3x00/4x00/5x00/6x00 Flash Prom	3.2.28	103346-29

TABLE 2-7 Unbundled Software

Sun Fire 3800/4800/4810/6800 Flash Prom	5.11.6	111346-02
E450 Flash Prom	3.22.0	106122-09
E250 Flash Prom	3.22.0	106530-06
E420R Flash Prom	3.29.0	109082-04

Note – The packages and/or patches listed in TABLE 2-7 may not be present in all configurations.

Array Storage Rules

The following tables specify the supported features of the Sun StorEdge T3 array, and the Sun StorEdge A3500FC array.

TABLE 2-8 Supported Features of the Sun StorEdge T3 Array

Feature	Supported
Cascading	Yes
Zone Type	Name Server zone[1], SL zone
Maximum number of arrays per SL zone	8
Maximum initiators per LUN	2
Maximum initiators per zone	2[2]

1. The host must be connected to the F-Port on the switch; Sun StorEdge T3 array must be connected to the TL port of the switch.
2. This implies 2 initiators (2 hosts) for simple arrays (T3WG), but 4 initiators (2 hosts) for a partner pair (T3ES). Eash host has one path to each of the Sun StorEdge T3 arrays in the partner pair.

The Sun StorEdge A3500FC array is not supported on a host that has the Sun StorEdge Traffic Manager enabled with Sun StorEdge Traffic Manager-supported devices or has Fabric devices connected.

TABLE 2-9 Supported Features of the Sun StorEdge A3500FC Array

Feature	Supported
Cascading	No
Zone Type	SL zone only
Maximum number of arrays per SL zone	4
Maximum initiators per SL zone	2

TABLE 2-10 Supported Features of Network-Attached Storage and SNDR

	Supported
Cascading	Fabric name server zone
Zone Type	Fabric name server zone (HBA as F-Port pt-to-pt)
Maximum device ports per zone	8[1,2]

1. With the PCI dual Fibre Channel Network Adapter+ HBA, only physical port 2 can be used for FCIP.
2. With the CPCI Dual Fibre Channel Network Adapter HBA, only physical port 1 can be used for FCIP.

Fibre Channel (FC) Tape Libraries

Both the L180 and L700 FC Tape Libraries require StorageTek 9840 FC tape drives. You must upgrade to the most recent software for each L180 or L700 FC-Tape unit.

You can configure either the Sun StorEdge L180 or L700 Tape Library with a switch.

- The Sun StorEdge L180 Tape Library requires one 16-port switch, configured as two 8-port zones
- The Sun StorEdge L700 requires a minimum of one 8-port switch and one 16-port switch
- The switch may be zoned to allow up to four hosts per zone
- You can configure a maximum of three StorageTek 9840FC drives per zone
- A library may share a zone with up to three drives
- A single zone cannot have more than one tape library

Switch Port Types

Port Type	Supported
SL Ports	Private loop (Sun StorEdge A5200 array, Sun StorEdge A3500FC array, Sun StorEdge T3 array, L180 or L700 FC-Tape device)
TL Ports	Translated loop (Sun StorEdge T3 array)
F Ports	Point-to-Point fabric (HBA)
T Ports	Trunk ports for switch cascading (ISLs) configured initially in Fabric port mode

Zones

Zoning allows the user to divide the switch ports into zones for more efficient and secure communication among functionally grouped nodes. There are several types of zones and a port may be defined in any. No port can be in all zone types simultaneously.

Hard Zones

Hard zones isolate ports through internal switch hardware; no communication across hard zone boundaries is possible. Hard zoning provides a way of isolating a set of ports from other ports within the fabric, desirable for security and resource dedication. Up to sixteen hard zones are possible within a fabric. A particular port may be placed in only one hard zone (no overlapping hard zones). If hard zones are enabled, name server zones and SL zones do not communicate across defined hard zone boundaries.

Name Server Zones

Name server zones allow the division of the fabric (one or more Switch chasses) into as many as 256 fabric-wide zones; each name server zone defines which ports or devices receive name server information, as defined by the FC-GS3 document. If hard zones are enabled, name server zones do not communicate across defined hard zone boundaries. Up to 16 name server zones are possible within one hard zone.

SL Zones

SL zones on the switch allow the division of the fabric into zones that define the ports that can communicate with each other. A particular port may be placed in only one SL zone (no overlapping SL zones). If hard zones are enabled, SL zones do not communicate across defined hard zone boundaries.

The switch does not prevent the user from creating an SL zone spanning more than one switch; however, the current release of the Sun StorEdge FC switch (3.1) requires the user not to extend the SL zone beyond one switch.

Zone Type	Supported Behavior
Hard Zone	Supports Segmented Loop zones and name server zones[1]
Segmented Loop zone	SL ports only
Name Server Zone	F Ports, T Ports, and TL Ports

1. The Segmented Loop zone and the name server zones cannot co-exist in the same hard zone.

Zoning Rules

- A minimum of one switch port per zone
- A maximum of 16 zones per 16-port switch
- A maximum of 30 zones for cascading 16-port to 16-port switches
- Only port-based zoning is supported.
- Zones are non-overlapping, except in cascading switches, in which ISL can be shared across name server zones that exist in the same hard zone.
- Server and storage may be in the same name server zone across interswitch links (ISLs) on separate switches. This enables you to have servers at a recovery site. It also means you can have local and remote storage in the same zone, so that storage can be mirrored at both locations.

Cascading Rules

- Hub-to-switch connectivity is not supported
- Maximum of two switches cascaded in series
- Maximum cascading distance is ten kilometers
- A maximum of two switches can be cascaded
- Both 8-port to 16-port and 16-port to 8-port switch connectivity is supported

Rules for Adding and Removing Devices While the Hosts are Online

You can add all initial and additional storage devices while the host is online, except the Sun StorEdge A3500 FC array, which requires rebooting the host on the first LUN addition.

In high availability configurations, where alternative methods to reconstruct the data exist, you can remove a device or path. Host volume management or multi-pathing software handles this device removal. For non-available configurations, you must ensure that no host application is configured to use the device.

In the case of a fabric configuration (name server zone), you must unconfigure the device on the host. This ensures that during the boot process the host does not attempt to probe this device to create device nodes.

You can add or remove a host without shutting down the SAN.

Guidelines for Configuration

Switches

For high-availability applications, configure two sets of switches in parallel.

Zones and Arrays

- Sun StorEdge T3 arrays support SL zones and name server zones (or zones in which a host has made a point-to-point Fabric connection to a switch and the Sun StorEdge T3 array is attached to a TL port).
- Do not mix different arrays in the same zone. A single zone can contain only Sun StorEdge A3500FC arrays, or only Sun StorEdge T3 arrays.
- You may configure a minimum of one port per zone
  For example, a 16-port switch can have a maximum of 16 zones.
- Zones cannot overlap (for example, a particular port can only belong to one zone). An exception to this rule is, even though ISL ports must be in separate name server zones, if the ISL ports are in the same hard zone, the nameserver zones can overlap.

Zones and Storage

- You can dynamically add storage to an SL zone, using `luxadm` procedures for the Sun StorEdge T3 arrays.
- Segmented Loop (SL) zones and name server zones (translated loop zones) must be in different hard zones on a switch.

TABLE 2-11 Arrays, Zones, and Initiators

Array	Maximum Arrays/Zone	Maximum Initiators/Zone
Sun StorEdge A3500FC array	4	2
Sun StorEdge T3 array	8 (8 Sun StorEdge T3WG or 6 Sun StorEdge T3ES)	2 for a single array, 4 for a partner pair

Configuration Examples

Single Host Connected to One Storage Array

Note – The Sun StorEdge A5200 array is not supported at this time.

FIGURE 2-1 shows one host connected through fiber-optic cables to one Sun StorEdge A3500FC controller module. Each controller module has two Fibre Channel ports.

FIGURE 2-2 shows one host connected through fiber-optic cables to one Sun StorEdge A5200 controller module. Each controller module has two Fibre Channel ports.

FIGURE 2-3 shows one host connected through fiber-optic cables to one Sun StorEdge T3 array partner pair.

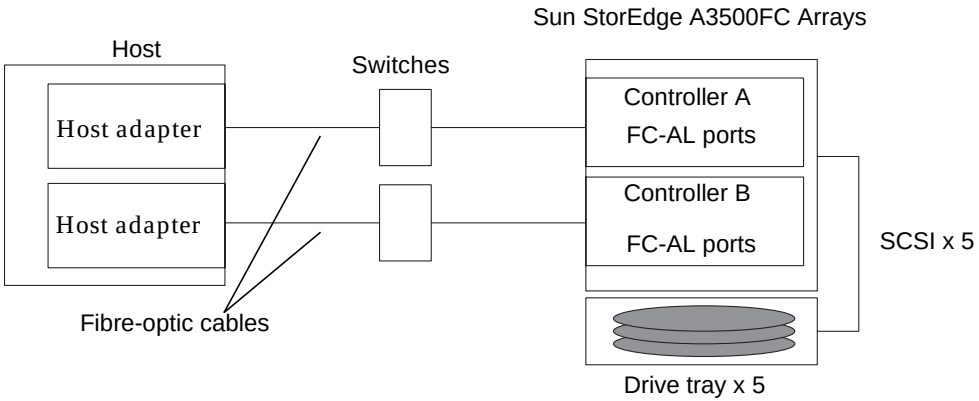


FIGURE 2-1 Single Host Connected to One Sun StorEdge A3500FC Controller Module

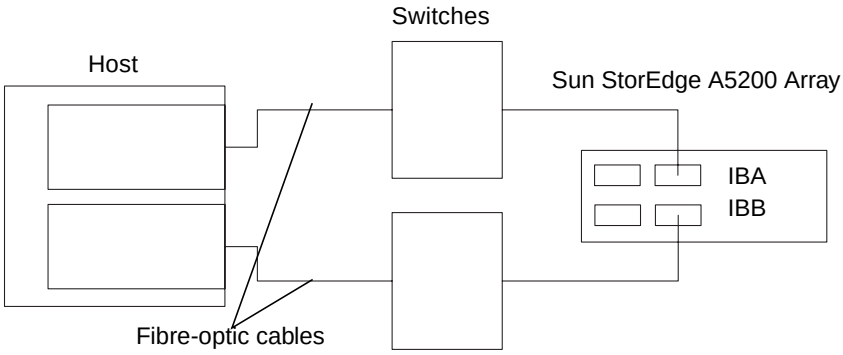


FIGURE 2-2 Single Host Connected to One Sun StorEdge A5200 Controller Module

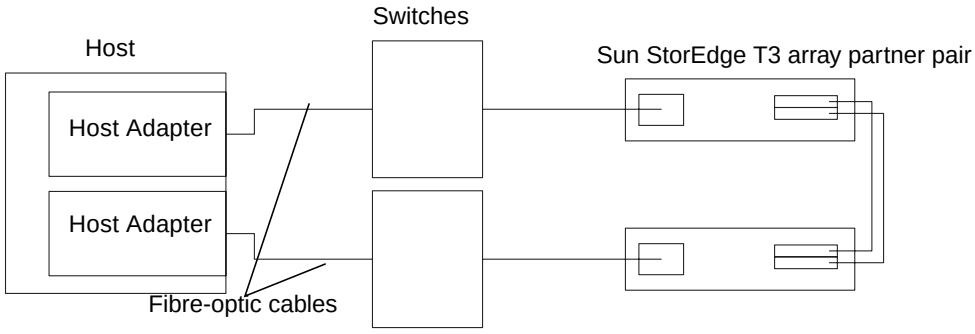


FIGURE 2-3 Single Host Connected to One Sun StorEdge T3 Array Partner Pair

Single Host Connected to Multiple Storage Arrays

FIGURE 2-4 shows one host connected through fiber-optic cables to Sun StorEdge A3500FC controller modules. You can connect controller modules in the same or separate cabinets.

FIGURE 2-5 shows one host connected to multiple Sun StorEdge A5200 arrays.

FIGURE 2-6 shows one host connected to Multiple Sun StorEdge A5200 arrays and a Single FC-Tape library.

FIGURE 2-7 shows a single host connected to multiple Sun StorEdge T3 array partner pairs.

FIGURE 2-8 shows a single host connected to muliple Sun StorEdge T3 arrays and multiple Sun StorEdge A3500FC arrays.

FIGURE 2-9 shows a single host with cascading switches connected to a Sun StorEdge T3 array and a local storage Sun StorEdge A5200 array and Sun StorEdge T3 array.

Note – You can attach different types of storage devices to the same switch, as long as the storage devices are on different zones.

Each controller that is connected to a switch must have a unique loop ID. Whenever you add a second controller to a switch, make sure that the loop ID of the controller being connected is different from the loop ID of any other controller currently connected to the same switch.

Caution – Make sure that the controller module of the array is split between two switches. For example, connect controller A to switch 1 and controller B to switch 2.

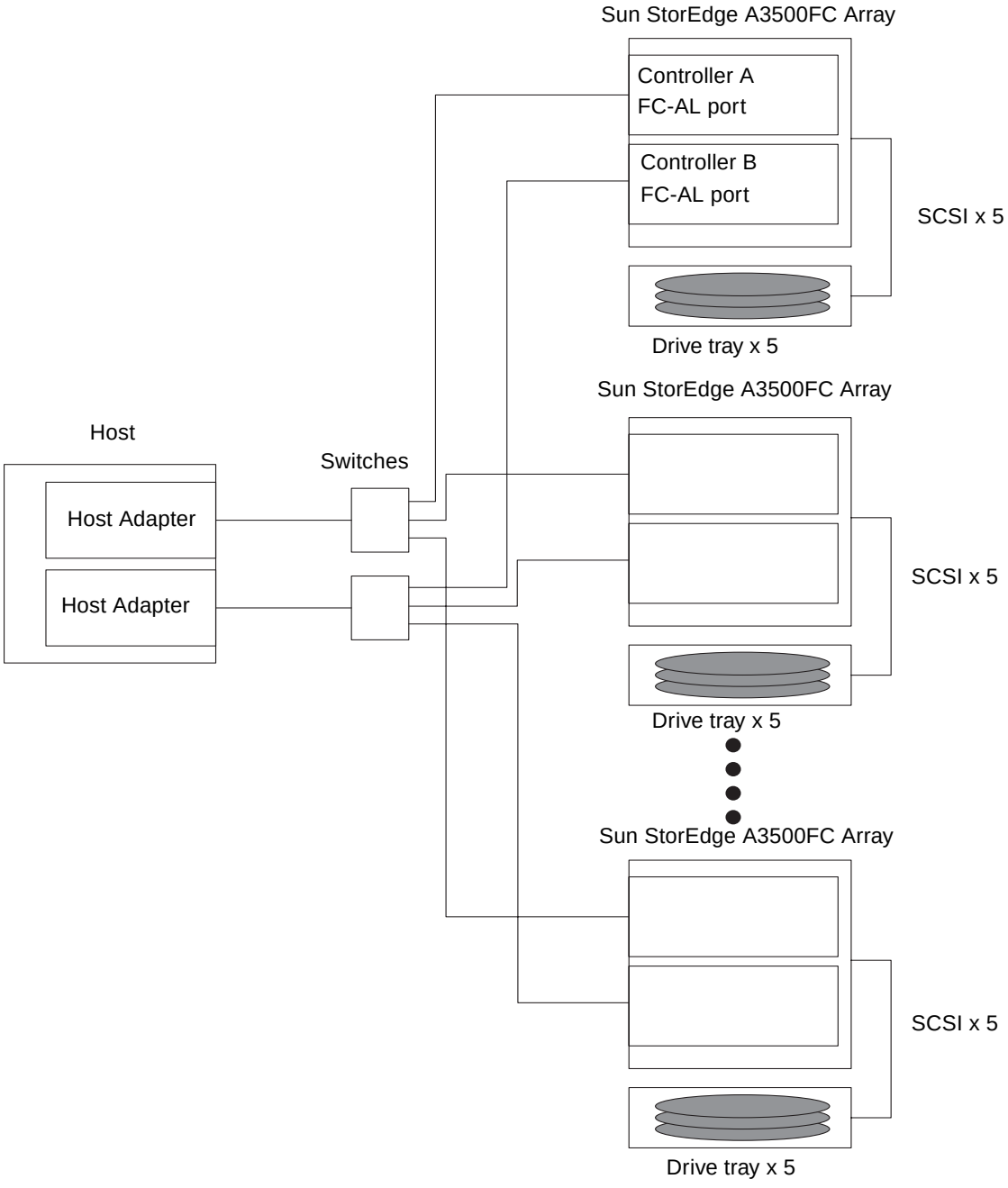


FIGURE 2-4 Single Host Connected to Multiple Sun StorEdge A3500FC Arrays

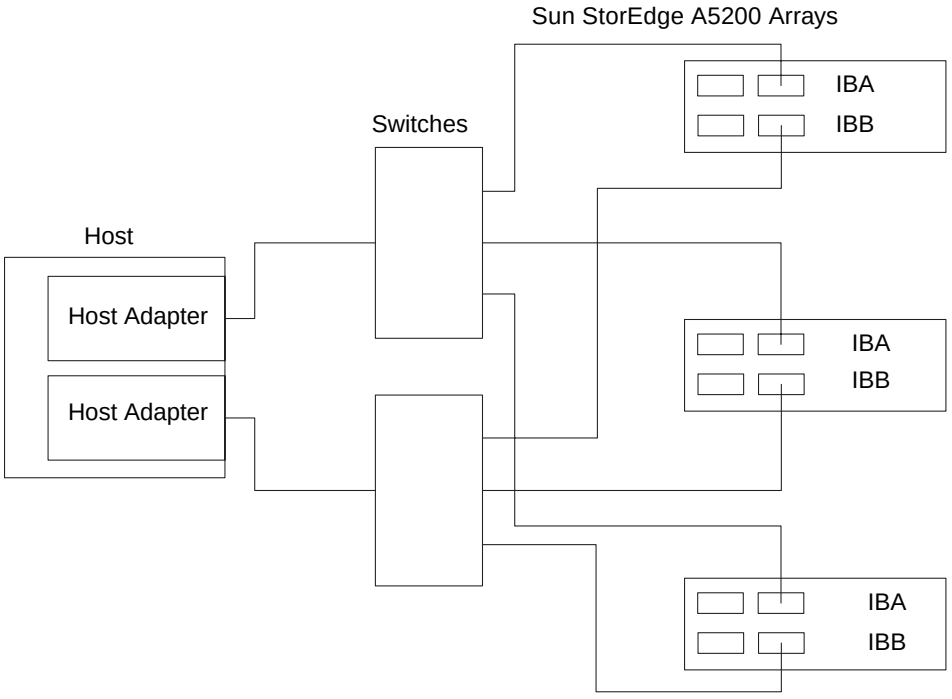


FIGURE 2-5 Single Host Connected to Multiple Sun StorEdge A5200 Arrays

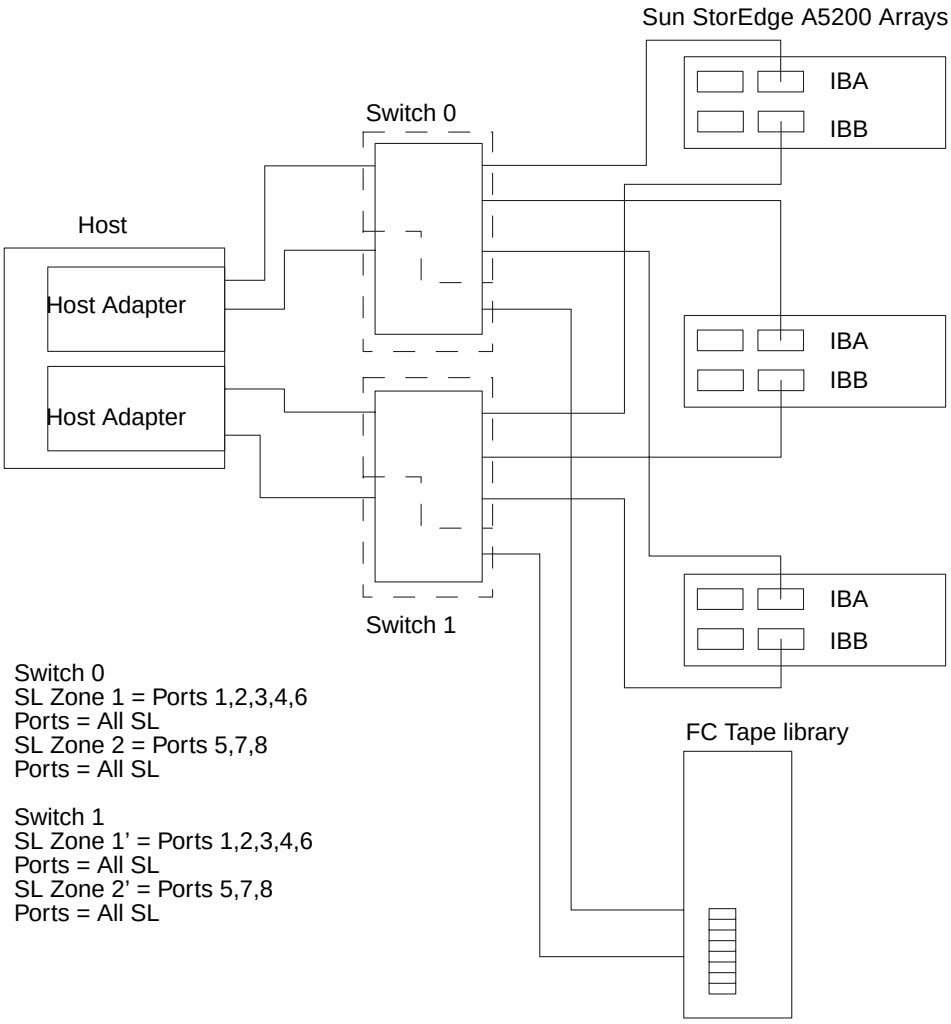


FIGURE 2-6 Single Host Connected to Multiple Sun StorEdge A5200 Arrays and a Single FC-Tape Library

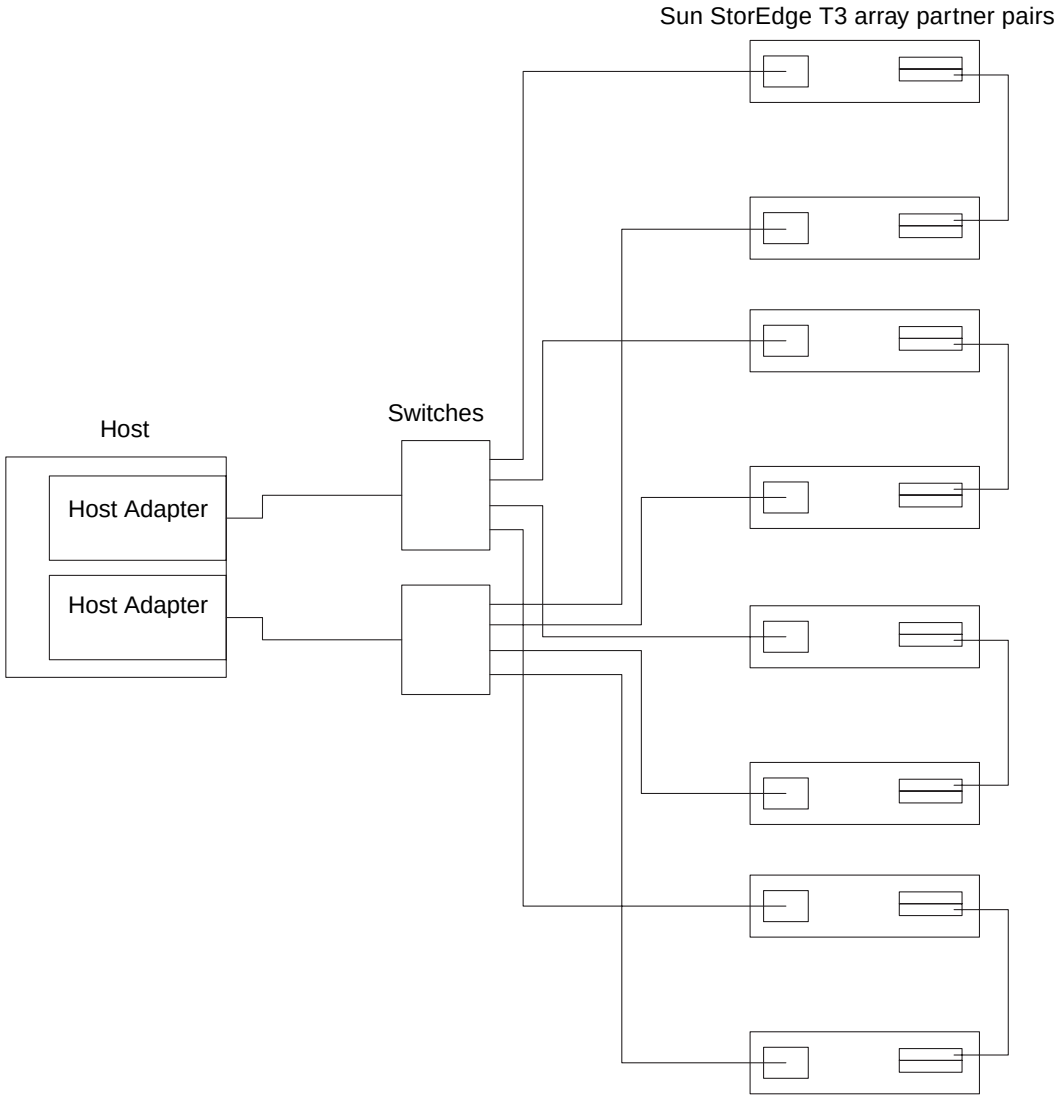


FIGURE 2-7 Single Host Connected to Multiple Sun StorEdge T3 Array Partner Pairs

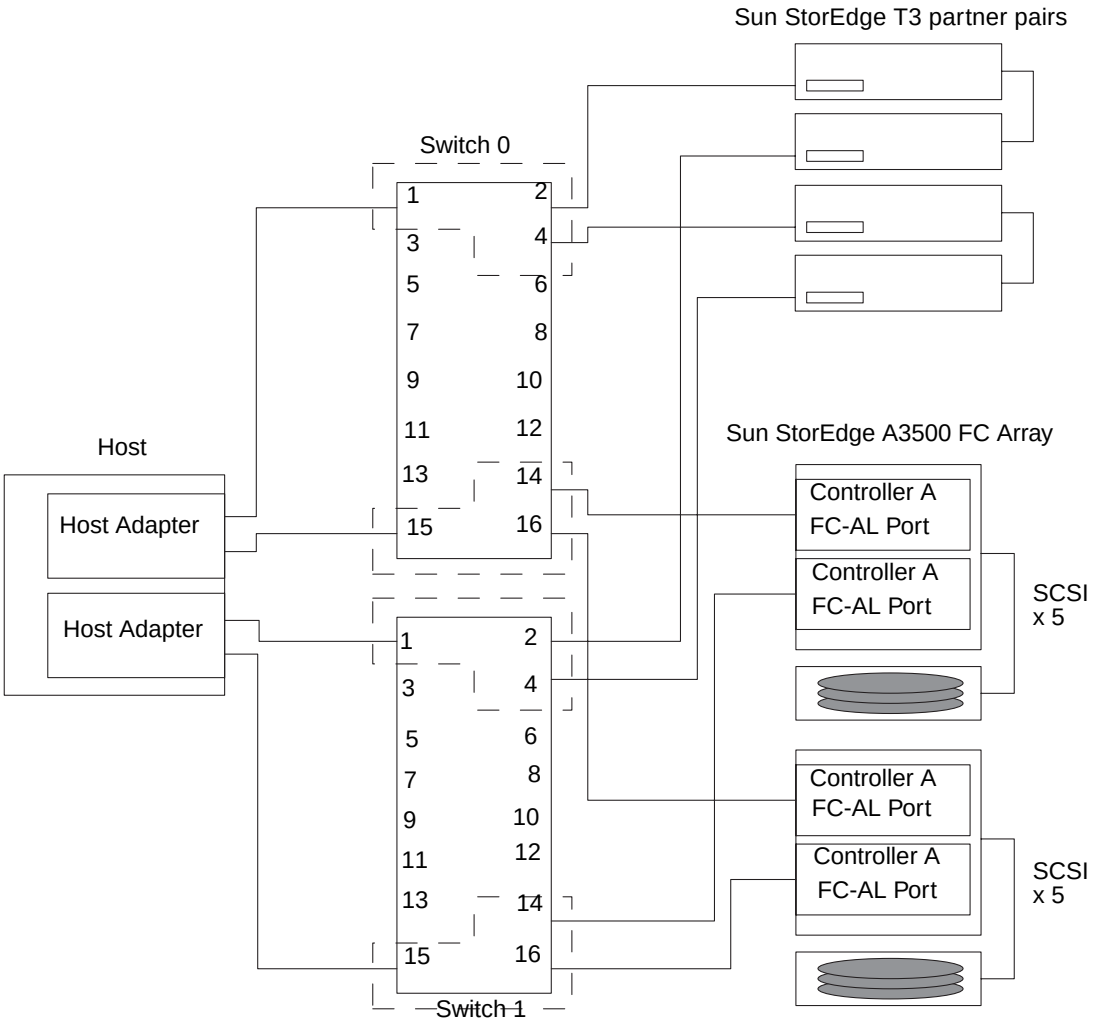


FIGURE 2-8 Single Host Connected to Multiple Sun StorEdge T3 Arrays and Multiple Sun StorEdge A3500FC Arrays

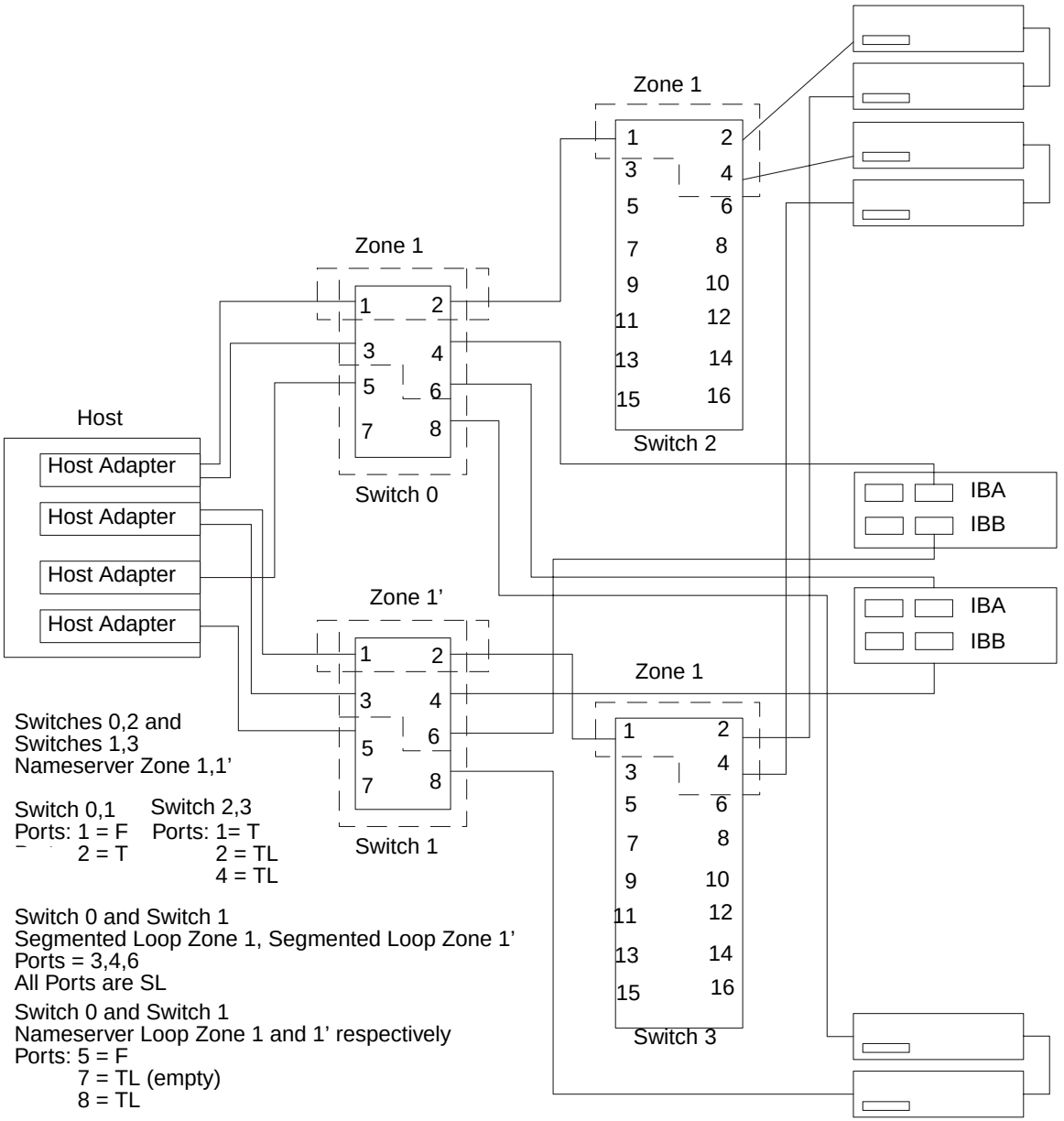


FIGURE 2-9 Single Host Cascading Switches Connected to Sun StorEdge T3 Array and Local Storage Sun StorEdge A5200 Array and Sun StorEdge T3 Array

Multihost

FIGURE 2-10 shows two hosts connect to a maximum of four Sun StorEdge A3500 FC arrays.

FIGURE 2-11 shows two hosts connected to three Sun StorEdge A5200 arrays.

FIGURE 2-12 shows two hosts connected to four Sun StorEdge T3 array partner pairs.

FIGURE 2-13 shows two hosts connected to a Sun StorEdge T3 array Partner Group in which each host maintains separate, non-shared storage.

FIGURE 2-14 shows a multihost configuration with cascading switches connected to an FC tape library, a Sun StorEdge T3 array, and a Sun StorEdge A5200 array.

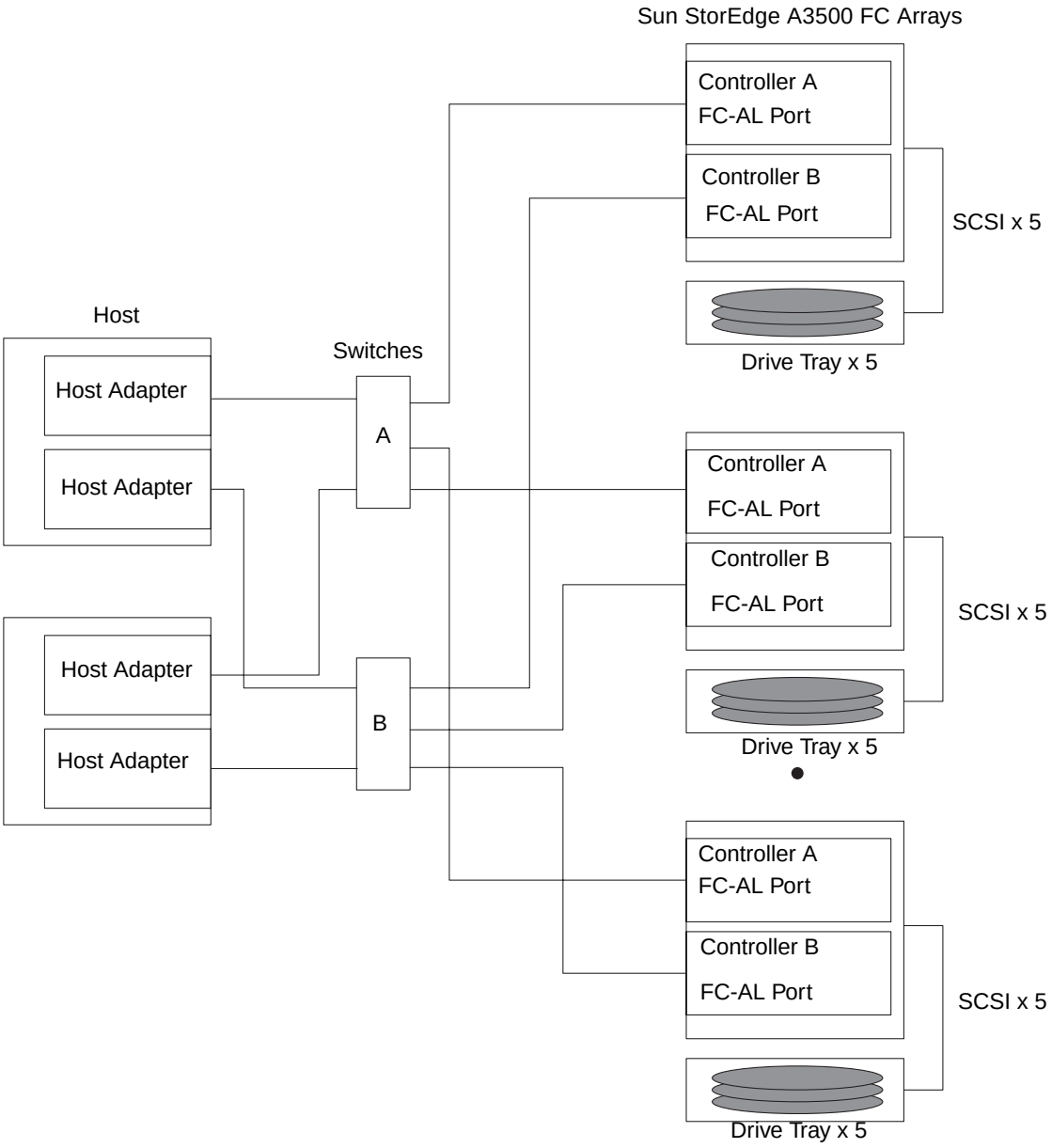


FIGURE 2-10 Two Hosts Connected to a Maximum of Four Sun StorEdge A3500FC Arrays

Note – You can attach different storage types to the same switch as long as the storage devices are on different zones.

Each controller that is connected to a switch must have a unique loop ID. Whenever you add a second controller to a switch, make sure that the loop ID of the controller being connected is different from the loop ID of any other controller currently connected to the same switch.

Caution – Ensure that the controller modules are not connected to the same switch.

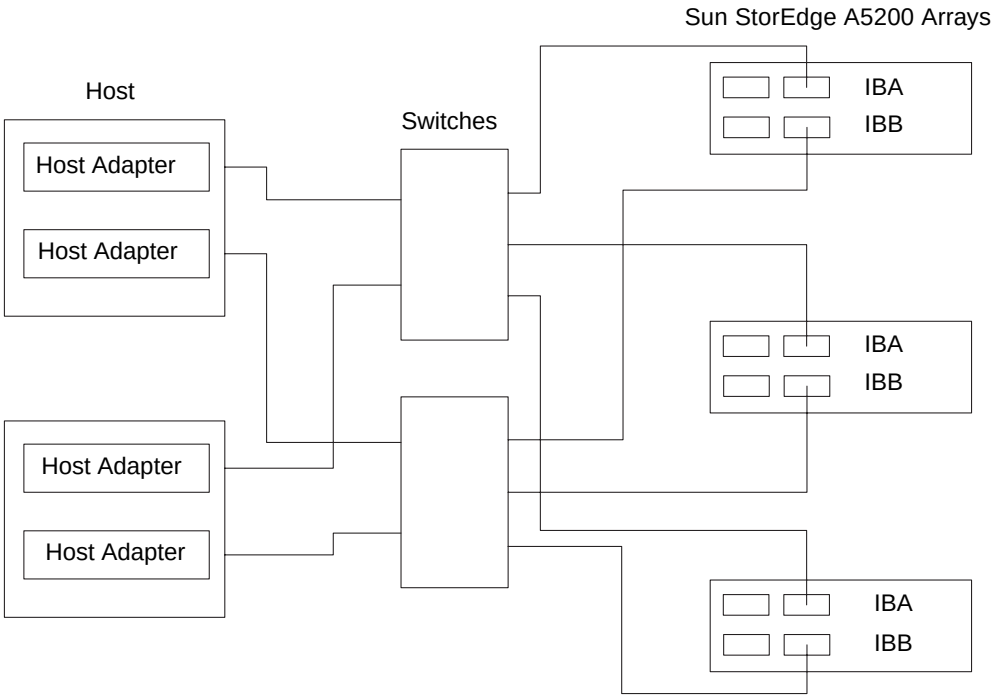


FIGURE 2-11 Two Hosts Connected to Three Sun StorEdge A5200 Arrays

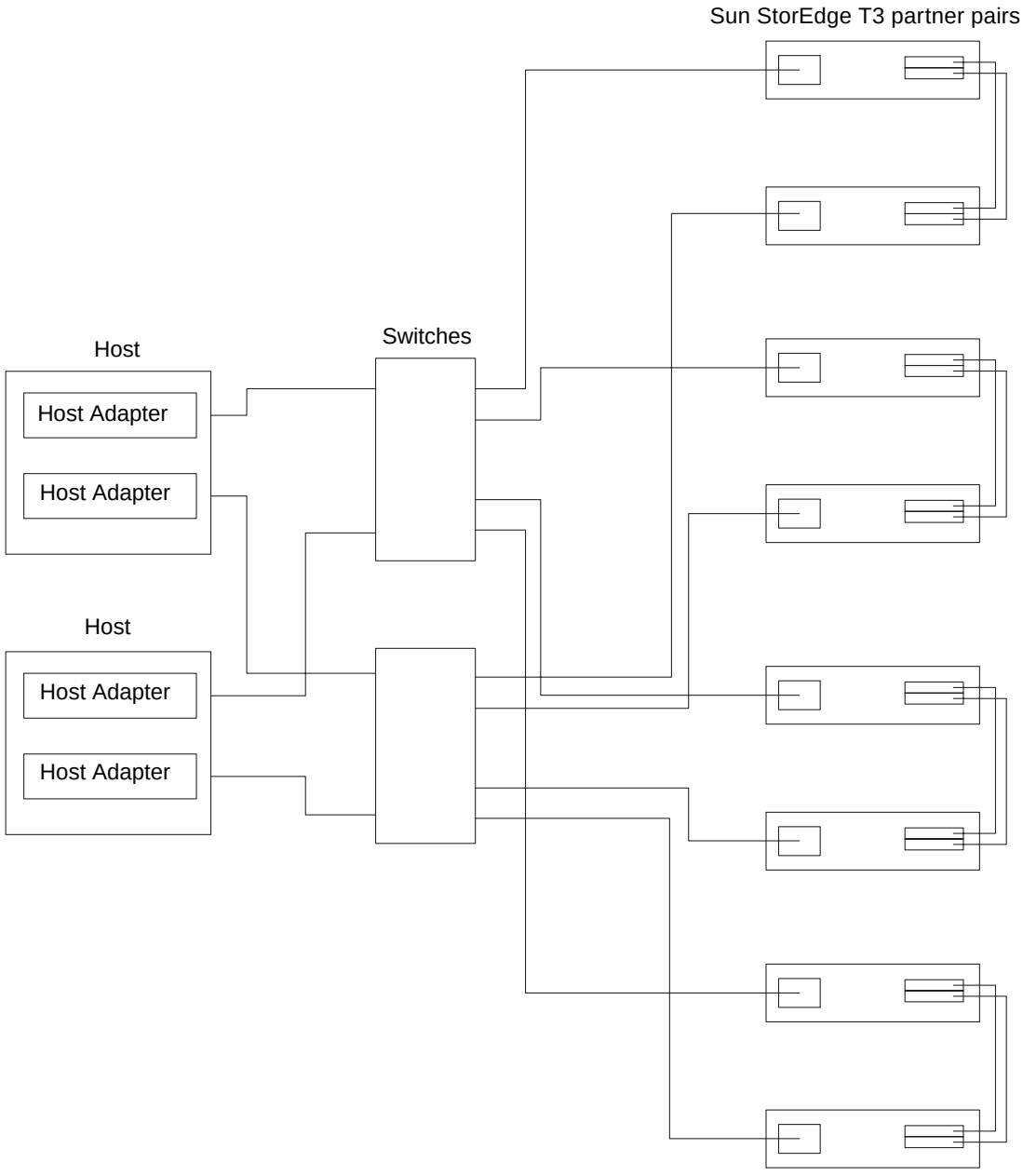


FIGURE 2-12 Two Hosts Connected to Four Sun StorEdge T3 Array Partner Pairs

Note – You must enable Sun StorEdge Traffic Manager software for failover across multiple hosts to function. The `mp_support` on the Sun StorEdge T3 array should be set to `mpxio`.

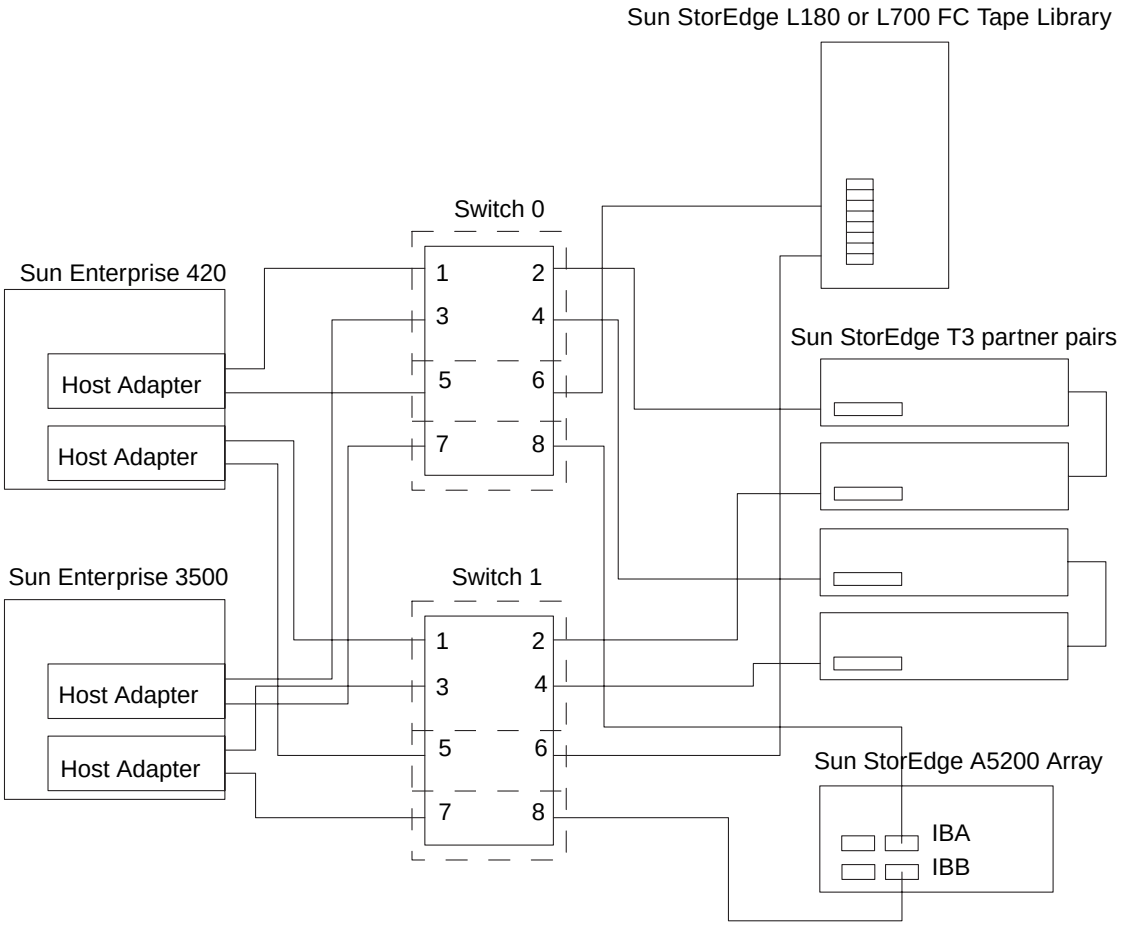


FIGURE 2-13 Two Hosts Connected to Sun StorEdge T3 Array Partner Group: Each Host with Separate Non-shared Storage

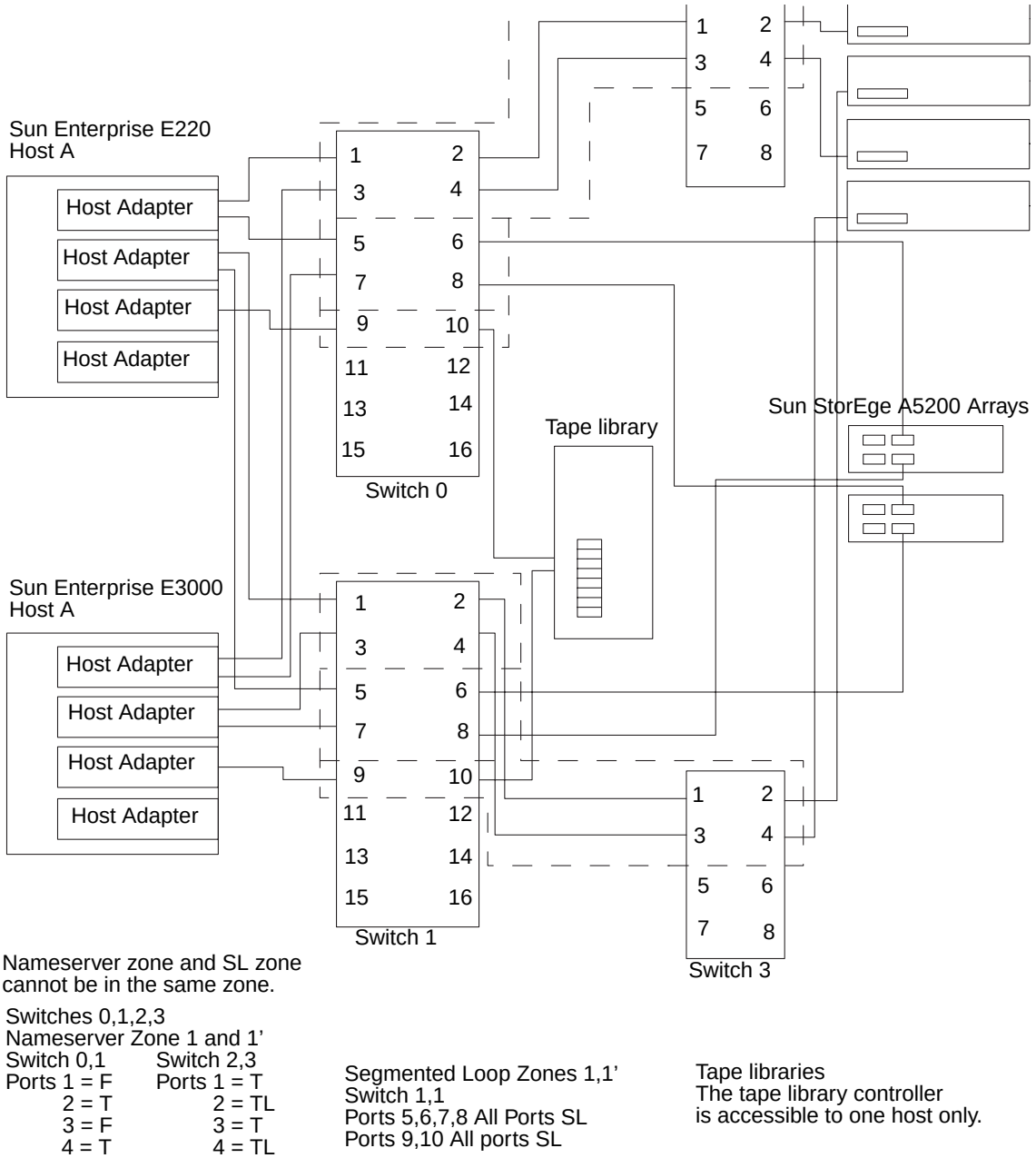


FIGURE 2-14 Multi-Host with Cascading Switches Connected to FC-Tape, Sun StorEdge T3 Array, and Sun StorEdge A5200 Array

Note – You must enable Sun StorEdge Traffic Manager software for failover across multiple hosts to function. The `mp_support` on the Sun StorEdge T3 array should be set to `mpxio`.

CHAPTER 3

Sun StorEdge SAN Release 3.1 Diagnostic Tools

This chapter provides an overview of the tools you can use to monitor, diagnose, troubleshoot, and gather information on the Sun StorEdge Network FC Switch-8 and Switch-16 switches and the Brocade Silkworm switches.

Sun StorEdge Network FC Switch-8 and Switch-16 Switch Diagnostic Tools

Storage Automated Diagnostic Environment

The Storage Automated Diagnostic Environment is a host-based online health and diagnostic monitoring tool for storage area network (SAN) and direct-attached storage (DAS) devices.

The Storage Automated Diagnostic Environment offers the following features:

- A common web-based user interface for device monitoring and diagnostics
- Distributed test invocation by means of lists or topology
- Topology grouping for multi-level hosts and components
- Alternate master support for redundancy
- Revision checking

- Remote notification through SRS, SRS/NetConnect, RSS, HTTP, NSM, and SMTP Providers, or email
- Support for storage area networks (SANs)

Storage Automated Diagnostic Environment Functions

For each device, the Storage Automated Diagnostic Environment performs the following functions:

1. Sends the information, by way of a discovery event, to the system administrator and/or the Network Storage Command Center (NSCC) through an interface with the transport mechanisms.

Note – The first access to a device yields a discovery event that collects all the information about that device, plus other events for other preconfigured devices, that may be generated by health monitors.

---

2. Reads the proper `/var/adm/messages` files, finds relevant entries, and reports them as events through the local email notification mechanism, if configured.
3. Connects to Sun StorEdge T3 and T3+ array storage devices directly through in-band data paths and out-of-band management paths.
4. Reads the device's configuration and state information, stores it locally in the cache, compares the results of the last run, and transmits the differences.
5. Reads threshold information and reports errors when the frequency threshold reaches predefined levels.

Storage Automated Diagnostic Environment Agent Functionality

The Storage Automated Diagnostic Environment remotely monitors Sun network storage devices. The Storage Automated Diagnostic Environment can monitor host message files for errors, or connect directly through the "in-band" data path or "out-of-band" management path of Sun StorEdge devices, in order to obtain status information about each device being monitored.

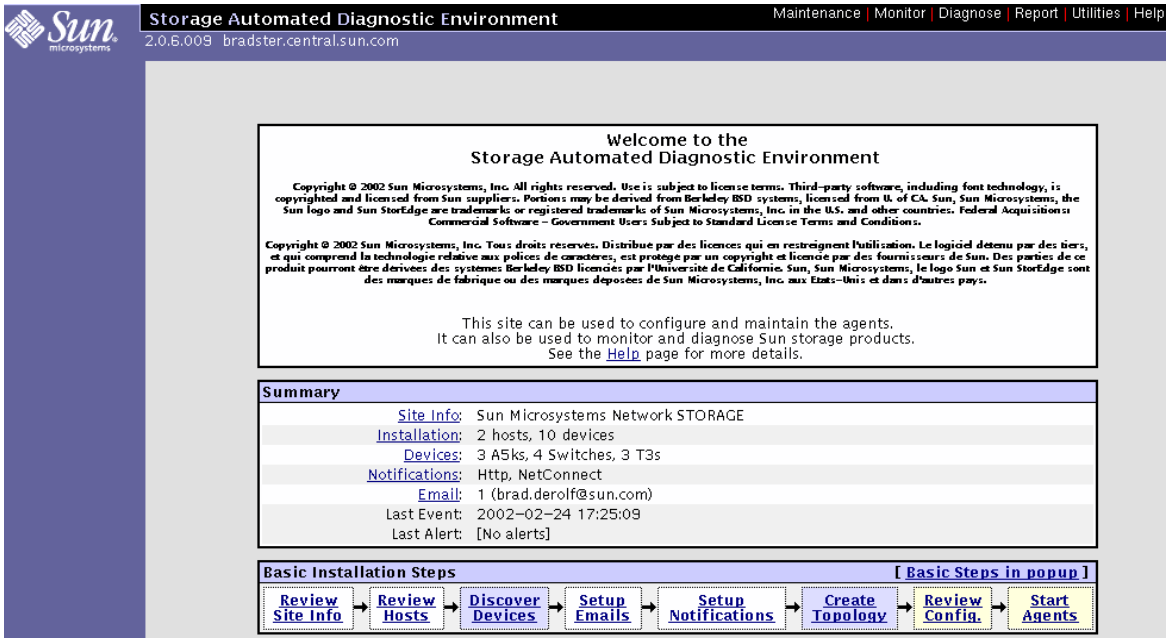


FIGURE 3-1 Storage Automated Diagnostic Environment Main Window

Storage Automated Diagnostic Environment Diagnostic Functionality

Diagnostic tests have been integrated into the Storage Automated Diagnostic Environment for device diagnostics and field replaceable unit (FRU) isolation. Each test can be run individually from the command line or from the Storage Automated Diagnostic Environment user interface.

The following tests are described in the Storage Automated Diagnostic Environment *Diagnostics* chapter.

- Sun StorEdge A3500FC Array Test (`a3500fctest`)
- Sun StorEdge A5000 Array Enclosure Test (`a5ksestest`)
- Sun StorEdge A5000 Array Test (`a5ktest`)
- Sun StorEdge FC Tape Test (`fctapetest`)
- Sun StorEdge PCI FC-100 Host Adapter Board Test (`ifptest`)
- Sun StorEdge PCI Dual Fibre Channel Host Adapter Board Test (`qlctest`)
- Sun StorEdge SBus FC-100 Host Adapter Board Test (`socaltest`)
- Sun StorEdge network FC switch-8 and switch-16 Switch Test (`switchtest`)
- Sun StorEdge T3 and T3+ array Tests (`t3ofdg`, `t3test`, `t3volverify`)
- Virtualization Engine Tests (`vediag`, `veluntest`)
- Brocade Silkworm Test (`brocadetest`)

From the Storage Automated Diagnostic Environment user interface, you can select tests from the topology or from a list view. When the tests execute, the Storage Automated Diagnostic Environment initiates the test on the proper host. You can retrieve test results by using the Test Manager selection from the GUI.

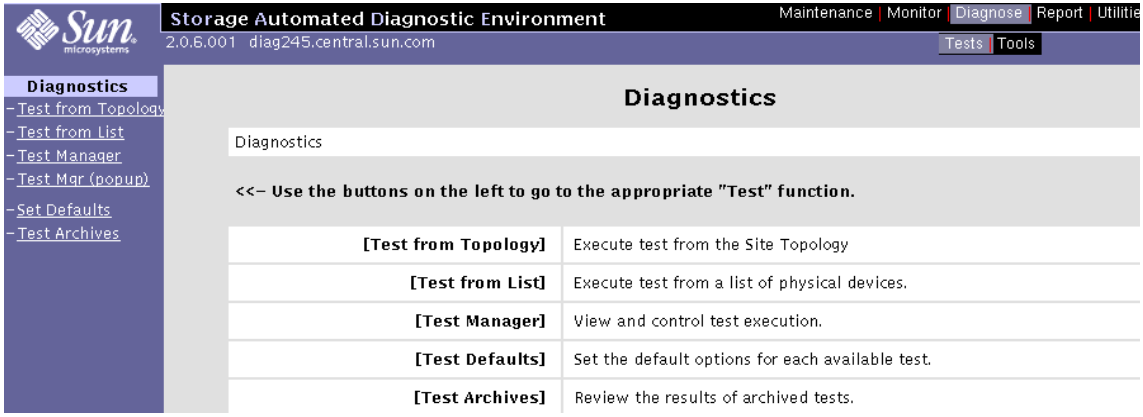
Running Diagnostic Tests From the GUI Window

If you run the diagnostic test from the Storage Automated Diagnostic Environment main window, you can easily access test configuration, control, and results using the buttons in the dialog boxes. The test parameter options, however, are unique for each test and are illustrated in the individual sections with each test in this chapter.

▼ To Access the Diagnostic Tests

1. **Click the Diagnose link in the Storage Automated Diagnostic Environment main window.**

2. **Click the Test link in the Diagnose page.**



You can run Storage Automated Diagnostic Environment diagnostic tests from the test list or from a topology. The functional tests are designed to test the target FRU and operate on in-band or out-of-band data paths. The Storage Automated Diagnostic Environment will cause the test to be run on the appropriate Host.

Note – You can invoke the Link Test by right-clicking on the link displayed in the Test from Topology

---

Storage Automated Diagnostic Environment's implementation of diagnostic tests verify the operation of all the user-selected components. Tests are selected from a graphical view of the system's topology. The Storage Automated Diagnostic Environment Graph view shows the physical topology of a system or merged system. Using the Topology view, you can select specific subtests and test options. The monitoring status of devices and links appears both in the test topology view and in the list view.

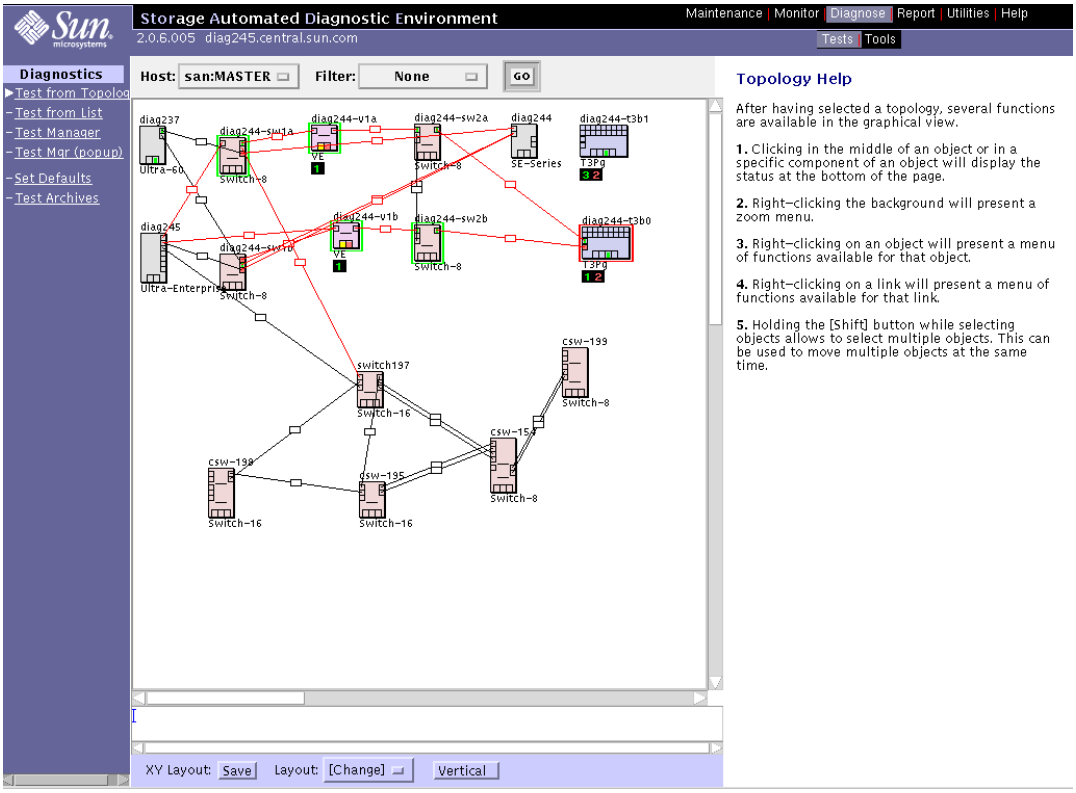


FIGURE 3-2 Storage Automated Diagnostic Environment Topology Window

Sansurfer GUI 2.08.22 or above (SUNWsmgr)

Use the Sansurfer switch GUI to configure the Sun FC Network switches. It is a useful monitoring tool as it gives real-time performance data and error counters. It also has a built-in Port Test that allows connections and GBICs to be verified.

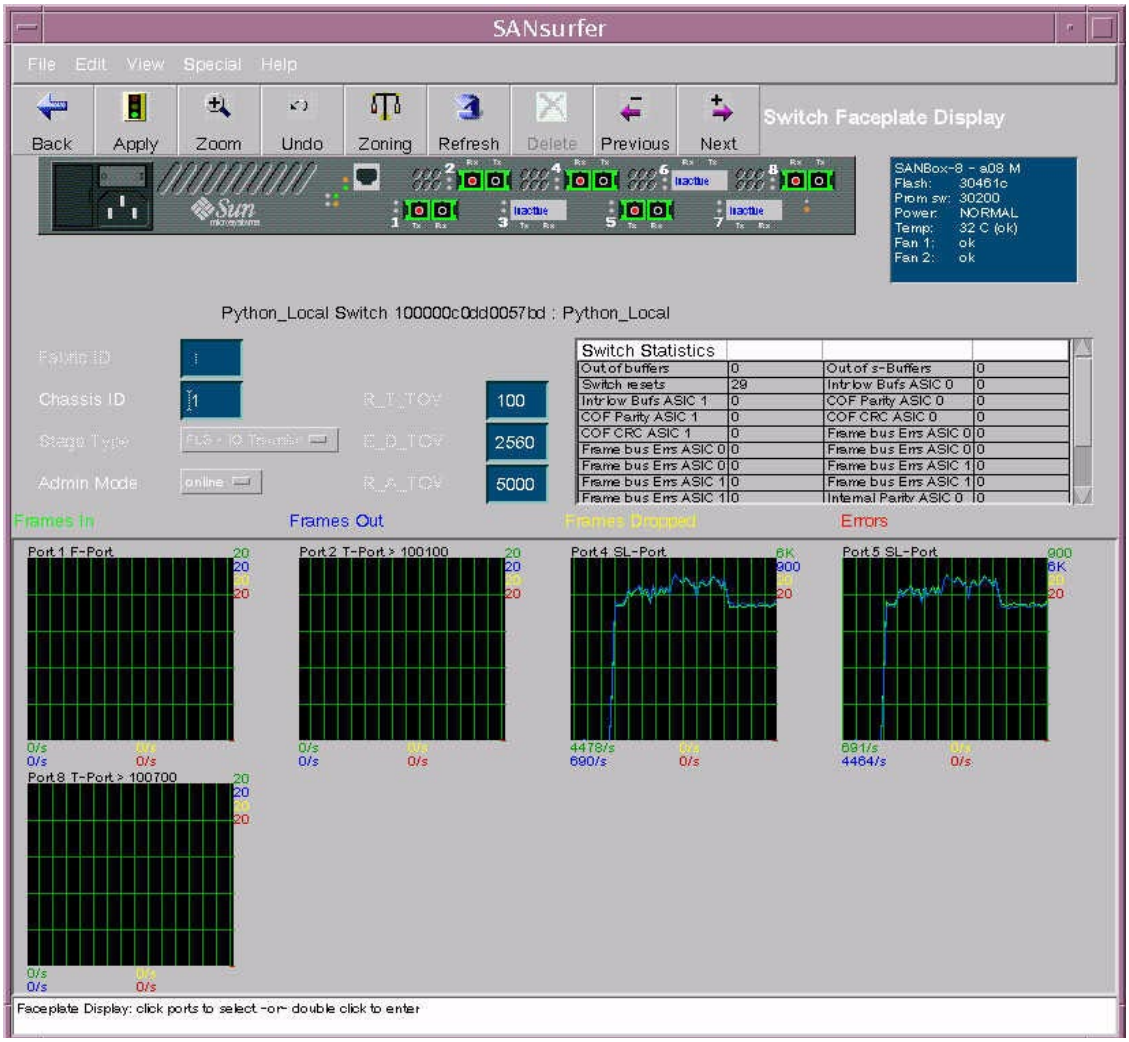


FIGURE 3-3 Sansurfer GUI Main Window

For more information and to download the package, go to:

`http://www.sun.com/storage/san/`

Other Tools

Sun Explorer Data Collector (SUNWexplo) and T3Extractor

Both the Sun Explorer Data Collector and the T3Extractor are essential data gathering tools that are required for service calls or escalations. Both are command-line, host-based tools that collect pertinent information you need to see the complete picture of the host.

Visit the following websites for more information and to download these tools.

Explorer

`http://eservices.central/knowledge/products/explorer/`

T3Extractor

`http://hes.west/nws/products/T3/tools.html`

Capture and Sanbox API

The Capture and Sanbox API utilities are switch information gathering tools. Currently:

- Capture is supported for field engineer use only, but not for customer use.
- T3 Extractor and Capture are available with Explorer 3.5.1.
- There is *no* support for the Sanbox API.

For more information and to download these utilities, go to:

`http://diskworks.ebay/SW/sw.html`

Note – You can gather the same information by querying the Storage Automated Diagnostic Environment that you can gather using the sanbox API. These methods are completely supported, unlike command-line sanbox API usage.

Brocade Diagnostic Tools

The tools available for troubleshooting differ from the original release of the Sun StorEdge SAN 3.0. Since then, Sun StorEdge Stortools 4.x and Network Storage Agent 2.1 have had their functionality combined into a single diagnostic package called the Storage Automated Diagnostic Environment. Brocade Silkworm switches also have their own GUI called WebTools.

Storage Automated Diagnostic Environment and Brocade

With the Storage Automated Diagnostic Environment 2.0 release, Brocade is now supported under the same diagnostic framework as the rest of the Sun SAN product family. This support includes monitoring for error and alert conditions, revision checking, graphic topology display, and fault isolation diagnostics.

Note – Patch 112580-01 or higher is required with Storage Automated Diagnostic Environment 2.0 for Brocade support.

---

brocadetest(1M)

The Storage Automated Diagnostic Environment has incorporated the launching of various Brocade Silkworm switch diagnostic tests under one Storage Automated Diagnostic Environment test, brocadetest(1M). This test is launched within the Storage Automated Diagnostic Environment framework and determines the correct Brocade specific test to run, depending on port type.

CODE EXAMPLE 3-1 Example CLI brocadetest

```
#  /opt/SUNWstade/Diags/bin/brocadetest -v -o "dev=

5:172.20.67.167|passwd=password|iterations=1000"
Called with options: dev=5:172.20.67.167|passwd=xxxxxxx|iterations=1000
Connect to 172.20.67.167
Opened 172.20.67.167
Logged into 172.20.67.167
Clear port errors: send diagClearError 5
Port errors cleared
port is in loopback mode
Running command: CrossPortTest 1000,1
Note: You should only have a loopback on port 5.
If you have more than one loopback installed,
this test may report false errors.
Test Passed
Loopback took 34 seconds to run.
Fan #1 is OK, speed is 8640 RPM
Fan #2 is OK, speed is 8760 RPM
Fan #3 is OK, speed is 8910 RPM
Fan #4 is OK, speed is 8820 RPM
Fan #5 is OK, speed is 8820 RPM
Fan #6 is OK, speed is 8820 RPM

*********************************
Detected possible bad Power supply
Power Supply #1 is absent
*********************************

Power Supply #2 is OK

Close 172.20.67.167
```

Other Diagnostic Tools

Brocade Silkworm switches also support a wide range of CLI tests that can be invoked while connected directly to the switch via a serial connection to the Silkworm 2400, telnet or via the Front Panel of the Silkworm 2800. Some of the tests pertinent for troubleshooting are listed below.

Storage Automated Diagnostic Environment's `brocadetest` invokes crossPortTest for testing loopback ports, spinFab for testing E-Port connections between switches, and loopPortTest for testing L Ports.

- `supportShow`
- `switchShow`
- `qlShow`
- `diagShow`
- `crossPortTest`
- `loopPortTest`
- `spinFab` (previously `spinSilk`)
- `nsShow`

supportShow

`supportShow` runs nearly all commands and should be gathered when placing a service call or escalation. The Explorer Data Collection utility, `SUNWexplo`, gathers the `supportShow` output if the Brocade Silkworm switch is placed in the `/opt/SUNWexplo/etc/saninput.txt`

```
# Input file for extended data collection
# Format is SWITCH SWITCH-TYPE PASSWORD LOGIN
# Valid switch types are ancor and brocade
# LOGIN is required for brocade switches, the default is admin
172.20.67.167   brocade password admin
172.20.67.164   brocade password admin
```

CODE EXAMPLE 3-2 supportShow Sample Output

```
telnet> Trying 172.20.67.167...
Connected to 172.20.67.167.
Escape character is '^]'.

Fabric OS (tm)  Release v2.6.0

login: admin
Password:

diag167:admin> supportshow

Kernel:     5.4
Fabric OS:  v2.6.0
Made on:    Tue Jan 15 15:10:28 PST 2002
Flash:      Tue Jan 15 15:12:04 PST 2002
BootProm:   Thu Jun 17 15:20:39 PDT 1999

 26   25   26   25   27  Centigrade
 78   77   78   77   80  Fahrenheit

Power Supply #1 is absent
```

CODE EXAMPLE 3-3 `switchshow` Example Output

```
diag167:admin> switchshow
switchName:     diag167
switchType:     3.4
switchState:    Online
switchMode:     Native
switchRole:     Subordinate
switchDomain:   1
switchId:       fffc01
switchWwn:      10:00:00:60:69:20:1e:fc
switchBeacon:   OFF
Zoning:         ON (Main)
port  0: sw  Online      E-Port  10:00:00:60:69:10:71:25 "diag164"
(upstream)
port  1: --  No_Module
port  2: sw  Online        F-Port  21:01:00:e0:8b:23:61:f9
port  3: --  No_Module
port  4: --  No_Module
port  5: --  No_Module
port  6: sw  Online      E-Port  10:00:00:60:69:10:71:25 "diag164"
port  7: sw  Online        F-Port  21:00:00:e0:8b:03:61:f9
```

CODE EXAMPLE 3-4 `qlshow` Example Output

```
diag167:admin> qlshow
Self:   10:00:00:60:69:20:1e:fc domain 1
State:  Master
Scope:  single
AL_PA bitmap:   30000000 00000000 00000000 00000000
Local AL_PAs
                (not available)
Local looplet states
    Member:     1 3 4
    Online:     - - -
    Looplet 1:  offline
    Looplet 3:  offline
    Looplet 4:  offline
```

CODE EXAMPLE 3-5 `diagShow` Example Output

```
diag167:admin> diagshow
nTicks: 0, Max: 4473924

Diagnostics Status:  Tue Mar 19 14:04:30 2002

port#:   0   1   2   3   4   5   6   7
diags:  OK  OK  OK  OK  OK  OK  OK  OK
state:  UP  DN  UP  DN  DN  DN  UP  UP

  pt0:    4086880 frTx   64382622 frRx          0  LLI_errs.
  pt2:   38616950 frTx     300398 frRx         12  LLI_errs.
  pt6:   28852033 frTx  235091315 frRx        111  LLI_errs.
  pt7:  331090679 frTx    8930476 frRx         31  LLI_errs.

Central Memory OK
Total Diag Frames Tx: 8318
Total Diag Frames Rx: 8911
```

CODE EXAMPLE 3-6 `crossPortTest` Example Output

```
diag167:admin> crossporttest 1000,1

Running Cross Port Test ....... passed.
```

The "1000" is the number of passes, the "1" denotes singlePortAlso mode, which allows the test to be run on a single port with a loopback connector plug inserted

CODE EXAMPLE 3-7 loopPortTest Example Output

```
diag164:admin> loopporttest 100,2,0x7e7e7e7e,4
Configuring L-port 2 to Cable Loopback Port........done.
Will use pattern: 7e7e7e7e     7e7e7e7e     7e7e7e7e     7e7e7e7e

Running Loop Port Test ........ passed.

Configuring Loopback L-port(s) back to normal L-
port(s).........done.
```

Note –

The syntax is `loopporttest` <*num_passes*>,<*port*>,<*user_pattern*>,<*pattern_width*>

The loopPortTest only works on logged in L-Ports

To test ports with Loopback connectors, use crossPortTest

CODE EXAMPLE 3-8 spinFab Example Output

```
diag167:admin> spinfab 1,0,0

spinFab0 running...

spinFab0: Completed 1 megs, status:  passed.
        port 0 test status: 0x00000000 --  passed.
```

CODE EXAMPLE 3-9 nsShow Example Output

```
diag164:admin> nsshow
{
 Type Pid    COS     PortName               NodeName
TTL(sec)
 NL   0312e4;
3;50:02:0f:23:00:00:3d:2c;50:02:0f:20:00:00:3d:2c; na
    FC4s: FCP [SUN     T300            0118]
    Fabric Port Name: 20:02:00:60:69:10:71:25
 NL   031ee8;
3;50:02:0f:23:00:00:3e:e5;50:02:0f:20:00:00:3e:e5; na
    FC4s: FCP [SUN     T300            0118]
    Fabric Port Name: 20:0e:00:60:69:10:71:25

The Local Name Server has 2 entries }
```

Note – nsShow is a listing of worldwide names (WWNs) of the devices connected to the switch.

▼ To Access the Brocade Silkworm Switch

You can access the Silkworm switches in multiple ways:

- Telnet via a standard RJ-45 Ethernet port
- The front panel (2800 only)
- A serial connection (2400 only)
- The WebTools GUI

The serial connection available on the 2400 switch is intended for initial IP address configuration only. Once the IP address is configured, the switch is to be accessed via telnet or the WebTools GUI.

The Front Panel access method on the 2800 switch can be used to run most commands that the switch supports. However, the screen is limited in size and messages are restricted to one or two lines of output. Once the IP addressed is configured through the front panel, further switch setup and diagnostics can be run via a telnet connection or the WebTools GUI.

The WebTools GUI is a separately licensed feature. All Brocade switches that are sold by Sun Professional Services should come with the license pre-installed. WebTools can be accessed via a standard web browser (Netscape or Microsoft Internet Explorer with a Java Plugin) by pointing the browser to http://<ip_address_of_switch>

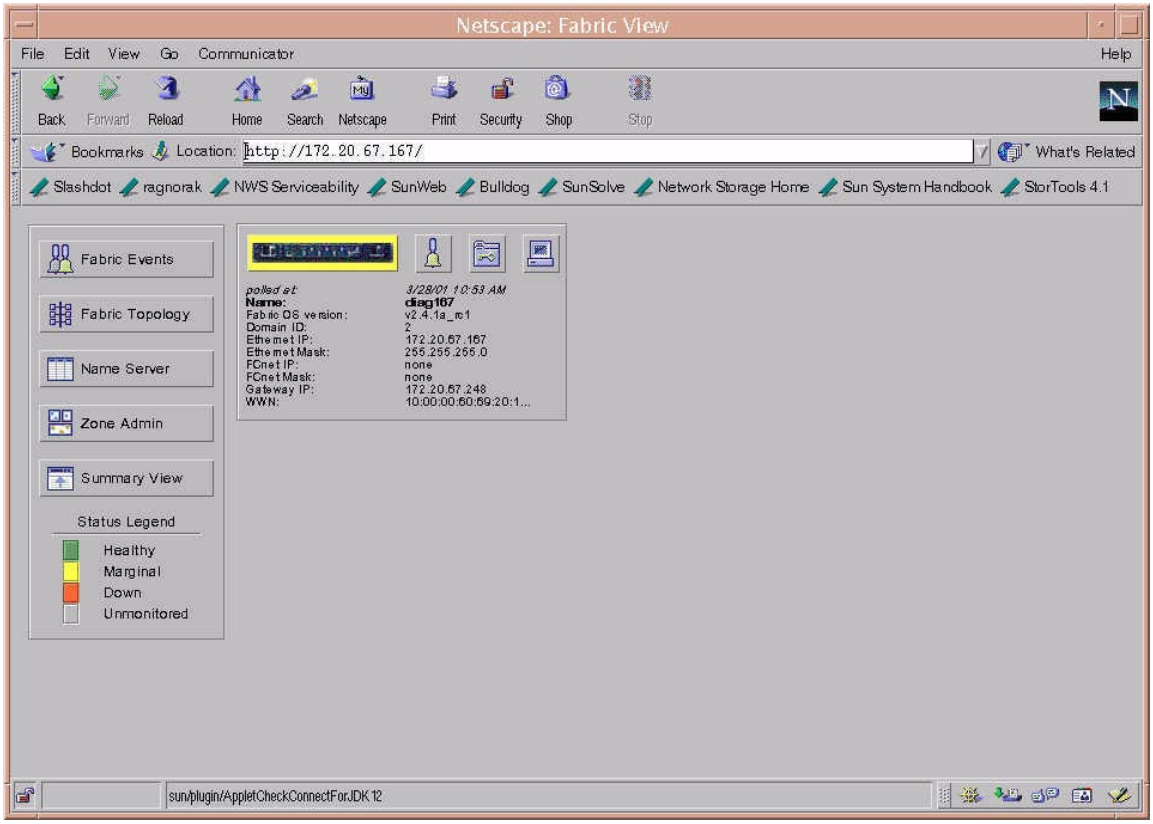


FIGURE 3-4 Brocade Webtools GUI

See the *Brocade Web Tools User's Guide* for more information on WebTools usage.

Port Differences between Sun StorEdge Ports and Brocade Ports

TABLE 3-1 Port Differences

Sun StorEdge Port	Brocade Port	Function
T_Port	E_Port	Expansion port. Used for interswitch connections.
SL_Port (segmented loop)	L-Port	Loop port. In Sun StorEdge switch, the SL_Port is Private Loop only.
TL_Port (translative loop)	L-Port	Loop port. This port enables private devices to communicate with fabric or public devices. In the Brocade switch, this address translation is automatic. In Sun StorEdge switches, the private device must be configured on a TL-Port.
F_Port	F_Port	A fabric port that is point-to-point only, not loop capable, and used to connect N_Ports to the switch.
FL_Port	FL_Port	A fabric port that is loop-capable and used to connect NL_Ports to the switch.
N / A	G_Port	Brocade has a G_Port, which is a generic port. This port can operate as either an E_Port or an F_Port. A port is defined as a G_Port when it is not yet fully connected or has not yet assumed a specific function in the fabric.
N / A	U_Port	Brocade has a U_Port or Universal Port. This port can operate as an E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not yet fully connected or has not yet assumed a specific function in the fabric.

General Troubleshooting

This information in this chapter lists the broad steps on how a Sun-trained representative approaches a SAN problem. It lists various tools and resources available at each step. Actual fault isolation techniques and troubleshooting case studies are not documented in this guide.

It is expected that using Storage Automated Diagnostic Environment for monitoring will vastly decrease the time-consuming process of narrowing down the problem.

Sun StorEdge Network FC Switch

Before any of the tools and resources are used to troubleshoot a Sun StorEdge network FC switch-8 or switch-16 switch, the Sun-trained representative first makes sure that the system is set up properly.

Setup Requirements

- One Enterprise 450 Workgroup Server
- Solaris 8 update 6 (10/01) with all relevant Sun StorEdge SAN release 3.1 patches and packages

  The information found in “Packages and Patches” on page 17 is mandatory and must be installed in the order listed. The assumption is that you are starting from an updated Solaris 8 (update 6, 10/01) installation.
- One Sun StorEdge T3 array Partner Pair (2 LUNs per brick)
- One Sun StorEdge A5200 array (22 disks)
- Four FC switches (2 local, 2 remote)
- Storage Automated Diagnostic Environment software package

Troubleshooting Steps

The following steps are how a Sun-trained representative isolates and troubleshoots a problem.

Step 1) Discover the Error Using the Following Tools:

- Storage Automated Diagnostic Environment messages
- `/var/adm/messages`
- Application-specific errors

Step 2) Determine the extent of the problem Using the Following Tools:

- `cfgadm -al` output
- `luxadm -e` port output
- Storage Automated Diagnostic Environment topology view
- Multipathing information (Sun StorEdge Traffic Manager, VxDMP)

Note – The information gathered here will determine on which subsection to focus attention: Host-to-Switch, Switch-to-Switch (cascaded), or Switch-to-Storage.

Step 3) Check the Array Status:

- Open a telnet session to the Sun StorEdge T3 array
- Refer to the `luxadm` display output for Sun StorEdge A5200 arrays
- RAID Manager (cli utilities) for Sun StorEdge A3500FC arrays
- Storage Automated Diagnostic Environment instrumentation reports
- LED status
- Explorer/T3Extractor output

Step 4) Check the Switch Status

- Capture/Explorer output
- SANsurfer GUI
- LED status (online/offline)
- Port Modes (SL/TL/F)
- Nameserver Information

Note – The Storage Automated Diagnostic Environment is used to detect user configuration errors that may not show up as hard errors anywhere else. For example, a user might accidentally change an HBA port to SL mode when it was previously F mode.

Step 5) Start Testing the FRUs

- Storage Automated Diagnostic Environment Functional Tests (`switchtest`/`qlctest`)
- SANsurfer GUI port tests
- Sun StorEdge T3 array tests
- Sun StorEdge A3500FC health check

The conclusion of these tests isolate the problem to a FRU to be replaced. The Sun-trained representative then refers to the appropriate hardware manual for FRU replacement procedures.

Step 6) Verify the Fix

- `/var/adm/messages`
- Storage Automated Diagnostic Environment agent status
- Storage Automated Diagnostic Environment functional tests
- Sun StorEdge Traffic Manager (or VxDMP) to return to normal path conditions

Brocade Silkworm Switch

This section highlights the differences of troubleshooting with a Brocade Silkworm configuration to that of a configuration that contains the current Sun StorEdge Network Fibre Channel family of switches. Current support is limited to diagnosing failures down to the FRU level. In Sun's support model, the entire Brocade Silkworm switch is considered a FRU. Many of Brocade's internal diagnostics and messages, while useful for depot or Root Cause Analysis situations, are not ultimately pertinent to a Sun Field Engineer trying to isolate to a FRU.

This section lists the broad steps on how a Sun-trained representative approaches a Brocade problem in a SAN environment. It lists various tools and resources available at each step.

Step 1) Discover the Error Using the Following Tools:

- Storage Automated Diagnostic Environment messages and alerts
- `/var/adm/messages`
- Application-specific errors

Step 2) Determine the extent of problem using the Following Tools:

- `cfgadm -al` output
- `luxadm -e` port output
- Storage Automated Diagnostic Environment Topology error display
- Multipathing information (Sun StorEdge Traffic Manager and VxDMP)

Note – The information gathered thus far will determine which subsection on which to focus: Host-to-Switch, Switch-to-Switch (cascaded), or Switch-to-Storage.

Step 3) Check Array Status

- Open a telnet session to the Sun StorEdge T3 array
- Refer to the `luxadm` display output for Sun StorEdge A5200 arrays
- Raid Manager Healthcheck for the Sun StorEdge A3500FC arrays
- Storage Automated Diagnostic Environment instrumentation reports
- LED status
- Explorer/T3Extractor output

Step 4) Check switch status

- Explorer output (`supportShow` output)
- WebTools GUI
- LED Status
- Storage Automated Diagnostic Environment instrumentation reports
- Port Modes (F/L/E, online, offline)
- Nameserver Information (`nsshow`, `nsallshow`)

Step 5) Start Testing FRUS

- Storage Automated Diagnostic Environment tests, such as the `brocadetest`(1M), `qlctest`(1M), `t3test`(1M), `linktest`(1M), and a5ktest(1M).
- Brocade CLI tests (`loopPortTest`, `spinFab`, `crossPortTest`)
- Sun StorEdge T3 Array tests, such as `T3OFDG`(1M)
- Sun StorEdge A3500FC arrays Healthcheck

Note – The conclusion of these tests isolate the problem to a FRU to be replaced. Follow the appropriate hardware manual for proper FRU replacement procedures.

Step 6) Verify the fix

- `/var/adm/messages` (path online, multipath informational messages)
- Storage Automated Diagnostic Environment status
- Sun StorEdge Traffic Manager or VxDMP, to return the path to its normal state

APPENDIX **A**

Frequently Asked Questions

Q	Which SAN configurations are supported with this release?
A	SAN configuration rules are those rules tested and supported in the Sun StorEdge SAN 3.1 release. For details, refer to Sun StorEdgeTM SAN 3.0/3.1/3.2 release Software/Firmware Upgrades and Documentation at: `http://www.sun.com/storage/san/index.html`
Q	What functionality does the SAN 3.1 release offer?
A	• Longer distances • Cascaded switch configurations • Disaster recovery configurations • Higher connectivity in the same zone • Host connectivity in Fabric topology • Diagnostics available with the Storage Automated Diagnostic Environment software package
Q	Why isn't the Sun StorEdge A5200 array a supported device?
A	Although the Sun StorEdge A5200 array can function in the SAN 3.1 environment, the Brocade Silkworm switch does not currently work with Storage Automated Diagnostic Environment loop devices. This problem is currently being corrected and support for the Sun StorEdge A5200 array is expected with the next release.
Q	What is included in the Brocade software bundle?
A	This bundle includes QuickLoop, which is necessary for SAN 3.x configurations. Additionally, Zoning and Brocade WebTools are included.
Q	Can both Sun switches and Brocade switches be used in the same SAN?

A	This combination has not been tested and is therefore not supported.
Q	Do the Sun diagnostic tools work with Brocade switches?
A	The Storage Automated Diagnostic Environment 2.0 software package works with Brocade in the Sun SAN 3.1/3.2 environment.

Acronyms & Glossary

This glossary contains a definitions for terms used in this guide.

Acronyms

AL_PA Arbitrated Loop Physical Address; 8-bit value used to identify a device.

F_Port On a Fibre Channel switch, a port that supports an N_Port. A Fibre Channel port in a point-to-point or Fabric connection.

FL_Port On a Fibre Channel switch, a port that supports Arbitrated Loop devices.

G_Port On a Fibre Channel switch, a port that supports either F_Port or E_Port

NAS Network Attached Storage

N_Port A Fibre Channel port in a point-to-point or Fabric connection.

NL_Port Node loop port; a port that supports Arbitrated Loop protocol.

SL_Port Segmented Loop Port. A port connected to a private loop device.

SNDR Sun StorEdge Network Data Replicator (formerly “Sun StorEdge Remote Dual Copy”)

T_Port An inter-switch port, one that is used to attach a port on one switch to a port on another switch.

TL_Port A Translated Loop Port on the Sun StorEdge T3 array.

Glossary

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. These zones are not yet useful or interesting in Suns current SAN implementations.

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.

Fabric Fibre channel network built around one or more switches. It is also common to refer to something as a "Fabric device" or being in "Fabric mode". When used in this context, it simply means a public device, capable of logging into a Fabric and having public loop characteristics (as opposed to a private loop legacy device).

Hard Zones Hard Zones allow the division of the Fabric (one or more Switch chassis) into as many as 16 Fabric-wide zones that define the ports that can communicate with each other. A particular port may be placed in only one Hard Zone (no overlapping Hard Zones). If Hard Zones are enabled, Name Server Zones and SL Zones will not communicate across defined Hard Zone boundaries.

Name Server Zones allow the division of the Fabric (one or more Switch chassis) into as many as 256 Fabric-wide zones that define which ports or devices receive Name Server information. If Hard Zones are enabled, Name Server Zones will not communicate across defined Hard Zone boundaries.

Private Loop An Arbitrated Loop without a Fabric switch

Public Loop An Arbitrated Loop attached to a Fabric switch.

Segmented Loop A set of ports that behave as one private loop.

Zone A set of ports and their connected devices (zone) that behave as a single private loop. SL Zones on the switch allow the division of the Fabric (one or more Switch chassis) into Fabric-wide zones that define the ports that can communicate with each other.

Zoning Zoning allows the user to divide the Fabric ports into zones for more efficient and secure communication among functionally grouped nodes. There are several types of zones and a port may be defined in any. No port can be in all zone types simultaneously.

Index

W

Z