# Sun StorEdge™ Network FC Switch-8 and Switch-16 Field Troubleshooting Guide

Sun StorEdge SAN 3.1 Release

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Part No. 816-1701-12
April, 2002 Revision A

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# Contents

# Preface

The *Sun StorEdge SAN release 3.1 Field Troubleshooting Guide* describes how to diagnose and troubleshoot the Sun StorEdge network FC switch-8 and switch-16 hardware. It provides information and pointers to additional documentation you may need for installing, configuring, and using the configuration. The book is primarily intended for use by experienced system support engineers who already have a good understanding of the product.

The Appendices found in this guide explain how to diagnose and troubleshoot Brocade Silkworm switches.

## 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.<br>Use `ls -a` to list all files.<br>`% You have mail.` |
| **AaBbCc123** | What you type, when contrasted with on-screen computer output | `% su`<br>`Password:` |
| *AaBbCc123* | Book titles, new words or terms, words to be emphasized | Read Chapter 6 in the *User's Guide.*<br>These are called *class* options.<br>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 | # |

# Related Documentation

| Application | Title | Part Number |
|---|---|---|
| Installer / User's Information | *Sun SANbox-8 Fibre Channel Switch Installer's/User's Manual* | 875-1881-10 |
| GUI and User | *SANbox Segmented Loop Switch User's Manual* | 875-3059-10 |
| Installation / Configuration Information | *Sun StorEdge SAN release 3.0 Installation and Configuration Guide* | 816-0830-10 |
| Installer / User | *SANbox 8/16 Segmented Loop Switch Management User's Manual* | 875-3060-10 |
| Troubleshooting | *Sun StorEdge SAN release 3.0 Troubleshooting Guide* | 806-6923-10 |
| Late news | *Sun StorEdge SAN release 3.0 Release Notes* | 806-6924-10 |
| Software | *CDInsert* | 804-7491-10 |
| Late news | *Sun StorEdge A5200 Product Notes* | 805-1018-13 |
| Late news | *Sun StorEdge T3 Disk Tray Release Notes* | 806-1497-12 |
| Late news / Best Practices | *Sun StorEdge A3x00/A3500 FC Best Practices Guide* | 806-6419-10 |
| Late news | *Sun StorEdge A3500FC Release Notes*[1] | 805-7758-11 |
| Hub information | *Sun StorEdge FC-100 Hub Installation and Service Manual* | 805-0315-12 |

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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.

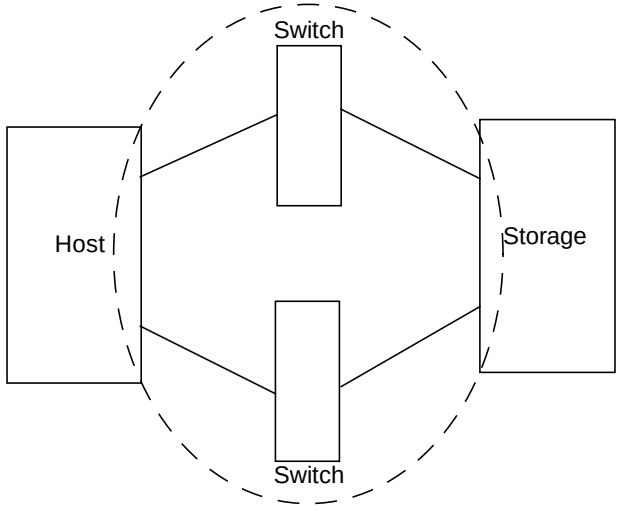



**FIGURE 1-1** Switch and Interconnections

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.* This guide also assumes you have been trained on all the components that comprise the storage and switch configuration.

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 release 3.1 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 network FC switch-8 or switch-16 with one or more hosts and storage.

## The Sun StorEdge Network FC Switch-8 or Switch-16 Switch

Either of the Sun StorEdge Network FC Switch-8 or Switch-16 units functions with the Sun StorEdge A3500FC array, or a Sun StorEdge T3 array.

## 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 FC Tape Library |
| | Sun StorEdge L700 Tape Library |

# Supported Configurations

To support a high-availability environment, use these configurations to ensure switch redundancy. See the example diagrams 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 Environment Rules

- All hosts in a zone must be running Solaris 8 Release 4/01 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 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

## FC Tape

- Sun StorEdge L180 Tape Library with StorageTek 9840 tape drives
- Sun StorEdge L700 FC Tape Library with StorageTek 9840 tape drives

# Packages and Patches

**The packages and patches found in** TABLE 2-2 **are mandatory and must be installed in the order listed.** The assumption is that you are starting from an updated Solaris 8 6/01 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 2-2** Solaris 8 6/01 Minimum Required Packages and Patches

| 8_Recommended | Solaris 8 Recommended and Security Patches |
|---|---|
| SUNWsan | SAN Foundation package |
| 111847-04 | SUNWsan patch |
| 108982-09 | Solaris Driver patch |
| 108984-08 | Solaris Driver patch |
| 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 |
| 109529-06 | `luxadm/libg_fc/liba5k` patch |
| 111413-07 | `luxadm/libg_fc/liba5k` patch |
| SUNWcfpl | `cfgadm_fp` plugin library package |
| SUNWcfplx | `cfgadm_fp` plugin library package |
| 111846-03 | cfgadm_fp plugin patch |
| 111267-02 | specfs patch |
| 110614-02 | ses driver patch |
| SUNWstade<br>112580-01 | Storage Automated Diagnostic Environment package<br>Brocade patch |
| SUNWsmgr | SANsurfer Switch Manager 2.08.22 package (Sun Switches only) |
| 111096-03 | SANsurfer patch |

# Unbundled Software

For a list of unbundled software, refer to TABLE 2-3.

**TABLE 2-3** 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)<br>3.2 (Fabric) | 111118-02 |
| VERITAS File System | 3.4 | |
| Instant Image | 3.0 | |
| SNDR | 3.0 | |
| Alternate Pathing | 2.3.1 | 110722-01<br>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 2-3** 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 2-3 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.

**Note –** Sun StorEdge A5000 and Sun StorEdge A5100 arrays are *not* supported.

**TABLE 2-4** Supported Features of the Sun StorEdge A5200 Array

| Feature | Supported |
|---|---|
| Cascading | No |
| Zone type | SL zone only |
| Maximum number of arrays per SL zone | 3 |
| Maximum initiators per SL zone | 2 |
| Maximum initiators per array | 4 (2 per loop) |
| Split loop support | No |

**TABLE 2-5** 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 2-6** 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 2-7** 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.

## Switches

For high availability, configure any two sets of switches in parallel:

- Sun StorEdge Network FC Switch-8
- Sun StorEdge Network FC Switch-16

## 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 16 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 chassis) 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 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 2-8** 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

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.

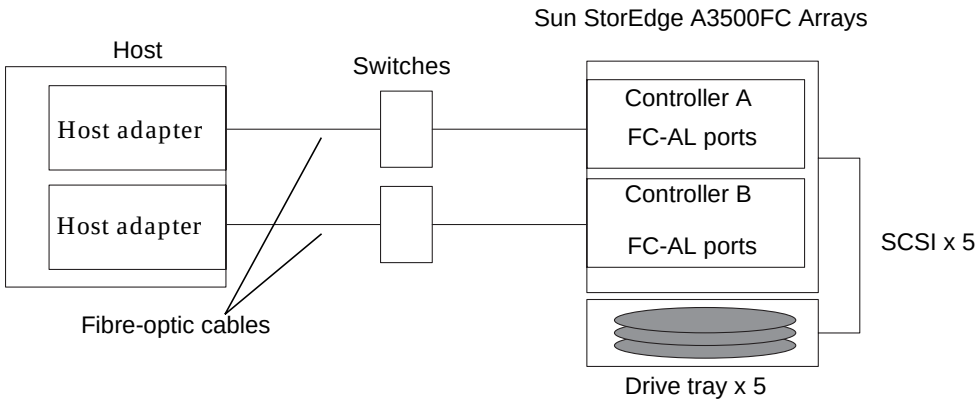



**FIGURE 2-1** Single Host Connected to One Sun StorEdge A3500FC Controller Module

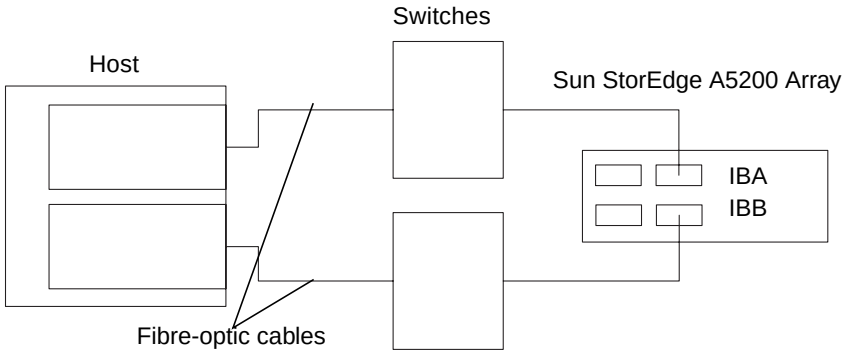



**FIGURE 2-2** Single Host Connected to One Sun StorEdge A5200 Controller Module

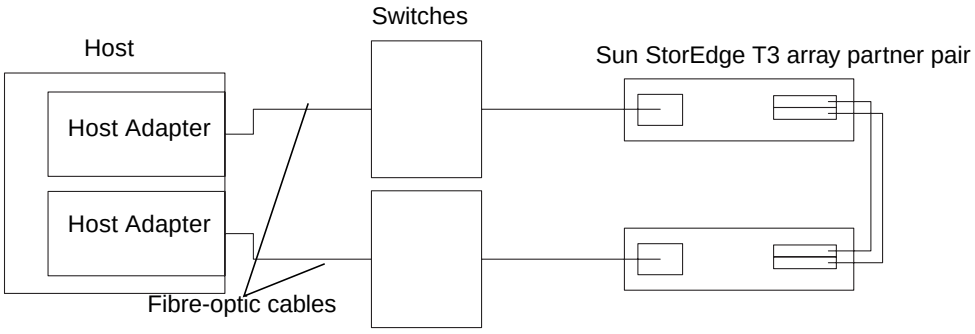



**FIGURE 2-3** Single Host Connected to One Sun StorEdge T3 Array Partner Pair

# 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 multiple 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.

---

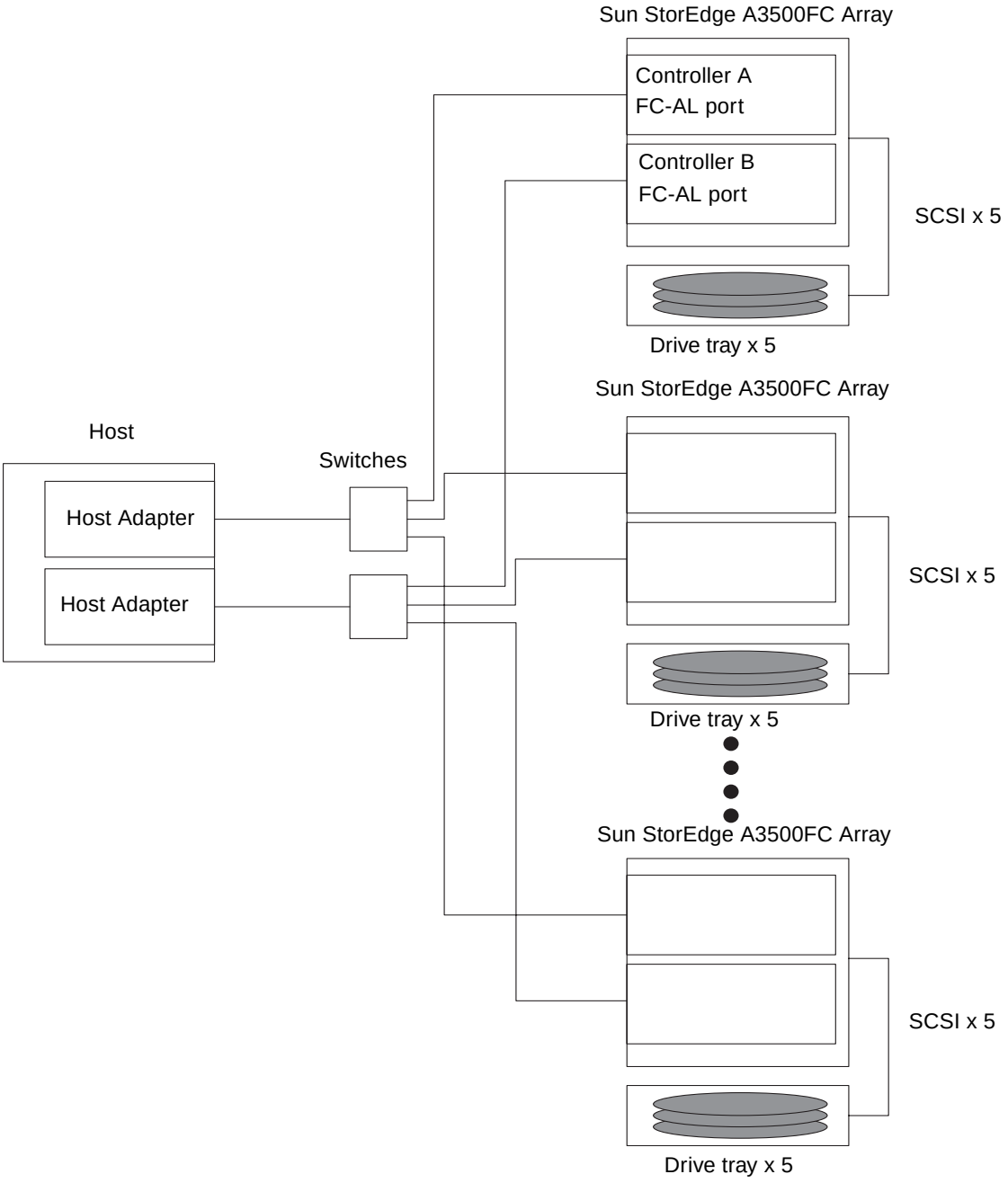



**FIGURE 2-4** Single Host Connected to Multiple Sun StorEdge A3500FC Arrays

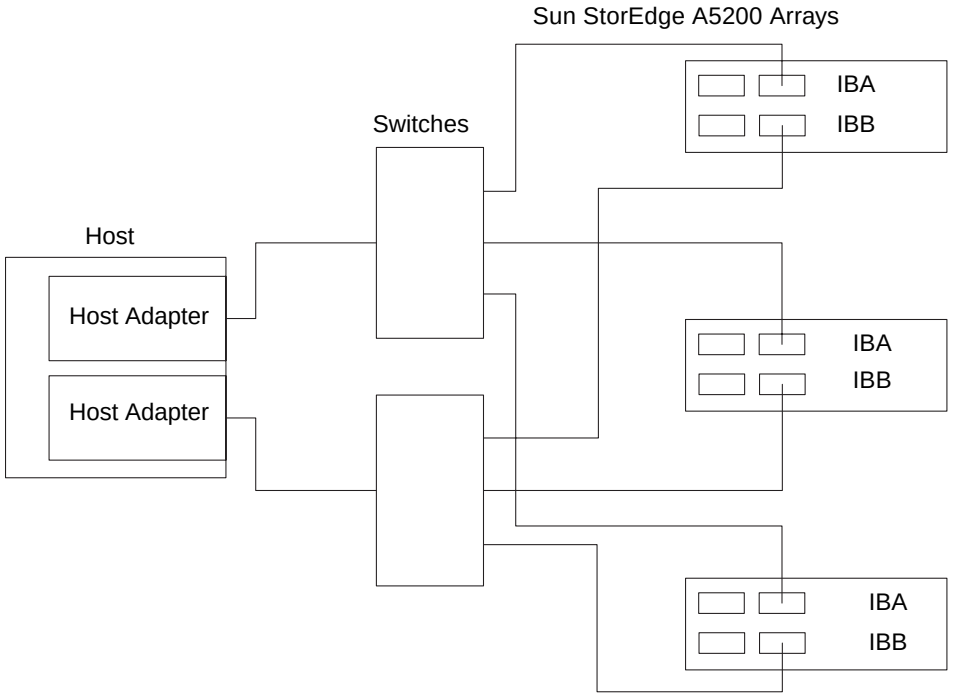



**FIGURE 2-5** Single Host Connected to Multiple Sun StorEdge A5200 Arrays

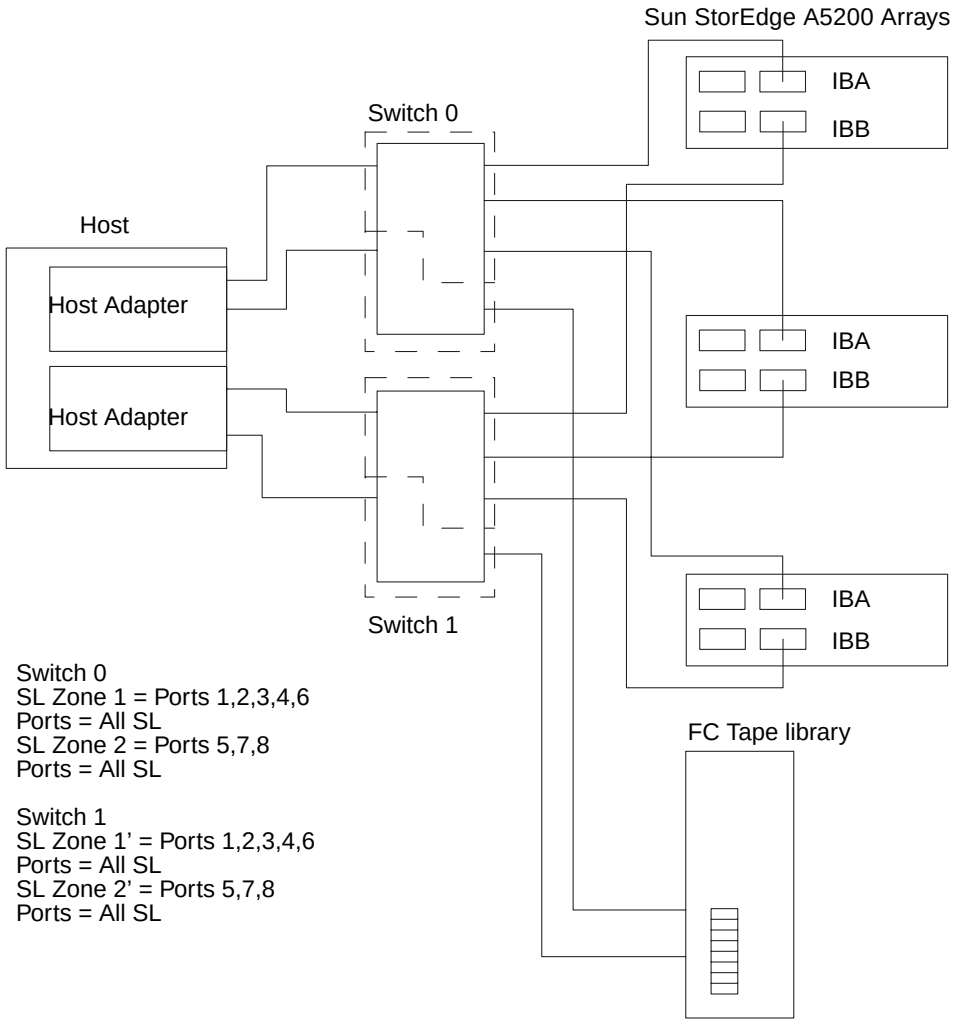



**FIGURE 2-6** Single Host Connected to Multiple Sun StorEdge A5200 Arrays and a Single FC-Tape Library

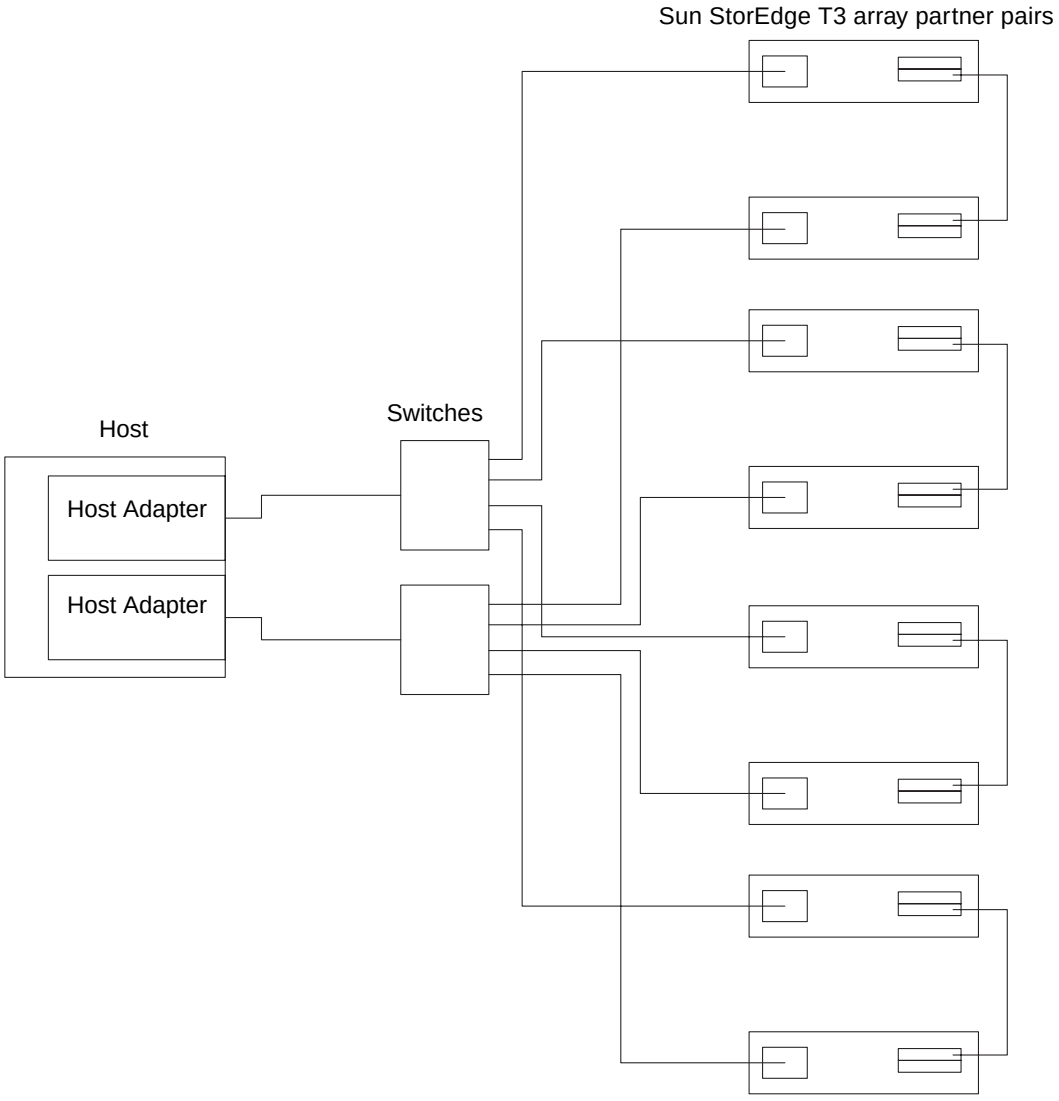



**FIGURE 2-7** Single Host Connected to Multiple Sun StorEdge T3 Array Partner Pairs

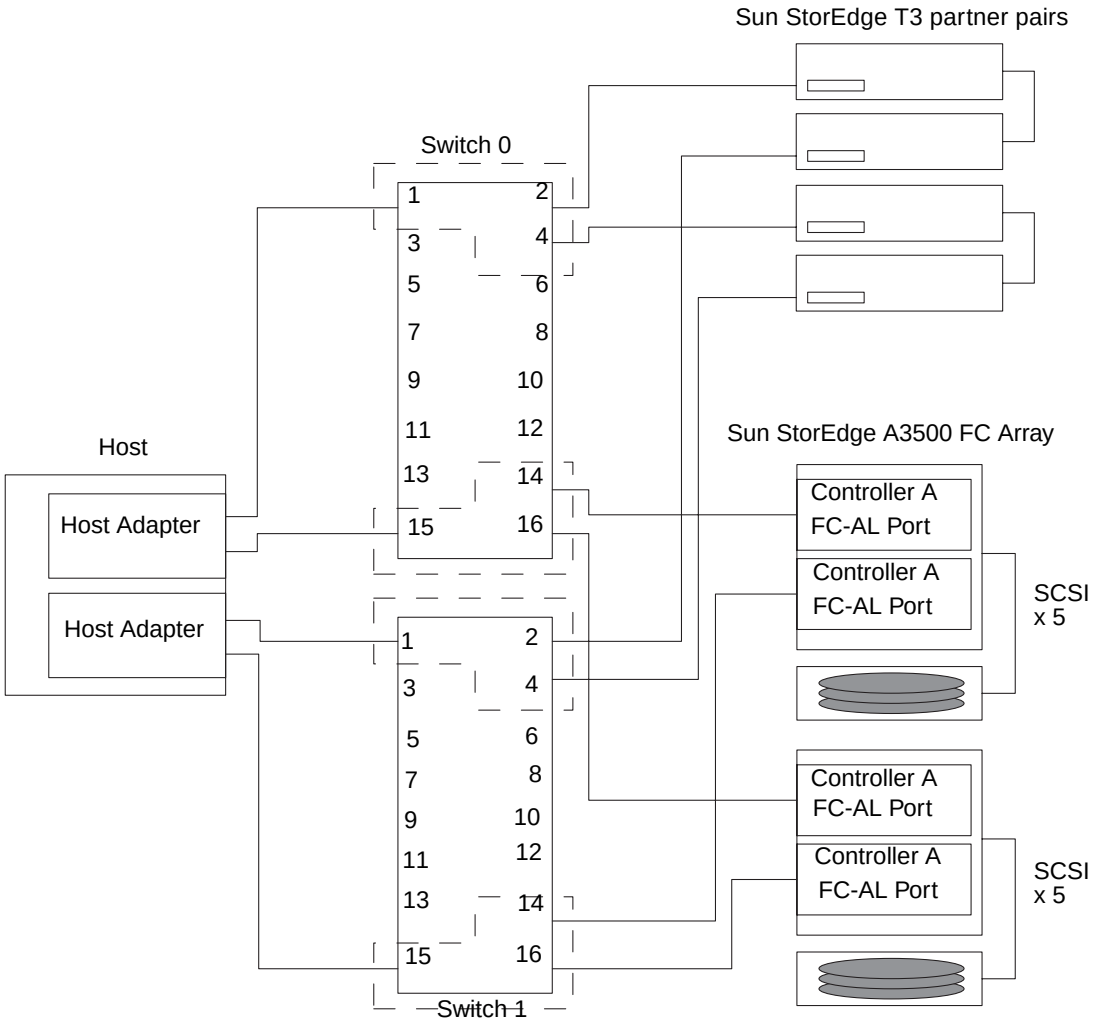



**FIGURE 2-8** Single Host Connected to Multiple Sun StorEdge T3 Arrays and Multiple Sun StorEdge A3500FC Arrays

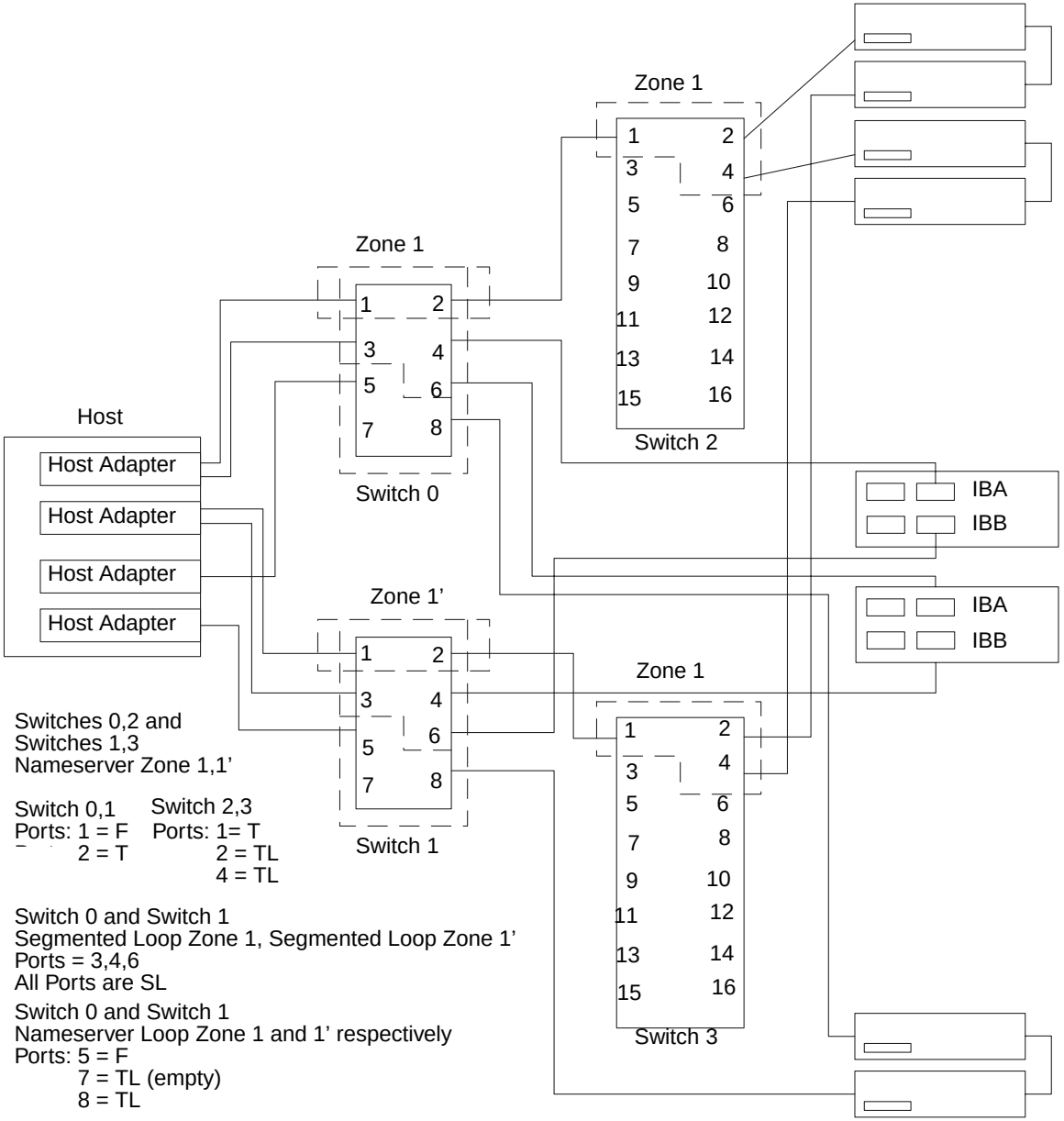



**FIGURE 2-9** Single Host Cascading Switches Connected to Sun StorEdge T3 Array and Local Storage Sun StorEdge A5200 Array and Sun StorEdge T3 Array

# Multihost

FIGURE 2-10 shows an example of a multihost configuration: two hosts connected through fiber-optic cables, using switches, to two Sun StorEdge A3500FC controller modules.

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.

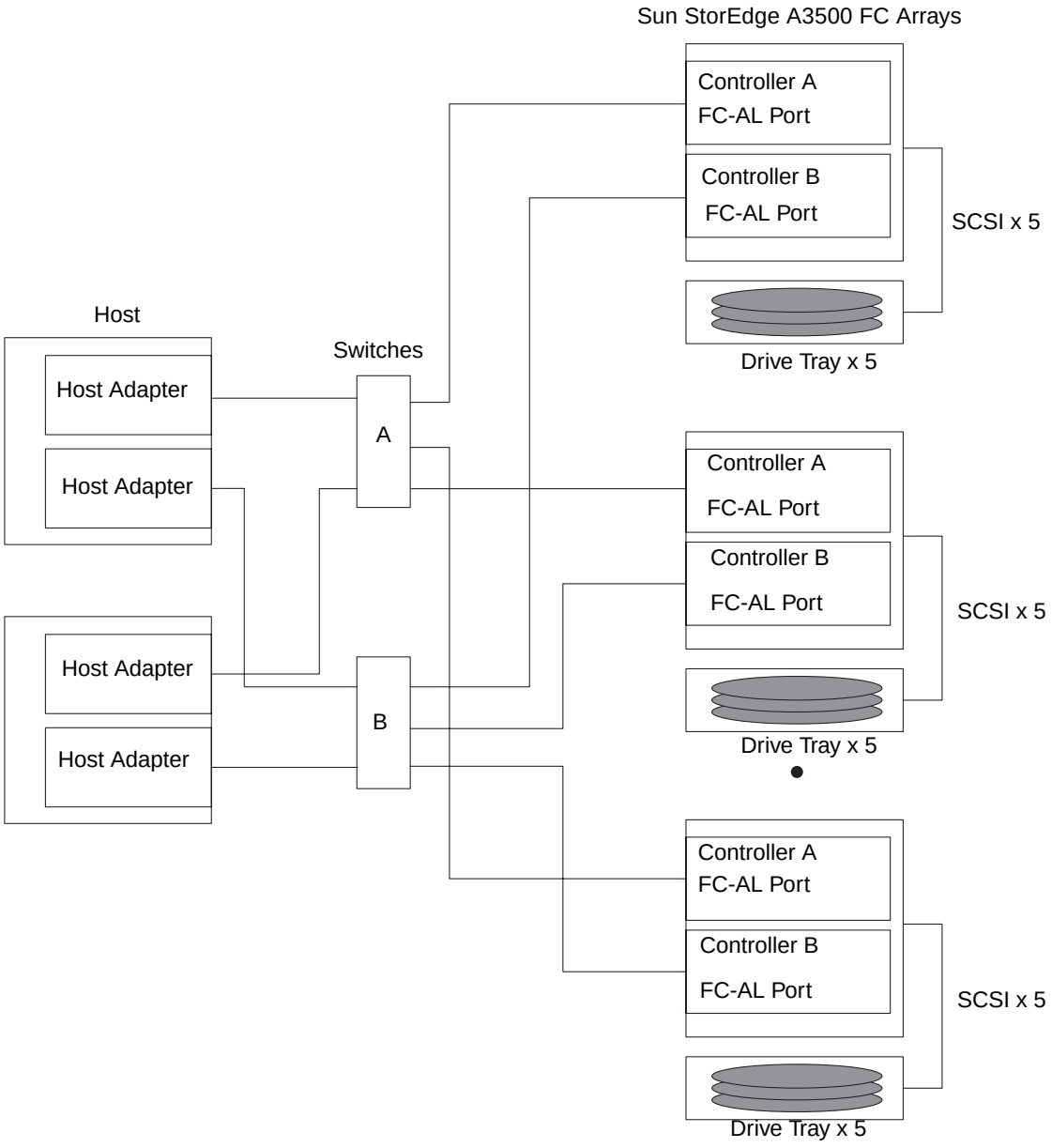



**FIGURE 2-10** Two Hosts Connected to a Maximum of Four Sun StorEdge A3500FC Arrays

**Note –** You can attach different storage types to the same switch so 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.

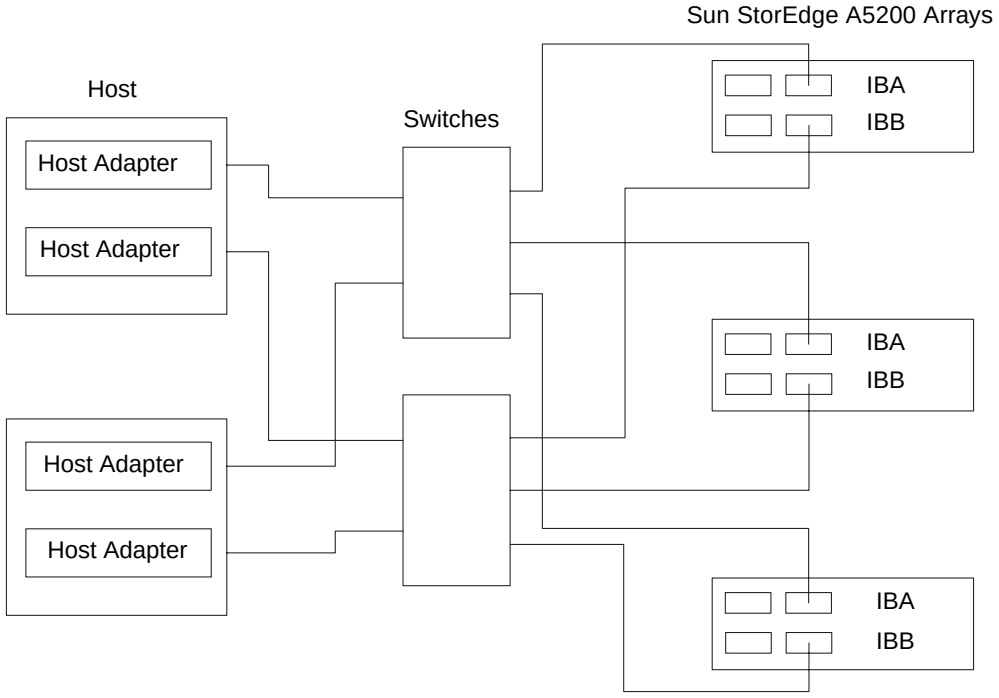



**FIGURE 2-11** Two Hosts Connected to Three Sun StorEdge A5200 Arrays

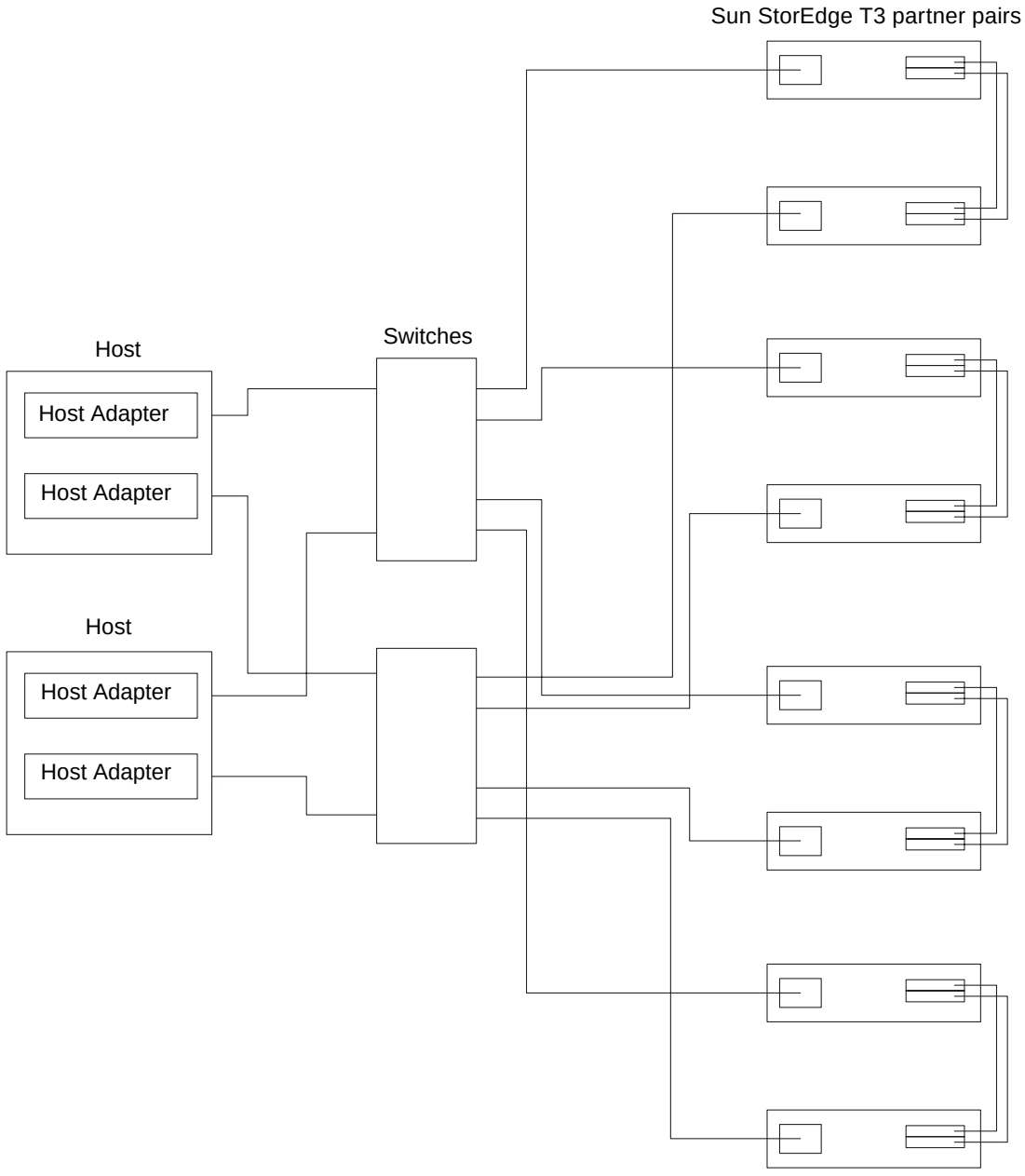



**FIGURE 2-12** Two Hosts Connected to Four Sun StorEdge T3 Array Partner Pairs

**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`.

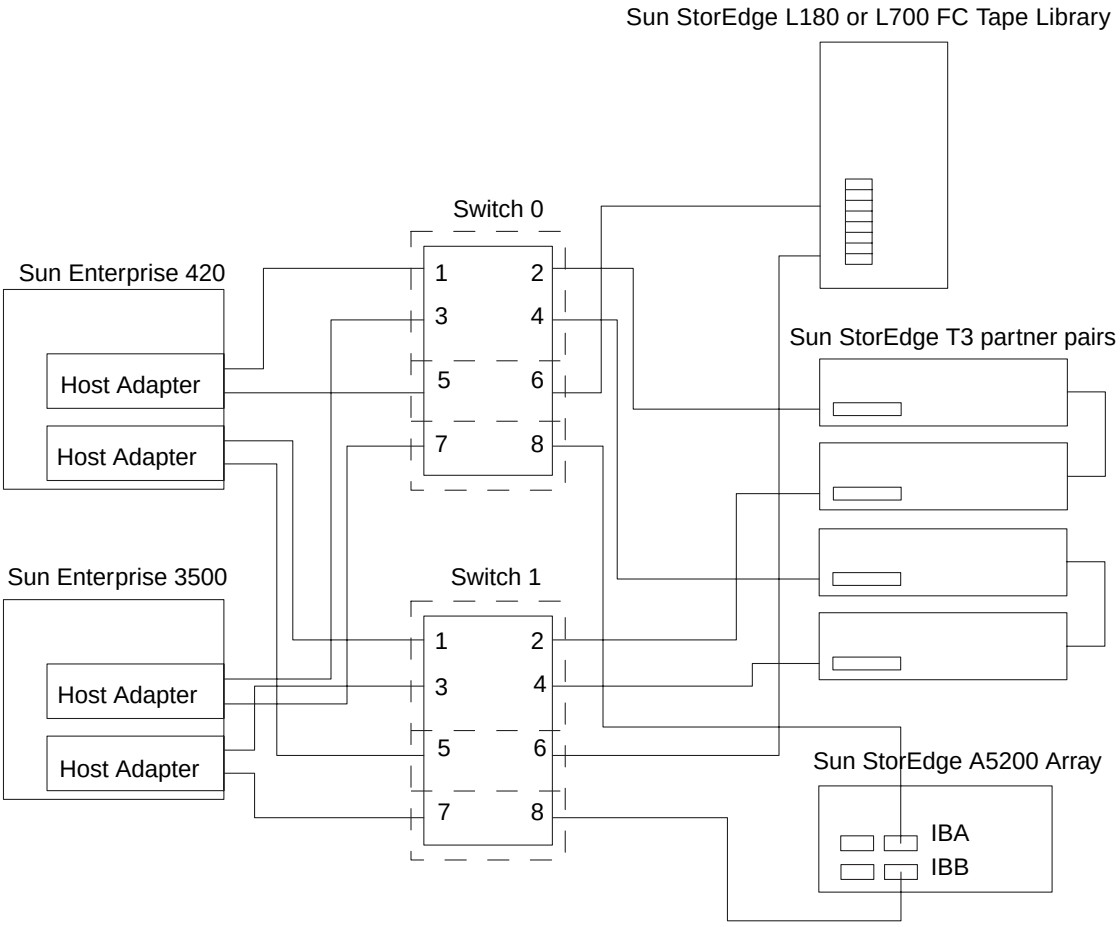



**FIGURE 2-13** Two Hosts Connected to Sun StorEdge T3 Array Partner Group: Each Host with Separate Non-shared Storage

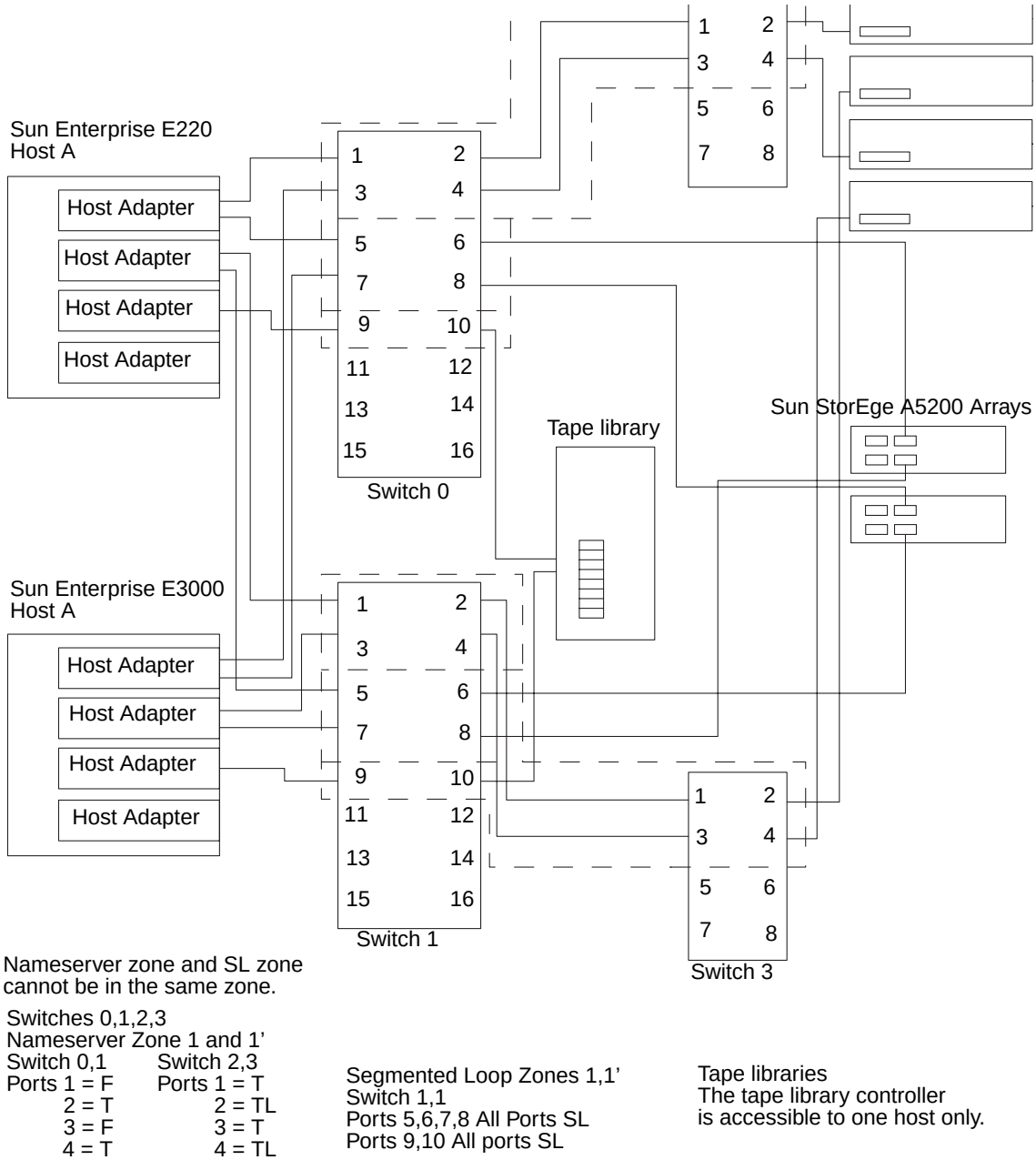



**FIGURE 2-14** Multi-Host with Cascading Switches Connected to FC-Tape, Sun StorEdge T3 Array, and Sun StorEdge A5200 Array

**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

# Diagnostic Tools

This chapter provides an overview of the tools you can use to monitor, diagnose, troubleshoot, and gather information on the Sun StorEdge SAN release 3.0. Detailed installation and configuration information can be found in the respective documentation of the tool.

## 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. It can be configured to monitor on a 24-hour basis, collecting information that enhances the reliability, availability, and serviceability (RAS) of the storage 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
- Support for the service processor and virtualization engine components of Sun StorEdge 3900 and 6900 series offerings
- 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.

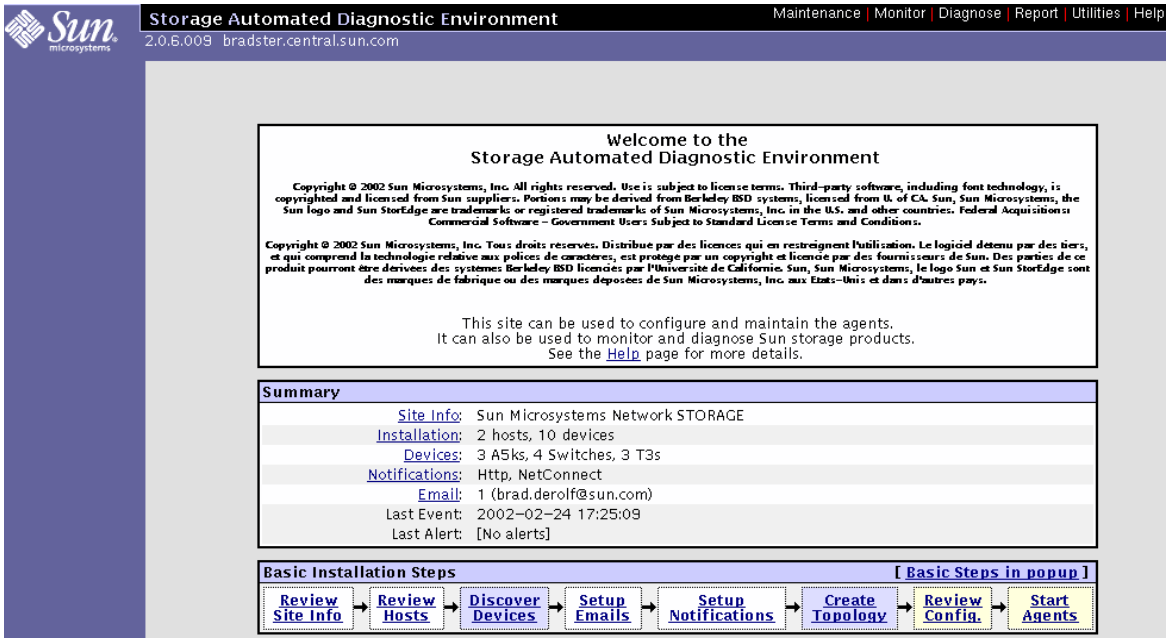



**FIGURE 3-1** Storage Automated Diagnostic Environment Main Window

## 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.

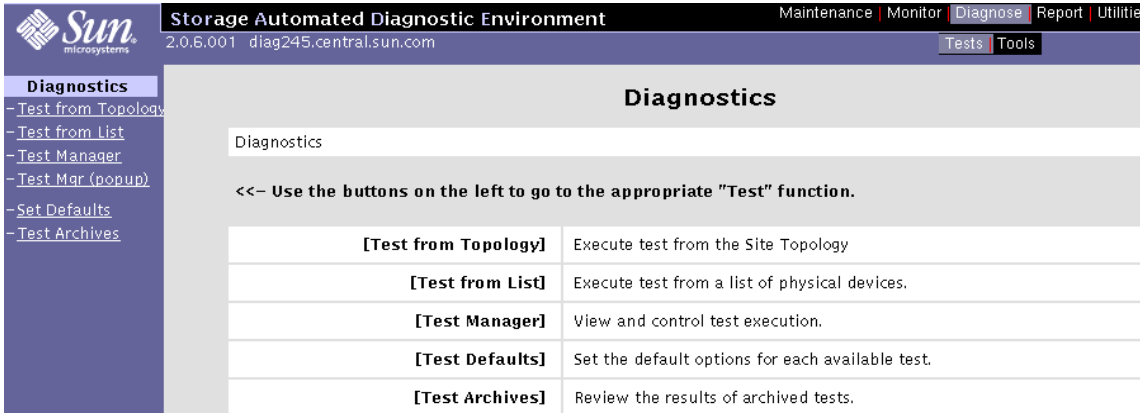
## Running Diagnostic Tests From the GUI Window

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.

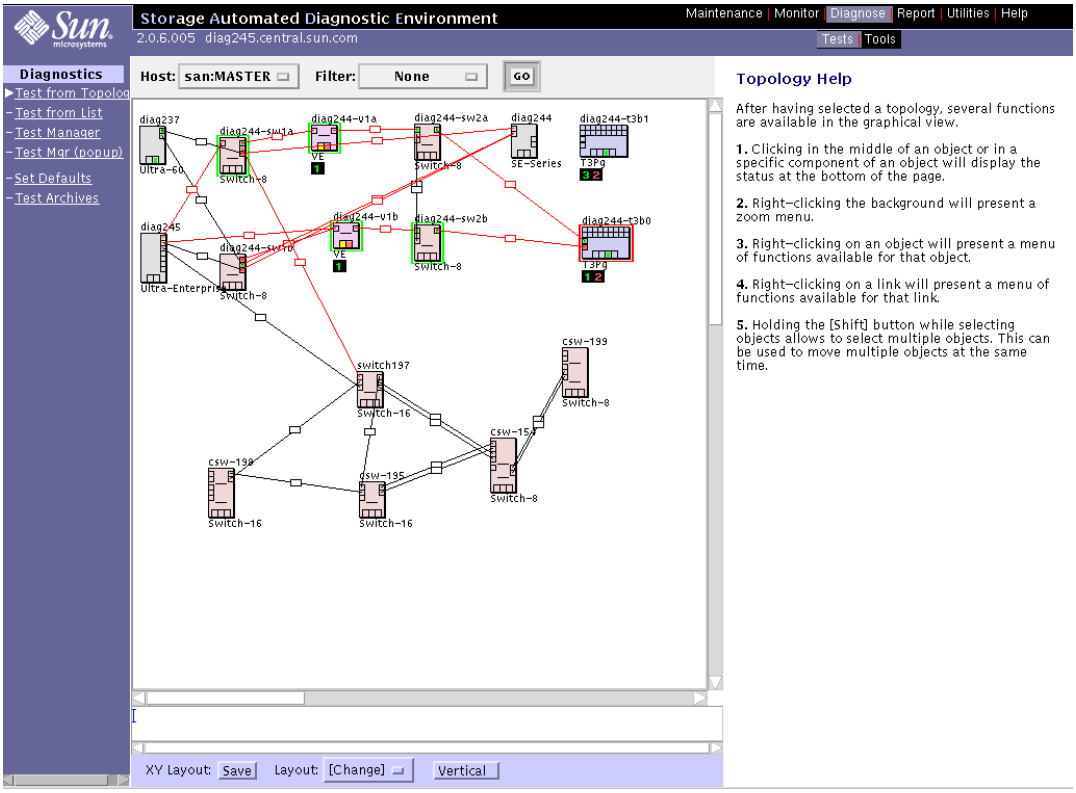



**FIGURE 3-2** Storage Automated Diagnostic Environment Topology Window

# 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.

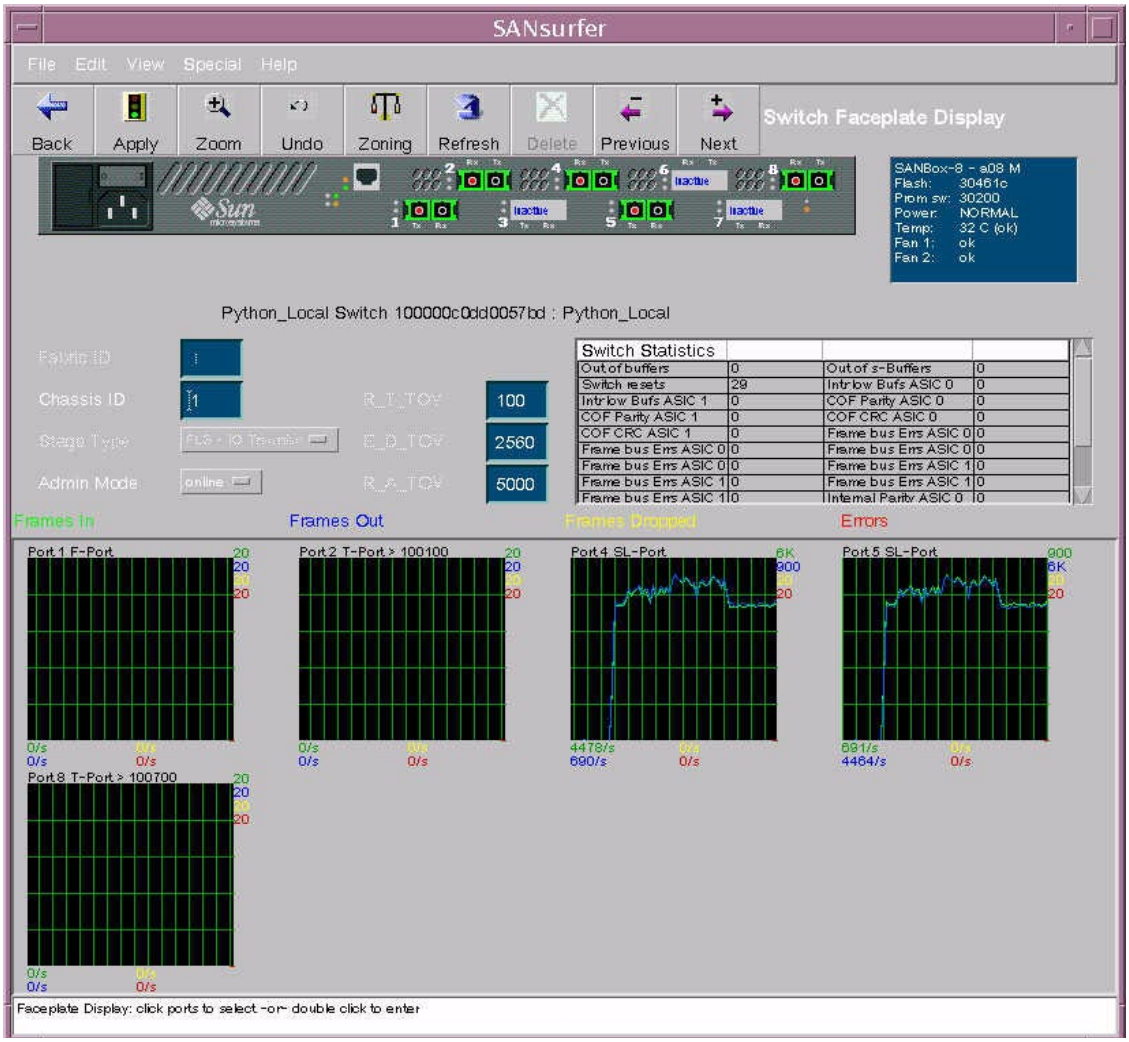



**FIGURE 3-3** Sansurfer GUI Main Window

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

# Sample Capture Output

```
Capture Version 1.0.1
---------------------

IP Address:     172.20.67.155

********************
Version Information
********************
HW:             1003
PROM:           30300
FLASH:          30461
CHASSIS TYPE:   A8
CHASSIS NUMBER: 0
Fabric Id:      1
WWN:            100000c0dd009e0e
MAC:            00c0dd009e0d

***************
Chassis Status
***************
Number of Ports: 8
Power:  OK
Temp:   OK
Temp =  31.0c
Fan 1:  OK
Fan 2:  OK
GBIC 1 :        Optical shortwave
GBIC 2 :        Optical shortwave
GBIC 3 :        Optical shortwave
GBIC 4 :        Optical shortwave
GBIC 5 :        Optical shortwave
GBIC 6 :        Optical shortwave
GBIC 7 :        None installed
GBIC 8 :        Optical shortwave

****************
Time Out Values
****************
Active:

Timeout Values:
  edtov:        2560
  mfstov:       640
  ratov:        5000
  rttov:        100

...continued on next page...
```

```
...continued from previous page...


************
Port Status
************
Port #   Port Type       Admin State     Oper State      Status Loop Mode
------   ---------       -----------     ----------      ------ -------
   1      F_Port           online         online         logged-in
   2      T_Port           online         online         logged-in
   3      F_Port           online         offline       Not-logged-in
   4      SL_Port          online         online         logged-in        Target
Devices:  1   Address: 0x00
        0x01
   5      SL_Port          online         online         logged-in        Target
Devices: 24   Address: 0x00
        0xb5
        0xba
... <snip 18 devices>
        0xe8
        0xef
   6      F_Port           online         online         logged-in
   7      F_Port           online         offline       Not-logged-in
   8      F_Port           online         offline       Not-logged-in
*********
Topology
*********
Port #:      Remote: Chassis   StageType   PortAddr    LinkAddr
   01              00             IOT       100000      000000
   02              01             IOT       100100      104100
   03              00             IOT       100200      000000
   04              00             IOT       100300      000000
   05              00             IOT       100400      000000
   06              00             IOT       100500      000000
   07              00             IOT       100600      000000
   08              00             IOT       100700      000000
******************
Links Information
******************
Chassis: 00      Remote: Chassis      Port    FCAddr     WWN
   Port:    02           01           02      104100     100000c0dd009e48
Chassis: 01      Remote: Chassis      Port    FCAddr     WWN
   Port:    02           00           02      100100     100000c0dd009e0e

...continued on next page...
```

*...continued from previous page...*

```
***********
port count
***********
Port Number:    1
Inframes:       17171439        Outframes:      30858503
LinkFails:      5               SyncLosses:     4
InvalidTxWds:   534             OLS Out:        42898
-------------------------
Port Number:    2
Inframes:       31052936        Outframes:      17368056
InvalidTxWds:   1               OLS Out:        3
Total LIP Rcvd: 102             LIP F7 F7:      102
-------------------------
Port Number:    3
Inframes:       0               Outframes:      0
InvalidTxWds:   4
...<output deleted>
************
Name Server
************
Port  Address  Type  PortWWN             Node WWN                FC-4 Types
----  -------  ----  ----------------  ----------------  -----------------
00    100000   N     210000e08b032a01  200000e08b032a01
05    100500   N     210000e08b030926  200000e08b030926  SCSI_FCP
**********************
World-wide Name Zone
**********************
WWN Zone total: 0
****************
NameServer Zone
****************
NameServer Zone total : 0
***************
Broadcast Zone
**************
Broadcast Zone total : 0
*********
Hard Zone
*********
Zone: 1, Enabled: yes
Port: 1
Port: 2
Port: 3
Port: 6
Port: 7
Port: 8
```

*...continued on next page...*

```
...continued from previous page...

Zone: 2, Enabled: yes
Port: 4
Port: 5

*******
SL Zone
*******
Zone: 2, Enabled: yes
Port: 4
Port: 5

Sample sanbox API outputs:
$ sanbox version 172.20.67.155
HW: 1003
PROM: 30300
FLASH: 30461
WWM: 100000c0dd009e0e
MAC: 00c0dd009e0d

$ sanbox nameserver 172.20.67.155

Port  Address  Type  PortWWN            Node WWN                FC-4 Types
----  -------  ----  -----------------  ----------------  -----------------
00    100000   N     210000e08b032a01  200000e08b032a01
05    100500   N     210000e08b030926  200000e08b030926  SCSI_FCP

$ sanbox links 172.20.67.155
Chassis: 00 Remote: Chassis Port FCAddr WWN
Port: 02 01 02 104100 100000c0dd009e48
Chassis: 01 Remote: Chassis Port FCAddr WWN
Port: 02 00 02 100100 1000000c0dd009e0e

$ sanbox initiators 172.20.67.155
WWN: 100000c0dd009e0e 210100e08b231026 200100e08b231026 4 0x01

$ sanbox port_status 172.20.67.155.0
bad port number: 0
Error: OK

$ sanbox port_status 172.20.67.155 1
Port: 1 F_Port Logged-in
0x100000 210000e08b032a01 200000e08b032a01

##End
```

**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.

# FC Switch LEDs and Back Panel Controls

FIGURE 3-4 and FIGURE 3-5 identify the parts of the switch chassis back. Port numbers are marked on the chassis.

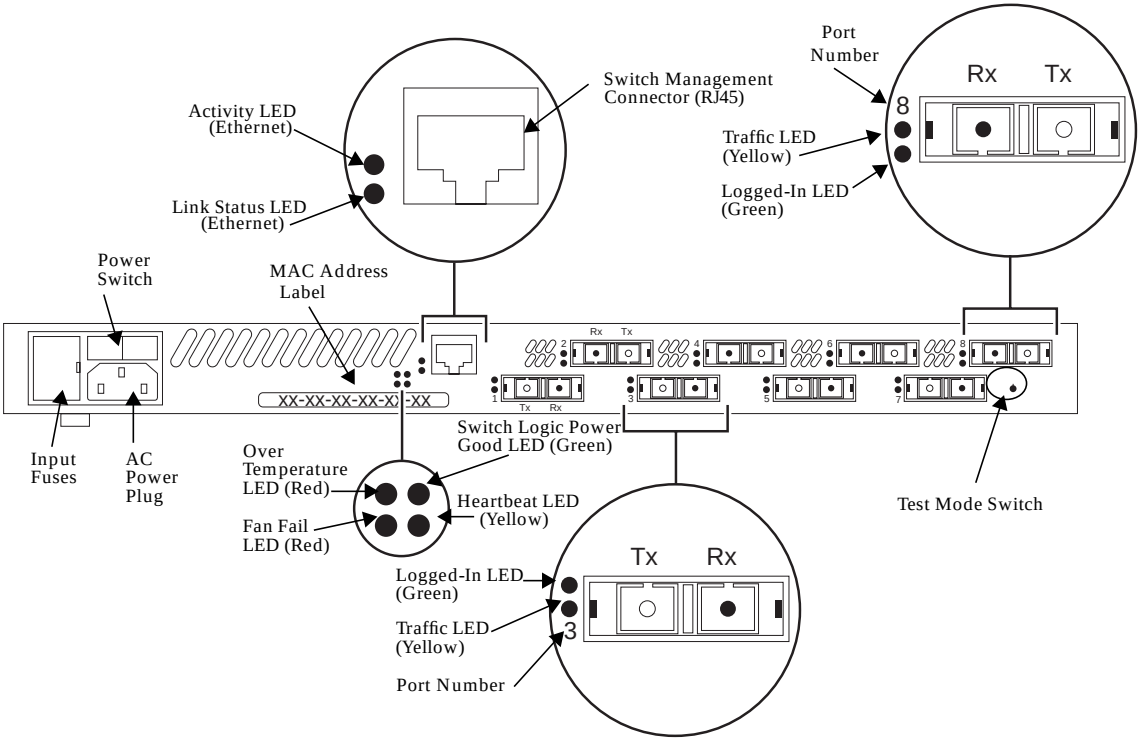



**FIGURE 3-4** Chassis Back (8-Port Switch)

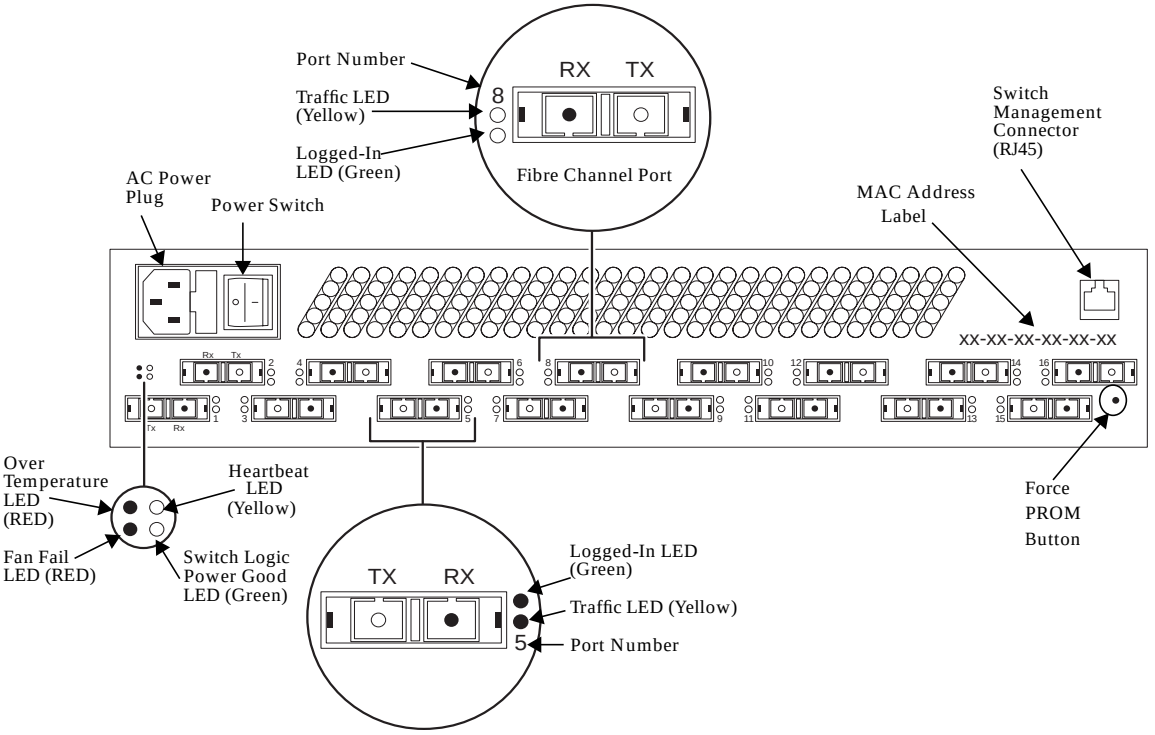



**FIGURE 3-5** Chassis Back (16-Port Switch)

# Power Switch

FIGURE 3-4 and FIGURE 3-5 show the location of the power switch. The power switch is a rocker switch. Press the right side (labeled 1) to turn it ON; press the left side (labeled 0) to turn it OFF.

When you press the power switch and turn it ON, there is a two-second delay before the fans start and the Power Good LED on the back of the chassis illuminates. The Power Good light indicates that the switch logic is receiving power within the proper voltage range.

# Back Panel LEDs

LEDs visible through lenses in the back of the chassis indicate chassis and port status. During a reset operation (for about two seconds at the beginning of power-on) all LEDs are forced ON. The following definitions are valid following the POST when the POST finds no errors.

## Heartbeat LED (Yellow)

The heartbeat LED indicates the status of the internal switch processor and the results of POSTs run at power-on.

Following a normal power-on, the heartbeat LED blinks about once per second to indicate that the switch has passed the POSTs and the internal switch processor is running.

## Switch Logic Power Good LED (Green)

This LED is ON when the power supply is delivering power within normal limits to the switch logic (the power switch must be ON).

## Fan Fail LED (RED)

This LED is normally OFF. It comes ON only when the speed of a fan drops below operational level.

## Over Temperature LED (Red)

This LED is normally OFF. The over temperature LED lights to indicate that the air temperature inside the switch has exceeded a certain limit. If this LED lights, inspect the following:

- Ambient air temperature: maximum 40°C (104°F)
- Proper clearance: 163 mm (6.5”) back, right side, and front
- Fan Operation
- Power supply operation

### Logged-In LED (Green)

Each port has its own Logged-In LED. The Logged-In LED indicates the logged-in or initialization status of the connected device or loop of devices. Initially (immediately after the switch completes the POST successfully, the switch holds all Logged-In LEDS OFF (no light). Each remains OFF until the port and its attached devices are able to perform a loop initialization (LIP) successfully. Following a successful LIP on a given port, the switch turns the Logged-In LED ON (lit) for that port. This shows that the port is properly connected and able to communicate with its attached devices. The LED for this port remains ON as long as the port is initialized.

If the established link is broken (a fiber opens or the connected port goes out of service), the Logged-In LED is shut OFF. If the link is replaced or the connected port comes back into service, the port and its attached devices try to regain initialized status. If the initialization is re-established, the switch turns the Logged-In LED back ON and communication continues.

### Traffic LED (Yellow)

Each port has its own port traffic LED. The traffic LED for a particular port is ON when Class 2 or 3 frames are entering or leaving the port. The switch turns the LED ON for 50 milliseconds for each frame, so you should be able to see it for one frame. This LED does not light for frames following an arbitrated loop in bypass mode.

## AC Input Power Connector and Fuses

A standard 3-wire computer-type AC power cable (supplied with the switch) connects between the AC input power connector and an AC outlet. See FIGURE 3-4 and FIGURE 3-5.

An input fuse holder is incorporated into the AC input power connector assembly. It holds two input fuses.

### Switch Management Connector

The switch management connector is a 10/100BASE-T Ethernet interface that provides a connection to a management station.

---

**Note –** A sticker on the back of the chassis contains the MAC Address. The MAC Address is used for the physical address for ethernet communication.

---

# Ethernet LEDs

## Link Status LED (Green)

The green LINK status LED lights only when the Ethernet interface establishes an electronic link.

## Activity LED (Yellow)

The yellow Activity LED lights when the interface is transmitting data to the network or receiving data from the network.

CHAPTER 4

# Diagnosing and Troubleshooting the Switch

This section provides information for diagnosing and troubleshooting problems with the switch.

- Power Checks and Troubleshooting helps you solve AC power and power supply problems.
- Power-On-Self-Test (POST) checks the condition of the Sun StorEdge Network FC Switch-8 and Switch-16 switch, except for GBICs.
- Cable Continuity tests for open fibers in the cable network.

## Power Checks and Troubleshooting

The following procedure assumes the Power Good LED does not illuminate.

Check that:

- The power switch is in the ON (l) position.
- The AC power outlet has the proper voltage.
- The power cable has continuity and is plugged into both the AC power outlet and the switch chassis.
- The input fuses are functioning properly.
- If the logged-in LED is off and the device attached to the port is a host, be sure the host is powered on and booted.

- If the logged-in LED is off and the device attached to the port is a storage unit, be sure it is powered on and is operating normally. You can verify the status of your array from the array's front LEDs and from RM6. Refer to the Sun StorEdge array manuals for information.

# Power-On-Self-Test (POST)

At startup, the switch runs a series of Power-On-Self-Test diagnostics. These POST diagnostics check for proper switch operation, excluding the GBICs. If no fatal errors are encountered, the switch becomes operational.

During the POST, the switch logs any errors encountered. Some POST errors are fatal; others are non-fatal. A fatal error disables the switch so that it does not operate. A non-fatal error allows the switch to operate, but with some decrease in performance until the problem is corrected.

- A PROM checksum failure is an example of a fatal error. It indicates that the PROM firmware is corrupt, and the switch does not operate.
- A failure associated with a Fibre Channel port is an example of a non-fatal error. The switch can isolate the bad port while the other ports continue to operate.

---

**Note –** In the following POST error descriptions, note that some errors result in a switch that is operable, but in a degraded way (non-fatal errors). Other errors result in a switch that is not operable (fatal errors). If the problem is non-fatal, you can run in a degraded mode until the problem is fixed.

---

When POST is complete and errors are encountered, the switch uses the heartbeat LED to blink an error code that describes the first fatal error encountered. The LED blinks in a pattern relating to the failure, pauses, and then restarts the same blinking pattern.

The switch then reads its error log, and if it has encountered non-fatal errors that affect one or more ports (with remaining ports operable), it disables the bad ports and blinks the Logged-in LED of the affected port or ports. If the errors is non-fatal but does not affect a single port or group of ports, only the heartbeat LED blinks an error code. In all cases, the switch displays the POST error indications until you power it off. For example:

- If the POST encounters a PROM checksum error, the entire switch is inoperable. The heartbeat LED blinks the error code for the fatal POROM checksum error. The entire switch is down, and no port Logged-in LEDs are lit because the problem does not affect a port or ports.
- If the POST encounters a bus error, the switch may operate in a degraded mode because it has multiple buses. It can operate with one or more buses in operation, but some normal processing functions, such as in-order delivery, may be adversely affected. The heartbeat blinks the error code for the non-fatal bus error. The switch may operate more slowly, but no port Logged-in LEDs are lit because the problem does not affect the ports.
- If the POST encounters a port error, the switch may operate with the remaining ports. The heartbeat blinks an error code for the non-fatal port error. The switch disables the failing port or ports and blinks their Logged-in LEDs.
- If the heartbeat LED is blinking normally and you cannot access the switch by way of the SANSurfer GUI, check the IP address and verify that it is set correctly. Refer to the *Sun Switch Management Installer's and User's Manual* for instructions on how to check and set the IP address. Also check the Ethernet cable.

The POST diagnostic program performs the following basic tests:

- Checksum tests on the Boot firmware located in a PROM and the main switch firmware located in FLASH memory.
- Functional hardware tests on internal switch memory.
- Various read / write register and loopback data-path tests on the switch logic board.
- Frame bus and auto route logic tests
- Switch management port logic tests
- Arbitrated loop tests

# Using the Test Mode Switch

The test mode switch is a small rotary switch located on the back of the switch chassis. The test mode switch enables the switch chassis to perform the following functions:

- Normal Operation: Performs POST diagnostics once at the time of startup and then proceeds to normal operation.
- Force PROM: Used to gain access to the PROM when flash memory or the resident configuration file is disabled.

The test mode switch position determines which functions are performed when the switch chassis is powered on. See FIGURE 4-1 for test mode switch functions and positions. Normal operation is indicated by the alignment of the small notch on the test mode switch with the dot on the faceplate.

**Caution –** Use the test mode switch on the back panel while performing maintenance tasks *only*. Data may be corrupted if the test mode switch is used while the switch chassis is operating.

# Front Panel Switch Modes

The following are the settings for the 10-position rotary switch:

| | |
|---|---|
| 0 | Normal operations |
| 1 | Continuous test |
| 2 | Test bypass |
| 3 | Operator test |
| 4 | Normal operation/initial test with force PROM mode |
| 5 | Continuous test with force PROM mode |
| 6 | Test bypass with force PROM |
| 7 | Operator test with force PROM |
| 8 | Normal operation/initial test with watchdog timer disabled |
| 9 | Continuous test with watchdog timer disabled |

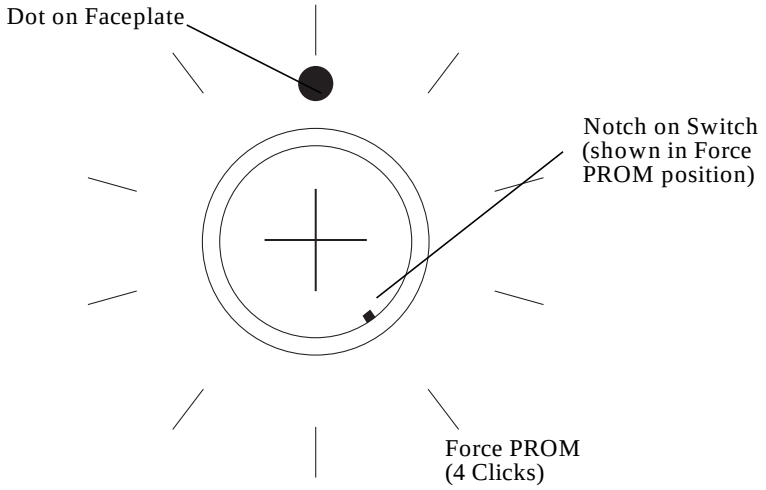



**FIGURE 4-1** Test Mode Switch Functions and Positions

## ▼ To Troubleshoot Test Mode Switch Functions

1. **Use a small screwdriver to change the test mode switch positions.**

   Use the normal position as reference and count the number of clicks (one click per position). These clicks are not audible and are best detected by touch.

2. **Isolate the switch chassis.**

   Data may be lost or corrupted if the test mode switch is used while data is being transmitted.

3. **Using a small screwdriver, rotate the test mode switch to the desired position.**

4. **Turn the power off and then back on to reset the switch chassis.**

5. **Observe the heartbeat LED for error codes (five blinks is normal when in the Force PROM mode).**

   Correct conditions or reconfigure the switch as needed.

6. **Return the test mode switch to the normal position, aligning the small notch with the dot on the faceplate.**

7. **Turn the switch off and then back on to reset the switch chassis.**

# Heartbeat LED Blink Patterns

## Normal (all pass)

If all POST diagnostics pass, the switch goes to normal operation and the heartbeat LED blinks at a steady rate of one blink per second.


**FIGURE 4-2** Heartbeat LED—Normal

## Failure Blink Patterns

The heartbeat LED indicates the error with a series of blinks, a three-second pause, and then the same series of blinks. The number of blinks between the three-second pause indicates the error. The blinks occur at about twice the speed of the normal heartbeat.

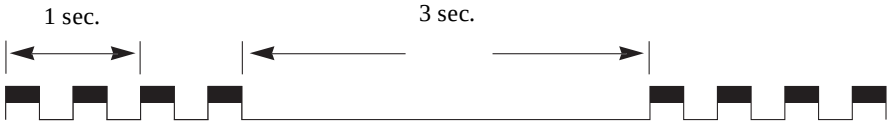



**FIGURE 4-3** Heartbeat LED—Failure Blink Patterns

## PROM Checksum Failure (One Blink)

The switch is not operable.

This checksum test of the PROM verifies the integrity of the PROM data. A failure indicates the PROM data is corrupted. The heartbeat LED blinks once between the three-second pauses. No port Logged-in LEDs blink.

## RAM Failure (Two Blinks)

The switch is not operable.

This test verifies the data and address buses to the SRAM and verifies SRAM integrity. A failure indicates that the data bus, address bus, or SRAM is failing. The heartbeat LED blinks twice between the three-second pauses. No port Logged-in LEDs blink.

## Flash Checksum Failure/Switch Management Port (Ethernet) Tests Good (Three Blinks)

The switch is not operable.

The flash checksum test verifies the integrity of the flash data. If the flash data is corrupt, the POST next checks the Switch Management port to find out if it is functional. The Switch Management port is the load path for loading new flash data. If the Switch Management ports tests good, the heartbeat LED blinks three times between the three-second pauses. No port Logged-in LEDs blink.

You may load new flash control code via the Switch Management port. See the Switch Management manual for a description of how to load new flash code.

## Flash Checksum Failure / Switch Management port (Ethernet) Failure (Four Blinks)

The switch is not operable.

The flash checksum test verifies the integrity of the flash data. If the flash data is corrupt, the POST checks the Switch Management port to find out if it is functional. The Switch Management port is the load path for loading new flash data. If the Switch Management ports tests bad, the heartbeat LED blinks four times between the three-second pauses. No port Logged-in LEDs blink. This means that the flash control code is corrupt and the Switch Management port may not operate well enough to load new flash code.

## Force PROM Mode in Effect (Five Blinks)

This is an alarm.

Five blinks indicate that the processor is reading the default configuration from PROM instead of from flash memory.

The test mode switch is in the force PROM position. This error never occurs unless you are using the force PROM button. The heartbeat LED blinks five times between the three-second pauses.

## Switch ASIC Test Failure (Six Blinks)

The switch is not operable.

The switch ASIC test verifies the base functionality of each switch ASIC, including the control port interface and all functions performable with the confines of an individual ASIC. A failure indicates a faulty switch ASIC. The heartbeat LED blinks six times between three-second pauses. The switch disables the ports associated with the bad ASIC and blinks the ports' Logged-in LEDs. An ASIC that fails this test could affect the operation of the remaining ports.

## GBIC Bypass Port Loopback Test Failure (Seven Blinks)

The switch is operable.

The GBIC bypass port loopback test verifies (on a port-by-port basis) the ability of each switch ASIC to loop data out through the Serdes chip on a port and back to the ASIC control port (bypassing the GBIC). A failure indicates either a faulty switch ASIC or an ASIC-to-Serdes interface problem. the heartbeat LED blinks seven times between three-second pauses. The switch disables the failing port or ports and blinks their Logged-in LEDs. The ports whose Logged-in LEDs are not blinking have passed the test and are all usable.

## Fibre Channel Port Loopback Test Failure (Eight Blinks)

---

**Note –** This test runs in Continuous Test only. Continuous Test is controlled by the test mode switch. Use this test only under the direction of customer support, which will tell you how to activate the test.

---

The switch is not operable while in continuous test.

In continuous test mode, the switch fibre channel port loopback test verifies the ability of each switch ASIC to loop data out through each fibre channel port, through a loopback plug, and back to the ASIC control port. In order to accomplish this test, you must attach a loopback plug to each GBIC as you test it.

### ▼ To Test the GBIC

1. **Place the chassis into Continuous Test.**
2. **Remove all GBICs from the chassis, except the one you want to test.**

   The GBIC under test may be in any port. The Continuous Test skips all empty ports.
3. **Insert a loopback plug into the GBIC.**
4. **Cycle the chassis power to cause a reset.**
5. **After a few seconds of testing, if the heartbeat LED is blinking about once per second (normal), the GBIC passes the test. If the heartbeat LED blinks the eight-blink error code, the GBIC failed.**

   Repeat steps 2 through 5 to test all the GBICs, one at a time.
6. **When all the tests are complete, place the test mode switch back in the 'Normal Run' position (small dot on the end of the shaft pointing straight up).**
7. **Cycle the chassis power to cause a reset.**

## Switch Bus Test Failure (Nine Blinks)

The switch is not operable.

The switch bus test verifies the ability of the switch ASICs to communicate with each other via the buses that interconnect the ASICs. A failure indicates an inability of an ASIC pair to communicate over one or more buses. The heartbeat LED blinks nine times between three-second pauses. No port Logged-in LEDs blink.

## Switch Auto-Route Test Failure (10 Blinks)

The switch is operable.

The switch auto-route test verifies the auto-route capability of individual ports to route frames to the other ports in the chassis. The heartbeat LED blinks 10 times between three-second pauses. the switch disables the failing ports or port-pairs and blinks their Logged-in LEDs.

The ports whose Logged-in LEDs are not blinking have passed the test.

## Eleven and Twelve Blinks—Not Used

## Arbitrated Loop Test Failure (13 Blinks)

The switch is operable.

The arbitrated loop test verifies the ability of the arbitrated loop ports to initialize properly. The heartbeat LED blinks 13 times between three-second pauses. The switch disables the failing ports and blinks their Logged- LEDs.

The ports whose Logged-in LEDs are not blinking have passed the test.

## Switch Management Port Failure (14 Blinks)

The switch is operable.

The switch management port test verifies the functionality of the Ethernet data bus. A failure indicates that communication over the Ethernet port will probably be adversely affected. The heartbeat LED blinks 14 times between three-second pauses. No port Logged-in LEDs blink.

## NVRAM Test Failure (15 Blinks)

The switch is not operable.

The Non-Volatile Memory (NVRAM) test verifies the status of the NVRAM battery (not low), performs a checksum on any existing data, and performs a data write/read test on the unused areas of the NVRAM. A test failure in any the these three tests causes the heartbeat LED to blink 15 times between three-second pauses.

### Hung Flash Control Code

The switch is not operable.

If the Power Good LED is lit and the heartbeat LED and the remaining front-panel LEDs blink in unison, the flash control code running the processor is hung.

### Complete Failure

The switch is not operable.

If the Power Good LED is lit and the heartbeat LED does not blink at all (always ON or always OFF) the switch is not operable.

## Cable Continuity Tests

When there is a problem communicating over a particular link and both the switch and the connected device pass their respective tests, check the continuity of the cables by running the Storage Automated Diagnostic Environment `switchtest`. Depending on the configuration, you may need to run the `switchtest` offline.

CHAPTER 5

# Switch Counter Information

Switch Counter data should be used only as supporting data. *Do not use this data as the primary source in the troubleshooting process*.

General points to keep in mind when viewing counters follow.

- Quickly increasing counter values or abnormally high counter values may indicate a problem.
- A LIP that occurs on one port in a zone propagates to all the ports that have devices attached to them in the same zone. The LIP counter is incremented on all those ports.
- Normal activity may also increase counter values.
- Counters increment on power cycles.

Running the Sun StorEdge PCI Dual Fibre Channel Host Adapter Board Test (`qlctest`) from the Storage Automated Diagnostic Environment increments the following counters:

- In frames
- Out frames
- Link failure
- Sync losses 100ms
- Invalid tx words rec
- LIP total received
- LIP F7F7
- LIP F8F7
- AL Init Attempts
- Sync Loss
- LIP during Init

To view any counter, use the SanSurfer GUI Port Display window (see FIGURE 5-1), through which you can view the counters non-disruptively.

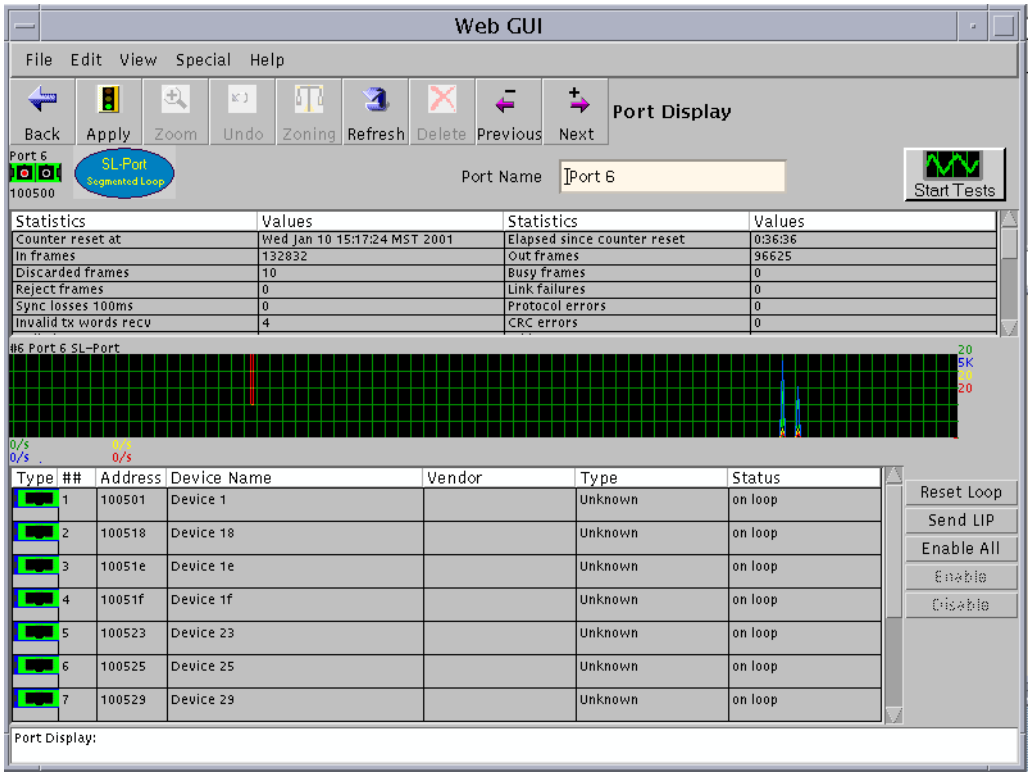



**FIGURE 5-1** SanSurfer GUI Port Display

TABLE 5-1 on the following page describes the counters from the Port Display window.

# Counter Descriptions

**TABLE 5-1** Port Display Window Counters

| Counter Name (in port display) | Description |
|---|---|
| Address ID errors | Number of address identifiers (S_ID, D_ID) found to be in error. |
| AL Init Attempts | Number of times the port entered the initialization state. |
| AL Init Errors | Number of times the port entered initialization and the initialization failed. |
| Busy frames | Number class 2 and class 3 fabric busy (F_BSY) frames generated by this port in response to incoming frames. This usually indicates a busy condition on the fabric or N_port that is preventing delivery of this frame. |
| Counter reset at | Show the time and date of the last time the switch was reset. |
| CRC errors | Number of invalid Cyclic Redundancy Check (CRC) frames detected. |
| Delimiter errors | Number of delimiter errors detected. Delimiters, such as SOFc3 (star of frame, class 3), EOFn (end of frame), or others are improper or invalid. |
| Discarded frames | Number of class 2 and class 3 sequences that were discarded by this port. A sequence can be discarded because of detection of a missing frame (based on SEQ_CNT), detection of and E_D_TOV timeout, receiving a reject frame, receiving frames for a stopped sequence, or other causes. |
| Elapsed since counter reset | Length of time that has elapsed since the last switch reset was performed. |
| In frames | Number of class 2 and class 3 frames received by this port. |
| Invalid tx words recv | Number of invalid transmission words detected during decoding. Decoding is from the 10-bit characters and special K characters. |
| Laser Faults | Number of times a laser fault was detected. |
| LIP Flow Cntrl Errors | This is a switch internal error condition (for factory use only). |
| Link Failures | Number of optical link failures detected by this port. A link failure ia loss of synchronization for a period of time greater than the value of R_fT_fTOV or by loss of signal while not in the offline state. A loss of signal causes the switch to attempt to re-establish the link. If the link is not re-established by the time specified by R_T_TOV, a link failure is counted. A link reset is performed after a link failure. |

**TABLE 5-1** Port Display Window Counters

| Counter Name (in port display) | Description |
|---|---|
| Link reset in | Number of link reset primitives received from an attached device. |
| Link reset out | Number of link reset primitives sent from this port to an attached port. |
| LIP AL_PD AL_PS | Number of F7, AL_PS LIPs, or AL_PD (vendor specific) resets performed. |
| LIP during INit | Number of times the switch received a LIP while it was already in the initialization state. |
| LIP F7 AL_PS | This LIP is used to re initialize the loop. An L_port, identified by AL_PS, may have noticed a performance degradation and is trying to restore the loop. |
| LIP F7F7 | A loop initialization primitive frame used to acquire an AL_PA. |
| LIP F8 AL_PS | This LIP denotes a loop failure detected by the L_port identified by AL_PS. |
| LIP F8F7 | Currently not used. |
| LIP Total Received | Number of loop initialization primitive frames received. |
| LISM Failed | The LISM primitive is used to select a temporary loop master for initialization. This counter shows the number of times the switch was unable to establish itself as the loop master. |
| LOF Timeout ELS | Currently undefined. |
| LOF Timeouts | Number of times the switch was unable to transmit a frame within the R_T_TOV value. |
| Long Frame Errors | Number of times a frame longer than the maximum frame size was received. |
| Loss of Signal | Number of signal losses detected for this port. |
| OLS in | Number of offline sequences received. An OLS is issued for link initialization, a Receive & Recognize Not_Operation (NOS) state, or to enter the offline state. |
| OLS out | Number of offline sequences issued by this port. An OLS is issued for link initialization, a Receive & Recognize Not_Operation (NOS) state, or to enter the offline state. The switch may issue an OLS to perform offline diagnostics or to power down. |
| OPN Returns | Number of times a device on the loop didn't accept an open primitive. This usually indicates a device error. |
| Out Frames | Number of class 2 and class 3 frames transmitted by this port. |
| Protocol errors | Number of primitive sequence protocol errors. An error indicates that a sequence protocol violates the FC-2 signaling protocol. |

**TABLE 5-1** Port Display Window Counters

| Counter Name (in port display) | Description |
|---|---|
| Reject Frames | Number of frames, from devices, that have been rejected. Frames can be rejected for any of a large number of reasons. |
| Reserved | N/A |
| Retry LIPs | Currently not used. |
| Short Frame Errors | Number of times a frame shorter than 36 bytes was received. |
| Smoothing Overflow Errors | Number of times that a violation of FC rules on the incoming signal were detected. An example of a violation is an insufficient number of idles received between frames. |
| Sync Loss | Number of synchronization losses detected through reception of invalid transmission words on the port. |
| Sync losses 100 ms | Number of synchronization losses (>100 ms) detected by this port. A loss of synchronization is detected by receipt of an invalid transmission word. |

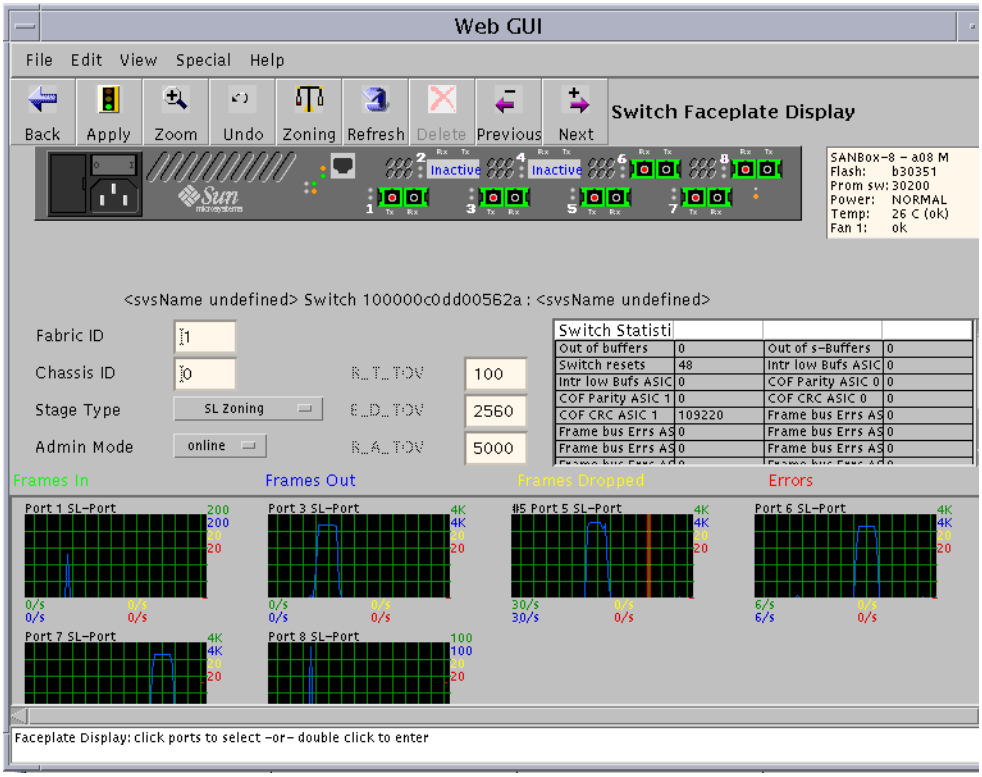



**FIGURE 5-2** SanSurfer Web GUI

TABLE 5-2 on the following page lists the counter names and briefly describes them.

**TABLE 5-2** Counter Names and Descriptions (Faceplate Window)

| Counter | Description |
|---|---|
| COF CRC ASIC 0<br>COF CRC ASIC 1<br>COF CRC ASIC 2*<br>COF CRC ASIC 3* | Internal switch counter that tracks errors during frame outputs from the specified ASIC. A non-zero value may indicate an internal problem with the switch. |
| COF Parity ASIC 0<br>COF Parity ASIC 1<br>COF Parity ASIC 2*<br>COF Parity ASIC 3* | Parity error detected curing reading of the frame in the CPORT OUt FIF) (COF) for the specified ASIC. A non-zero value may indicate an internal problem with the switch. |
| Frame bus Errs ASIC 0 Port 1<br>Frame bus Errs ASIC 0 Port 2<br>Frame bus Errs ASIC 0 Port 3<br>Frame bus Errs ASIC 0 Port 4<br>Frame bus Errs ASIC 1 Port 1<br>Frame bus Errs ASIC 1 Port 2<br>Frame bus Errs ASIC 1 Port 3<br>Frame bus Errs ASIC 1 Port 4<br>Frame bus Errs ASIC 2 Port 1<br>Frame bus Errs ASIC 2 Port 2<br>Frame bus Errs ASIC 2 Port 3<br>Frame bus Errs ASIC 2 Port 4<br>Frame bus Errs ASIC 3 Port 1<br>Frame bus Errs ASIC 3 Port 2<br>Frame bus Errs ASIC 3 Port 3<br>Frame bus Errs ASIC 3 Port 4 | Errors detected in the data being sent over the frame bus between ASICs. A non-zero value may indicate an internal problem with the switch. |
| Internal Parity ASIC 0 Port 1<br>Internal Parity ASIC 0 Port 2<br>Internal Parity ASIC 0 Port 3<br>Internal Parity ASIC 0 Port 4<br>Internal Parity ASIC 1 Port 1<br>Internal Parity ASIC 1 Port 2<br>Internal Parity ASIC 1 Port 3<br>Internal Parity ASIC 1 Port 4<br>Internal Parity ASIC 2 Port 1*<br>Internal Parity ASIC 2 Port 2*<br>Internal Parity ASIC 2 Port 3*<br>Internal Parity ASIC 2 Port 4*<br>Internal Parity ASIC 3 Port 1*<br>Internal Parity ASIC 3 Port 2*<br>Internal Parity ASIC 3 Port 3*<br>Internal Parity ASIC 3 Port 4* | Parity error detected with data transfer internal to the switch. A non-zero value may indicate an internal problem with the switch. |

**TABLE 5-2** Counter Names and Descriptions (Faceplate Window)

| Counter | Description |
|---|---|
| Intr low Bus ASIC 0<br>Intr low Bus ASIC 1<br>Intr low Bus ASIC 2*<br>Intr low Bus ASIC 3* | Number of times a low buffer condition has occurred on the specific ASIC. |
| Out of buffers | Number of large frames that have been sent by this switch. |
| Out of s-buffers | Number of small frames that have been sent by this switch. |
| Switch resets | Number of times the switch has been reset since it was manufactured. |

* Available only for switches with more than 8 ports.

CHAPTER 6

# Examples of Fault Isolation

## Overview

In this section, several example scenarios are detailed and tips are given about where to look for errors and how to interpret various outputs and displays. The scenarios will cover these situations

- Switch-to-Storage Fault (Sun StorEdge T3 array)
- Switch-to-Switch Fault (T Port cascades)
- Switch-to-HBA Fault
- Sun StorEdge A5200 array Example

In all scenarios, command line equivalents will be demonstrated where possible.

Also, in all scenarios, it is assumed that the latest patches, firmware and packages are running. Sun StorEdge Traffic Manager is enabled in all cases to simulate a redundant configuration; however, no volume management software is running except if explicitly noted.

# Setup Requirements

- One Enterprise 450 Workgroup Server
- Solaris 8 update 6 with all relevant Sun StorEdge SAN release 3.0 patches and packages
- 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

A high level SAN Topology is displayed in FIGURE 6-1.

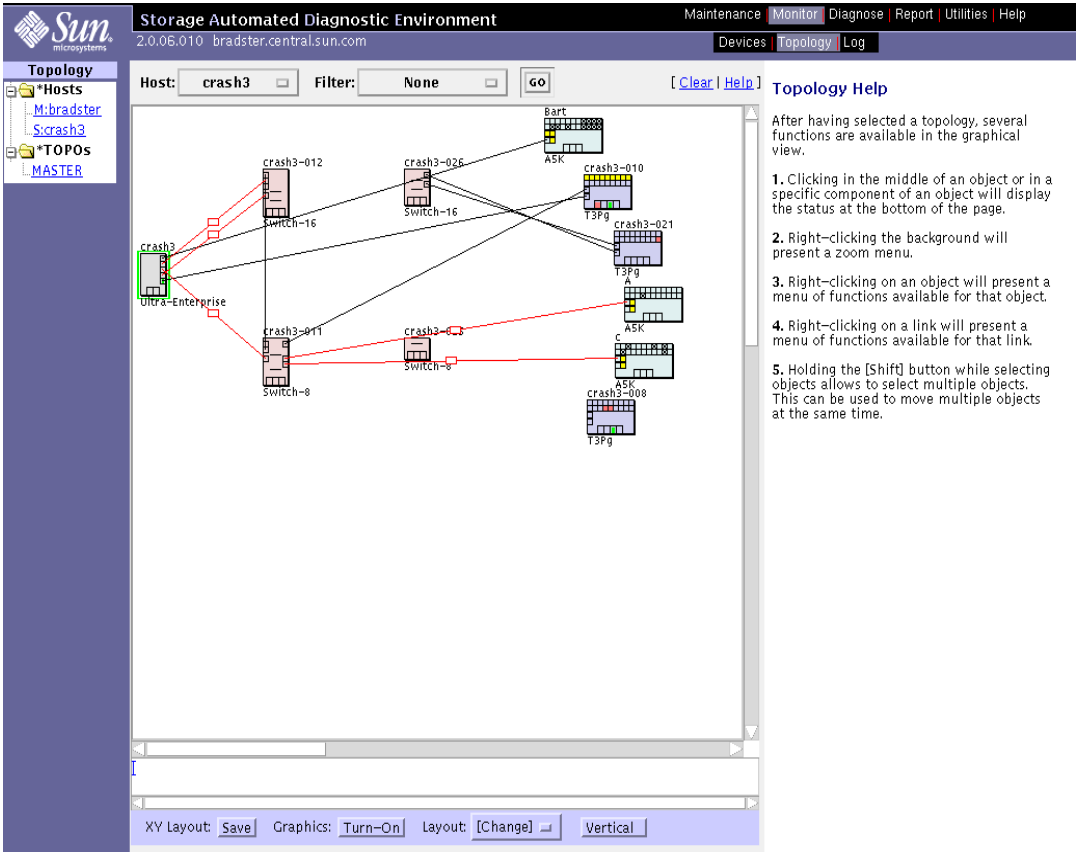



**FIGURE 6-1** High Level Configuration using the Storage Automated Diagnostic Environment

# Troubleshooting Outline

This section lists the broad steps on how to approach a SAN problem. It lays out a methodical approach and lists various tools and resources available at each step. It is expected that using Storage Automated Diagnostic Environment for monitoring will vastly decrease the time-consuming process of narrowing down the problem.

The full examples that follow this section give further details on each step.

**Step 1) Discover Error**

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

**Step 2) Determine the extent of the problem**

- `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 Array Status**

- open a telnet session to the Sun StorEdge T3 array
- display `luxadm` output for Sun StorEdge A5200 arrays
- Raid Manager (CLI utilities) for Sun StorEdge A3500FC arrays
- Storage Automated Diagnostic Environment messages and alerts
- 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 –** You can use the Storage Automated Diagnostic Environment 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. Follow the appropriate hardware manual for proper 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

# Converting a Fabric Address into Fabric ID, Chassis ID, ASIC, Port and AL_PA.

You will occasionally see messages like the following in `/var/adm/messages`:

```
Mar 7 10:06:18 vikings genunix: [ID 936769 kern.info] ssd6 is /pci@8,700000/pci
@3/SUNW,qlc@4/fp@0,0/ssd@w50020f2300009697,1

Mar 7 10:06:18 vikings scsi: [ID 365881 kern.info]     <SUN-T300-0117 cyl 34145
 alt 2 hd 72 sec 128>

Mar 7 10:06:18 vikings genunix: [ID 408114 kern.info] /pci@8,700000/pci@3/SUNW,
qlc@4/fp@0,0/ssd@w50020f2300009697,1 (ssd6) online

Mar 7 10:06:18 vikings scsi: [ID 799468 kern.info] ssd7 at fp0: name w50020f230
0009697,0, bus address 1084e4

Mar 7 10:06:18 vikings genunix: [ID 936769 kern.info] ssd7 is /pci@8,700000/pci
@3/SUNW,qlc@4/fp@0,0/ssd@w50020f2300009697,0

Mar 7 10:06:18 vikings scsi: [ID 365881 kern.info]     <SUN-T300-0117 cyl 34145
 alt 2 hd 56 sec 128>

Mar 7 10:06:18 vikings genunix: [ID 408114 kern.info] /pci@8,700000/pci@3/SUNW,
qlc@4/fp@0,0/ssd@w50020f2300009697,0 (ssd7) online

Mar 7 10:06:20 vikings scsi: [ID 799468 kern.info] ssd8 at fp1: name w50020f230
0000457,1, bus address 1044e8
```

Or, you may see a `luxadm -e dump_map` output:

```
# luxadm -e dump_map /devices/pci@8,700000/pci@3/SUNW,qlc@4/fp@0,0:devctl

Pos  Port_ID Hard_Addr Port WWN         Node WWN         Type
0    1084e4  1000e4    50020f2300009697 50020f2000009697 0x0  (Disk device)
1    108000  0         210100e08b2366f9 200100e08b2366f9 0x1f (Unknown Type,Host Bus
Adapter)
#
```

In both of these outputs, a Fibre Channel address appears (the six-digit number, **1084e4** for example), which potentially provides useful troubleshooting information. The key to this is knowing how the switches encode their addresses.

For a Qlogic (Ancor) switch, the address must first be changed from Hex to a 24-bit binary number.

## Example

1084e4 translates into hexadecimal as 100001000010011100100. (The calculator removes the first 3 bits because they were zeros. The number is actually 000100001000010011100100, which is the number used in this example). 000100001000010011100100 is the 24-bit binary representation of 1084e4.

Qlogic encodes this number the following way:

| | |
|---|---|
| Bits 0-3 | Fabric ID |
| Bits 4-9 | Chassis ID |
| Bits 10-13 | ASIC |
| Bits 14-15 | Port |
| Bits 16-23 | AL_PA |

- The AL_PA will be zero if the device is a full fabric device, otherwise, it will be the AL_PA of the loop device.
- Qlogic switches have 2 or 4 ASICS (2 on the 8port switch, 4 on the 16port switch). These ASICs are numbered from 0-3.
- Each ASIC has 4 ports, numbered 0-3.
- The numbering on the switch faceplate goes from 1-8 or 1-16.
- So, ASIC 0, port 0 is actually Port 1 if you were looking at the switch. ASIC 3, port 3 would be Port 16 if you were looking at the switch.

000100001000010011100100 is broken down as follows:

| | |
|---|---|
| 0001 | Fabric ID |
| 000010 | lChassis ID |
| 0001 | ASIC ID |
| 00 | Port ID |
| 11100100 | AL_PA |

You can convert these back into usable numbers. Binary -> Decimal (except for AL_PA, change it to Hex)

| | |
|---|---|
| Fabric ID | 1 |
| Chassis ID | 2 |
| ASIC ID | 1 |
| Port ID | 0 |
| AL_PA | E4 |

From this information, you can conclude the following:

- The Fabric ID of the switch is 1
- The Chassis ID of the switch is 2 (set in the SANsurfer GUI)
- The port in question is port 0 of ASIC 1.
- Port 0 of ASIC 1 is Port 5, if you were to look at the switch faceplate. (Refer to TABLE 6-1 to see the ASIC/Port breakdown.)
- The AL_PA of the device is E4.

Knowing this information, you can easily determine where this device is located in the SAN.

**TABLE 6-1** ASIC & Port Values

| Switch Port | ASIC ID | Port ID |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 1 |
| 3 | 0 | 2 |
| 4 | 0 | 3 |
| 5 | 1 | 0 |
| 6 | 1 | 1 |
| 7 | 1 | 2 |
| 8 | 1 | 3 |
| 9 | 2 | 0 |
| 10 | 2 | 1 |
| 11 | 2 | 2 |
| 12 | 2 | 3 |
| 13 | 3 | 0 |
| 14 | 3 | 1 |
| 15 | 3 | 2 |
| 16 | 3 | 3 |

# Example #1—Switch-to-Storage Error

1. **Discover the Error**

   The first indication of a problem surfaced from a Storage Automated Diagnostic Environment email:

```
You requested the following events be forwarded to you from 'diag226.central.sun.com'.

Source   : Agent-diag226.central.sun.com
Category : Message
EventType: AlarmEvent
EventTime: 08/10/2001 14:30:08

Message(s) found in logfile: /var/adm/messages on diag226.central.sun.com (id=80fee746):

Warning Mar 10 14:27:46 SCSI    diag226.Central.Sun.COM scsi: [ID 107833 kern.notice]
ASC: 0x47 (scsi parity error), ASCQ: 0x0, FRU: 0x0

Warning Mar 10 14:27:46 SCSI    diag226.Central.Sun.COM scsi: [ID 107833 kern.notice]
ASC: 0x47 (scsi parity error), ASCQ: 0x0, FRU: 0x0

Warning Mar 10 14:27:47 SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 10 14:27:47 FABRIC  diag226.Central.Sun.COM fp: [ID 517869 kern.warning]
WARNING: fp(1): N_x Port with D_ID=1006e8, PWWN=50020f23000003c5 disappeared from fabric
('port.u1p1'  in t3:diag190.Central.Sun.COM)

Warning Mar 10 14:28:07 Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info]
/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70) multipath status: degraded,
path /pci@6,4000/SUNW,qlc@3/fp@0,0 (fp1) to target address: 50020f23000003c5,1 is offline
('port.u1p1'  in t3:diag190.Central.Sun.COM)

Warning Mar 10 14:28:07 Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info]
/scsi_vhci/ssd@g60020f20000003c53b699aa10005114c (ssd71) multipath status: degraded,
path /pci@6,4000/SUNW,qlc@3/fp@0,0 (fp1) to target address: 50020f23000003c5,0 is offline
('port.u1p1'  in t3:diag190.Central.Sun.COM)

Warning Mar 10 14:28:12 Sun StorEdge Traffic Manager   diag226.Central.Sun.COM
Initiating failover for device ssd (GUID 60020f20000003c53b699aa10005114c)
('volume.u1vol1'  in t3:diag190.Central.Sun.COM)
...
```

```
...
Warning Mar 10 14:28:13 SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'reset': retrying command

Warning Mar 10 14:28:27 Sun StorEdge Traffic Manager   diag226.Central.Sun.COM
Failover operation completed successfully for device ssd (GUID
60020f20000003c53b699aa10005114c): failed over from primary to secondary
('volume.u1vol1'  in t3:diag190.Central.Sun.COM)

Source   : Agent-diag226.central.sun.com
Category : Switch
EventType: StateChangeEvent
EventTime: 08/10/2001 14:30:09

'port.7' in SWITCH csw-194 (ip=172.20.67.194) is now Not-Available (status-state changed
from 'Online' to 'Offline'):

------------------------------------------------------------------------
Source   : Agent-diag226.central.sun.com
Category : T3message
EventType: AlarmEvent
EventTime: 08/10/2001 14:30:10

Message(s) found in logfile: /var/adm/messages.t300 on diag226.central.sun.com (id=
80fee746):

Mar 10 21:16:50 diag190.Central.Sun.COM ISR1[1]: W: u1ctr ISP2100[2] Received LOOP DOWN
async event
Mar 10 21:17:16 diag190.Central.Sun.COM MNXT[2]: W: u2ctr starting lun 0 failover
```

**Note –** The *Message Event* from above is extracted from the `/var/adm/messages` file. It is possible that this problem would be initially discovered by watching the `/var/adm/messages` file instead of Storage Automated Diagnostic Environment emails. This will depend on customer configuration. For example, the *T3message Event* may be noted by monitoring the T3 syslog.

What is known at this point?

- The physical path `/pci@6,4000/SUNW,qlc@3/fp@0,0 (fp1)` is in degraded mode.
- Port 7 on the switch at `172.20.67.194` went offline.
- There was a LUN failover to `u2ctr`.

**2. Determine the extent of the problem**

**a. `cfgadm -al` output**

```
# cfgadm -al
c4                             fc-fabric    connected    configured   unknown
c4::50020f23000003d5           disk         connected    configured   unknown
c5                             fc-fabric    connected    configured   unknown
c5::50020f23000003c5           disk         connected    configured   unusable
```

The output above shows that one of the Sun StorEdge T3 arrays (`c5::50020f23000003c5`) is listed as *unusable*, indicating a problem. Correlate the WWN in Step 3, when you check the status of the storage array.

**b. luxadm -e port**

```
# luxadm -e port

Found path to 4 HBA ports
/devices/pci@6,4000/SUNW,qlc@2/fp@0,0:devctl                    CONNECTED
/devices/pci@6,4000/SUNW,qlc@3/fp@0,0:devctl                    NOT CONNECTED
/devices/pci@6,2000/pci@1/SUNW,qlc@4/fp@0,0:devctl              CONNECTED
/devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0:devctl              CONNECTED
```

The output above shows that one of the HBAs is *not connected*. Given that there was only one Sun StorEdge T3 array controller on this path, this would be expected behavior, even if the HBA was not failing. This output is inconclusive at this point.

**3. Check Array Status**

Telneting to the Sun StorEdge T3 array partner pair reveals:

- Both controllers are online
- Controller u2 has taken over LUN ownership
- There was a failure reaching the master (u1) controller

```
diag190:/:<1>sys stat
Unit   State      Role    Partner
-----  ---------  ------  -------
  1    ONLINE     Master    2
  2    ONLINE     AlterM    1


diag190:/:<4>fru stat
CTLR    STATUS   STATE       ROLE         PARTNER    TEMP
------  -------  ----------  ----------  -------    ----
u1ctr   ready    enabled     master      u2ctr      36.5
u2ctr   ready    enabled     alt master  u1ctr      37.5

diag190:/:<2>port list
port   targetid   addr_type   status   host   wwn
u1p1      1        hard       online   sun    50020f23000003c5
u2p1      2        hard       online   sun    50020f23000003d5

diag190:/:<3>port listmap
port   targetid   addr_type   lun   volume        owner   access
u1p1      1        hard        0    v0            u2      primary
u1p1      1        hard        1    v1            u2      failover
u2p1      2        hard        0    v0            u2      failover
u2p1      2        hard        1    v1            u2      primary
```

In the *port list* output from above, correlate the `cfgadm` output from **Step 2** (`c5::50020f23000003c5`) to the current array. This problem is affecting the master (u1) controller.

**4. Check Switch Status**

View the capture output to check port 7 and the Nameserver information. Port 7 should be a TL Port with the Sun StorEdge T3 array master controller connected to it.

```
7      TL_Port          online         offline       Not-logged-in

************
Name Server
************

Port  Address  Type  PortWWN            Node WWN               FC-4 Types
----  -------  ----  -----------------  -----------------  ----------------------
Database is empty
```

As show above, the port is offline and the Nameserver has no information about it. This could also be confirmed by bringing up, or having the customer bring up the SANsurfer GUI and checking the port state.

**5. Start Testing FRUs**

The following basic FRUs exist in the switch-to-storage link.

- Switch or Switch port
- Switch-side GBIC
- Cable
- Sun StorEdge T3 array MIA
- Sun StorEdge T3 array controller

**a. Rule out the Sun StorEdge T3 array controller for now, based on the healthy status reported in Step 3.**

**b. To rule out the remaining FRUs, uncable the link and place a loopback connector into the GBIC in port 7.**

**c. Run the Storage Automated Diagnostic Environment `switchtest` on this port**

If this test fails:

- Replace GBIC and retest
- If switchtest fails again, replace the entire switch.

If this test passes

- Reseat or Replace the MIA
- Reseat or Replace the cable

In this example, the results of `switchtest` from the command line follow.

```
First Pass with loopback connector inserted

# /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc1-sw2-f1-e2-sw3-e2-tl7

"switchtest:  called with options: dev=qlc1-sw2-f1-e2-sw3-e2-tl7"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc1-sw2-f1-e2-sw3-e2-tl7."
"Chassis Status for device: qlc1-sw2-f1-e2-sw3-e2-tl7 Power: OK Temp: OK 31.0c Fan 1: OK
Fan 2: OK"
08/10/01 15:16:38 diag226.Central.Sun.COM Storage Automated Diagnostic Environment: VTSID
6008 switchtest.FATAL : "Port 7 is Offline with Pattern 0x4a4a4a4a on Device qlc1-sw2-f1-
e2-sw3-e2-tl7" Probable_Cause(s): <Fibre Channel cable disconnected to HBA>
<Bad GBIC or bad Fibre Channel cable >

Replace the GBIC and rerun the test.

# /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc1-sw2-f1-e2-sw3-e2-tl7
"switchtest:  called with options: dev=qlc1-sw2-f1-e2-sw3-e2-tl7"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc1-sw2-f1-e2-sw3-e2-tl7."
"Chassis Status for device: qlc1-sw2-f1-e2-sw3-e2-tl7 Power: OK Temp: OK 31.0c Fan 1: OK
Fan 2: OK"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x7e7e7e7e"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x78787878"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0xe7e7e7e7"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0xb5b5b5b5"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0xaa55aa55"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x7f7f7f7f"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x0f0f0f0f"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x4a4a4a4a"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x00ff00ff"
"Testing Device: qlc1-sw2-f1-e2-sw3-e2-tl7 Port: 7 Pattern: 0x1e1e1e1e"
"Port 7 passed all tests on qlc1-sw2-f1-e2-sw3-e2-tl7"
"switchtest: Stopped successfully."
```

After replacing the GBIC, the tests pass.

6. **Conclude that the original GBIC was bad, recable the link, and check status.**

   After recabling the link, the following messages appear in `/var/adm/messages`:

```
Mar 10 15:20:52 diag226.Central.Sun.COM fp: [ID 517869 kern.warning] WARNING: fp(1): N_x
Port with D_ID=1006e8, PWWN=50020f23000003c5 reappeared in fabric

Mar 10 15:20:52 diag226.Central.Sun.COM scsi: [ID 243001 kern.info]
/pci@6,4000/SUNW,qlc@3/fp@0,0 (fcp1):

Mar 10 15:20:52 diag226.Central.Sun.COM         Dynamically discovered 2 LUNs for D_ID=
1006e8

Mar 10 15:20:52 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70) multipath status:
optimal, path /pci@6,4000/SUNW,qlc@3/fp@0,0 (fp1) to target address: 50020f23000003c5,1
is standby

Mar 10 15:20:52 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g60020f20000003c53b699aa10005114c (ssd71) multipath status:
optimal, path /pci@6,4000/SUNW,qlc@3/fp@0,0 (fp1) to target address: 50020f23000003c5,0
is standby
```

   As shown above, the Sun StorEdge T3 array (`PWWN=50020f23000003c5`) has reappeared in the fabric. Sun StorEdge Traffic Manager has noted that the path is now standby.

7. **You can manually fail the path back to its primary and continue production.**

```
Run the failover command
# luxadm failover primary /dev/rdsk/c6t60020F20000003C53B699AA10005114Cd0s2

Check for success in /var/adm/messages

Mar 10 15:25:22 diag226.Central.Sun.COM       Failover operation completed successfully
for device ssd (GUID 60020f20000003c53b699aa10005114c): failed over from secondary to
primary

Check status of path

# luxadm display /dev/rdsk/c6t60020F20000003C53B699AA10005114Cd0s2

DEVICE PROPERTIES for disk: /dev/rdsk/c6t60020F20000003C53B699AA10005114Cd0s2
  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:           Unsupported
  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/c6t60020F20000003C53B699AA10005114Cd0s2
  /devices/scsi_vhci/ssd@g60020f20000003c53b699aa10005114c: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
```

**FIGURE 6-2** Sun StorEdge Traffic Manager Failover Example

As shown above, the LUN is now back using the primary path.

# Example #2—Switch-to-Switch Error

In this example, Storage Automated Diagnostic Environment helps narrow down the troubleshooting to a specific link subsection almost immediately. You can skip a couple of steps and save time by focusing on the correct link.

1. **Discover the error**

   The first indication of any problem surfaced from a Storage Automated Diagnostic Environment email.

```
You requested the following events be forwarded to you from 'diag226.central.sun.com'.

Source   : Agent-diag226.central.sun.com
Category : Message
EventType: AlarmEvent
EventTime: 08/10/2001 19:02:48

Message(s) found in logfile: /var/adm/messages on diag226.central.sun.com (id=80fee746):

Warning Mar 10 19:01:34 SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command
Warning Mar 10 19:01:47 SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command
Warning Mar 10 19:02:04 SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command
Threshold-Error Mar 10 19:02:04 Received 22 'SSD Alert' message(s) on 'ssd70'  in 137 mins
[threshold is 20 in 24hours] Last-Message: 'diag226.Central.Sun.COM scsi: [ID 243001
kern.warning] WARNING: /scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70): '

-------------------------------------------------------------------------
Source   : Agent-diag226.central.sun.com
Category : Switch
EventType: AlarmEvent
EventTime: 08/10/2001 19:02:49

Change in Port Statistics on switch switch-155 (ip=172.20.67.155):

Port-2: Received 222 'SyncLosses' in 47 mins (value=234 )
Port-2: Received 241 'LinkFails' in 47 mins (value=311 )
-------------------------------------------------------------------------

...
```

```
...

Source   : Agent-diag226.central.sun.com
Category : San
EventType: LinkEvent
EventTime: 08/10/2001 19:03:27

CRC-ERROR (20 in 4 mins): Origin: Port 2 on switch '172.20.67.156'. Destination: Port 2
on switch 'switch-155/172.20.67.155':

Probable Cause: 1) GBIC on Switch1 Port.
2) GBIC on Switch2 Port.
3) Cable.
4) Port of Switch1.
5) Port of Switch2.

Recommended Action: To isolate to a single FRU, please run Storage Automated Diagnostic
Environment tests on affected components.
 Register-Origin : qlc0-sw0-f3-e2
 Register-Destin.: qlc0-sw0-f3-e2-sw1-e2
```

From this output, note the following:

- SCSI errors exist that affect `/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c`
- Various link errors exist on switch 172.20.67.155 and switch 172.20.67.156.
- Storage Automated Diagnostic Environment suggests five suspect components including GBICs, a cable, and switch ports.

2. **Determine the extent of the problem**

   a. **Using the SAN Topology functionality of the Storage Automated Diagnostic Environment, determine between which switch pairs the link error is located.**

   b. **cfgadm -al output**

```
# cfgadm -al
c4                             fc-fabric    connected    configured   unknown
c4::50020f23000003d5           disk         connected    configured   unknown
c5                             fc-fabric    connected    configured   unknown
c5::50020f23000003c5           disk         connected    configured   unknown
```

The `cfgadm` output shown above appears to be clean, with no hard failures noted.

   c. **Sun StorEdge Traffic Manager information**

To find the Sun StorEdge Traffic Manager information for `/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c`, you first need to find a physical path.

```
# ls -la /dev/rdsk | grep -i 60020f20000003c53b699abc00006c4c | grep s2

lrwxrwxrwx  1 root    root       67 Mar 10 17:38 c6t60020F20000003C53B699ABC00006C4Cd0s2
-> ../../devices/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c:c,raw
```

Use this path to query Sun StorEdge Traffic Manager.

```
# luxadm display /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2

DEVICE PROPERTIES for disk: /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SUN
  Product ID:           T300
  WWN(Node):            50020f20000003d5
  WWN(Port A):          50020f23000003d5
  WWN(Port B):          50020f23000003c5
  Revision:             0117
  Serial Num:           Unsupported
  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/c6t60020F20000003C53B699ABC00006C4Cd0s2
  /devices/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c:c,raw
   Controller           /devices/pci@6,4000/SUNW,qlc@2/fp@0,0
     Device Address     50020f23000003d5,1
     Class              primary
     State              ONLINE
   Controller           /devices/pci@6,4000/SUNW,qlc@3/fp@0,0
     Device Address     50020f23000003c5,1
     Class              secondary
     State              STANDBY
```

As displayed in the output above, the primary path is still online. However, given the nature of the errors (CRC Loss of Signal), do not assume there are no errors. This could be an intermittent error.

1. Fail the path to the secondary path
2. Test the FRUs in the primary path using the SANsurfer GUI.
3. Fail the Sun StorEdge T3 array LUN to the secondary path manually from the command line.

```
#  luxadm failover secondary /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2
```

4. Watch for successful failover in `/var/adm/messages`, shown below.

```
Mar 10 19:23:41 diag226.Central.Sun.COM
Failover operation completed successfully for device ssd (GUID
60020f20000003c53b699abc00006c4c): failed over from primary to secondary
```

**3. Check the Array Status**

Skip this step for now, as you are concentrating on the switch-to-switch link. You can return to this step, if needed.

**4. Check the Switch Status**

You can use either Capture or the SANsurfer GUI to view the port status. Pay particularly close attention to the T Ports between the two switches.

Refer to FIGURE 6-3 to view Port 2 Counter Status.

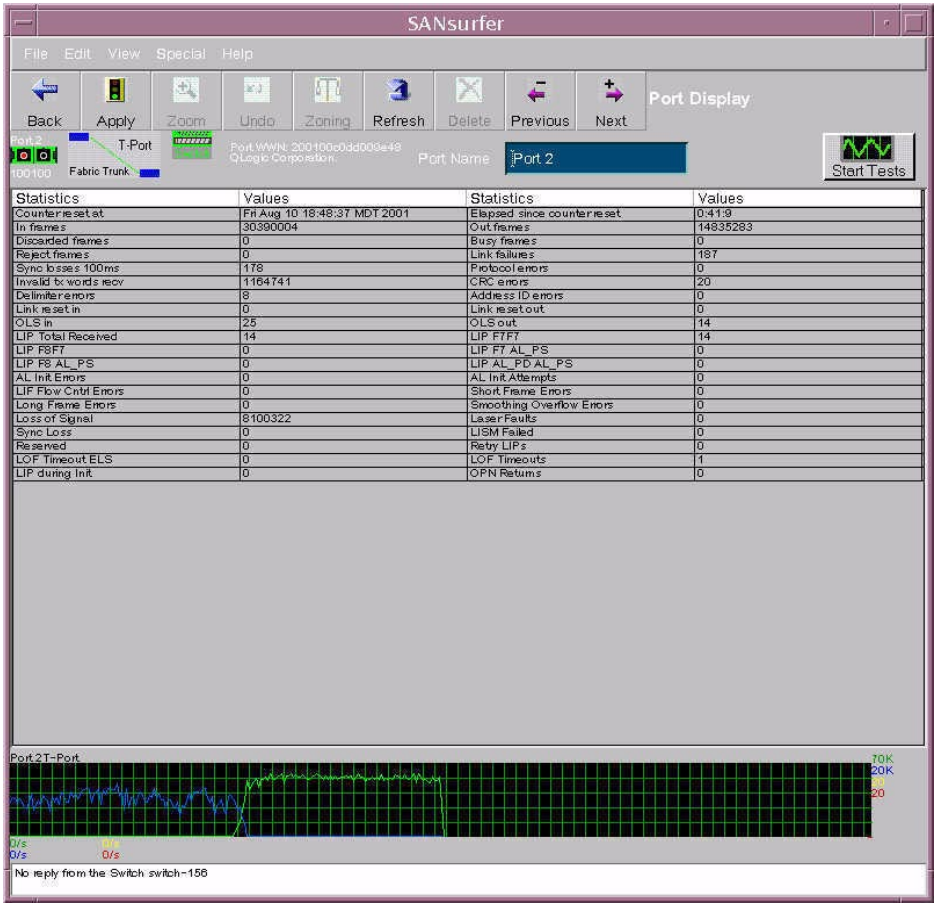



**FIGURE 6-3** Sansurfer GUI Port 2 Counter Status

### 5. Start testing FRUs

The high number of errors counters shown in FIGURE 6-3 is a cause for concern. However, it should not be used without taking into account the interval over which the counters have been accumulating. A switch that has not been reset in six months may very well have a high error counter rate.

Take care to observe the counters over a period of time and note any increases. One technique is to reset the counters in the GUI:

**a. Click the Special > Reset Count menu.**

**b. Use the Storage Automated Diagnostic Environment `switchtest` or the SANsurfer `Port` test to generate load between the switches and watch for rising error counters.**

The first Storage Automated Diagnostic Environment `switchtest` is run on the entire link, starting from the local switch. This test exercises the entire switch-to-switch link. The output is shown below.

```
# /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc0-sw0-f3-e2

"switchtest:  called with options: dev=qlc0-sw0-f3-e2"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc0-sw0-f3-e2."
"Chassis Status for device: qlc0-sw0-f3-e2 Power: OK Temp: OK 31.0c Fan 1: OK Fan 2: OK"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x7e7e7e7e"
08/10/01 20:26:02 diag226.Central.Sun.COM Storage Automated Diagnostic Environment: VTSID
6006 switchtest.FATAL : "Switchtest failed with bad Pattern 0x7e7e7e7e on Device qlc0-
sw0-f3-e2 Port 2 Field loss_of_signal_cnt"
Probable_Cause(s):  <Faulty hba/gbic/hub/switch/cable/disk>
<Another user may be already running Switchtest on this port> Recommended_Action(s):
<See /var/adm/messages for more information:> <Select StorEdge Expert Mode or run stexpert
from
the cli to re-test the selected device to see if the problem persists. StorEdge Expert
will attempt to isolate the failing FRU.>

<If the problem persists, call your authorized Sun service provider.>
```

**c. Isolate the local switch and GBIC from the rest of the link. First, uncable the link and insert a loopback connector into the local switch GBIC. Then, rerun the test.**

---

**Note –** A green *logged in* indicator does *not* appear when you insert a loopback connector into a T port (as well as F port), making it difficult to determine if the loopback is inserted correctly. Even though there is no green indicator, the test does run and reports back results.

---

The output of this `switchtest` is shown below.

```
# /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc0-sw0-f3-e2

"switchtest:  called with options: dev=qlc0-sw0-f3-e2"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc0-sw0-f3-e2."
"Chassis Status for device: qlc0-sw0-f3-e2 Power: OK Temp: OK 31.0c Fan 1: OK Fan 2: OK"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x7e7e7e7e"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x78787878"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0xe7e7e7e7"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0xb5b5b5b5"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0xaa55aa55"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x7f7f7f7f"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x0f0f0f0f"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x4a4a4a4a"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x00ff00ff"
"Testing Device: qlc0-sw0-f3-e2 Port: 2 Pattern: 0x1e1e1e1e"
"Port 2 passed all tests on qlc0-sw0-f3-e2"
"switchtest: Stopped successfully."
```

With the loopback connector in, the test passed. The switch and GBIC can be ruled out as causes for the error for now.

**d. Run tests on the remote switch.**

Storage Automated Diagnostic Environment tests communicate only with remote switches via the Inband path, which has been disconnected and is still considered suspect. To get around this, you must use the SANsurfer GUI to connect directly to the remote switch (via the remote switch's IP address) and use *Port Test* to test the port and GBIC. Remember to insert a loopback connector in the remote switch's port. (This will require the assistance of someone at the remote site.)

The results of this test are shown below. The results are captured in the `/.Webgui/Webgui.log` file.

```
08/10/2001 20:41:09 Switch [switch-156] Port 2 Begin 60 second online test, frame size =
2148, bit pattern 0x7e7e7e7e.
    Test results recorded in//.Webgui/Weblog.gui
08/10/2001 20:42:10 Switch [switch-156] Port 2 online test completed.
08/10/2001 20:42:10 Switch [switch-156] Port 2 Test results:
    Port 2 Test Loops 122843, Failures Detected 0
```

From the results of this test, you can conclude that the remote switch and GBIC are also not the cause of the error. This leaves the ISL cable as suspect. At this point, contact a Third Party fiber cable provider to investigate the 10km link.

For this example, you can conclude the cable was the cause for the error and proceed as if it were fixed.

6. **Verify the Fix**

After repairing the faulty cable, you should see messages such as the one below appear in `/var/adm/messages` when the link is reconnected.

```
Mar 10 20:45:43 diag226.Central.Sun.COM scsi: [ID 243001 kern.info]
/pci@6,4000/SUNW,qlc@2/fp@0,0 (fcp0):

Mar 10 20:45:43 diag226.Central.Sun.COM

Dynamically discovered 2 LUNs for D_ID=1046e4
```

The messages above indicate that this link is again seeing the Sun StorEdge T3 array LUNs across the cascaded link. You should also see the ISL ports come back online in the SANsurfer GUI.

a. **You can now re-enable the primary path to the affected LUN(s) using Sun StorEdge Traffic Manager. For example:**

```
# luxadm failover primary /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2
```

**b. View the results of this command in `/var/adm/messages`, shown below.**

```
Mar 10 20:50:48 diag226.Central.Sun.COM

Failover operation completed successfully for device ssd (GUID
60020f20000003c53b699abc00006c4c): failed over from secondary to
primary
```

The I/O is now traveling over the primary path for this LUN.

**c. Fix all paths that were failed over in Step 2.**

# Example #3—Host-to-Switch Failure

In this example, you will explore a fault that occurs between the Host and the switch, where the Host is connected to the switch via a F-Port (Fabric point-to-point).

The current limitations with ECHO commands and Qlogic HBAs (detailed in the *Introduction* to this section) require special considerations when troubleshooting.

1. **Discover the Error**

   This time, the errors are in `/var/adm/messages`.

```
Mar 11 13:44:33 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70):

Mar 11 13:44:33 diag226.Central.Sun.COM SCSI transport failed: reason 'tran_err':
retrying command

Mar 11 13:44:33 diag226.Central.Sun.COM qlc: [ID 686697 kern.info] NOTICE: Qlogic qlc(0):
Loop OFFLINE

Mar 11 13:44:33 diag226.Central.Sun.COM qlc: [ID 686697 kern.info] NOTICE: Qlogic qlc(0):
Link ONLINE

Mar 11 13:44:35 diag226.Central.Sun.COM scsi: [ID 243001 kern.info]
/pci@6,4000/SUNW,qlc@2/fp@0,0 (fcp0):

Mar 11 13:44:35 diag226.Central.Sun.COM Dynamically discovered 2 LUNs for D_ID=1046e4

Mar 11 13:44:38 diag226.Central.Sun.COM qlc: [ID 686697 kern.info] NOTICE: Qlogic qlc(0):
Loop OFFLINE

Mar 11 13:44:43 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70):

Mar 11 13:44:43 diag226.Central.Sun.COM SCSI transport failed: reason 'tran_err':
retrying command

Mar 11 13:45:51 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/scsi_vhci (scsi_vhci0):

...
```

```
...

Mar 11 13:45:51 diag226.Central.Sun.COM
/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70): Command Timeout on path
/pci@6,4000/SUNW,qlc@2/fp@0,0 (fp0)

Mar 11 13:45:51 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70):

Mar 11 13:45:51 diag226.Central.Sun.COM        SCSI transport failed: reason 'timeout':
retrying command

Mar 11 13:45:55 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70):

Mar 11 13:45:55 diag226.Central.Sun.COM       SCSI transport failed: reason 'tran_err':
retrying command

Mar 11 13:46:08 diag226.Central.Sun.COM fp: [ID 517869 kern.warning] WARNING: fp(0):
OFFLINE timeout

Mar 11 13:46:35 diag226.Central.Sun.COM scsi: [ID 243001 kern.info]
/pci@6,4000/SUNW,qlc@2/fp@0,0 (fcp0):

Mar 11 13:46:35 diag226.Central.Sun.COM        offlining lun=1 (trace=0), target=1046e4
(trace=2800004)

Mar 11 13:46:35 diag226.Central.Sun.COM scsi: [ID 243001 kern.info]
/pci@6,4000/SUNW,qlc@2/fp@0,0 (fcp0):

Mar 11 13:46:35 diag226.Central.Sun.COM        offlining lun=0 (trace=0), target=1046e4
(trace=2800004)

Mar 11 13:46:35 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70) multipath status:
degraded, path /pci@6,4000/SUNW,qlc@2/fp@0,0 (fp0) to target address: 50020f23000003d5,1
is offline

Mar 11 13:46:35 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g60020f20000003c53b699aa10005114c (ssd71) multipath status:
degraded, path /pci@6,4000/SUNW,qlc@2/fp@0,0 (fp0) to target address: 50020f23000003d5,0
is offline

...
```

```
...

Mar 11 13:46:40 diag226.Central.Sun.COM scsi: [ID 243001 kern.info] /scsi_vhci
(scsi_vhci0):

Mar 11 13:46:40 diag226.Central.Sun.COM Initiating failover for device ssd (GUID
60020f20000003c53b699abc00006c4c)

Mar 11 13:46:40 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/pci@6,4000/SUNW,qlc@3/fp@0,0 (fcp1):

Mar 11 13:46:40 diag226.Central.Sun.COM FCP: WWN 0x50020f23000003c5 reset successfully

Mar 11 13:46:41 diag226.Central.Sun.COM scsi: [ID 243001 kern.warning] WARNING:
/scsi_vhci/ssd@g60020f20000003c53b699aa10005114c (ssd71):

Mar 11 13:46:41 diag226.Central.Sun.COM SCSI transport failed: reason 'reset': retrying
command

Mar 11 13:46:56 diag226.Central.Sun.COM scsi: [ID 243001 kern.info] /scsi_vhci
(scsi_vhci0):

Mar 11 13:46:56 diag226.Central.Sun.COM Failover operation completed successfully for
device ssd (GUID 60020f20000003c53b699abc00006c4c): failed over from primary to secondary
```

From the `/var/adm/messages` output, note the following:

- Qlogic qlc(0) has experienced multiple OFFLINE/ONLINE messages
- target=1046e4 on /pci@6,4000/SUNW,qlc@2/fp@0,0 (fcp0) was taken offline
- A LUN with GUID of 60020f20000003c53b699abc00006c4c was failed over using Sun StorEdge Traffic Manager

*1046e4* refers to a device on *port 6* (which is the physical *port 7* on the switch) with an ALPA of e4. This switch has a fabric ID of 1 and a chassis id of 1. (See explanation earlier in this section for instructions on how to read these addresses).

2. **Determine the extent of the problem**

**a. cfgadm -al output**

```
# cfgadm -al
...
c4                             fc-fabric    connected    configured   unknown
c4::50020f23000003d5           disk         connected    configured   unusable
c5                             fc-fabric    connected    configured   unknown
c5::50020f23000003c5           disk         connected    configured   unknown
```

- One of the Sun StorEdge T3 array LUNs (`C4::50020f23000003d5`) is unusable.

**b. luxadm -e port**

```
# luxadm -e port

Found path to 4 HBA ports
/devices/pci@6,4000/SUNW,qlc@2/fp@0,0:devctl                    NOT CONNECTED
/devices/pci@6,4000/SUNW,qlc@3/fp@0,0:devctl                    CONNECTED
/devices/pci@6,2000/pci@1/SUNW,qlc@4/fp@0,0:devctl              CONNECTED
/devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0:devctl              CONNECTED
```

- The device `/devices/pci@6,4000/SUNW,qlc@2/fp@0,0:devctl` has lost all of its targets (in this example, it had only one target).

The Host-to-HBA connection seems like a good place to begin troubleshooting.

**c. Multipathing Status**

1. From the command line, search for a disk with GUID `60020f20000003c53b699abc00006c4c`.
2. Display `luxadm` on the disk to get the Sun StorEdge Traffic Manager status.

An example is shown below.

```
# ls -la /dev/rdsk | grep -i 60020f20000003c53b699abc00006c4c | grep s2
lrwxrwxrwx  1 root    root       67 Mar 10 17:38 c6t60020F20000003C53B699ABC00006C4Cd0s2
-> ../../devices/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c:c,raw

# luxadm display /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2
DEVICE PROPERTIES for disk: /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SUN
  Product ID:           T300
  WWN(Node):            50020f20000003c5
  WWN(Port A):          50020f23000003d5
  WWN(Port B):          50020f23000003c5
  Revision:             0117
  Serial Num:           Unsupported
  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/c6t60020F20000003C53B699ABC00006C4Cd0s2
  /devices/scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c:c,raw
   Controller           /devices/pci@6,4000/SUNW,qlc@2/fp@0,0
     Device Address     50020f23000003d5,1
     Class              primary
     State              OFFLINE
   Controller           /devices/pci@6,4000/SUNW,qlc@3/fp@0,0
     Device Address     50020f23000003c5,1
     Class              secondary
     State              ONLINE
```

This confirms that path `/devices/pci@6,4000/SUNW,qlc@2/fp@0,0` is OFFLINE.

You can determine if this disk is on the Master or AltMaster by keeping track of the Device Address that is on the primary controller (in this case, `50020f23000003d5`). This is the WWN of the primary path controller. Refer to **3. Check Array Status**, below, for more information.

### 3. Check Array Status

Briefly check the array status to ensure there are no major issues on the Sun StorEdge T3 array.

```
diag190:/:<1>port list

port   targetid   addr_type   status   host   wwn
u1p1      1        hard       online   sun    50020f23000003c5
u2p1      2        hard       online   sun    50020f23000003d5
```

From this output, it is apparent that the problem is affecting the AltMaster (u2p1) controller (50020f23000003d5). This correlates with the Device Address (50020f23000003d5) found in the previous step.

```
diag190:/:<2>port listmap

port   targetid   addr_type   lun   volume        owner   access
u1p1      1        hard        0    v0            u1      primary
u1p1      1        hard        1    v1            u1      failover
u2p1      2        hard        0    v0            u1      failover
u2p1      2        hard        1    v1            u1      primary
diag190:/:<3>sys stat
Unit   State      Role    Partner
-----  ---------  ------  -------
  1    ONLINE     Master    2
  2    ONLINE     AlterM    1
```

This output confirms what you have already discovered. A failover has occurred and it is affecting the AltMaster only. The controller itself is ONLINE, so the problem most likely is outside the Sun StorEdge T3 array.

4. **Check the Switch Status**

   a. **Concentrate on the Host-to-Switch link.**

      The HBA in the affected path is `/pci@6,4000/SUNW,qlc@2/fp@0,0`.

   b. **Use the Storage Automated Diagnostic Environment GUI to see what switch is connected to this HBA.**

   c. **Look at the output of discman below:**

      `/pci@6,4000/SUNW,qlc@2/fp@0,0.` corresponds to `qlc(0)`.

```
# /opt/SUNWstade/diags/bin/discman

HBA Port 0 Path: /devices/pci@6,4000/SUNW,qlc@2/fp@0,0:devctl

                RegisterName: qlc0
                LGroup: StorEdge-QLC-HostBusAdaptors
                PGroup: /StorEdge
                IO Board Slot:      3
                Slot on IO Board:   0
                Port on Card:      0
                NodeWWN: 200000e08b032a01
                PortWWN: 210000e08b032a01
                Mode: online
                DriverName: fp
                Instance: 0
                al_pa: 31
                DeviceType: 3
```

Looking further in the **discman** output, the first switch in this path is `172.20.67.155`, as shown below. Also evident is that the HBA connects to this switch on port 3, as an F Port.

```
Device # 0:

LogicalPath:
PhysPath:
HBA node path:
RegisterName:   qlc0-sw0-f3
LGroup:         StorEdge-8P-Switches(qlc0)
PGroup:         /StorEdge/qlc0
NodeWWN:
PortWWN     210000e08b032a01
Status: 0
sw_PortNum:             3
sw_PortType:    F_Port
sw_ipAddr:      172.20.67.155
```

Check Capture for some more details on port 3.

```
************
Port Status
************

Port #   Port Type       Admin State     Oper State      Status          Loop Mode
------   ---------       -----------     ----------      ------          ---------
   1      F_Port           online         offline       Not-logged-in
   2      T_Port           online         online         logged-in
   3      F_Port           online         offline       Not-logged-in

***********
port count
***********
Port Number:    1
Inframes:       0               Outframes:      0
LinkFails:      1               OLS Out:        1
-------------------------
Port Number:    2
Inframes:       30              Outframes:      1046115
InvalidTxWds:   1               OLS Out:        3
Total LIP Rcvd: 102             LIP F7 F7:      102
-------------------------
Port Number:    3
Inframes:       1594519         Outframes:      41204
Discards:       402             LinkFails:      13895
Prim Seq Errs:  10252           InvalidTxWds:   3
OLS In:         10251           OLS Out:        13139

************
Name Server
************

Port  Address  Type  PortWWN            Node WWN                FC-4 Types
----  -------  ----  -----------------  -----------------  ----------------------
Database is empty
```

From the above information, notice that port 3 is currently not logged in, has a relatively high number of errors, and currently has no information in the Nameserver. You can also look at the SANsurfer GUI (or have the customer look and relate the information).

In this case, port 3 may be experiencing a high rate of ongoing errors, even when Sun StorEdge Traffic Manager is not using the path for data.

5. **Start testing FRUs**

The FRUs in the Host-to-Switch link are:

- HBA
- Cable
- Switch GBIC
- Switch/SwitchPort

Start from the HBA and work outward.

**a. Run a `qlctest` on the HBA**

Uncable the link and insert a loopback connector into the HBA port.

```
# /opt/SUNWstade/diags/bin/qlctest -v -o dev=qlc0,run_connect=Yes,checksum=Disa>

"qlctest:  called with options: dev=qlc0,run_connect=Yes,checksum=Disable,selftest=
Disable,mbox=Disable,ilb_10=Disable,ilb=Disable,elb=Enable,icnt=1000,run_all=Critical"

"qlctest: Started."
"Program Version is 4.0.1"
"Testing qlc0 device at /devices/pci@6,4000/SUNW,qlc@2/fp@0,0:devctl."
"Running external loopback test"
"Performing Loop Back Frame Test. Pattern: 0x7e7e7e7e"
"Performing Loop Back Frame Test. Pattern: 0x7e7e7e7e"
"Performing Loop Back Frame Test. Pattern: 0x78787878"
"Performing Loop Back Frame Test. Pattern: 0xe7e7e7e7"
"Performing Loop Back Frame Test. Pattern: 0xb5b5b5b5"
"Performing Loop Back Frame Test. Pattern: 0xaa55aa55"
"Performing Loop Back Frame Test. Pattern: 0x7f7f7f7f"
"Performing Loop Back Frame Test. Pattern: 0x0f0f0f0f"
"Performing Loop Back Frame Test. Pattern: 0x4a4a4a4a"
"Performing Loop Back Frame Test. Pattern: 0x00ff00ff"
"Performing Loop Back Frame Test. Pattern: 0x1e1e1e1e"

"qlctest: Stopped successfully."
```

The results of this test show that the HBA is most likely not the problem.

### b. `switchtest` on the switch GBIC

Insert a loopback connector into the switch port. (Remember there is no LED indicator when inserting a loopback connector into a F-Port).

If this test passes:

- Replace the cable.

If this test fails:

- Replace GBIC and rerun the test.
- If it fails on second pass, replace the entire switch.

```
# /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc0-sw0-f3

"switchtest:  called with options: dev=qlc0-sw0-f3"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc0-sw0-f3."
"Chassis Status for device: qlc0-sw0-f3 Power: OK Temp: OK 32.0c Fan 1: OK Fan 2: OK"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x7e7e7e7e"
08/11/01 16:24:27 diag226.Central.Sun.COM Storage Automated Diagnostic Environment: VTSID
6010 switchtest.FATAL : "Switchtest
failed with bad Pattern 0x7e7e7e7e on Device qlc0-sw0-f3 Port 3" Probable_Cause(s):
<Faulty hba/gbic/hub/switch/cable/disk>
<Another user may be already running Switchtest on this port>
```

It failed the first pass.

**c. Replace the GBIC and rerun the test**

```
#  /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc0-sw0-f3

"switchtest:  called with options: dev=qlc0-sw0-f3"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc0-sw0-f3."
"Chassis Status for device: qlc0-sw0-f3 Power: OK Temp: OK 32.0c Fan 1: OK Fan 2: OK"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x7e7e7e7e"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x78787878"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0xe7e7e7e7"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0xb5b5b5b5"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0xaa55aa55"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x7f7f7f7f"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x0f0f0f0f"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x4a4a4a4a"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x00ff00ff"
"Testing Device: qlc0-sw0-f3 Port: 3 Pattern: 0x1e1e1e1e"
"Port 3 passed all tests on qlc0-sw0-f3"
"switchtest: Stopped successfully."
```

The results above indicate that the original GBIC was the malfunctioning FRU.

**d. Recable the entire link and re-enable this path.**

After recabling, you should see messages similar to the example below in /var/adm/messages.

```
Mar 11 16:30:50 diag226.Central.Sun.COM qlc: [ID 686697 kern.info] NOTICE: Qlogic qlc(0):
Link ONLINE

Mar 11 16:30:50 diag226.Central.Sun.COM fp: [ID 517869 kern.info] NOTICE: fp(0): Change
in FC Topology old = Private Loop new = Fabric

Mar 11 16:30:50 diag226.Central.Sun.COM fp: [ID 517869 kern.warning] WARNING: fp(0): N_x
Port with D_ID=1046e4, PWWN=50020f23000003d5 reappeared in fabric

Mar 11 16:30:50 diag226.Central.Sun.COM scsi: [ID 243001 kern.info]
/pci@6,4000/SUNW,qlc@2/fp@0,0 (fcp0):

Mar 11 16:30:50 diag226.Central.Sun.COM         Dynamically discovered 2 LUNs for D_ID=
1046e4

Mar 11 16:30:50 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g60020f20000003c53b699abc00006c4c (ssd70) multipath status:
optimal, path /pci@6,4000/SUNW,qlc@2/fp@0,0 (fp0) to target address: 50020f23000003d5,1
is standby

Mar 11 16:30:50 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g60020f20000003c53b699aa10005114c (ssd71) multipath status:
optimal, path /pci@6,4000/SUNW,qlc@2/fp@0,0 (fp0) to target address: 50020f23000003d5,0
is standby
```

The above messages indicate that the devices on the path are again recognized and Sun StorEdge Traffic Manager has placed them in standby mode.

**e. Re-enable the path manually.**

```
# luxadm failover primary /dev/rdsk/c6t60020F20000003C53B699ABC00006C4Cd0s2
```

You should see /var/adm/messages similar to the example below, indicating a successful failover.

```
Mar 11 16:33:01 diag226.Central.Sun.COM        Failover operation completed successfully
for device ssd (GUID 60020f20000003c53b699abc00006c4c): failed over from secondary to
primary
```

# Example #4—Command Line Only: Sun StorEdge A5200 Array Storage Side Error

1. **Discover the error.**

   The problem begins with an email from the Storage Automated Diagnostic Environment to the system administrator.

```
You requested the following events be forwarded to you from 'diag226.central.sun.com'.

Source   :
Category : A5k
EventType: AlarmEvent
EventTime: 08/08/2001 13:15:57

interface_board.B.gbic0 status changed from O.K. to Not Installed on DPL4 (wwn=
5080020000083cb0)

------------------------------------------------------------------------
Source   :
Category : Message
EventType: AlarmEvent
EventTime: 08/08/2001 13:15:58

Message(s) found in logfile: /var/adm/messages on diag226.central.sun.com (id=80fee746):

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command
...
```

```
...
Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:03  SCSI    diag226.Central.Sun.COM         SCSI transport failed:
reason 'tran_err': retrying command

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020373cce1c (ssd65)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020373cce1c,0 is offline  ('disk_rear.0.wwn'  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203745053c (ssd64)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203745053c,0 is offline  ('disk_rear.7.wwn'  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f6f4 (ssd63)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203719f6f4,0 is offline  ('disk_front.4.wwn'  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g2000002037450d71 (ssd62)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 2200002037450d71,0 is offline  ('disk_rear.3.wwn'  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f810 (ssd61)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203719f810,0 is offline  ('disk_front.1.wwn'  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f7d0 (ssd60)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203719f7d0,0 is offline  ('disk_front.3.wwn'  in a5k:DPL4)

...
```

```
...
Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f7b0 (ssd59)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203719f7b0,0 is offline  (’disk_front.6.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g2000002037450d4d (ssd58)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 2200002037450d4d,0 is offline  (’disk_rear.2.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g2000002037450d4c (ssd57)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 2200002037450d4c,0 is offline  (’disk_rear.6.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g2000002037450d6b (ssd56)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 2200002037450d6b,0 is offline  (’disk_front.9.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719eb58 (ssd55)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203719eb58,0 is offline  (’disk_front.5.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203745060f (ssd54)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203745060f,0 is offline  (’disk_front.8.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f803 (ssd53)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 220000203719f803,0 is offline  (’disk_front.2.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020374505ca (ssd52)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020374505ca,0 is offline  (’disk_rear.5.wwn’  in a5k:DPL4)

...
```

```
...
Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f802 (ssd51)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 200000203719f802,0 is offline  (’disk_front.7.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ses@g5080020000083cb0 (ses36)
multipath status: optimal, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 5080020000083cb4,0 is offline

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ses@g5080020000083cb0 (ses36)
multipath status: optimal, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 5080020000083cb3,0 is offline

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g200000203719f7e0 (ssd50)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 200000203719f7e0,0 is offline  (’disk_front.0.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020373ccb07 (ssd49)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020373ccb07,0 is offline  (’disk_rear.1.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020373cc091 (ssd48)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020373cc091,0 is offline  (’disk_front.10.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g2000002037450d3a (ssd47)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 2000002037450d3a,0 is offline  (’disk_rear.9.wwn’  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020374504e2 (ssd46)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020374504e2,0 is offline  (’disk_rear.10.wwn’  in a5k:DPL4)

...
```

```
....
Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020374507de (ssd45)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020374507de,0 is offline  ('disk_rear.8.wwn'  in a5k:DPL4)

Warning Mar 8 13:14:23  Sun StorEdge Traffic Manager   diag226.Central.Sun.COM Sun
StorEdge Traffic Manager: [ID 779286 kern.info] /scsi_vhci/ssd@g20000020373cc1ac (ssd44)
multipath status: degraded, path /pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target
address: 22000020373cc1ac,0 is offline  ('disk_rear.4.wwn'  in a5k:DPL4)

Threshold-Error Mar 8 13:13:46  Received 1 'Loop Offline' message(s)  in 7 mins [threshold
is 1 in 5mins]       Last-Message: 'diag226.Central.Sun.COM qlc: [ID 686697 kern.info]
NOTICE: Qlogic qlc(3): Loop OFFLINE '

Threshold-Error Mar 8 13:14:03  Received 1 'Loop Online' message(s)  in 7 mins [threshold
is 1 in 5mins]        Last-Message: 'diag226.Central.Sun.COM qlc: [ID 686697 kern.info]
NOTICE: Qlogic qlc(3): Loop ONLINE '

Threshold-Warning       Mar 8 13:14:03  Received 5 'SSD Warning' message(s) on 'ssd52'
in 24 mins [threshold is 5 in 24hours]  Last-Message: 'diag226.Central.Sun.COM scsi: [ID
243001 kern.warning] WARNING: /scsi_vhci/ssd@g20000020374505ca (ssd52): '

------------------------------------------------------------------------
Source   :
Category : Switch
EventType: StateChangeEvent
EventTime: 08/08/2001 13:16:00

'port.5' in SWITCH python_local (ip=172.20.67.193) is now Not-Available (status-state
changed from 'Online' to 'Offline'):
```

**Note –** The *Message* Event from above is extracted from the `/var/adm/messages` file. It could be that this problem would be initially discovered by watching the `/var/adm/messages` file rather than Storage Automated Diagnostic Environment emails. This will depend on customer configuration. However, the Sun StorEdge A5200 array Event and the *Switch* Event would not be noted in `/var/adm/messages`.

From the `/var/adm/messages` output, note the following:

- GBIC 0 on IB Board B of the Sun StorEdge A5200 array named "DPL4" has gone offline.
- Sun StorEdge Traffic Manager path failures affecting all disks in "DPL4"
- The HBA Qlogic qlc(3) has experienced Offline / Online Events.
- Port 5 of the switch 172.20.67.193 has changed state to offline.

**2. Determine the extent of the problem**

There are multiple areas that you can check:

- Storage Automated Diagnostic Environment Tests for configuration changes and overall health
- `cfgadm -al` for fabric configuration
- Sun StorEdge Traffic Manager status

**a. Type the `cfgadm -al` command:**

```
#cfgadm -al

c2                              fc-private   connected    configured   unknown
c2::210000203719eb58            disk         connected    configured   unknown
c2::210000203719f6f4            disk         connected    configured   unknown
c2::210000203719f7b0            disk         connected    configured   unknown
c2::210000203719f7d0            disk         connected    configured   unknown

c3                              fc-private   connected    configured   unknown
c3::220000203719eb58            disk         connected    configured   unusable
c3::220000203719f6f4            disk         connected    configured   unusable
c3::220000203719f7b0            disk         connected    configured   unusable
c3::220000203719f7d0            disk         connected    configured   unusable
```

Notice from the abbreviated example above that one path to the disks (c3) is "unusable." Sun StorEdge Traffic Manager hides the physical (c3) controller, but this output does reveal that a problem on one of the dual paths.

**b. Check the multipathing status**

1. Run `luxadm display /dev/rdsk/<disk>` to confirm Sun StorEdge Traffic Manager failures.

```
#luxadm display /dev/rdsk/c6t2000002037450D71d0s2

DEVICE PROPERTIES for disk: /dev/rdsk/c6t2000002037450D71d0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SEAGATE
  Product ID:           ST39103FCSUN9.0G
  WWN(Node):            2000002037450d71
  WWN(Port A):          2100002037450d71
  WWN(Port B):          2200002037450d71
  Revision:             034A
  Serial Num:           LS6810850000
  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/c6t2000002037450D71d0s2
  /devices/scsi_vhci/ssd@g2000002037450d71:c,raw
   Controller           /devices/pci@6,2000/pci@1/SUNW,qlc@4/fp@0,0
     Device Address     2100002037450d71,0
     Class              primary
     State              ONLINE
   Controller           /devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0
     Device Address     2200002037450d71,0
     Class              primary
     State              OFFLINE
```

The above output shows that the path `/devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0` is OFFLINE.

---

**Note –** A Sun StorEdge A5200 array under Sun StorEdge Traffic Manager control should have two primary/ONLINE paths.

---

### c. Check the HBA status

Is Qlogic (`qlc3`) the same as the physical path `/devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0`?

Using either the GUI or a command line, check the Sun Storage Automated Diagnostic Environment to find out.

**CODE EXAMPLE 6-1**

```
# /opt/SUNWstade/diags/bin/discman

Abbreviated Output

HBA Port 3 Path: /devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0:devctl

                RegisterName: qlc3
                LGroup: StorEdge-QLC-HostBusAdaptors
                PGroup: /StorEdge
                IO Board Slot:      4
                Slot on IO Board:   0
                Port on Card:      1
                NodeWWN: 200000e08b031026
                PortWWN: 210000e08b031026
                Mode: offline
                DriverName: fp
                Instance: 3
                al_pa: 1
                DeviceType: 3
```

Yes, Qlogic (`qlc3`) is the same as the physical path.

**d. Type the** `luxadm -e port` **command**

---

**Note –** You should also run `luxadm -e port` command to see the state of the HBAs.

---

```
#luxadm -e port
/devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0:devctl                NOT CONNECTED
```

In this case, a *NOT CONNECTED* message appears. In this configuration, the single Sun StorEdge A5200 array was the only device on the loop. You cannot draw any conclusions from this output at this time.

**3. Check the Array Status**

Run `luxadm display DPL4` to look for status.

```
#luxadm display DPL4

Output (Abbreviated)

ESI Interface board(IB) (A top, B bottom)
        A: O.K.(rev.-04)
                GBIC module (1 on left, 0 on right in IB)
                0 O.K.(mod.-05)
                1 Not Installed
        B: O.K.(rev.-04)
                GBIC module (1 on left, 0 on right in IB)
                0 Not Installed
                1 Not Installed
```

The above output confirms that IB Board B and GBIC 0 are no longer displayed.

**4. Check the switch status.**

You can check the switch status either by viewing (or asking the customer to view) the Sansurfer GUI or by checking the results of the Capture utility.

**CODE EXAMPLE 6-2** Capture Utility

```
#./capture 172.20.67.193 > /tmp/capture.out

Output (abbreviated)

************
Port Status
************

Port #   Port Type       Admin State     Oper State      Status          Loop Mode
------   ---------       -----------     ----------      ------          ---------
   1      F_Port           online         online          logged-in
   2      T_Port           online         online          logged-in
   3      F_Port           online         offline       Not-logged-in
   4      SL_Port          online         online          logged-in        Target
Devices:  1   Address: 0x00
        0x01
   5      SL_Port          online         offline       Not-logged-in
   6      F_Port           online         online          logged-in
   7      F_Port           online         offline       Not-logged-in
   8      T_Port           online         online          logged-in
```

In the above output, Port 5 (Switch-to-Storage link) is offline, but Port 4 (Host-to-Switch link) is logged in. Concentrate the testing to the switch-to-storage link from Port 5.

**5. Start Testing FRUs**

Running `switchtest` from the GUI or the command line on Port 5 should fail.

Command line example:

```
# /opt/SUNWstade/diags/bin/switchtest -v -o dev=qlc3-sw2-i4-d5

"switchtest:  called with options: dev=qlc3-sw2-i4-d5"
"switchtest: Started."
"Start: switchtest"
"Testing device qlc3-sw2-i4-d5."
"Chassis Status for device: qlc3-sw2-i4-d5 Power: OK Temp: OK 32.0c Fan 1: OK Fan 2: OK"
08/08/01 14:19:49 diag226.Central.Sun.COM Storage Automated Diagnostic Environment 4.1:
VTSID 6008 switchtest.FATAL :
"Port 5 is Offline with Pattern 0x4a4a4a4a on Device qlc3-sw2-i4-d5" Probable_Cause(s):
<Fibre Channel cable disconnected to HBA> <Bad GBIC or bad Fibre Channel cable >
```

Based on the Storage Automated Diagnostic Environment email that pointed out the failed GBIC on IB board B, you should consider the failed GBIC your first suspect.

If you did not have the email notice, you could use Storage Automated Diagnostic Environment Tests or the Sun StorEdge Sansurfer GUI to help isolate the individual FRUs in the link:

- Switch, switch port, switch port GBIC
- Cable
- Sun StorEdge A5200 array GBIC

To isolate the above FRUs, start with what you can test using the switch.

**a. Insert the loopback connector into port 5 and rerun `switchtest`.**

- If it passes, you can rule out the switch port and switch GBIC.
- If it fails, replace the GBIC and try again. If the second test fails, replace the switch.

**b. Since the path is uncabled, move the GBIC from the Sun StorEdge A5200 array to the same switch port and test it as well.**

- If it passes, the problem is the cable. Move the GBIC to its original location and replace the cable.
- If it fails, replace the GBIC.

In this case, the problem was a bad GBIC in IB Board B.

**c. Replace the GBIC.**

**6. Verify the fix**

In the previous example, the problem was a bad GBIC in IB Board B. After replacing that GBIC, watch for `/var/adm/messages` that let you know things are back online.

`/var/adm/messages` Example:

```
Mar  8 14:34:26 diag226.Central.Sun.COM Sun StorEdge Traffic Manager: [ID 779286
kern.info] /scsi_vhci/ssd@g20000020374504e2 (ssd46) multipah status: optimal, path
/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0 (fp3) to target address: 22000020374504e2,0 is online
```

You should see messages such as those above for all affected Sun StorEdge A5200 array disks.

## Recommendations

- Check the Sansurfer GUI to ensure Port 5 is active.
- Check *luxadm display* for proper GBIC insertion.
- Check the individual disks for the state of Sun StorEdge Traffic Manager.

Command line example:

```
# luxadm display /dev/rdsk/c6t20000020374504E2d0s2

DEVICE PROPERTIES for disk: /dev/rdsk/c6t20000020374504E2d0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SEAGATE
  Product ID:           ST39103FCSUN9.0G
  WWN(Node):            20000020374504e2
  WWN(Port A):          21000020374504e2
  WWN(Port B):          22000020374504e2
  Revision:             034A
  Serial Num:           LS6763540000
  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/c6t20000020374504E2d0s2
  /devices/scsi_vhci/ssd@g20000020374504e2:c,raw
   Controller           /devices/pci@6,2000/pci@1/SUNW,qlc@4/fp@0,0
     Device Address     21000020374504e2,0
     Class              primary
     State              ONLINE
   Controller           /devices/pci@6,2000/pci@1/SUNW,qlc@5/fp@0,0
     Device Address     22000020374504e2,0
     Class              primary
     State              ONLINE
```

Other resources to check (if applicable)

- Storage Automated Diagnostic Environment agent messages
- Storage Automated Diagnostic Environment diagnostic tests

APPENDIX **A**

# Brocade Upgrades and Installations

## Installing a New SAN

This section contains topics that describe how to install a new SAN system using Brocade Silkworm switches..

### Required Software Components

The following software components might be required for your particular SAN system. Refer to the documentation for each individual product to insure proper installation.

#### Software Components

- Sun StorEdge Traffic Manager

This is available as a patch which can be installed on Solaris 8 release 10/01 or later. It should be installed with the latest revision of Sun StorEdge Network Foundation Software.

- Sun StorEdge Network Foundation

This software is included with the Solaris upgrades for the FC switch product. It includes the drivers to support switches, management tools and storage devices.

- VERITAS Volume Manager

VERITAS Volume Manager is a separately installed software product that provides host-based storage management, such a disk labeling, mirroring, striping, and RAID 5.

- Brocade Webtools

Brocade switches support Java-enabled Webtools. Brocade Webtools is a GUI that provides management capabilities, such as maintaining zones, setting port attributes, and setting up cascaded switches.

- `cfgadm` plug-in for Fabric on-demand node creation

This component is delivered with the Solaris upgrades for the FC switch product. It is used to discover SAN-attached devices, in addition to creating and deleting nodes for these devices. These features are implemented through the `cfgadm` framework. See the `cfgadm_fp`(1M) man page for additional information.

- `luxadm` and `libg_fc/liba5k`

These components are enhanced to support the SAN-attached devices. They provide persistent switch-attached device configuration across reboots, probe SAN-attached devices that are available on a host, and provide information on various devices.

- Storage Automated Diagnostic Environment

The Storage Automated Diagnostic Environment is a separately installed software product. It is a lightweight, remote, monitoring agent designed to track storage product reliability, availability and serviceability. The Storage Automated Diagnostic Environment also provides revision and patch level checking, log file monitoring, and diagnostic testing.

# Downloading Patches and Packages

You can download the required software components from the following web sites listed in TABLE A-1.

**TABLE A-1** Software Download Sites

| Software | Downloading Web Site |
|---|---|
| packages and documentation | `http://www.sun.com/storage/san/` |
| patches | `http://sunsolve/sun.com` |

Refer to Appendix B of this guide package and patch supportability guidelines in a Brocade configuration.

## ▼ To Verify Successful Patch Downloads

1. **Use one of the following three utilities to obtain the `checksum` value of the patch you downloaded:**

**CODE EXAMPLE A-1** Solaris `/usr/bin/sum` Utility

```
% /usr/bin/sum 108982-09.zip
2010 880 108982-09.zip
% /usr/bin/sum -r 108982-09.zip
63160    880 108982-09.zip
```

**Note –** The sum utility can also be located in the `/usr/ucb` directory.

**CODE EXAMPLE A-2** Example of GNU md5sum Utility

```
% md5sum 108982-09.zip
1297fcd385f618c726489c6c7f57c900 108982-09.zip
```

Download the GNU md5sum utility from http://www.sunfreeware.com or from http://sunsolve.Sun.com/md5/md5.tar.z.

2. **Compare the** checksum **value that is displayed to the patch** checksum **value given at the** checksum **File link**:

   http://sunsolve.Sun.com

   If the values are identical, the patches were properly downloaded.

---

**Note –** The checksum file at http://sunsolve.Sun.com is approximately 614 kBytes.

---

# Installing the Software

TABLE A-2 lists the required software packages and patches installation sequence.

**TABLE A-2** Software Installation Sequence

| Patch or Package | Software |
|---|---|
| Solaris 8 | Solaris 8 10/01 (update 6) |
| 8_Recommended | Solaris 8 Recommended and Security patch cluster |
| SUNWsan | Sun StorEdge SAN Foundation Kit |
| SUNWcfpl | cfgadm plug-in 32-bit package |
| SUNWcfplx | cfgadm plug-in 64-bit package |
| 111412-07 | Sun StorEdge Traffic Manager |
| 111095-07 | fcp/fp/fctl/usoc drivers patch |
| 111096-03 | fcip driver patch |
| 111097-07 | qlc driver patch |
| 111413-07 | luxadm/liba5k and libg_fc patch |
| 111846-03 | cfgadm plug-in library patch |
| 111847-01 | SANWsan patch; SAN Foundation Kit patch |
| SUNWstade<br>112580-01 | Storage Automated Diagnostic Environment package<br>Brocade patch |

## ▼ To Install the Software

**Note –** These instructions are to install the Leadville 5c patch.

1. **Install Solaris 8 10/01 (upgrade 6).**
2. **Install the latest Solaris 8 Recommended Security patch cluster.**
   See the README file for patch installation instructions and notes.
3. **Install the `SUNWsan` package.**

```
# pkgadd -d SUNWsan
```

4. **Install cfgadm plug-in library packages `SUNWcfpl` and `SUNWcfplx`.**

```
# pkgadd -d pkg-location SUNWcfpl
# pkgadd -d pkg-location SUNWcfplx
```

5. **Install the SAN Foundation Kit `SUNWsan` patch 111847-01, or higher, if required.**
6. **Install Sun StorEdge Traffic Manager patch 111412-07.**

```
# patchadd 111412-07
```

7. **Install `fctl/fp/fcp/usoc` driver patch 111095-xx.**

```
# patchadd 111095-07
```

8. **Install `fcip` driver patch**

```
# patchadd 111096-03
```

9. **Install `qlc` driver patch**

```
# patchadd 111097-07
```

10. **Install** `luxadm`, `liba5k`, and `lib_fc` **patch**

```
# patchadd 111413-07
```

11. **Install** `cfgadm` **plug-in library patch**

```
# patchadd 111846-03
```

12. **Update MANPATH to access** `cfgadm_fp` **(1M) man page.**

    For `sh` or `ksh`, type:

```
# MANPATH=/opt/SUNWsan/man:$MANPATH;export MANPATH
```

    For `csh`, type:

```
% setenv MANPATH /opt/SUNWsan/man:$MANPATH
```

13. **Install the Storage Automated Diagnostic Environment package** SUNWstade**.**

```
# pkgadd -d SUNWstade
```

14. **Install the Storage Automated Diagnostic Environment Brocade patch.**

```
# patchadd 112580-01
```

15. **Reboot the system.**

    For each of the storage devices, upgrade the software, firmware, or configuration.

    After the above steps, you can leverage additional features provided by Brocade Silkworm 2400 (8-port), 2800 (16-port) for:

- Sun StorEdge Traffic Manager functionality
- additional fabric zones
- additional initiators per zone
- host fabric connectivity
- cascaded switch configurations
- `Quickloop` zones

# Installing Firmware on Brocade Silkworm Switches

## ▼ To Download Firmware from the Brocade Web Site

You can locate and download Brocade firmware on a special website provided by Brocade. The URL for the Brocade site is site is `http://www.brocade.com`.

1. **Click the Partners link.**
2. **Click the Brocade Partner Network link.**
3. **Enter the Sun-internal login.**

   Enter the Sun-internal password.
4. **Under Services and Support, click Firmware.**
5. **Click v2.6.x Firmware**
6. **Download v2.6.0a (UNIX version) and the Readme.txt file to your local host.**

## ▼ To Install Firmware from UNIX (Solaris)

Follow these steps:

1. **From the Brocade web site, retrieve the switch firmware (for example, v2.6.x).**
2. **Download the firmware into your root (/) directory.**

---

**Note –** Since UNIX contains `rshd` and `cat` daemons, you do not need to retrieve the `rsh.ZIP` file.

---

3. **Log into the UNIX system as root and edit the following files:**

   a. **Type the IP address and the switch name into the** `/etc/hosts` **file.**

```
# vi /etc/hosts <IP_address><switch_name>
```

   The output is displayed, as in in CODE EXAMPLE 6-3.

   **CODE EXAMPLE 6-3** `/etc/hosts` file

```
# cat /etc/hosts
#
# Internet host table
#
10.4.50.208 iopswitch03.ebay
10.4.50.212 iopswitch08.ebay
```

   b. **Type the switch name into the** `/.rhosts` **file.**

```
# /.rhosts <switch_name>
```

---

**Note –** If you are logged in as a normal user and not as “root”, the `/.rhosts` file is referred to the user’s home directory .rhosts file. For example, if a normal user named `nancy` is logged in, she would edit the file `/home/nancy/.rhosts`.

---

4. **If you are using a UNIX system with Solaris installed, check the** `/etc/nsswitch.conf` **file to make sure the [hosts] lookup table is appropriately set.**

## ▼ To Install Firmware using FTP

As an alternative to modifying the `/.rhosts` file, you can use the `ftp` method, which is explained below.

---

**Note –** You can invoke the command without any parameters, in which case you are prompted for input, including the choice of whether to use `ftp` or `rshd`.

If you invoke the command with three parameters, `rshd` is used. If you invoke the command with four parameters, `ftp` is used.

---

1. **From a UNIX system, telnet into the switch and download the firmware with the** `firmwareDownload` **command.**

```
firmwareDownload

<Your UNIX IP address>
<Your UNIX Login user's name>
</v2.4.1f>
<FTP_password>
```

2. **To check the syntax, type:**

```
help firmwareDownload
```

---

**Note –** With version 2.1 and higher, commands are not case-sensitive.

---

3. **Check the syntax by typing** `firmwaredownload` **and following the screen prompts. See** CODE EXAMPLE A-3 **for an FTP example.**

**CODE EXAMPLE A-3** FTP Example

```
oem240:admin>firmwareDownload

Server Name or IP Address [host]: 10.32.99.29
User Name [user]: root
File Name [/usr/switch/firmware]: /var/tmp/v2.6.x
Protocol (RSHD or FTP) [rshd]: ftp
Password:
84776+3832+130980, csum 2ef6
loading to ram ......................
writing flash 0 ......................
writing flash 1 ......................
download complete
oem240:admin>fastboot
```

4. **To download a firmware file from the host “citadel”, using the account “jdoe”, and the file “/home/jdoe/firmware”, type the following:**

**CODE EXAMPLE 6-4** RSHD Example

```
sw5:admin> firmwareDownload “citadel”, “jdoe”,
“/home/jdoe/firmware”
```

5. **Reboot the switch. Type:**

```
fastboot
```

---

**Note –** It takes less than one minute to reboot the switch.

---

6. **Log back into the switch to verify the correct version, as shown in** CODE EXAMPLE A-4**.**

**CODE EXAMPLE A-4** Verification of Firmware Version

```
oem240:admin> version

Kernel: 5.3.1
Fabric OS: v2.6.x
Made on: Wed Sep 19 13:05:15 PDT 2001
Flash: Wed Sep 19 13:07:16 PDT 2001
BootProm: Thu Jun 17 15:20:39 PDT 1999
```

# Upgrading the SAN

This section contains topics about how to upgrade your SAN system to the latest version.

## Downloading Patches and Packages

Download all patches and packages to the host prior to beginning the upgrade procedure.

## Verifying Upgrade Compliance

Before starting the upgrade, insure that your system is stable and that all required software and patches are accessible. Refer to Appendix B for the supportability matrix.

## ▼ To Upgrade Software

If you have multiple hosts on your SAN, you can upgrade them simultaneously or one at a time without affecting your SAN environment. Hosts that are not being upgraded will not be affected during the upgrade. You can upgrade the host software one host at a time or several hosts in parallel.

**Caution –** Your system will be unavailable to users and the SAN during the upgrade procedure.

The order in which the SAN components should be upgraded is as follows:

1. **Familiarize yourself with the required software components, versions and patches. Refer to Appendix B for the supportability matrix.**
2. **Back up all data.**

## Volume Management

If you are using VERITAS Volume Manager, refer to the *VERITAS Volume Manager Installation Guide* for special instructions about upgrading your system. There are several steps that need to be followed prior to your system upgrade.

1. **Upgrade the Solaris Operating System.**

   To take advantage of full Fabric support for your SAN, you must upgrade to at least Solaris 8 10/01, upgrade 6. For information on how to upgrade your systems, refer to *Solaris 8 Installation Supplement*, part number 806-5182, available at http://docs.sun.com.

## Sun StorEdge SAN 3.1

The packages on your system that were previously used should be available. To verify their availability, use the `pkginfo` command.

*pkg_name* is the name of the package on which you need to obtain the information.

```
# pkginfo -l pkg_name
```

1. **Upgrade your SUNWsan package to StorEdge SAN 3.1.**

   Before you start, check your system to see if it has been installed, and if it is already up to date. Use the `pkginfo` command to see if it has been installed.

```
# pkginfo SUNWsan
```

The system returns:

```
system      SUNWsan      SAN Foundation Kit
```

The output indicates that the SUNWsan package has already been installed. If your system has the SUNWsan package installed, use the `showrev` command to see if it is up-to-date.

```
# showrev -p | grep 111847
```

The system returns:

```
Patch: 111847-01 Obsoletes:  Requires:  Incompatibles:  Packages:
SUNWsan
```

The `showrev` results line indicates that the SUNWsan package is already up to date. If patch 111847-01 has not been installed, install it using the `patchadd` command.

```
# patchadd patch-location/111847-01
```

2. **If your system does not have the SUNWsan package installed, install the new SUNWsan package from your StorEdge SAN 3.1 software.**

```
# pkgadd -d pkg-location SUNWsan
```

## `cfgadm` Plug-in Library Packages

1. **Install `cfgadm` plug-in library packages `SUNWcfpl` and `SUNWcfplx`.**

```
# pkgadd -d pkg-location SUNWcfpl
# pkgadd -d pkg-location SUNWcfplx pkgadd -d pkg-location SUNWcfplx
```

# Software Installation

For the Brocade Silkworm switch, the GUI capability is available through the switch firmware and requires a Java-enabled browser on the host. Refer to “Related Brocade Documentation” in Appendix B for instructions on how to access Brocade documentation.

---

**Note –** Once the packages have successfully installed, follow steps 6 through 13 in “To Install the Software” on page 138.

---

## ▼ To Upgrade the Storage Automated Diagnostic Environment Package

For all upgrades, you must first install the most recent Leadville patches. Refer to “To Install the Software” on page 138 for installation instructions before installing the `SUNWstade` package and the Brocade patch.

For detailed installation and usage instructions for the Storage Automated Diagnostic Environment, refer to the *Storage Automated Diagnostic Environment User’s Guide*, part number 816-3142-11.

1. **If your SAN Management host is not running the current version, remove the existing package and install the latest version. Remove the old package with the `pkgrm` command.**

```
# pkgrm SUNWstade
```

Removing the initial installation does not erase the previous configuration information. The cache and topology information of each device is also retained to maintain a consistent, historical view of the Sun StorEdge devices.

2. **Reinstall the package using the following command:**

```
# pkgadd -d .
```

3. **Install the Storage Automated Diagnostic Environment Brocade patch.**

```
# patchadd 112580-01
```

4. **Run `ras_install` to enable the `cron` and to configure the agent as master or slave. Upgrade the Master first.**

   Check your SAN Management host to find the version of the Storage Automated Diagnostic Environment installed.

```
# pkginfo -l SUNWstade
```

APPENDIX **B**

# Brocade Troubleshooting

## Introduction

This appendix provides basic guidelines that you can use to isolate problems found in a Brocade Silkworm® configuration. It assumes you have been trained on all the components, such as storage and switch, that make up the configuration.

The scope of this appendix is to highlight 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 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 relevant to a Sun Field Engineer trying to isolate to a FRU.

# Related Documentation

## Brocade Documentation

- Brocade Silkworm® 2400/2800 Hardware Reference Manual
- Brocade Silkworm® 3800 Hardware Reference Manual
- Brocade Fabric OS™ Hardware Reference Manual
- Brocade Fabric OS™ Release Notes
- Brocade WebTools User's Guide
- Brocade Zoning User's Guide
- Brocade QuickLoop User's Guide

## Sun Documentation

The Sun StorEdge switch documents are referenced for overall configuration guidelines.

- Sun StorEdge Network FC switch-8 and switch-16 Installation and Configuration Guide, SAN 3.0 Release, part number 816-0830-12
- Sun StorEdge Network FC switch-8 and switch-16, SAN 3.0 Release, Release Notes, part number 816-0842-12

# Supported Configurations

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

Refer to Chapter 2, “Configurations” of this guide for supported hardware configurations. Brocade Silkworm switch configurations and Sun switch configurations have different minimum operating system (OS) and patch requirements, shown in TABLE B-1.

**TABLE B-1** SAN Supportability Matrix

| Host OS | OS Level | Patches or Service Pack | Server Type | HBAs | HBA Firmware | Sun Multipath Driver Patches |
|---|---|---|---|---|---|---|
| Solaris | 8 u6 | Patches: Recommended security patches.<br><br>Leadville unbundled packages:<br><br>`SUNWsan`<br>`SUNWcfpl`<br>`SUNWcfplx` | Sun:<br><br>Ex20<br><br>Ex50<br><br>Ex80R<br><br>Ex500<br><br>Fx800<br><br>F4810<br><br>E10000 | Amber x6799A | 1.12 / 1.13 | Leadville 5C<br><br>111095-07<br><br>111096-03<br><br>111097-07<br><br>111412-07<br><br>111413-07<br><br>111846-03<br><br>111847-01 |
| | | | | Crystal+ x6727A | 1.13 | |
| | | | | Diamond x6748A | 1.13 | |
| | | | | Ivory x6757A | 1.13.06 | |

## ▼ To generate the most recent patch list specific to the Brocade SAN

1. **Access the PatchPro Realization Table**
2. **Select SAN/Brocade SAN 3.1**
3. **Select the Brocade SAN Release icon for installations and upgrades**

**TABLE B-2** 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 B-3** 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 B-4** 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 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, QuickLoop allows switches to replace hubs in a private loop environment. QuickLoop is a separately licensed product.

---

**Note –** For the Brocade Sun StorEdge SAN 3.1 phase, 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 auto-configure as L Ports and HBAs will auto-configure as F Ports.

---

### *Features*

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

## Current Issues with the Storage Automated Diagnostic Environment and Brocade

- You cannot run the `brocadetest`(1M) between the Brocade Silkworm switch F Port and the Sun HBA.
- ELS-ECHO diagnostics are not supported by the Brocade Switch `linktest` between the HBA and the Brocade Silkworm switch.
- Brocade Silkworm switches must be added manually or discovered by subnet discovery. Do not put Brocade Silkworm switch IP addresses in the `/etc/fcswitch.conf` file, as you can with Sun StorEdge network FC switches.
- The minimum Brocade Silkworm switch firmware to use with Storage Automated Diagnostic Environment is v2.6.0

# 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.

## Example CLI brocadetest(1M)

```
#  /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, by opening a telnet session, or by way of 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`
- `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 B-1** 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 B-2** `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 B-3** `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 B-4** `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 B-5** `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 B-6** 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 –** Notes on `loopPortTest`

- Syntax is `loopporttest` <*num_passes*>,<*port*>,<*user_pattern*>,<*pattern_width*>
- Only works on logged in L-Ports
- To test ports with Loopback connectors, use crossPortTest

**CODE EXAMPLE B-7** 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 B-8** 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 WWNs of the devices connected to the switch.

# Port Differences between Sun StorEdge Ports and Brocade Ports

**TABLE B-5** 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. |

# Accessing the Brocade Silkworm switch

You can access Brocade Silkworm switches in multiple ways:

- Open a telnet session by way of a standard RJ-45 Ethernet port
- Access the front panel (Brocade Silkworm 2800 only)
- Use a serial connection (Brocade Silkworm 2400 only)
- Use the Brocade WebTools GUI

The serial connection available on the Brocade Silkworm 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. See the *Brocade Silkworm 2400 Hardware Reference Manual* for further serial port details.

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. See the *Brocade Silkworm 2800 Hardware Reference Manual* for more details on the front panel operation.

## 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.

You can access the WebTools GUI with a standard web browser (Netscape or Microsoft Internet Explorer with a Java Plugin) by pointing the browser to `http://<ip_address_of_switch>`.

---

**Note –** The Java Plugin that is supplied with Solaris 8 U6 is required.

---

- **To Verify the Web License, type the following**:

```
admin> licenseshow

SeRdQeQSbzTfSqSY:
Web license
Zoning license
Quickloop license
```

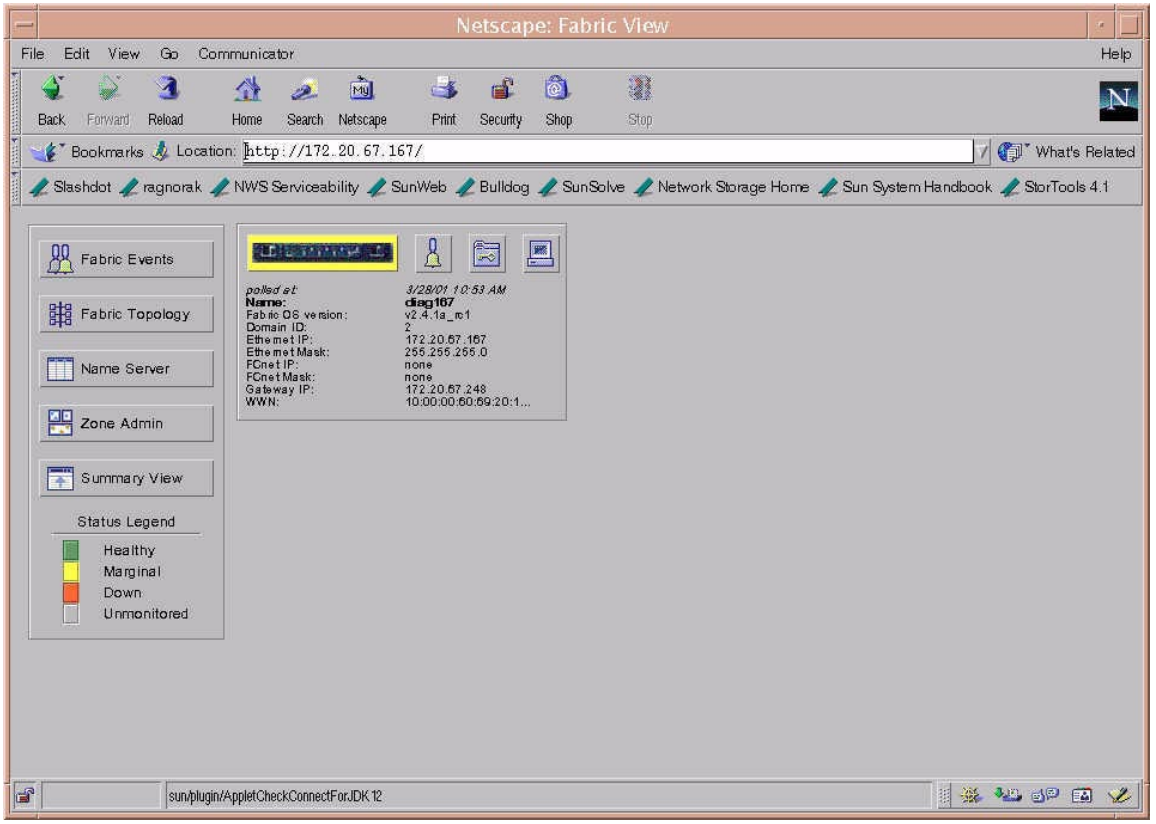



**FIGURE B-1** Brocade Webtools GUI

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

---

**Note –** The rest of this guide will assume telnet usage.

---

# Power On Self Tests (POST)

When the switch is powered up, it runs a series of POST tests including:

- Dynamic RAM Test
- Port Register Test
- Central Memory Test
- CMI Connector Test
- CAM Test
- Port Loop Back Test

POST behaves differently, depending on boot method. A power-cycle (power-off and power-on) is considered a cold boot. All other boots from a powered-on state are considered warm boots.

POST execution per cold boot executes a longer version of the Memory Test. POST execution per warm boot executes a shorter version of Memory Test. Boot time with POST varies, depending on boot method.

As the POST test successfully performs each test, a message “Passed” is displayed via telnet on the front panel.

After the switch completes the POST, the port module returns to a steady state from the flashing state shown during tests.

If a yellow port module light is displayed or is slowly flashing, this indicates that the port is in a failed state.

Should the switch fail to complete POST, the green power LED will be set to blink. This indicates that the switch failed one of the initial stages of POST and that the CPU is not able to bring up the operating system. Should this occur, replace the switch.

# Removing Power

**Caution –**
Error messages are stored in RAM and are lost when power is removed from the switch. Capture and view the error log output and note any error messages before removing power.

## Status and Activity Indicators

### *Front Panel LED Port Indicators*

| Front Panel LEDs | Definition |
|---|---|
| No light showing | No light or signal carrier (no module, no cable) for media interface LEDs |
| Steady yellow | Receiving light or signal, but not yet online |
| Slow[1] yellow | Disabled (result of diagnostics or portDisable command). Flashes every two seconds. |
| Fast[2] yellow | Error, fault with port. Flashes every 1/2 second. |
| Steady green | Online (connected with device) |
| Slow[1] green | Online, but segmented (loopback cable or incompatible switch) flashes every two seconds. |
| Fast[2] green | Internal loopback (diagnostics). Flashes every 1/2 second. |
| Flickering green | Online and frames flowing through port. |

[1]Slow —2 seconds interval
[2]Fast — 1/2 second interval

See the *Brocade Silkworm Hardware Reference Manual* for further details.

### *Initialization Steps:*

At power-on or reset, the following steps occur.

1. Preliminary POST diagnostics
2. VxWorks operating system initialization
3. Hardware initialization (resets, internal addresses assigned to ASICs, serial port initialized, front panel initialized)
4. Full POST
5. Universal Port Configuration
6. Link initialization—receiver / transmitter negotiation to bring connected ports online
7. Fabric analysis—the switch checks for ports connected to other Fabric elements. If there are other Fabric elements connected, it identifies the master switch.
8. Address assignment—once the master switch has been identified, port addresses may be assigned. Each switch tries to keep the same addresses that were previously used. These are stored in the switch's configuration flash PROM.
9. Routing table construction—after addresses are assigned, the unicast routing tables are constructed
10. Enable normal port operation

---

**Note –** If any of the steps listed above fails, replace the entire switch as a single FRU.

---

# General Troubleshooting Procedures

This section lists the broad steps on how to approach a Brocade Silkworm switch problem in a SAN environment. It lays out a methodical approach and lists various tools and resources available at each step. It is expected that using Storage Automated Diagnostic Environment for monitoring will greatly reduce the time consuming process of narrowing down the problem.

**Step 1) Discover the Error**

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

**Step 2) Determine the extent of problem**

- `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 here will determine which subsection to focus your attention: 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

# Troubleshooting Case Study

The following case study illustrates a practical application of the steps outlined above. This is only one way to approach the problem; there may be others.

---

**Note –** Knowledge and training on all components in a SAN are prerequisites before you attempt the procedures below.

In this test case, the I/O load was generated using the `dex` disk exerciser to simulate customer load, and the steps below allowed the I/O to continue uninterrupted throughout the procedure.

---

## Configuration

- Sun Fire V880
- Solaris 8 10/01 with all recommended and latest Leadville driver patches
- Sun StorEdge T3 array Partner Pair with FW 1.18
- Brocade Silkworm 2400 and 2800 switches with v2.6.0 firmware
- Storage Automated Diagnostic Environment with patch 112580-01

---

**Note –** The Storage Automated Diagnostic Environment was configured to send email alerts to a system admininstrator's email address.

---

# Storage Automated Diagnostic Environment Topology

In this example, the two switches were zoned in such a way to allow two separate paths for the Sun StorEdge T3 array partner pair. In normal configurations, two separate pairs of switches should be used to eliminate single points of failure.

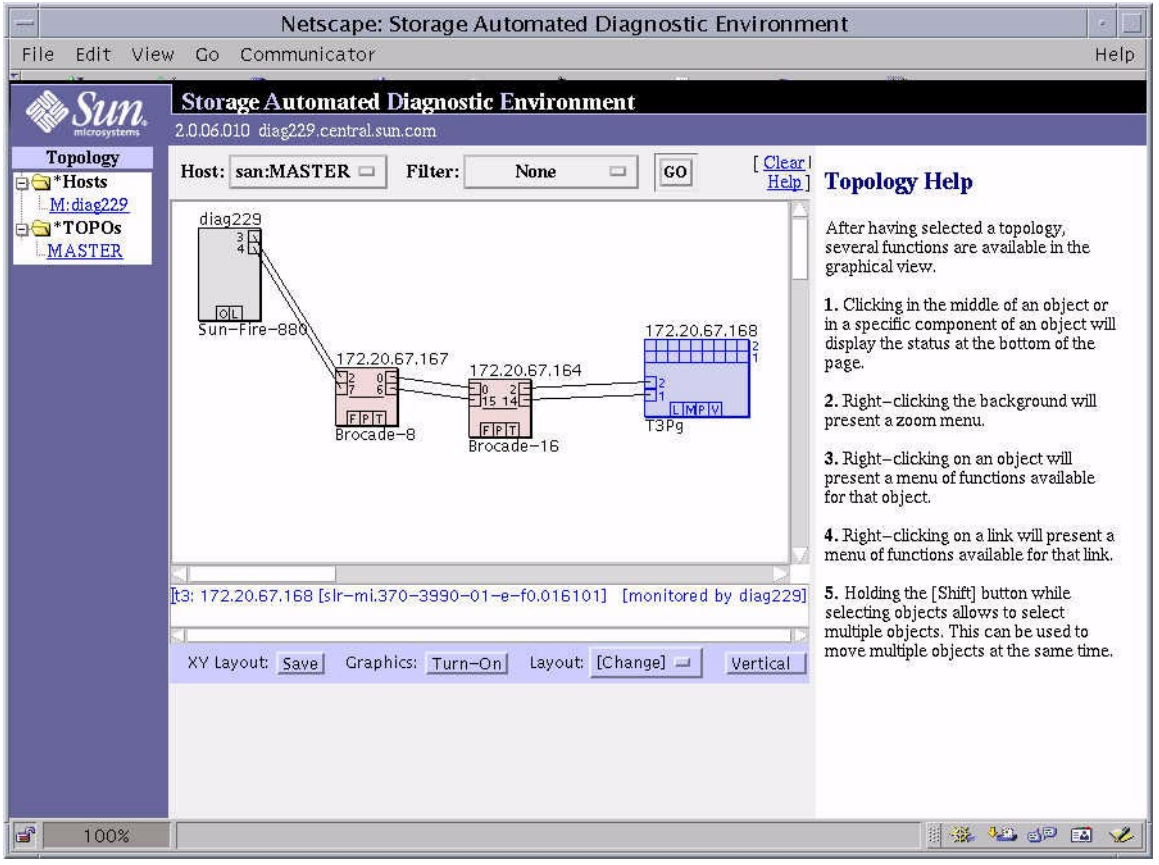



**FIGURE B-2** Storage Automated Diagnostic Environment Topology

**Step 1) Discover the Error using Storage Automated Diagnostic Environment Alerts**

```
Site     : Lab Broomfield
Source   : diag229.central.sun.com
Severity : Warning
Category : Message
DeviceId : message:diag229.central.sun.com
EventType: LogEvent.driver.MPXIO_offline
EventTime: 03/19/2002 13:10:03

Found 2 'driver.MPXIO_offline' warning(s) in logfile: /var/adm/messages on
diag229.central.sun.com (id=80c61254):

Mar 19 13:09:40 WWN:50020f2300003d2c   diag229.Central.Sun.COM mpxio: [ID
779286 kern.info] /scsi_vhci/ssd@g60020f2000003ee53aaf7a09000da257
(ssd76) multipath status: degraded, path
/pci@9,600000/pci@2/SUNW,qlc@4/fp@0,0 (fp3) to target address:
50020f2300003d2c,1 is offline  ( in backup:diag229.central.sun.com)
Mar 19 13:09:40 WWN:50020f2300003d2c   diag229.Central.Sun.COM mpxio: [ID
779286 kern.info] /scsi_vhci/ssd@g60020f2000003ee53c18b7010003a5a8
(ssd77) multipath status: degraded, path
/pci@9,600000/pci@2/SUNW,qlc@4/fp@0,0 (fp3) to target address:
50020f2300003d2c,0 is offline  ( in backup:diag229.central.sun.com)

Found 1 'driver.Fabric_Warning' warning(s) in logfile: /var/adm/messages
on diag229.central.sun.com (id=80c61254):
INFORMATION:
  Fabric warning

Mar 19 13:09:20 WWN:50020f2300003d2c   diag229.Central.Sun.COM fctl: [ID
288011 kern.warning] WARNING: fctl(3): N_x Port with D_ID=312e4, PWWN=
50020f2300003d2c disappeared from fabric  ( in
backup:diag229.central.sun.com)

...continued on next page...
```

```
...continued from previous page...

'port.2' in BROCADE 172.20.67.167 (ip=172.20.67.167) is now Not-Available
(status-state changed from 'online' to 'offline'):

INFORMATION:
A port on the switch has logged out of the fabric and gone offline


RECOMMENDED-ACTION:
  1. Verify cables, GBICs and connections along Fibre Channel path
  2. Check SAN Topology GUI to identify failing segment of the data path
  3. Verify correct FC switch configuration
  4. Verify port is enabled

...

brocade.MessageLog on 172.20.67.167 (ip=172.20.67.167):

PhysicalState of port 2 changed from 'inSync(6) to 'noLight(4)

...

status of hba /devices/pci@9,600000/pci@2/SUNW,qlc@4/fp@0,0:devctl on
diag229.central.sun.com changed from CONNECTED to NOT CONNECTED
INFORMATION:
  monitors changes in the output of luxadm -e port

  Found path to 20 HBA ports

  /devices/sbus@2,0/SUNW,socal@d,10000:0   NOT CONNECTED
```

**FIGURE B-3** Storage Automated Diagnostic Environment Alert

This Alert shows:

- An error on port two of switch `172.20.67.167` occurred
- A Sun StorEdge Traffic Manager offline event occurred
- The HBA is offline

### Step 2) Determine the extent of the problem using `cfgadm -al` output

**CODE EXAMPLE B-9** `cfgadm -al` output to check OS level fabric condition

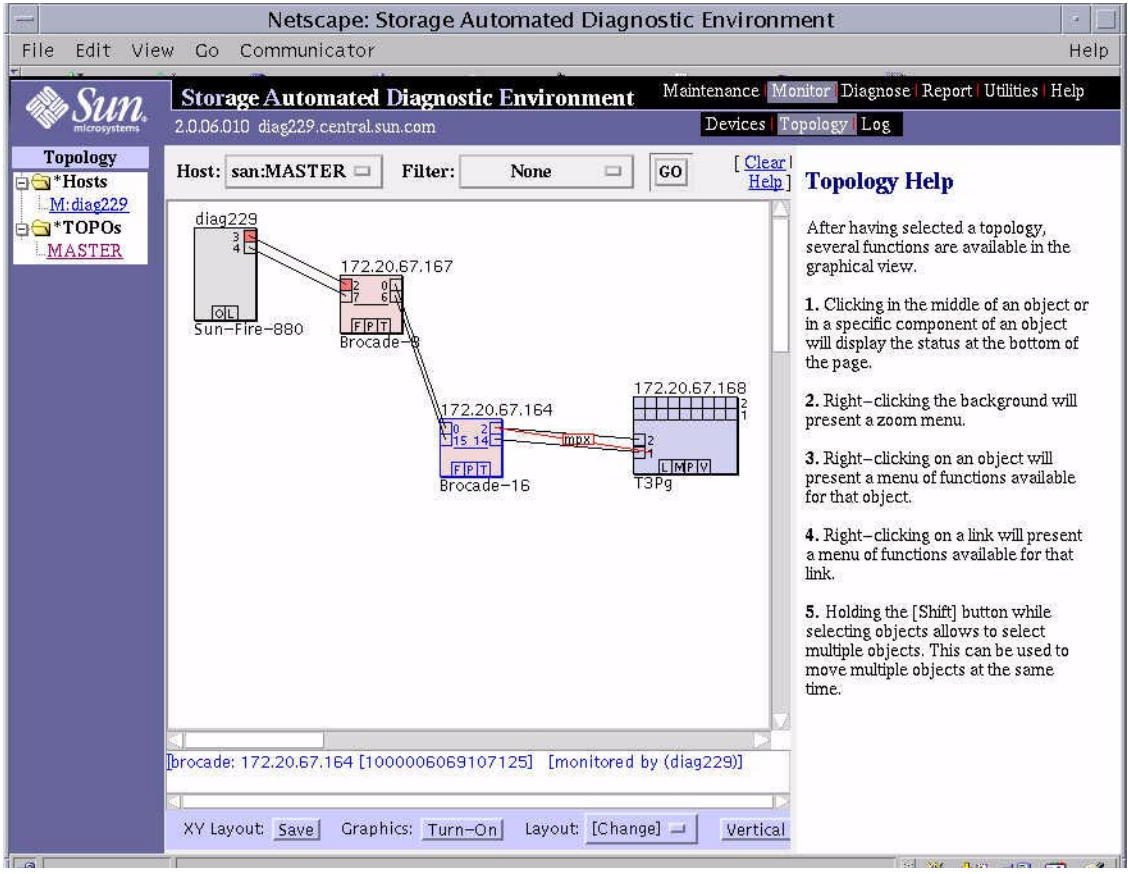
```
c2                            fc-fabric    connected    configured   unknown
c2::50020f2300003d2c           disk        connected    configured   unusable
c3                            fc-fabric    connected    configured   unknown
c3::50020f2300003ee5           disk        connected    configured   unknown
```

The device on c2 has disappeared. In addition, the `luxadm` output of the Sun StorEdge T3 arrays shows the following.

```
# luxadm display /dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2

DEVICE PROPERTIES for disk:
/dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2
  Status(Port A):       O.K.
  Status(Port B):       O.K.
  Vendor:               SUN
  Product ID:           T300
  WWN(Node):            50020f2000003ee5
  WWN(Port A):          50020f2300003d2c
  WWN(Port B):          50020f2300003ee5
  Revision:             0118
  Serial Num:           Unsupported
  Unformatted capacity: 488642.000 MBytes
  Write Cache:          Enabled
  Read Cache:           Enabled
    Minimum prefetch:   0x0
    Maximum prefetch:   0x0
Device Type:          Disk device
  Path(s):
  /dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2
  /devices/scsi_vhci/ssd@g60020f2000003ee53aaf7a09000da257:c,raw
   Controller           /devices/pci@9,600000/pci@2/SUNW,qlc@4/fp@0,0
     Device Address     50020f2300003d2c,1
     Class              primary
     State              OFFLINE
   Controller           /devices/pci@9,600000/pci@2/SUNW,qlc@5/fp@0,0
     Device Address     50020f2300003ee5,1
     Class              secondary
     State              ONLINE
```

From this output, notice that the primary path to this LUN is OFFLINE and the secondary path has taken over. This matches the Sun StorEdge Traffic Manager event from the Storage Automated Diagnostic Environment. You can also check the Storage Automated Diagnostic Environment topology for any errors.




From the topology, notice the HBA and port two of the first switch have errors.

Also, a Sun StorEdge Traffic Manager event has occurred on the Sun StorEdge T3 arrays.

---

**Note –** Sun StorEdge Traffic Manager events are only shown between the last switch and the storage. From this Topology view, concentrate on the link between the HBA and the switch port 2.

---

**Step 3) Check the status of the array**

```
diag168.Central.Sun.COM:/etc:<18>port listmap

port   targetid   addr_type   lun   volume        owner   access
u1p1      1         hard        0    diag169u1v1   u1      primary
u1p1      1         hard        1    diag169u2v1   u1      failover
u2p1      2         hard        0    diag169u1v1   u1      failover
u2p1      2         hard        1    diag169u2v1   u1      primary
```

All LUNs have failed over to the u1 controller.

**Step 4) Check the status of the switch using `switchshow`**

```
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  No_Light
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
```

This `switchshow` output from the first switch confirms that port 2 has gone offline. No other ports seem to be affected at this point.

**Step 5) Start testing FRUs**

In the Switch-to-HBA link there are potentially four FRUs:

- HBA
- Cable
- Switch GBIC
- Switch chassis

Using the Storage Automated Diagnostic Environment, begin by testing the switch GBIC and the switch chassis.

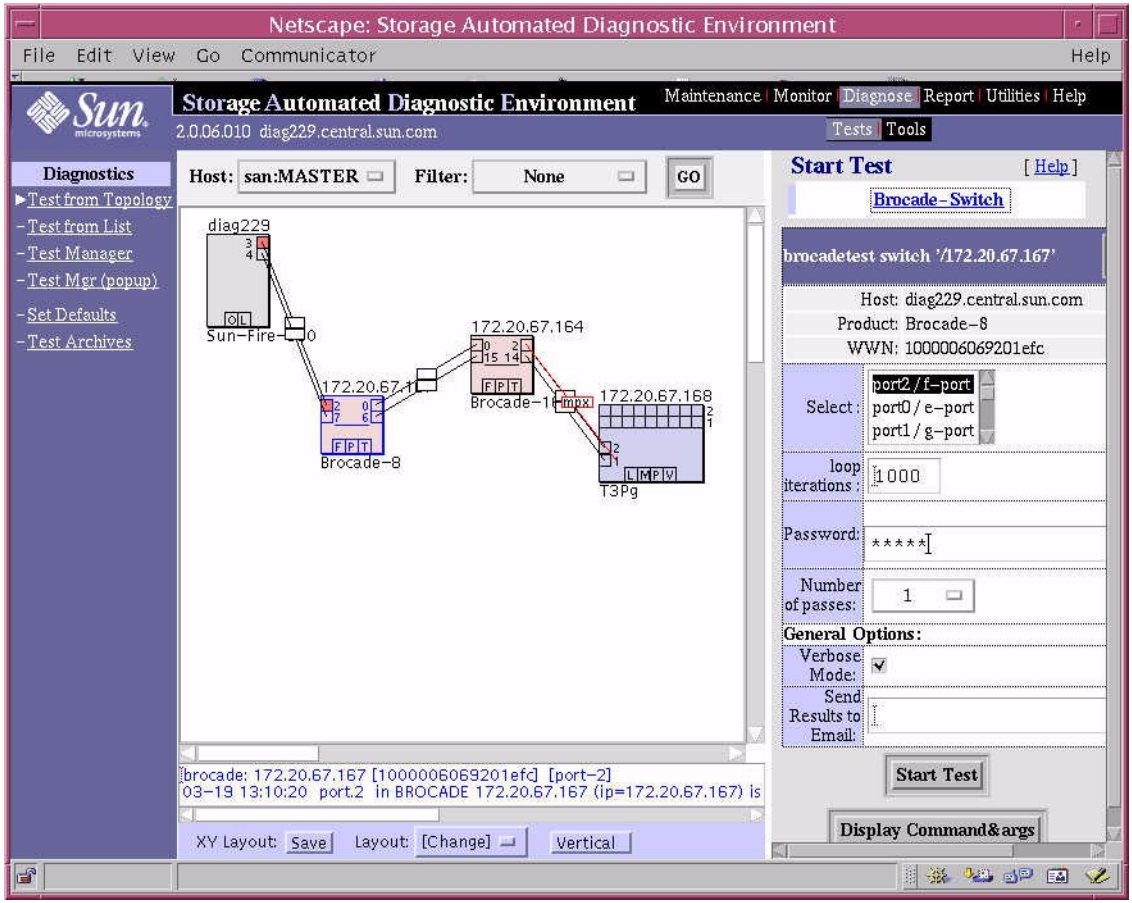



**FIGURE B-4** Storage Automated Diagnostic Environment Brocade Switch Test

Using the Diagnostic Tests on port 2, the test fails and displays a message, recommending you insert a loopback plug into port 2. No communication can be established between the switch and the HBA, as shown in FIGURE B-5.

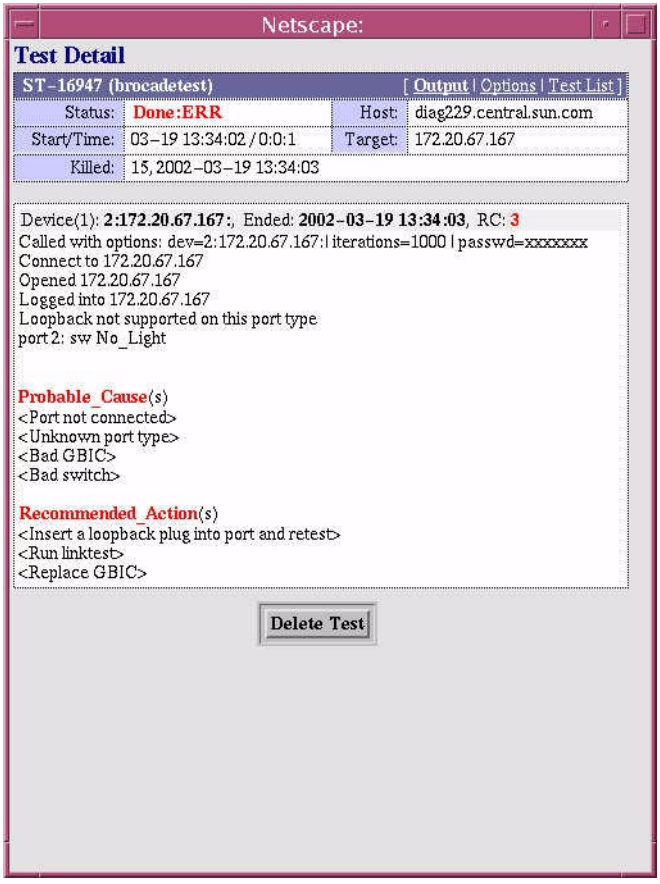



**FIGURE B-5** Test Detail showing Failed Test

After inserting a loopback plug and rerunning the test, the test now passes, as shown in FIGURE B-6.

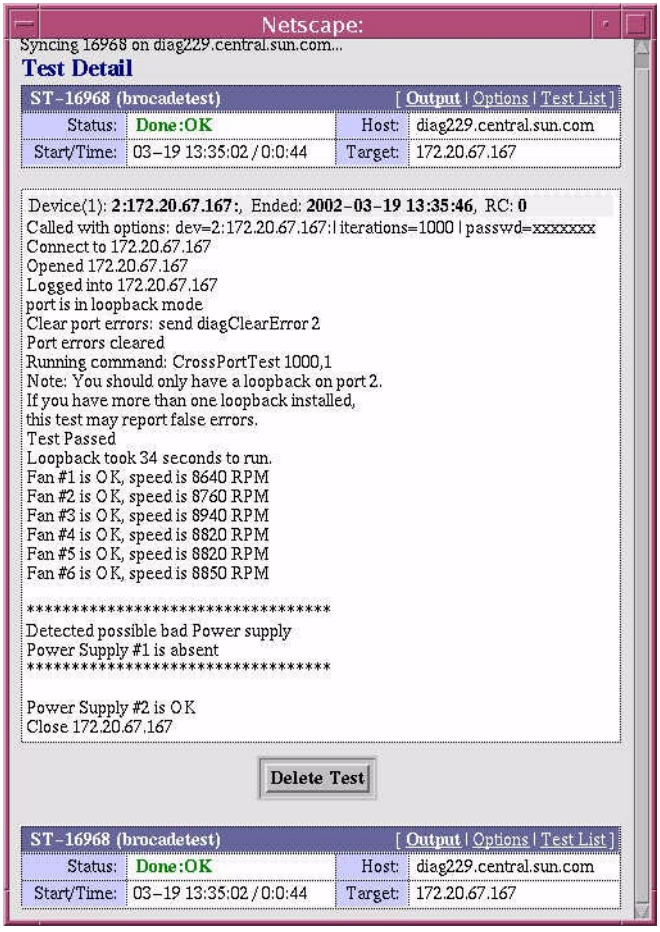



**FIGURE B-6** Test Detail Showing Test Passed

This suggests that the GBIC and switch port are most likely not the cause of the error.

Test the HBA by inserting the loopback plug into the HBA and running the HBA test (`qlctest`), shown in FIGURE B-7.

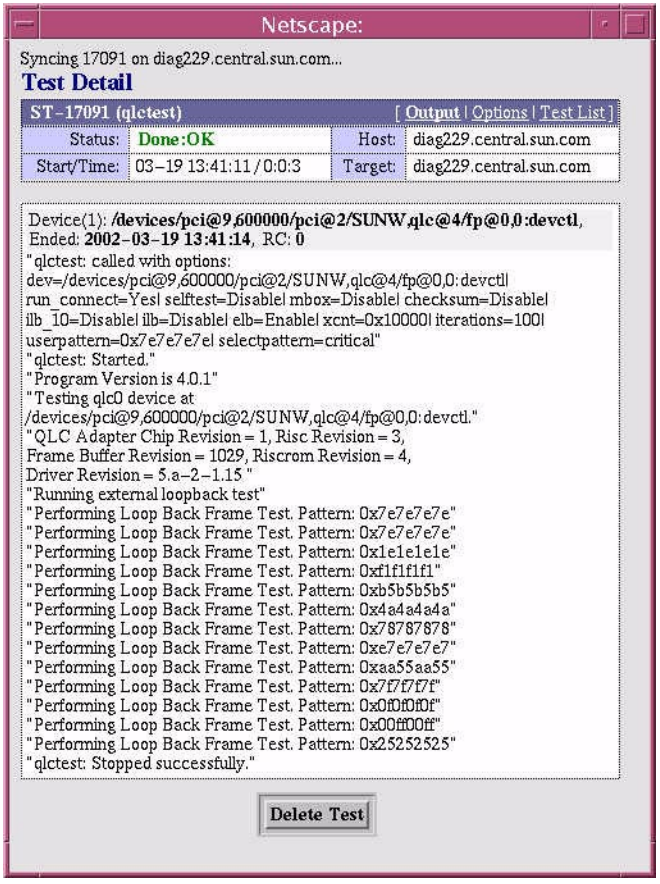



**FIGURE B-7** Storage Automated Diagnostic Environment `qlctest`

The `qlctest` test also passes. The HBA is most likely not the cause of the error. This leaves the cable as the most likely problem. In this example, the cable was replaced and the connection was recabled.

**Step 6) Verify the fix**

## ▼ To verify the fix after replacing the cable

1. **Check the `cfgadm` output to see if the device appears back in the fabric.**

   **CODE EXAMPLE B-10** `cfgadm` Output

```
# cfgadm -al

c2                          fc-fabric    connected    configured   unknown
c2::50020f2300003d2c         disk        connected    configured   unknown
c3                          fc-fabric    connected    configured   unknown
c3::50020f2300003ee5         disk        connected    configured   unknown
```

   The c2 device is connected.

2. **Return the path to service using the Sun StorEdge Traffic Manager failover commands**

3. **Check the status of the device.**

```
# luxadm failover primary
/dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2

# luxadm display /dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2

DEVICE PROPERTIES for disk:
/dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2

Status(Port A): O.K.
Status(Port B): O.K.
Vendor: SUN
Product ID: T300
WWN(Node): 50020f2000003d2c
WWN(Port A): 50020f2300003d2c
WWN(Port B): 50020f2300003ee5
Revision: 0118
Serial Num: Unsupported
Unformatted capacity: 488642.000 MBytes
Write Cache: Enabled
Read Cache: Enabled
Minimum prefetch: 0x0
Maximum prefetch: 0x0
Device Type: Disk device

Path(s):
  /dev/rdsk/c6t60020F2000003EE53AAF7A09000DA257d0s2
  /devices/scsi_vhci/ssd@g60020f2000003ee53aaf7a09000da257:c,raw
   Controller           /devices/pci@9,600000/pci@2/SUNW,qlc@4/fp@0,0
     Device Address     50020f2300003d2c,1
Class              primary
State              ONLINE
Controller           /devices/pci@9,600000/pci@2/SUNW,qlc@5/fp@0,0
Device Address     50020f2300003ee5,1
Class              secondary
State              STANDBY
```

The primary path is now restored as the ONLINE path and I/O is again using this path. As a final check, look to the Storage Automated Diagnostic Environment topology. The ports that were in error are now green and the [mpx] error is green as well, as shown in FIGURE B-8.

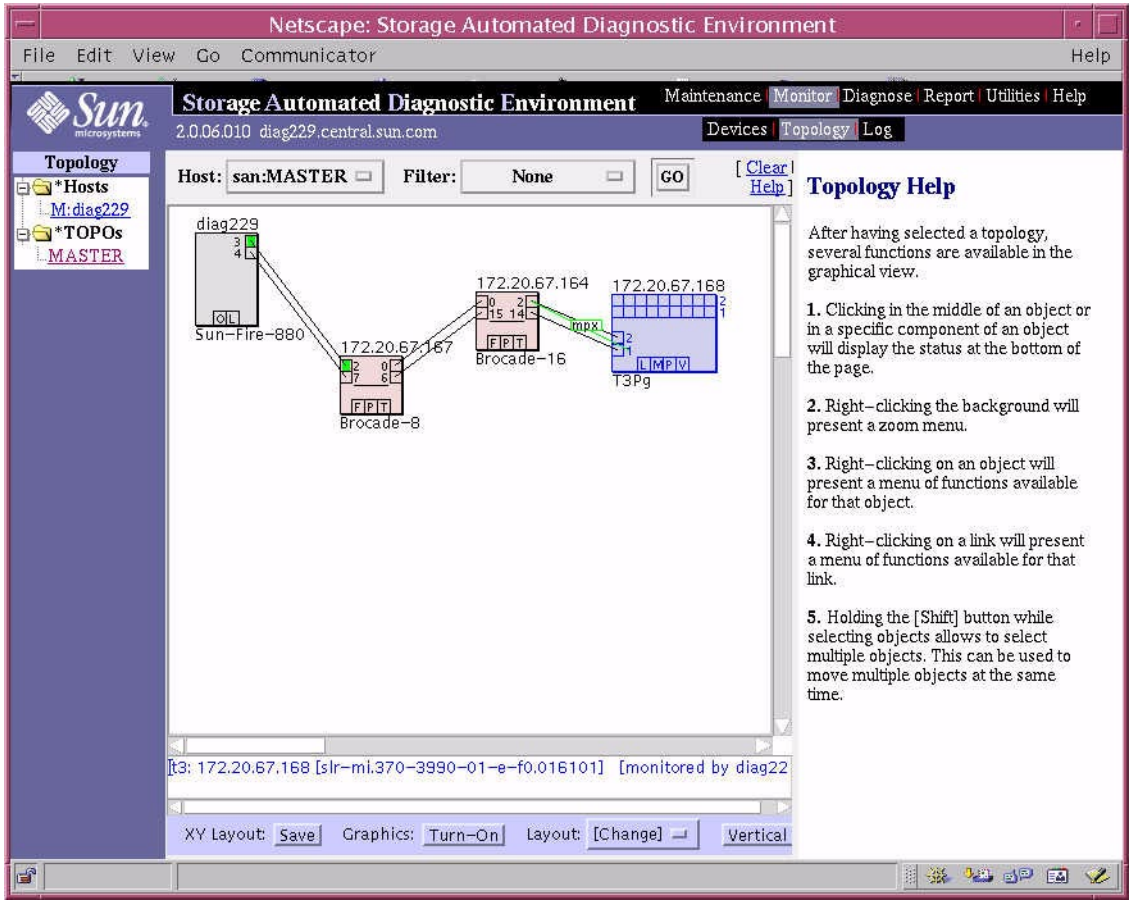



**FIGURE B-8** Error-free Topology

APPENDIX C

# Brocade Error Messages

This appendix explains the error message format and possible errors. This section includes:

- Error message formats
- Error message modules

## Error Message Formats

There are two error message formats depending on whether you are gathering information from the front panel or via Telnet. The front panel shows an abbreviated message and by way of Telnet displays the entire error message.

In all cases, the last error encountered is the first error displayed. Up to 32 messages are held in a buffer. If the 32 message limit is exceeded, the messages are overwritten in a first in, first out sequence.

**Note –** Error messages are stored in volatile RAM and are lost whenever power is removed from the switch. Access the error message log to view error messages before removing power.

## Front Panel Message Formats

The Brocade Silkworm switch's front panel displays error messages. The first line includes the error's date and time. The beginning of each second line on the front panel display starts with the module name, error name, and the severity level (1).

The possible values are:

- 1—critical
- 2—error
- 3—warning
- 4—informational
- 5—debug

---

**Note –** If the same error occurs within the same module but on different ports, the number of occurrences for that message is incremented in brackets (up to 999), and the error number is not incremented (that is, this error, though it may occur 999 times, occupies one message in the 32-message buffer).

---

### ▼ To Display Error Messages from the Front Panel

1. **From the front panel, select the Status menu.**
2. **Select Error Log.**
3. **Scroll through the error log. If no errors are encountered, the panel displays `No Error`.**

## Diagnostic Error Message Formats

If any port fails during a diagnostic test, it is marked BAD in the status display.

To retest a port that has been marked BAD, clear the port and set to OK using the `diagClearError` (`port#`) command. This command clears the port status only and does not clear the logs or change the port's condition. The `diagClearError` (`port#`) command should only be used during diagnostic procedures to reset a bad port for retest.

Some messages contain the following abbreviations:

- sb = Should Be
- er = Bits in error

**Note –** If you run the `portStateShow` or the `diagShow` command prior to running a test, errors may appear as a result of the normal synchronization process. These errors should be addressed if the number of errors found increases when running the `portStateShow` command again.

**TABLE C-1** Probable Failure Actions

| Failed Test | Action |
|---|---|
| ramTest | replace DRAM module or mainboard assembly |
| portRegTest | replace mainboard assembly |
| centralMemoryTest | replace mainboard assembly |
| cmiTest | replace mainboard assembly |
| cmemRetentionTest | replace mainboard assembly |
| sramRetentionTest | replace mainboard assembly |
| camTest | replace mainboard assembly |
| portLoopbackTest | replace mainboard assembly |
| crossPortTest | replace mainboard assembly, GBIC, or fiber cable |
| spinSilk | replace mainboard assembly, GBIC, or fibre cable |

## Error Message Numbers

An error number ERR#xxxx appears at the end of an error message. TABLE C-2 matches each error number with the test that caused the error and the name of the error. Look up the complete definition of the error name and the actions that will correct the error in TABLE C-3.

**TABLE C-2** Error Message Codes Defined

| Error Number | Test Name | Error Name |
|---|---|---|
| 0001 | n / a | DIAG-CLEAR_ERR |
| 0004 | n / a | DIAG-POST_SKIPPED |
| 0B15 | `sramRetentionTest` | DIAG-REGERR |
| 0B16 | | DIAG-REGERR_UNRST |
| 0B0F | | DIAG-BUS_TIMEOUT |
| 1F25 | `cmemRetentionTest` | DIAG-LCMRS |
| 1F26 | | DIAG-LCMTO |
| 1F27 | | DIAG-LCMEM |
| 0110 | `ramTest` | DIAG-MEMORY |
| 0111 | | DIAG-MEMSZ |
| 0112 | | DIAG-MEMNULL |
| 0415 | `portRegTest` | DIAG-REGERR |
| 0416 | | DIAG-REGERR_UNRST |
| 040F | | DIAG-BUS_TIMEOUT |
| 1020 | `centralMemoryTest` | DIAG-CMBISRTO |
| 1021 | | DIAG-CMBISRF |
| 1025 | | DIAG-LCMRS |
| 1026 | | DIAG-LCMTO |
| 1027 | | DIAG-LCMEM |
| 1028 | | DIAG-LCMEMTX |
| 1029 | | DIAG-CMNOBUF |
| 102A | | DIAG-CMERRTYPE |
| 102B | | DIAG-CMERRPTN |
| 102C | | DIAG-INTNOTCLR |
| 103O | | DIAG-BADINT |
| 106F | | DIAG-TIMEOUT |

**TABLE C-2** Error Message Codes Defined *(Continued)*

| Error Number | Test Name | Error Name |
|---|---|---|
| 2030 | `cmiTest` | DIAG-BADINT |
| 2031 | | DIAG-INTNIL |
| 2032 | | DIAG-CMISA1 |
| 2033 | | DIAG-CMINOCAP |
| 2034 | | DIAG-CMIINVCAP |
| 2035 | | DIAG-CMIDATA |
| 2036 | | DIAG-CMICKSUM |
| 223B | `camTest` | DIAG-CAMINIT |
| 223C | | DIAG-CAMSID |
| 2640 | `portLoopbackTest` | DIAG-ERRSTAT (ENCIN) |
| 2641 | | DIAG-ERRSTAT (CRC) |
| 2642 | | DIAG-ERRSTAT (TRUNC) |
| 2643 | | DIAG-ERRSTAT (2LONG) |
| 2644 | | DIAG-ERRSTAT (BADEOF) |
| 2645 | | DIAG-ERRSTAT (ENCOUT) |
| 2646 | | DIAG-ERRSTAT (BADORD) |
| 2647 | | DIAG-ERRSTAT (DISCC3) |
| 264F | | DIAG-INIT |
| 265F | | DIAG-PORT_DIED |
| 266E | | DIAG-DATA |
| 266F | | DIAG-TIMEOUT |
| 2660 | | DIAG-STATS(FTX) |
| 2661 | | DIAG-STATS(FRX) |
| 2662 | | DIAG-STATS(C3FRX) |
| 2670 | | DIAG-PORTABSENT |
| 2671 | | DIAG-XMIT |

**TABLE C-2** Error Message Codes Defined *(Continued)*

| Error Number | Test Name | Error Name |
|---|---|---|
| 3040 | `crossPortTest` | DIAG-ERRSTAT(ENCIN) |
| 3041 | | DIAG-ERRSTAT(CTL) |
| 3042 | | DIAG-ERRSTAT(TRUNC) |
| 3043 | | DIAG-ERRSTAT(2LONG) |
| 3044 | | DIAG-ERRSTAT(BADEOF) |
| 3045 | | DIAG-ERRSTATENCOUT) |
| 3046 | | DIAG-ERRSTAT(BADORD) |
| 3047 | | DIAG-ERRSTAT(DISC3) |
| 304F | | DIAG-INIT |
| 305F | | DIAG-PORTDIED |
| 3060 | | DIAG-STATS(FTX) |
| 3061 | | DIAG-STATS(FRX) |
| 3062 | | DIAG-STATS(C3FRX) |
| 306E | | DIAG-DATA |
| 306F | | DIAG-TIMEOUT |
| 3070 | | DIAG-PORTABSENT |
| 3071 | | DIAG-XMIT |
| 3078 | | DIAG-PORTWRONG |

**TABLE C-2** Error Message Codes Defined *(Continued)*

| Error Number | Test Name | Error Name |
|---|---|---|
| 384F | spinSilk | DIAG-INIT |
| 385F | | DIAG-PORTDIED |
| 3840 | | DIAG-ERRSTAT (ENCIN) |
| 3841 | | DIAG-ERRSTAT (CRC) |
| 3842 | | DIAG-ERRSTAT (TRUNC) |
| 3843 | | DIAG-ERRSTAT (2LONG) |
| 3844 | | DIAG-ERRSTAT (BADEOF) |
| 3845 | | DIAG-ERRSTAT (ENCOUT) |
| 3846 | | DIAG-ERRSTAT (BADORD) |
| 3847 | | DIAG-ERRSTAT (DISCC3) |
| 3870 | | DIAG-PORTABSENT |
| 3871 | | DIAG-XMIT |
| 3874 | | DIAG-PORTSTOPPED |

**TABLE C-3** Diagnostic Error Messages

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| DIAG-BADINT<br>`Err#1030, 2030`<br>[centralMemoryTest, cmiTest] | Port received an interrupt when not expecting one | ASIC failure | Replace mainboard assembly |
| DIAG-BUS_TIMEOUT<br>`Err#0BOF, 4040F`<br>[portRegTest, sramRetentionTest] | ASIC register or ASIC SRAM did not respond to an ASIC data access | ASIC failure | Replace mainboard assembly |
| DIAG-CAMINIT<br>`Err#223B`<br>[camTest] | Port failed to initialize due to one of the following reasons:<br>• Switch not disabled<br>• Diagnostic queue absent<br>• Malloc failed<br>• Chip is not present<br>• Port is not in loopback mode<br>• Port is not active | Software operational setup error or mainboard failure | Retry, reboot, or replace mainboard assembly |
| DIAG-CAMSID<br>`Err#223C`<br>[camTest] | ASIC failed SID NO translation test | ASIC failure | Replace mainboard assembly |
| DIAG-CLEAR_ERR<br>`Err#0001` | Port's diag error flag (OK or BAD) is cleared | Information only | None required |
| DIAG-CMBISRF<br>`Err#1021`<br>[centralMemoryTest] | ASIC's Central Memory SRAMs did not complete the BISR within the timeout period | ASIC failure | Replace mainboard assembly |
| DIAG-CMBISRTO<br>`Err#1020`<br>[centralMemoryTest] | ASIC's Central Memory SRAMs did not complete the BISR within the timeout period | ASIC failure | Replace mainboard assembly |
| DIAG-CMERRPTN<br>`Err#102B`<br>[centralMemoryTest] | Error detected at the wrong port | ASIC failure | Replace mainboard assembly |
| DIAG-CMERRTYPE<br>`Err#102A`<br>[centralMemoryTest] | Port got the wrong CMEM error type | ASIC failure | Replace mainboard assembly |
| DIAG-CMICKSUM<br>`Err#2036`<br>[cmiTest] | CMI message received failed bad checksum test. | ASIC or mainboard failure | Replace mainboard assembly |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| DIAG-CMIDATA<br>`Err#2035`<br>[cmiTest] | CMI data received but did not match data transmitted | ASIC or mainboard failure | Replace mainboard assembly |
| DIAG-CMIINVCAP<br>`Err#2034`<br>[cmiTest] | Unintended ASIC erroneously got CMI capture flag | ASIC or mainboard failure | Replace mainboard assembly |
| DIAG-CMINOCAP<br>`Err#2033`<br>[cmiTest] | CMI intended receiver ASIC failed to get CMI capture flag. | ASIC or mainboard failure. | Replace mainboard assembly |
| DIAG-CMISA1<br>`Err#2032`<br>[cmiTest] | An attempt to send a CMI message from ASIC to ASIC failed. | ASIC failure | Replace mainboard assembly |
| DIAG-CMNOBUF<br>`Err #1029`<br>[centralMemoryTest] | Port could not get any buffer | ASIC failure | Replace mainboard assembly |
| DIAG-DATA<br>`Err#266E, 306E`<br>[portLoopbackTest, crossPortTest] | Payload received by port did not match payload transmitted. | mainboard, GBIC module or fiber cable failure | Replace mainboard assembly, GBIC module or fiber cable |
| DIAG-ERRSTAT<br>`Err#2640-2647, 3040-3047, 3840-3847`<br>[portLoobackTest, crossPortTest, spinSilk] | Port Error Statistics counter is non-zero, meaning an error was detected when receiving frames.<br>One of the following status errors occurred.<br>• **Enc_in**—Encoding error, inside frame<br>• **CRC-err**—Cyclic redundancy check on frame failed<br>• **TruncFrm**—Truncated frame<br>• **FrmTooLong**—Frame too long<br>• **BadEOF**—Bad end of file<br>• **Enc_out**—Encoding error, outside frame<br>• **BadOrdSet**—Bad symbol on fiber optic cable<br>• **DiscC3**—Discarded Class 3 frames | ASIC, mainboard, GBIC module or fiber cable failure | Replace mainboard assembly, GBIC module, or fiber cable |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| DIAG-INIT<br>`Err#264F, 304F, 384F`<br>[portLoopbackTest, crossPortTest, spinSilk] | Port failed to go active in the loopback mode requested. | ASIC, mainboard, GBIC module or fiber cable failure | Replace mainboard assembly, GBIC module, or fiber cable. |
| DIAG-INTNIL<br>`Err#2031`<br>[cmiTest] | ASIC failed to get a CMI error (interrupt) | ASIC failure | Replace mainboard assembly |
| DIAG-INTNOTCLR<br>`Err#102C`<br>[centralMemoryTest] | The interrupt bit could not be cleared. | ASIC failure | Replace mainboard assembly |
| DIAG-LCMEM<br>`Err#1027`<br>[centralMemoryTest, cmemRetentionTest] | Data read from the Central Memory location did not match data previously written into the same location | ASIC failure | Replace mainboard assembly |
| DIAG-LCMEMTX<br>`Err#1F27, 1028`<br>[centralMemoryTest] | Central Memory transmit path failure: ASIC 1 failed to read ASIC 2 via the transmit path | mainboard failure | Replace mainboard assembly |
| DIAG-LCMRS<br>`Err#1F25, 1025`<br>[centralMemoryTest cmemRetentionTest] | Central Memory Read Short: M bytes requested but got less than M bytes | ASIC failure | Replace mainboard assembly |
| DIAG-LCMTO<br>`Err#1F267, 1026`<br>[centralMemoryTest, cmemRetentionTest] | Central Memory Timeout: Data transfer initiated, did not complete within the timeout period. | ASIC failure | Replace mainboard assembly |
| DIAG-MEMNULL<br>`Err#0112`<br>[ramTest] | Test failed to malloc. | mainboard failure | Replace mainboard assembly |
| DIAG-MEMSZ<br>`Err#0111`<br>[ramTest] | Memory size to be tested is less than or equal to zero | mainboard failure | Replace mainboard assembly |
| DIAG-MEMORY<br>`Err#0110`<br>[ramTest] | Data read from RAM location did not match previously-written data into same location. | CPU RAM failure | Replace mainboard assembly or DRAM module |
| DIAG-PORTABSENT<br>`Err#2670, 3070, 3870`<br>[portLoopbackTest, crossPortTest, spinSilk] | Port is not present | ASIC or mainboard failure | Replace mainboard assembly |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| DIAG-PORTDIED<br>`Err#265F, 305F, 385F`<br>[portLoopbackTest, crossPortTest, spinSilk] | Port was in loopback mode and then went inactive | ASIC, GBIC module or fiber cable failure | Replace mainboard assembly, GBIC module, or fiber cable |
| DIAG-PORTSTOPPED<br>`Err#3874`<br>[spinSilk] | Port is no longer transmitting, as indicated by the Number Of Frames Transmitted counter being stuck at N frames. | ASIC, GBIC module, or fiber cable failure. | Replace mainboard assembly, GBIC module, or fiber cable. |
| DIAG-PORTWRONG<br>`Err#3078`<br>[crossPortTest] | Frame erroneously received by port M instead of the intended port N | ASIC failure | Replace mainboard assembly |
| DIAG-POST-SKIPPED<br>`Err #0004`<br>[switch initialization] | POST is skipped. Its message recommended that POST be executed. | Informational only | None required |
| DIAG-REGERR<br>`Err#0B15, 0415`<br>[portRegTest, sramRetentionTest] | Data read from ASIC register or ASIC SRAM did not match data previously written into same location | ASIC failure | Replace mainboard assembly |
| DIAG-REGERR_URST<br>`Err#0B16, 0416`<br>[portRegTest, sramRetentionTest] | Port failed to unreset | ASIC failure | Replace mainboard assembly |
| DIAG-STATS<br>`Err#2660-2662-, 3060-3062`<br>[portLoopback Test, crossPortTest] | Port counter value did not match the number of frames actually transmitted. Possible counters reporting:<br>• **FramesTx**—number of frames transmitted<br>• **FramesRx**—number of frames received<br>• **CI3FrmRx**—number of Class 3 frames received | ASIC, GBIC module or fiber cable failure | Replace mainboard assembly, GBIC module or fiber cable |
| DIAG-TIMEOUT<br>`Err#266F, 306F, 386F`<br>[portLoopbackTest, crossPortTest, centralMemoryTest] | For portLoopbackTest and crossPortTest:<br>Port failed to receive frame within timeout period<br>For centralMemoryTest:<br>Port failed to detect an interrupt within the timeout period. | ASIC, GBIC module or fiber cable failure | Replace mainboard assembly, GBIC module, or fiber cable |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| DIAG-XMIT `Err#2271, 2671, 3071, 3871` [portLoopbackTest, crossPortTest, spinSilk, camTest] | Port failed to transmit frame | ASIC failure | Replace mainboard assembly |
| CONFIG CORRUPT | The switch configuration information has become irrevocably corrupted. | OS error | The system automatically resorts to the default configuration settings. |
| CONFIG OVERFLOW | The switch configuration information has grown too large to be saved or has an invalid size. | OS error | Contact customer support |
| CONFIG VERSION | The switch has encountered an unrecognized version of the switch configuration. | OS error | The system automatically resorts to the default configuration settings. |
| FABRIC, SEGMENTED, LOG_WARNING | Fabric segmented | • Incompatible fabric parameters and switches<br>• Conflict zones | Reconfigure fabric or zones |
| FABRIC, NO_ALIASID, LOG_WARNING | No free multicast alias | Too many multicast groups in use | Remove some of the groups |
| FABRIC, BADILS, LOG_WARNING | Bad ISL-ELS size | The ISL-ELS payload is wrong | Contact customer support |
| FLASH, BAD_MIRROR, LOG_WARNING | The system's flash memory has encountered an error | OS error | The system attempts to recover from its mirrored backup. Contact customer support. |
| RPC, SVC_EXIT | An RPC service daemon has terminated prematurely or unexpectedly. | OS error | Contact customer support |
| RPC, SVC_REG | An RPC service daemon could not establish service for a particular protocol handler. | OS error | Contact customer support |
| TEMP, 1_FAILED, LOG_WARNING | Switch overheated | Fan failure | Contact customer support |
| TEMP, 2_FAILED, LOG_ERROR | Switch overheated | Fan failure | Contact customer support |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| TEMP, 3_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| TEMP, 4_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| TEMP, 5_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| FANS, 1_FAILED, LOG_WARNING | Switch overheated | Fan failure | Contact customer support |
| FANS, 2_FAILED, LOG_ERROR | Switch overheated | Fan failure | Contact customer support |
| FANS, 3_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| FANS, 4_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| FANS, 5_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| FANS, 6_FAILED, LOG_CRITICAL | Switch overheated | Fan failure | Contact customer support |
| POWER, 1_FAILED, LOG_CRITICAL | Switch power failure | Power supply failure | Contact customer support |
| POWER, 2_FAILED, LOG_CRITICAL | Switch power failure | Power supply failure | Contact customer support |
| FCIU, IUBAD, L, S | Invalid IU | OS error | Contact customer support |
| FCIU, IUCOUNT, L, S | Total number of IUs Count < 0 | OS error | Contact customer support |
| FCPH, EXCHBAD, L, S | Bad exchange | OS error | Contact customer support |
| FCPH, EXCHFREE, L, S | Unable to free an exchange | OS error | Contact customer support |
| MQ, QWRITE, L, M | Message queue overflow | Task blocked | Contact customer support |
| MQ, QREAD, L, M | Message queue unread | OS error | Contact customer support |
| MQ, MSGTYPE, E, M | Unknown message type | OS error | Contact customer support |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| SEMA, SEMGIVE, L, M | Unable to give a semaphore | OS error | Contact customer support |
| SEMA, SEMTAKE, L, M | Unable to take a semaphore | OS error | Contact customer support |
| SEMA, SEMFLUSH, L, M | Unable to flush a semaphore | OS error | Contact customer support |
| PANIC, TASKSPAWN, LOG_PANIC | Task creation failed | OS error | Contact customer support |
| PANIC, SEMCREATE, LOG_PANIC | Semaphore creation failed | OS error | Contact customer support |
| PANIC, SEMDELETE, LOG_PANIC | Semaphore | OS error | Contact customer support |
| PANIC, QCREATE, LOG_PANIC | Message queuer failed | OS error | Contact customer support |
| PANIC, QDELETE, LOG_PANIC | Message queuer deletion failed | OS error | Contact customer support |
| PANIC, MALLOC, LOG_PANIC | Memory allocation failed | OS error | Contact customer support |
| PANIC, FREE, LOG_PANIC | Memory free failed | OS error | Contact customer support |
| PANIC, INCONSISTENT, LOG_PANIC | Data out of sync | OS error | Contact customer support |
| PANIC, INTCONTEXT, LOG_PANIC | Data out of sync | OS error | Contact customer support |
| PANIC, ZOMTIMSET, LOG_PANIC | Attempt to set a zombie timer | OS error | Contact customer support |
| PANIC, ZOMTIMKILL, LOG_PANIC | Zombie timer destroyed | OS error | Contact customer support |
| PANIC, FREETIMRLSD, LOG_PANIC | Free timer released | OS error | Contact customer support |
| PANIC, TIMEUSECNT, LOG_PANIC | Timer use count exceeded | OS error | Contact customer support |
| PANIC, LSDB_CKSUM, LOG_PANIC | Link State Database checksum failed | OS error | Contact customer support |
| SYS, NOMEM, LOG_CRITICAL | No memory | OS error | Contact customer support |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| SYS, SYSCALL, LOG_ERROR | System call failed | OS error | Contact customer support |
| SYS, BADPTR, LOG_ERROR | Bad system pointer | OS error | Contact customer support |
| SYS, INTRPT, LOG_CRITICAL | Bad system interrupt | OS error | Contact customer support |
| SYS, FLASHRD, LOG_ERROR | FLASH memory read error | OS error | Contact customer support |
| SYS, FLASHWR, LOG_ERROR | FLASH memory write error | OS error | Contact customer support |
| TIMERS, ENQFAIL, LOG_CRITICAL | Invalid timeout value | OS error | Contact customer support |
| TIMERS, MSG, LOG_WARNING | Invalid message | OS error | Contact customer support |
| FLANNEL, PHANTOM, LOG_WARNING | Port's PLT limit exceeded | OS error | Contact customer support |
| ASIC, MINI_BUFFER, LOG_WARNING | ASIC Failure | Bad mainboard | Contact customer support |
| LSDB, LSID, LOG_ERROR | Link State ID'd out of range | OS error | Contact customer support |
| LSDB, NOLOCALENTRY, LOG_CRITICAL | No database entry for local link state record | OS error | Contact customer support |
| LSDB, NOLSR, LOG_WARNING | No link state record for domain | OS error | Contact customer support |
| LSDB, MAXINCARN, LOG_WARNING | Local link state record reached max incarnation | OS error | Contact customer support |
| FLOOD, INVLSU, LOG_WARNING | Discard received LSU | OS error | Contact customer support |
| FLOOD, INVLSR, LOG_WARNING | Unknown LSR type | OS error | Contact customer support |
| FLOOD, LSRLEN, LOG_ERROR | Excessive LSU length | OS error | Contact customer support |
| HLO, INVHLO, LOG_ERROR | Invalid Hello received from port | OS error | Contact customer support |
| HLO, HLOTIMEOUT, LOG_ERROR | Incompatible Hello timeout from port | OS error | Contact customer support |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| HLO, DEADTIMEOUT, LOG_ERROR | Incompatible inactivity timeout from port | OS error | Contact customer support |
| FSPF, SCN, LOG_WARNING | Illegal SCN | OS error | Contact customer support |
| FSPF, NBRCHANGE, LOG_WARNING | Wrong neighbor ID in Hello message from port | OS error | Contact customer support |
| FSPF, INPORT, LOG_ERROR | Input port out of range | OS error | Contact customer support |
| FSPF, VERSION, LOG_ERROR | FSPF version not supported | OS error | Contact customer support |
| FSPF, SECTION, LOG_ERROR | Wrong section ID | OS error | Contact customer support |
| FSPF, REMDOMAIN, LOG_ERROR | Remote Domain ID out of range | OS error | Contact customer support |
| NBFSM, NGBRSTATE, LOG_ERROR | Wrong input to neighbor FSM | OS error | Contact customer support |
| MCAST, ADDPORT, LOG_WARNING | Add port failed | OS error | Contact customer support |
| MCCAST, REMPORT, LOG_WARNING | Remove port failed | OS error | Contact customer support |
| MCAST, ADDBRANCH, LOG_ERROR | Add branch failed | OS error | Contact customer support |
| MCAST, REMBRANCH, LOG_ERROR | Remove branch failed | OS error | Contact customer support |
| MCAST, NOPARENT, LOG_ERROR | Null parent | OS error | Contact customer support |
| MCAST, NOPARENTLSR, LOG_ERROR | Null IsrP | OS error | Contact customer support |
| UCAST, ADDPATH, LOG_CRITICAL | Add path failed | OS error | Contact customer support |
| UCAST, ADDPORT, LOG_WARNING | Add port failed | OS error | Contact customer support |
| UCAST, REMPORT, LOG_WARNING | Remove port failed | OS error | Contact customer support |

**TABLE C-3** Diagnostic Error Messages *(Continued)*

| Message | Description | Probable Cause | Action |
|---|---|---|---|
| UCAST, RRTIM, LOG_CRITICAL | Invalid reroute timer ID | OS error | Contact customer support |
| UCAST, SPFCOST, LOG_WARNING | No minimum cost path in candidate | OS error | Contact customer support |
| UCAST, RELICPDB, LOG_WARNING | Relic PDB to Domain | OS error | Contact customer support |

# 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

## SYMBOLS



## A



## B



## C



## D



## E

## U



## W



## Z