Sun StorEdge™ 6130 Array Technician's Reference Guide

Sun Microsystems, Inc.
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Preface

The *Sun StorEdge 6130 Array Technician's Reference Guide* is a troubleshooting guide for the Sun StorEdge™ 6130 array. It provides information about troubleshooting the various components of the array. For detailed configuration information, refer to the online help system.

The document is for internal use only by Sun field service and technical service personnel, who have been fully trained on all the components in the configuration.

Before You Read This Book

In order to fully use the information in this document, you should be trained and certified by Sun to install and service Sun StorEdge products, and you should be familiar and experienced with:

- The Solaris™ Operating System (Solaris OS)
- Multipathing and failover
- Storage area networks (SANs)
- Using command-line interfaces (CLIs)
- Using web-browser interfaces
- The contents of the *Sun StorEdge 6130 Array Release Notes*

How This Book Is Organized

This book contains the following chapters:

Chapter 1 introduces the Sun StorEdge 6130 array.

Chapter 2 presents information about tools used to troubleshoot, including the array LEDs, Storage Automated Diagnostic Environment (event information and diagnostic tests), and commands from the command-line interface (CLI).

Chapter 3 offers general troubleshooting guidelines. Sections for information gathering, troubleshooting questions, and problem isolation are presented.

Chapter 4 provides information about data host device troubleshooting.

Chapter 5 describes how to troubleshoot the controller module battery.

Chapter 6 describes how to troubleshoot and improve controller module performance.

Appendix A lists and describes error and warning messages.

Appendix B presents CLI commands and examples for troubleshooting the controller module.

Using UNIX Commands

This document might not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices. Refer to the following for this information:

- Software documentation that you received with your system
- Solaris™ Operating System documentation, which is at

  `http://docs.sun.com`

Shell Prompts

Shell	Prompt
C shell	*machine-name*`%`
C shell superuser	*machine-name*`#`
Bourne shell and Korn shell	`$`
Bourne shell and Korn shell superuser	`#`

Typographic Conventions

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

* The settings on your browser might differ from these settings.

Related Documentation

Product	Title	Part Number
Late-breaking news	• *Sun StorEdge 6130 Array Release Notes*	819-0034
Sun StorEdge 6130 array information	• *Sun StorEdge 6130 Array Getting Started Guide* • *Sun StorEdge 6130 Array Site Preparation Guide*	819-0032 819-0033
Diagnostics	• *Sun Storage Automated Diagnostic Environment Enterprise Edition Release Notes*	819-0431
Regulatory and safety information	• *Sun StorEdge 6130 Array Regulatory and Safety Compliance Manual*	819-0035
Controller unit information	• *LSI Logic Troubleshooting and Technical Reference Guide*	N/A

Accessing Sun Documentation

You can view, print, or purchase a broad selection of Sun documentation, including localized versions, at:

`http://www.sun.com/documentation`

For Sun StorEdge 6130 array documentation, go to:

`http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/Midrange/6130/index.html`

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Sun StorEdge 6130 Array Technician's Reference Guide, part number 819-1246-10.

CHAPTER 1

Introduction

This chapter introduces the Sun StorEdge 6130 array. This chapter contains the following sections:

Product Overview

The Sun StorEdge 6130 array is a high-performance, enterprise-class, full 2 Gigabit-per-second (Gb/s) Fibre Channel (FC) solution that combines outstanding performance with the highest reliability, availability, flexibility, and manageability. Its features include:

- **Hardware**
  - One controller module and up to seven expansion modules, each containing 5 to 14 disk drives per module. The controller module contains two independent FC redundant array of independent disks (RAID) controllers with 1 Gbyte of memory for processor memory and data cache. Expansion modules can contain all FC or all Serial Advanced Technology Attachment (SATA) drives. (SATA drives are a future enhancement and not included in this initial release.)
  - Each module has two power supplies for redundant power.
  - Each module has two removable fan components (each with two fans) for redundant cooling.
  - High-availability components such as hot-spare drives are always available, but are not part of the array's virtual disk.

- RAID-0, RAID-1, RAID-3, RAID-5, and RAID-1+0 are supported.

- **Software**
  - Array configuration and management is available through a remote CLI client (using `sscs`) or web-based management software.
  - The Sun Storage Automated Diagnostic Environment monitoring and diagnostic software is also accessible from a web browser or the command line.
  - Data host software consists of Sun StorEdge SAN Foundation Software for managing the data path I/O connections between data hosts and the array; and Sun StorEdge Traffic Manager software, which has multipathing functionality.
  - Optional software is also available; see the Sun StorEdge 6130 array online help and release notes for details.

For more information about hardware and software components, go to the online help system. Click the Search tab and type `hardware` or `software`.

Required Patches and Packages

See the *Sun StorEdge 6130 Array Release Notes* for the most current list of supported software packages and patches for management and data hosts. That document contains procedures for downloading, installing, and backing out changes.

In addition to the Release Notes, be sure to read the patch README file before installing any patch.

Solaris Driver Stack

TABLE 1-1 shows the driver stack for host bus adapters (HBAs), FC ports, the disk driver, the FC protocol, and the Sun FC transport library.

The driver stack is connected through the SUN Java Native Interaction (JNI) stack `jfca`.

TABLE 1-1 Solaris Driver Stack

Component	Description
`qlc`	ISP 2300 Family Fibre Channel (FC) HBA driver
`fp`	Sun FC port driver
`ssd`	Disk driver for FC-AL disks and SPARC Storage Array (SSA) disks
`fcp`	FC protocol driver
`fctl`	Sun FC transport library

Predictive Failure Analysis (PFA) Capabilities

Health and monitoring functions are provided by the Storage Automated Diagnostic Environment software. This software provides the following predictive failure analysis (PFA) capabilities:

- **FC links** – FC links are monitored at all end points through the Fibre Channel Extended Link Service (FC_ELS) link counters. When link errors surpass the specified threshold values, an alert is sent. The alert message advises Sun personnel to replace components that are experiencing high transient fault levels before a hard fault occurs. ELS counters exist only for internal links; there are no counters for host-side interfaces.
- **Enclosure status** – Enclosed devices such as arrays cause alerts to be sent if temperature thresholds are exceeded. This enables Sun personnel to address the problems before a device or enclosure fails.
- **Single point of failure (SPOF) notification** – Notification of path failures and failovers enables Sun to repair the primary path in a timely fashion. This notification reduces the time of exposure to single points of failure and helps to preserve data availability during the repair process.

CHAPTER 2

Troubleshooting Tools

This chapter provides an overview of the tools and resources available for troubleshooting problems that occur on the Sun StorEdge 6130 array. This chapter contains the following sections:

LED Status Indicators

This section contains a summary of the LED states for the Sun StorEdge 6130 array unit and FRUs. For more information on the LEDs, see the *Sun StorEdge 6130 Array Getting Started Guide* and the product online help.

Controller Module LEDs

The Sun StorEdge 6130 array controller module LEDs have three possible states:

- Off
- On
- Blinking

Controller module LEDs can be:

- Green – Controller module is operating normally.
- Amber – Controller module requires service.

Note – During the power-up process, the green and amber LEDs blink intermittently.

Front-Panel LEDs

FIGURE 2-1 shows the placement of the LEDs on the front of the module. TABLE 2-1 contains descriptions of the LED states and required action, if needed.

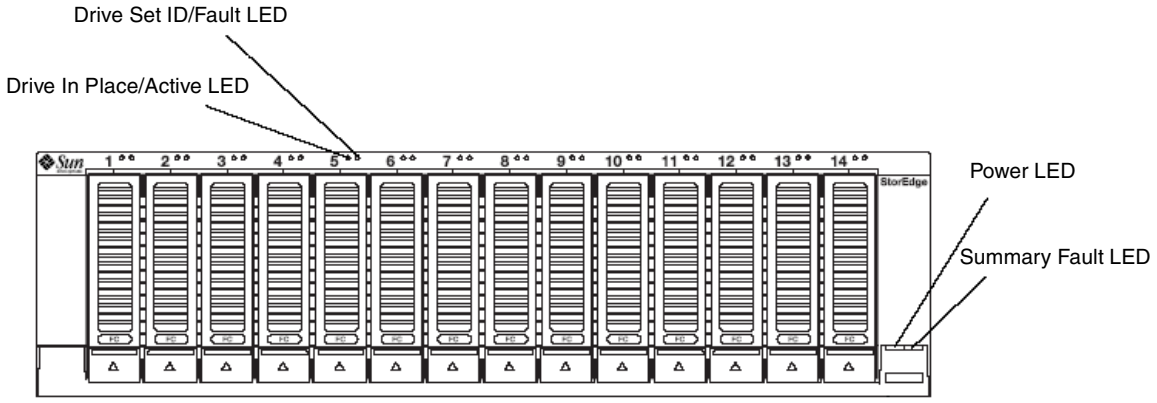

FIGURE 2-1 Front View of the Sun StorEdge 6130 Array Controller Module

TABLE 2-1 Controller Module Front-Panel LEDs

LED	State/Color	Cause and Action
Drive Set ID/Fault LED	On/Amber	Drive fault. Check logs for error messages.
	Blinking/Amber	Drive position identification. No action is needed.
Drive In Place/Active LED	On/Green	Drive is in place. No action is needed.
	Blinking/Green	Disk is active. No action is needed.

TABLE 2-1 Controller Module Front-Panel LEDs *(Continued)*

LED	State/Color	Cause and Action
Power LED	On/Green	At least one power supply is installed and functional. No action is needed.
Summary Fault LED	On/Amber	Tray level fault, one of the following: • Drive identify request • Drive fault • Enclosure summary fault Check logs for error messages.

Back-Panel LEDs

FIGURE 2-2 shows the placement of the LEDs on the back of the module. TABLE 2-2 contains descriptions of the LED states and required action, if needed.

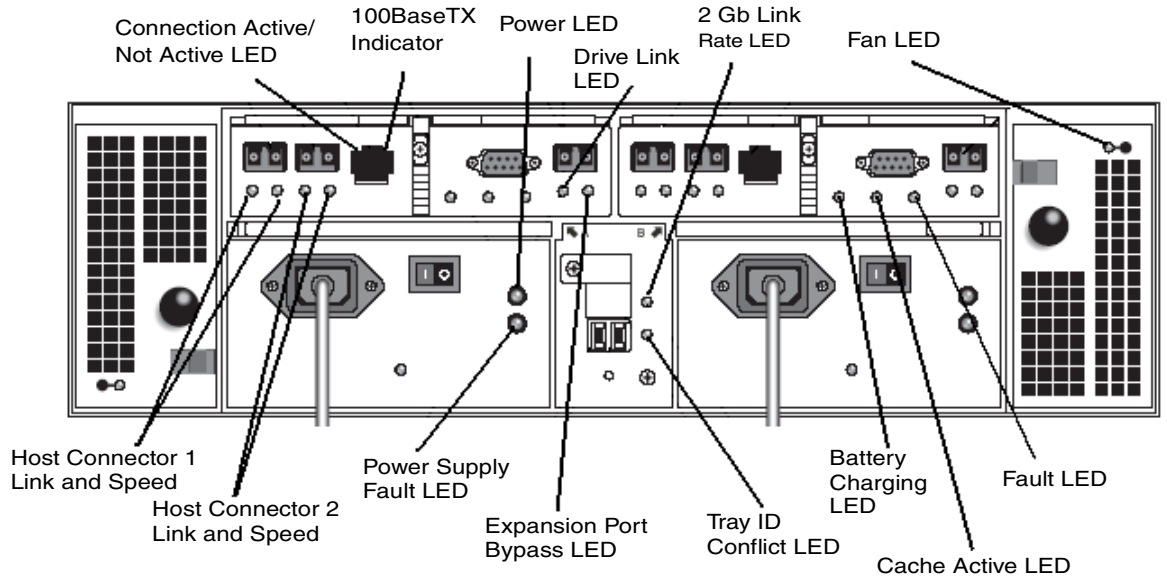

FIGURE 2-2 Back View of the Sun StorEdge 6130 Array Controller Module

TABLE 2-2 Controller Module Back-Panel LEDs

LED	State/Color	Cause and Action
Connection Active/ Not Active LED (on Ethernet connector)	On/Green	There is an active connection. No action is needed.
	Off	No active connection. No action is needed.
100BaseTX Indicator (on Ethernet connector)	On/Green	100BaseTX connection. No action is needed.
	Off	10BaseT connection, if Connection Active/Not Active LED is on. No action is needed.
Host Connector 1 Link LED	On/Green	Host connection is functioning normally. No action is needed.
	Off	No host is attached, or a problem is detected. If a host is attached, check logs for errors.
Host Connector 1 Speed LED	On/Green	2 Gb/s data rate from the host is detected. No action is needed.
	Off	1 Gb/s data rate from the host is detected. To change the rate, refer to the *Sun StorEdge 6130 Array Getting Started Guide.*
Host Connector 2 Link LED	On/Green	Host connection is functioning normally. No action is needed.
	Off	No host is attached, or a problem is detected. If a host is attached, check logs for errors.
Host Connector 2 Speed LED	On/Green	2 Gb/s data rate from the host is detected. No action is needed.
	Off	1 Gb/s data rate from the host is detected. To change the rate, refer to the *Sun StorEdge 6130 Array Getting Started Guide.*
Power LED	On/Green	The module is receiving power. No action is needed.
	Off	The module is not receiving power. Check the status of the Power Supply Fault LED.

TABLE 2-2 Controller Module Back-Panel LEDs *(Continued)*

LED	State/Color	Cause and Action
Power Supply Fault LED	On/Amber	There is a problem with the power supply. Check logs for errors.
	Off	Power is off, or power supply is functioning normally. No action is needed.
Drive Link LED	On/Green	Drive link is functioning normally. No action is needed.
	Off	A problem is detected with a link to a drive such as the midplane. Check logs for errors.
Expansion Port Bypass LED		See "Expansion Module LEDs" on page 10.
2 Gb Link Rate LED	On/Green	The FC disk drive loops are operating at 2 Gb/s.
	Off	The FC disk drive loops are operating at 1 Gb/s. Set the link rate to 2 Gb/s as described in the *Sun StorEdge 6130 Array Getting Started Guide.*
Tray ID Conflict LED	On/Amber	A tray ID conflict is detected. Check logs for errors.
	Off	No action is needed.
Battery Charging/ Charged LED	On/Green	Battery is charged. No action is needed. For more information, see "Troubleshooting the Controller Module Battery" on page 37.
	Blinking/Green	Battery is charging. No action needed.
	Off	There is a problem with the battery. Check logs for errors.
Cache Active LED	On/Green	Cache is in use. No action is needed.
	Off	If cache is enabled, there is a problem. Check logs for errors. If cache is disabled, there is no problem. No action is needed.

TABLE 2-2 Controller Module Back-Panel LEDs *(Continued)*

LED	State/Color	Cause and Action
Fan LED	On/Amber	There is a problem with the fan. Check logs for errors.
	Off	No action is needed.
Fault LED	On/Amber	Indicates a general fault. Check the states of other LEDs that indicate a fault. For example, if the Fan LED is on and amber, then the Fault LED should be on, too. Also check logs for errors.
	Off	Power is off, or module is functioning normally. No action is needed.

Expansion Module LEDs

Sun StorEdge 6130 array expansion modules have two Environmental Services Monitor (ESM) cards instead of two controller cards. Each ESM card has only the Expansion Port Bypass LED, shown in FIGURE 2-2 and described in TABLE 2-3.

TABLE 2-3 Expansion Module LEDs

LED	State/Color	Cause and Action
Expansion Port Bypass LED	On/Amber	The port is being bypassed. Check logs for errors.
	Off	No action needed.

FRU LEDs

In addition to the LEDs described in the previous sections, you can find LEDs on the following field-replaceable units (FRUs):

- Disk drives
- Fans
- ESM cards
- Power supplies
- I/O modules

LEDs on FRUs can be:

- Green – FRU is operating normally.
- Amber – FRU requires service.

Note – The fans have only an amber LED, which indicates a fan problem when lit. See the description on the Fan LEDs in TABLE 2-2.

Troubleshooting Interfaces

Web-based management software, such as the Storage Automated Diagnostic Environment, is used on the management host for troubleshooting. A command-line interface (CLI) is also available for troubleshooting and management from other hosts. CLI commands can be used to create scripts.

Management hosts can be located only on a Sun SPARC-based Solaris box. Remote management hosts can use the following operating systems, but will support only the CLI and not the Storage Automated Diagnostic Environment:

- IBM AIX
- Red Hat Linux
- HP-UX
- Microsoft Windows 2000

The command for management services is `sscs`, used with a subcommand to direct the operation. For a list of commands, see the `sscs`(1M) man page.

For more information on using the CLI, see the *Sun StorEdge 6130 Array Getting Started Guide*.

System Events, Alarms, and Log Files

The Sun StorEdge 6130 array uses several mechanisms to recognize a hardware failure. When a component (such as a module or FRU) recognizes that it has failed or the management software detects a failure, the component is removed from active service and its functions are assigned to other components of the array. The array generates a system event and records it in log files.

An event is a notification of something that happened on a device. Aggregated events and events that require action by service personnel (known as actionable events) are also referred to as alarms. There are four alarm types:

- **Down** – Identifies a device or component as not functioning and in need of immediate service.
- **Critical** – Identifies a device or component in which a significant error condition is detected that requires immediate service.
- **Major** – Identifies a device or component in which a major error condition is detected and service may be required.
- **Minor** – Identifies a device or component in which a minor error condition is detected or an event of significance is detected.

Viewing the Event Log

The Event Log is managed by the Sun Storage Automated Diagnostic Environment. You can also set up event notification so that actionable event information is sent to your e-mail address or pager. For more information, see the product online help and the *Sun StorEdge 6130 Array Getting Started Guide.*

▼ To View the Event Log

1. **Log in to the Storage Automated Diagnostic Environment.**

   For more information, see the *Sun StorEdge 6130 Array Getting Started Guide*.

2. **Click Administration > Event Log.**

   The Events page summarizes all events in the system event log.

3. **If you wish to view more specific information, click Details in the row that corresponds to the event for which you want details.**

   The Event Details page is displayed for the selected event.

Note – Refer to the following file for a listing of all possible generated events: `/opt/SUNWstade/System/EGrid/EventGrid2.pdf.`

Viewing Alarm Details

The Alarm Details page in the Storage Automated Diagnostic Environment enables you to sort Sun StorEdge 6130 array events by component, category, or event type. The Alarm Details page describes an event and its severity and tells what, if any, action should be taken.

▼ To View the Alarm Details Page

1. **Click Storage Automated Diagnostic Environment > Alarms.**

   The Alarms Summary page is displayed.

2. **Click Details for the alarm for which you want to display detailed information.**

   The Alarm Details page is displayed for the selected alarm.

   FIGURE 2-3 shows part of the Alarm Details page for an array alarm. This tab contains information such as event/alarm details, probable cause, recommended action, and notes.

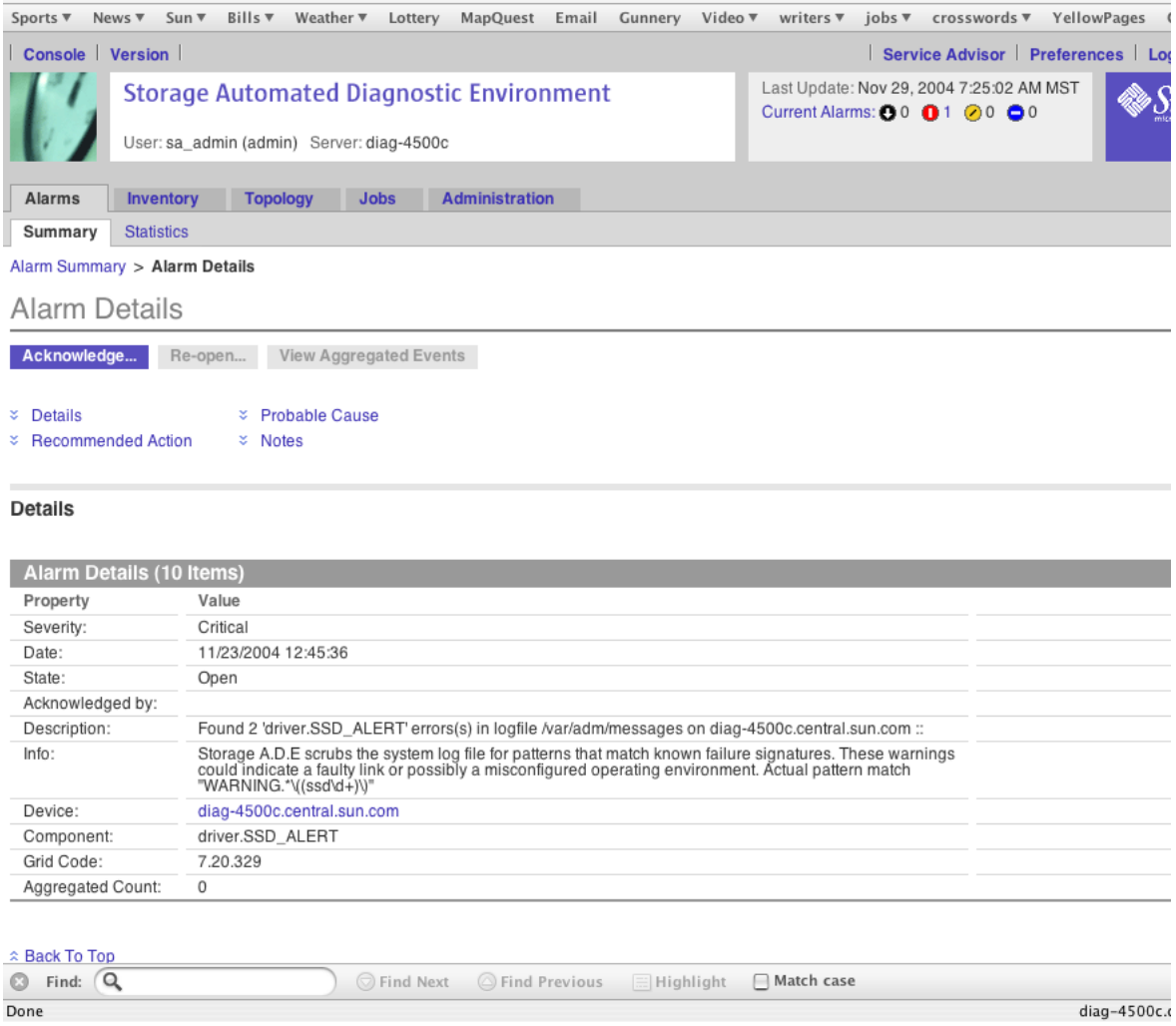

FIGURE 2-3 Alarm Details Page

The Alarm Statistics page, shown in FIGURE 2-4, enables you to generate reports containing alarm statistics.

For more information about these pages, see the online help.

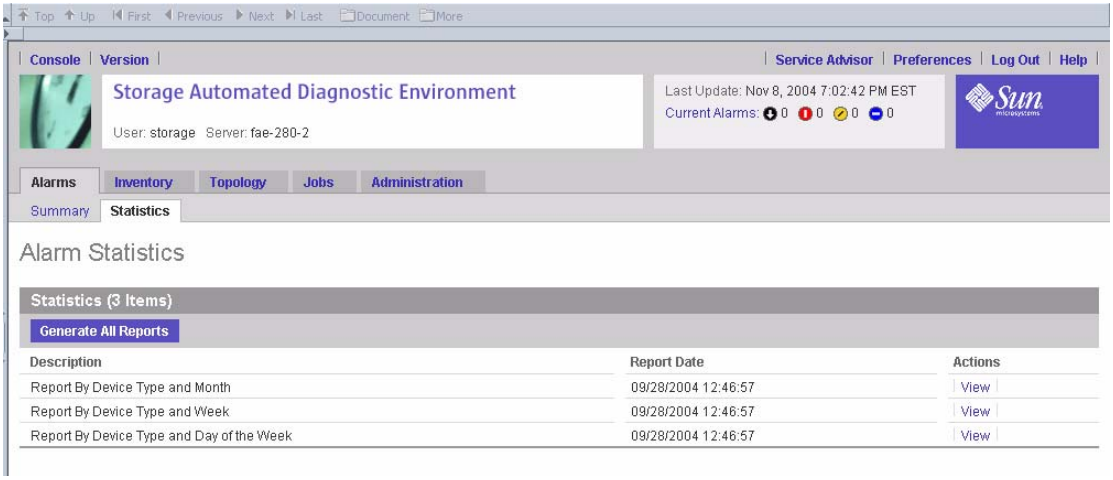

FIGURE 2-4 Alarms Statistics Page

Accessing Event Logs From the CLI

You can also retrieve event information through the CLI. Use the CLI to quickly determine the status of the array using:

- The Major Event Logger (MEL) on the controller module.
- `/var/adm/messages.6130`, which contains data host output.
- The `sscs list alarm` command, which lists detailed information on alarms. For a complete description of this command, see the manpages for the array.

6130SupportData Command

Use the `/opt/SUNWstade/bin/6130SupportData` CLI command to gather configuration and support data for the Sun StorEdge 6130 array. Use this data to verify configuration and error conditions. This is similar to the Solution Extract utility in the Storage Automated Diagnostic Environment.

`6130SupportData` collects a variety of data from the specified array and compresses it into a zip file. The data collected includes:

- `storageArrayProfile.txt` – The current array profile
- `majorEventLog.txt` – The contents of the MEL log

- `readLinkStatus.csv` – RLS counters for the components on the internal loop
- `NVSRAMdata.txt` – The contents of NVSRAM on both controllers
- `performanceStatistics.csv` – Volume performance counters
- `persistentReservations.txt` – List of persistent reservations
- `badBlocksData.txt` – List of bad sectors
- `stateCaptureData.dmp` – Low level configuration data and counters
- `driveDiagnosticData.txt` – The contents of the drive log database
- `objectBundle` – Raw ObjectBundle data

The syntax of the command is:

`6130SupportData` *key path filename*

where

key = device key (internal array serial number)

path = file path

filename = file name

Determining the Device Key With the CLI

To obtain the device key parameter using the CLI, use the `sscs list array` command from the `korn` shell to list details about the Sun StorEdge 6130 array. Note that the key, or serial number, is the first item in the list.

```
v4u-450f_ksh# ./sscs list array pts-toi-6130

Array: pts-toi-6130
   Serial Number:             SUN.54062390100.0433AWF00K
   Firmware Version:          06.10.09.15
   Array WWN:
   60:0A:0B:80:00:13:B9:8B:00:00:00:00:41:50:0A:E0
   Node WWN:                  20:04:00:A0:B8:13:B9:8B
   Default Host Type:         Solaris (with Traffic Manager)

...
```

Determining the Device Key With the Storage Automated Diagnostic Environment

You can also locate the device key parameter in the Storage Automated Diagnostic Environment by navigating to Inventory > Devices > Devices Detail.

The device key is found in the key row.

Using the 6130SupportData command

When you use the `6130SupportData` command as shown below, the data files are zipped to the file specified by the path (`/var/tmp`) and file name (`SUPPORTDATA`) parameters.

Note – There is always a space between the path name and the file name.

```
v4u-450f_ksh# cd /opt/SUNWstade/bin
v4u-450f_ksh# ./6130SupportData SUN.54062390100.0433AWF00K
/var/tmp SUPPORTDATA

Collecting support data for SUN.54062390100.0433AWF00K
rval= $VAR1 = 'Success';
```

Diagnostic Tests

The following diagnostic tests for the Sun StorEdge 6130 array are available from the Storage Automated Diagnostic Environment.

- Controller Read Test (out-of-band)
- Controller Write Test (out-of-band)
- Internal Loopback Test (out-of-band)
- All Controller Tests (out-of-band)
- Disk Test (in-band)

See the Storage Automated Diagnostic Environment online help for a description of each test and instructions for running it. If using the CLI, see the man pages for the command diagnostic options for information about device diagnostics tests.

Note – For you to run diagnostics on the array, both RAID controllers must be installed and online.

Unsupported SAN Tools

TABLE 2-4 lists useful tools available on the Product Technical Support (PTS) - Americas Network Storage Team web site that can assist in SAN troubleshooting. Access the tools at
`http://pts-americas.west/nws/products/Switch/tools.html`

Note – These tools are not supported and have not been tested in production environments.

TABLE 2-4 Miscellaneous SAN Tools and Scripts

SAN Tool	Description
`dumpmaps`	`luxadm` Dump Mapper This is a `ksh` script to extract `luxadm -e dump_map` from all connected HBAs. Also prints out the controller number, `qlc` instance, and HBA device path for the path dumping the map.
`hbamap`	Sun StorEdge SAN Foundation software-HBA Mapper This is a `ksh` script to map out the following HBA data for Sun StorEdge SAN Foundation software cards: • Controller number • `qlc` instance • Port Worldwide name (WWN) • ISP chip set • FCode • Connection status (from `luxadm -e port`) • Device path • Fabric address • `cfgadm` output

TABLE 2-4 Miscellaneous SAN Tools and Scripts *(Continued)*

SAN Tool	Description
`lunmap`	Sun StorEdge Traffic Manager and VxVM LUN Mapper This is a `ksh` script to map Sun StorEdge Traffic Manager devices to VxVM enclosure names: • VxVM enclosure name • Sun StorEdge Traffic Manager device name • Device WWN • LUN number • Number of primary and secondary paths • Path state (ONLINE/OFFLINE/STANDBY) • Controller, `qlc` instance, and device path `lunmap` can also check for path problems.
`sfkcheck`	SAN Foundation Kit (SFK) and SAN Revision Checker This is a `ksh` script to check revision levels of Sun StorEdge SAN Foundation software packages and patches. **Note:** `sfkcheck` uses an internal `/net` path to find the latest patch revisions. To run this on an external customer system, use the `-l` option, which checks for patches but does not provide the latest revision levels.
`SUNWexplo`	Sun Explorer Data Collector This is a data collection tool comprised of shell scripts and a few binary executables. Customers use the output from this tool to escalate problems to Sun.

CHAPTER 3

Basic Troubleshooting Procedures

This chapter offers troubleshooting guidelines, as well as instructions on information gathering, troubleshooting questions, and problem isolation. This chapter contains the following sections:

Troubleshooting Approach and Guidelines

Troubleshooting best practices include the following:

- Before you begin troubleshooting, collect the following information:
  - A clear and concise problem description.
  - Specific symptoms and behavior that the customer is experiencing.
- Use the Fault Signature Analysis feature of the Storage Automated Diagnostic Environment to focus your troubleshooting efforts.
- Locate available logs and diagnostic LEDs for the module.
- Isolate the failure, symptom, or unexpected behavior to the component field-replaceable unit (FRU).
- Employ log error messages to aid in FRU isolation.
- Identify failed hardware components using LEDs and messages.
- Identify faulty cabling using LEDs and messages.

If you need to further isolate the problem, refer to "Isolating Problems" on page 22.

Isolating Problems

This section provides an overall strategy for problem isolation.

1. **Determine the source of the error by checking the following messages or files:**
   - The Storage Automated Diagnostic Environment alerts or e-mail messages
   - `/var/adm/messages`
   - The Major Event Logger (MEL)
2. **Determine the extent of the problem by using the following methods:**
   - Review the Storage Automated Diagnostic Environment topology.
   - Check the `cfgadm -al` output on the data host.
   - Check the `luxadm`(1M) output on the data host.
   - Review the multipathing status using the Sun StorEdge Traffic Manager software or `vxdmp`(1M) command.

3. **Check the status of the controller module by using one or more of the following methods:**
   - Review the Storage Automated Diagnostic Environment device monitoring reports to determine the current health of the module.
   - Review the `luxadm`(1M) display output on the data host LUNs.
   - Review the LED status on the module.
   - Execute and review the output from the `6130SupportData` command.
4. **Check the status of the data host using the following tools:**
   - Review `/var/adm/messages`.
   - Review the error logs of data host applications.
   - Review format output.
   - Review the Explorer data collection utility (`SUNWexplo`) output.
5. **Quiesce the I/O along the path to be tested by using one of the following methods:**
   - For systems using VERITAS Dynamic Multipathing (DMP), disable `vxdmpadm`(1M).
   - For systems using the Sun StorEdge Traffic Manager software, unconfigure the Fabric device.
   - Follow the procedure described in "To Quiesce the I/O" on page 24.
   - Halt the application.
6. **Test and isolate FRUs by using the Storage Automated Diagnostic Environment diagnostic tests (this might require a loopback cable for isolation).**

   These tests isolate the problem to a FRU that must be replaced. For more information, see "Replacing FRUs" on page 30.

   After you have isolated and resolved the problem, do the following:

1. **Verify the fix by reviewing the following:**
   - Any new messages generated by the Storage Automated Diagnostic Environment
   - The Storage Automated Diagnostic Environment topology
   - The following data host output:

     ```
     luxadm(1M)
     cfgadm -al
     /var/adm/messages
     ```
2. **Return the path to service with one of the following methods:**
   - Use the multipathing software.
   - Restart the application.

Troubleshooting Multipathing Software Issues

Multipathing software provides ways to stop I/O on a path to help isolate problems in a configuration. All data hosts need one of the following Sun software products to manage multipathing. Note that only one product can be used at a time.

- **Sun StorEdge Traffic Manager** – Sun StorEdge Traffic Manager software is Sun's multipathing solution for Fibre Channel-connected storage devices and is part of the Sun StorEdge SAN Foundation software.
- **VERITAS Volume Manager with Dynamic Multipathing (VxVM)** – Dynamic Multipathing (DMP) increases performance to multicontroller disk arrays by spreading I/O between the multiple paths into the array. The software also provides easier access to data and automatic path recovery across redundant Fibre Channel (FC) loops.

This section describes how to manually stop I/O on a path if the multipathing software fails or is not available. It also discusses returning a DMP-enabled path to production after I/O has been stopped.

Manually Halting the I/O

If you need to halt I/O on a path and your multipathing software is not available, you can manually halt it with the CLI using one of two methods:

- Quiesce the I/O
- Unconfigure the controller/device path

These methods are explained in the following sections.

▼ To Quiesce the I/O

1. **Determine the path you want to disable.**
2. **Type the following command:**

```
# cfgadm -c unconfigure device
```

▼ To Unconfigure the Controller/Device Path

- **Type the following command to list the attached hardware:**

```
# 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::210100e08b23fa25           unknown      connected    unconfigured unknown
c2::2b000060220041f4           disk         connected    configured   unknown
c3                              fc-fabric    connected    configured   unknown
c3::210100e08b230926           unknown      connected    unconfigured unknown
c3::2b000060220041f9           disk         connected    configured   unknown
c4                              fc-private   connected    unconfigured unknown
c5                              fc           connected    unconfigured unknown
```

▼ To Return the Controller/Device Path to Production

1. **Type the following command:**

   This example uses the `configure` option to ensure that the specified device (in this case, `c2::2b000060220041f4`) is part of the system configuration.

```
# cfgadm -c configure c2::2b000060220041f4
```

2. **Verify that I/O has resumed on all paths.**

Dynamic Multipathing (DMP) Properties

DMP is a VERITAS Volume Manager feature that provides an alternate pathing mechanism for rerouting data in the event of a controller failover. DMP can coexist with the Sun StorEdge Traffic Manager multipathing software.

▼ To View Dynamic DMP Properties

1. **Type the** `vxdisk list` **command. For example:**

```
# vxdisk list Disk_1

Device:    Disk_1
devicetag: Disk_1
type:      sliced
hostid:    diag.xxxxx.xxx.COM
disk:      name=t3dg02 id=1010283311.1163.diag.xxxxx.xxx.com
group:     name=t3dg id=1010283312.1166.diag.xxxxx.xxx.com
flags:     online ready private autoconfig nohotuse autoimport imported
pubpaths:  block=/dev/vx/dmp/Disk_1s4 char=/dev/vx/rdmp/Disk_1s4
privpaths: block=/dev/vx/dmp/Disk_1s3 char=/dev/vx/rdmp/Disk_1s3
version:   2.2
iosize:    min=512 (bytes) max=2048 (blocks)
public:    slice=4 offset=0 len=209698816
private:   slice=3 offset=1 len=4095
update:    time=1010434311 seqno=0.6
headers:   0 248
configs:   count=1 len=3004
logs:      count=1 len=455
Defined regions:
 config   priv 000017-000247[000231]: copy=01 offset=000000 enabled
 config   priv 000249-003021[002773]: copy=01 offset=000231 enabled
 log      priv 003022-003476[000455]: copy=01 offset=000000 enabled
Multipathing information:

numpaths: 1
c11t600A0B800013AECF00000DEB4190B6B4d0s2       state=enabled
```

The `vxdisk` output includes this physical path to the LUN:

`c11t600A0B800013AECF00000DEB4190B6B4d0s2`

This path is currently enabled with DMP.

2. **Use the `luxadm`(1M) command to display further information about the underlying LUN.**

```
# /usr/sbin/luxadm di /dev/rdsk/c11t600A0B800013AECF00000DEB4190B6B4d0s2

DEVICE PROPERTIES for disk:
/dev/rdsk/c11t600A0B800013AECF00000DEB4190B6B4d0s2
  Vendor:               SUN
  Product ID:           CSM100_R_FC
  Revision:             0610
  Serial Num:           1T35117632
  Unformatted capacity: 6144.000 MBytes
  Write Cache:          Enabled
  Read Cache:           Enabled
    Minimum prefetch:   0x3
    Maximum prefetch:   0x3
  Device Type:          Disk device
  Path(s):

  /dev/rdsk/c11t600A0B800013AECF00000DEB4190B6B4d0s2
  /devices/scsi_vhci/ssd@g600a0b800013aecf00000deb4190b6b4:c,raw
   Controller          /devices/ssm@0,0/pci@1c,700000/SUNW,qlc@2,1/fp@0,0
    Device Address              200e00a0b813aed0,0
    Host controller port WWN    210100e08b279ca1
    Class                       primary
    State                       ONLINE
   Controller           /devices/ssm@0,0/pci@1c,700000/SUNW,qlc@3/fp@0,0
    Device Address              200f00a0b813aed0,0
    Host controller port WWN    210000e08b079da1
    Class                       secondary
    State                       STANDBY
```

▼ To Return the DMP-Enabled Paths to Production

1. **Type the following command:**

```
# vxdmpadm enable ctlr=cn
```

2. **Verify that the path has been re-enabled by typing the following command:**

```
# vxdmpadm listctlr all

CTLR-NAME       ENCLR-TYPE      STATE       ENCLR-NAME
=====================================================
c0              OTHER_DISKS     ENABLED     OTHER_DISKS
c2              SENA            ENABLED     SENA0
c3              SENA            ENABLED     SENA0
c20             Disk            ENABLED     Disk
c23             Disk            ENABLED     Disk
```

Troubleshooting SAN Connections

This section describes how to troubleshoot storage area network (SAN) connections to the array from a data host. The messages and errors that the data host detects are usually logged in the `/var/adm/messages` file.

SAN Troubleshooting Software

Software installed on a Solaris host is required to monitor and manage FC switches. The software includes:

- `SUNWsmgr` package for Sun switch configuration.
- `SUNWstade` package for monitoring and diagnostics. `SUNWstade` is the standalone device edition of the Storage Automated Diagnostic Environment.

Note – For troubleshooting SAN connections on operating systems other than Solaris, see the information that was packaged with the operating system.

Gathering Information

Collect the following information before you take further steps to isolate the problem.

- Patch and package information
- `cfgadm` output
- `format` output
- `luxadm` output
- Pertinent `/var/adm/message` errors
- Switch information from `/etc/opt/SUNWexplo/saninput.txt`

See TABLE 3-1 for specific troubleshooting questions.

SAN Troubleshooting Questions

TABLE 3-1 provides questions and links to related information to help you find the source of the problem.

TABLE 3-1 Host-Side Troubleshooting Questions

Question	Action
Is the system fully patched?	Check the revision level using the Storage Automated Diagnostic Environment (Manage functionality).
Are there error messages?	Check the `/var/adm/messages` file.
If the devices are fabric-connect, are they configured in `cfgadm`?	Use the `cfgadm -al` command.
Are the LUNs in their primary multipath states?	Gather Sun StorEdge Traffic Manager or `vsdmp` information. Check - `luxadm display /dev/rdsk/`*lun* (for Traffic Manager.)
Are the HBAs online?	Use the `luxadm -e port` command.
Are the devices seen from the HBA?	Use the `luxadm -e dump_map` *device* command.
Are the devices seen in `format`?	Use the - `format` command.
Are there any CRC or Invalid Tx word errors on the HBA path?	Use the - `luxadm -e rdls` *device* command.

Replacing FRUs

For the Sun StorEdge 6130 array, FRUs can be replaced by Sun field engineers or by Sun-trained customer administrators.

Maintenance Precautions

Before you perform any maintenance procedures on the Sun StorEdge 6130 array, follow these steps to prevent damaging any FRU during the removal and replacement process:

- Remove all plastic, vinyl, and foam material from the work area.
- Before handling any FRU, discharge any static electricity by touching a grounded surface.
- Wear an antistatic wrist strip at all times when handling any FRU.
- Do not remove a FRU from its antistatic protective bag until you are ready to install it.
- After removing a FRU from the cabinet, immediately place it in an antistatic bag or antistatic packaging.
- Handle any card FRU only by its edges, and avoid touching the components or circuitry.
- Do not slide a FRU over any surface.
- Limit body movement (which builds up static electricity) during the removal and replacement of a FRU.

▼ To Replace a FRU

1. **Go to the Sun Web Console page and click Storage Automated Diagnostic Environment.**
2. **In the top right of the page, click Service Advisor to open the Service Advisor page.**

   The Service Advisor combines hardware procedures with reports and automated steps. Choose one of the types of FRUs or other options to see the procedures.

CHAPTER 4

Troubleshooting Host Devices

This chapter describes how to troubleshoot components associated with a Sun StorEdge 6130 array.

This chapter contains the following sections:

Host Support

The Sun StorEdge 6130 array supports a maximum of 64 total partitions (when the premium feature key is purchased), with a maximum of 256 hosts per partition. The controller module contains two 2-Gb/s FC host ports per RAID controller (for a maximum of four), with up to 256 initiators supported by a dual-RAID controller tray.

The Sun StorEdge 6130 array supports Solaris Operating System 8 update 4, Solaris Operating System 9 base and higher, and other host operating systems. See the *Sun StorEdge 6130 Array Release Notes* for the most current list of supported host operating systems.

Using the Host Event Advisor

The Storage Automated Diagnostic Environment Event Advisor enables you to sort host events by component, category, or event type. The Event Advisor describes the severity of an event, and tells what action is required, if any. Refer to "Viewing Alarm Details" on page 12 and the Storage Automated Diagnostic Environment online help for more information.

Actionable Events on the Host

TABLE 4-1 lists some of the actionable host events displayed by the Event Advisor, and indicates information on each the cause of each event and the recommended action.

For a listing of all possible generated events, including host events, see `/opt/SUNWstade/System/EGrid/EventGrid2.pdf`.

TABLE 4-1 Actionable Host Events

Event	Probable cause	Recommended Action(s)
array_error disk.log	The Storage Automated Diagnostic Environment agent monitoring the array log file reports on: • Errors and Warnings ("E" and "W") found in the log file • Notice and Information ("N" and "I") lines about disks errors • Notices about the battery This event is generated as a host event because the message was about an array that the Storage Automated Diagnostic Environment is not monitoring.	1. Use the Storage Automated Diagnostic Environment log viewing functions to check messages before and after this message. 2. Check volume integrity associated with the disk in question. 3. Replace the component or called out in the event. 4. Monitor the component.

TABLE 4-1 Actionable Host Events *(Continued)*

Event	Probable cause	Recommended Action(s)
device_error	• The Storage Automated Diagnostic Environment detected a pattern described above in the array log file. It was generated as a host event because the message was about an array that the Storage Automated Diagnostic Environment is not monitoring. • Maintenance was performed on storage attached to host.	1. Use the Storage Automated Diagnostic Environment log viewing functions to check messages after this one. 2. Check volume integrity associated with the disk in question. 3. Replace the component called out in the event. 4. Check for maintenance operations occurring at this time.
device_warning disk.log	This is a generic event about information found in the array log file. The Storage Automated Diagnostic Environment has detected a pattern as described in the Info section of the [`Array_Log_File`] message. This was generated as a host event because the message was about an array that the Storage Automated Diagnostic Environment is not monitoring.	1. Check volume integrity associated with the component in question. 2. Replace the component called out in the [`Array_Log_File`] message. 3. Add this device to the monitored collective.
driver. MPXIO_offline	The Sun StorEdge Traffic Manager multipathing software has noted that the path to a storage device has gone offline.	• Check the Topology view to see what devices are affected. • Check all cables and connections. • Check for other alerts that may indicate an underlying problem (for example, switch ports offline). • Check the output of `cfgadm -al` and `luxadm -e` *`port`* to uncover other fabric problems.

TABLE 4-1 Actionable Host Events *(Continued)*

Event	Probable cause	Recommended Action(s)
driver. SF_CRC_WARN driver. SF_CRC_ALERT	Cyclic Redundancy Check (CRC) alerts are generated when the CRC codes for a data block do not match the CRC code when the data is read.	• Check the Storage Automated Diagnostic Environment for similar events and alarms for the device or host called out in the description. • Check the Storage Automated Diagnostic Environment topology for devices attached to the host bus adapter (HBA). • Run a `linktest` between the devices found in the topology. • Replace the component most likely to have caused this message: Gigabit Interface Converter (GBIC) HBA Controller (if applicable) Cable
driver. SF_DMA_WARN driver. SF_OFFLALERT	The host systems' message log has recorded an error resulting from a problem with the Fibre Channel.	• Check the Storage Automated Diagnostic Environment for information about the host and specifics about the HBA. • Check the Storage Automated Diagnostic Environment topology for devices attached to the HBA. • Run a `linktest` between the devices found in the topology. • Replace the component most likely to have caused this message: GBIC HBA Controller (if applicable) Cable

driver.SSD_WARN
 	
driver.
SSD_ALERT
	The Storage Automated Diagnostic Environment found warning messages in the system log file that called out a Serial SCSI Driver (SSD) device. The number of these messages exceeded the threshold setting.	• Check the Storage Automated Diagnostic Environment for other error type events for any of the devices being monitored.
		• Check with the system administrator for activity on the `ssd` device.
		• Run `linktest` to isolate a possible bad GBIC, cable, switch, or other component.
		• Check the kernel settings for multipathing support if the array is configured to use it:
		`# vi /kernel/drv/scsi_vhci.conf`
		`mpxio-disable="[yes|no]";`

TABLE 4-1 Actionable Host Events *(Continued)*

Event	Probable cause	Recommended Action(s)
power.battery	• The battery warranty period has expired. • The ability of the battery to hold a charge has diminished to the point where it can no longer be recharged. • The last refresh cycle failed, changing the status of the battery.	• Check the Storage Automated Diagnostic Environment status of the batteries for this array. • Replace the battery.
power.battery. replace	• The battery warranty period is about to expire. • The battery hold time may be low or the battery can no longer hold a charge.	• Check the Storage Automated Diagnostic Environment status of the batteries for this array. • Use `telnet` to connect to the array and run `refresh -s` to verify battery state. • Replace the battery.

Troubleshooting Third-Party Hosts

For information about troubleshooting hosts using operating systems other than Solaris, see the operating system documentation and technical support resources from the vendor.

CHAPTER 5

Troubleshooting the Controller Module Battery

This chapter describes how to troubleshoot the controller module battery. This chapter contains the following sections:

About the Controller Module Battery

Each controller module contains a 4-V lead acid battery pack for cache backup in case of power loss. The on-board battery is capable of holding cache up for three days.

The battery has a shelf life of six months, after which the battery should be recharged to maintain its two-year life span. Ambient temperature can affect shelf life.

See "Back-Panel LEDs" on page 7 for the location of the Battery Charging/Charged LED. On subsystem power-up, the LED flashes green until the battery performs its self-tests, and remains steady green while it is fully charged.

The minimum time for the series of tests to complete is 15 minutes. In addition to power-up, the tests are repeated every 25 hours. For more information, see "Battery Qualification Tests" on page 38.

About the Battery Management Controller

The Battery Management Controller utilizes an "intelligent charger" integrated circuit (IC). This means that the battery charger is utra-fast and microprocessor-controlled, as opposed to a manual battery charger.

The charger IC is configured as a pulsed current charger with two charging modes:

- **High current charge mode** – The charging current is regulated at 0.72 Amps until the cell voltage rises to 4.94 V.
- **Low current pulsed charge mode** – The charging current is removed until the battery voltage falls to 4.66 V. Charging current is then restored and regulated at 0.72 Amps until the battery voltage once again rises to 4.94 V. This cycle is repeated indefinitely.

The charger IC regulates charge voltage and charge current through a switch-mode regulator circuit. It contains a pulse width modulator which is used to bias a switching transistor. The source voltage of the switching regulator circuit is the 12 V source which is supplied through connector J1 and J3. The switching frequency of the regulator circuit is 100 KHz.

Battery Qualification Tests

The charger IC and additional comparator logic perform several battery qualification tests as well as constantly monitoring for battery charge faults. This series of tests occurs at subsystem power-up. The tests are automatically re-initialized approximately every 25 hours by a timer.

The tests include:

- **Regulated Voltage Test** – A specific voltage is regulated across the battery while the current into the battery is monitored by the charger IC. If the current fails to rise above a specific level before a maximum timeout period, the battery fails the test and enters the faulted state. If the test is passed, the charger IC proceeds to the next test, the regulated current test.
- **Regulated Current Test** – A specific current is regulated into the positive battery terminal while the battery voltage is monitored by the charger IC. If the voltage fails to rise above a specific level before a maximum timeout period, the battery fails the test and enters the faulted state. If the test is passed, the charger IC enters the high current charge mode.

If either of these tests fail, the charger IC enters the faulted state until the next power-up or the 25-hour timer reset pulse occurs, at which point the tests are performed again. When the charger is in the faulted state, the BBU Fault signal to

VSC055 1 (Port 1, Bit 3) is driven active and the Battery Enabled signal to VSC055 1 (Port 1, Bit 2) is driven inactive. The battery indicator on the controller FRU turns amber.

Battery and System Performance

The controller module software requests the use of the battery before entering into caching mode.

The battery logic grants the request only if the battery is at full charge (in the pulsed current maintenance charging mode) and passing all tests. This approach may slow system performance on initial installation or installation of a new battery.

Diagnosing a Controller Module Battery Problem

TABLE 5-1 contains indications of controller module battery problems and suggested courses of action.

TABLE 5-1 Sun StorEdge 6130 Array Controller Module Battery Troubleshooting

Question	Action
Is the array powered on, but the battery LED is off?	• Use the Storage Automated Diagnostic Environment Check to check the Event Log for cache battery errors. • Check the Major Event Logger (MEL) for messages.
Is the array powered on, but the battery LED is off, and no event messages indicate a battery problem?	1. Allow the controller module to run 24 hours in order to recharge the battery. 2. If the LED remains off after 24 hours, replace the battery.

Replacing a Controller Module Battery

If troubleshooting determines that the battery is near its expiration date, the risk of losing write cache data exists. Follow the Storage Automated Diagnostic Environment Service Advisor instructions for battery replacement. For more information, see “Replacing FRUs” on page 30.

CHAPTER 6

Gathering Array Performance Data

This chapter describes how to gather data that you can use to troubleshoot and improve array performance. This chapter contains the following sections:

Gathering Data Using the Browser Interface

Follow these steps to obtain array performance information using the browser interface.

1. **From the Sun Web Console, click Sun StorEdge 6130 Configuration Service.**

   The Array Summary page is displayed.

2. **Click the array for which you want to see performance statistics.**

   The Volume Summary page for that array is displayed.

3. **Click Administration > Performance Monitoring.**

   The Performance Monitoring page is displayed.

4. **To turn performance monitoring on, select the Performance Monitoring Enabled check box and specify the polling interval you want.**

   To view current statistics, go to the Performance Statistics section of the page.

Gathering Data Using the Command-Line Interface

Use one of the following command-line interface (CLI) commands to obtain detailed performance statistics:

```
sscs list -a array-name,... -T performance
```

```
sscs list -a array-name,... -t array_stats | controller_stats |
volume_stats [-c A | B ] [ -h host-name,... ] [ -g host-group-name,...
] [ -v volumename,...] [ -s name | total_iops | read_percent |
write_percent | total_data | avg_read_size | avg_read_rate |
peak_read_rate | avg_write_size | avg_write_rate | peak_write_rate ]
performance
```

APPENDIX **A**

System Message Listing

This appendix provides tables listing and describing system events, such as error and warning messages. This appendix contains the following sections:

Error Messages

Error messages are generated by events managed by the Sun Storage Automated Diagnostic Environment. The error messages are designed to be self-explanatory.

Command-Line Interface Error Messages

The array issues a variety of error messages to the command line, indicating an incorrectly entered command or invalid operation. When you type a command by itself, or the error is syntactic (for example, missing an argument or using the wrong format), the array displays the command synopsis. Otherwise, the array displays an error message consisting of a name in capital letters, a numerical code in hexadecimal digits, and a text message.

APPENDIX **B**

CLI Usage Examples

This appendix provides descriptions and examples of common command-line interface (CLI) commands. This appendix contains the following sections:

Sun StorEdge 6130 Array CLI Commands

The `sscs` command provides management for the Sun StorEdge 6130 array, enabling you to manage volumes, volume copies, snapshots, arrays, storage pools, profiles, virtual disks, and storage trays.

▼ To Get Help on CLI Commands

- **Type `sscs -H` or `sscs --help` to see a brief list of all subcommands. For example:**

```
6130:/:sscs --help
add         create      delete
export      import      list
login       logout      map
modify      remove      unmap
```

You can also use the `--help` option to show information about a specific command. For example, to show information about the `list` subcommand, type `sscs list --help`. To show information specifically about the `list array` command, type `sscs list --help array`.

Command Summary

TABLE B-1 lists the commands with a brief description. Remember to use these commands with `sscs` at the beginning. For example:

```
sscs remove -a myarray registeredarray
```

For more information, see the manpages for the array.

TABLE B-1 Sun StorEdge 6130 Array Commands

Command	Description
add -a *array-name* **-h** *host-name,...* **hostgroup** *host-group-name*	Adds hosts to a host group.
add -a *array-name* [**-l** *license-location*] [**-v** *version*] [**-c** *capability*] [**-d** *digest-key*] license	Adds a license to the specified array.
add [**-e** *email-address,...*] [**-i** *ip-address,...*] [**-t 1** | **2** | **3** | **4** | **5**] [**-lwarning** | **error** | **down**] **notification local_email** | **nscc_email** | **netconnect** | **trap**	Enables remote notification for one or more email addresses.
add [**-i** *ip-address*] [**-d**] [**-q**] **registeredarray**	Adds an array to the list of registered arrays.
add -u *user-name* **userrole storage** | **guest**	Adds a user name to the user access list.
create -a *array-name* [**-g** *host-group-name*] **host** *host-name*	Creates a storage host.
create -a *array-name* **hostgroup** *host-group-name*	Creates a storage host group.
create -a *array-name* **-w** *initiator-wwn* **-h** *host-name* **-o solaris_dmp** |**solaris** | **aix** | **hpux** | **linux** | **irix** | **ptx** | **netware_failover** | **netware_non_failover** | **win2k_clustered** | **win2k_non_clustered** |**winnt** | **winnt_non_clustered initiator** *initiator-name*	Creates an initiator.
create -a *array-name* **-p** *profile-name* [**-d** *description*] **pool** *pool-name*	Creates an empty storage pool on the array.
create -a *array-name* **-r 0** | **1** | **3** | **5 -s 8 K** | **16 K** | **32 K** | **64 K** | **128 K**| **256 K** | **512 K -h on** | **off -n variable** | **2** | **3** |…| **30 -D ANY** | **FC** |**SATA** [**-d** *profile-description*] **profile** *profile-name*	Creates a storage profile on the array.

TABLE B-1 Sun StorEdge 6130 Array Commands *(Continued)*

Command	Description
create -a *array-name* **-V** *volume-name* [**-L low** | **verylittle** | **little** |**average** | **high** | **full**] [**-f failbasewrite** | **failsnapshot**] [**-v** *vdiskname*] [**-m** *volume-name*] [**-w** *0..100*] [**-n** *2..30*] [**-d** *disk-name,...*] [**-r 0** | **1** | **3** | **5**] [**-D ANY** | **FC** | **SATA**] **snapshot** *snapshot-name*	Creates a snapshot volume on the array.
create -a *array-name* **-p** *pool-name* **-s** *size* **TB** | **GB** | **MB** | **B** [**-v** *virtual-disk-name*] [**-n** *2..30*] [**-d** *disk-name,...*] **volume** *volume-name*	Creates a volume within a specified pool.
create -a *array-name* **-s** *source-volume-name* **-t** *target-volume-name* [**-p lowest** | **low** | **medium** | **high** | **highest**] **volume-copy**	Creates a copy of the volume.
delete -a *array-name* **host** *host-name,...*	Deletes one or more hosts.
delete -a *array-name* **hostgroup** *host-group-name,...*	Deletes one or more host groups.
delete -a *array-name* [**-T** *wwn* | *initiator_name*] **initiator** *initiator-id,...*	Deletes one or more initiators.
delete -a *array-name* **pool** *pool-name,...*	Deletes one or more storage pools.
delete -a *array-name* **profile** *profile-name,...*	Deletes one or more storage profiles.
delete -a *array-name* **snapshot** *snapshot-name,...*	Deletes the specified snapshot.
delete -a *array-name* **volume** *volume-name*	Deletes one or more named volumes.
delete -a [*array-name*] **-s** [*source-volume-name*] **-t** [*target-volumename*] **volume-copy**	Deletes one or more volume copies.
export array *array-name*	Renders an extensible markup language (XML) representation of the array to `stdout`. You can redirect (>) the output to a file or other mechanism.
export -a *array-name* **profile** [*profile-name,...*]	Exports one or more array profiles into an XML representation of the profile to `stdout`. You can redirect (>) the output to a file or other mechanism.

TABLE B-1 Sun StorEdge 6130 Array Commands *(Continued)*

Command	Description
import -a *array-name* **-x** *xml-location* [**-f**] **profile** [*profile-name,...*] **import -a** *array-name* **-x** *xml-location* **-L profile** [*profile-name,...*]	Imports one or more profiles from a specified XML file.
import -x *xml-location* [**-L** *list*] **array** [*array-name*]	Applies an array configuration file to the specified array.
list [**-s** *1..3*] [**-f** *device-type*] [**-a**] **alarm** *alarm-id,...*	Lists detailed information about the specified alarms.
list array [*array-name,...*]	Lists information about one or more arrays.
list -a *array-name* **controller** [**A** | **B**]	Lists configuration information about the specified controller.
list -a *array-name* **date**	Lists the current date and time in hours, minutes, and seconds.
list [**-n** *device_id*] [**-i** *ip-address*] **device**	Lists details about a device or the devices being monitored.
list -a *array-name* [**-t** *tray-id*] **disk** [*disk-name,...*]	Lists disk information.
list -a *array-name* **-c A** | **B fcport** *fcport-id,...*	Lists Fibre Channel port information for the controller of the specified array.
list -a *array-name* **host** *host-name,...*	Lists the host names and details for an individual host.
list -a *array-name* **hostgroup** *host-group-name,...*	Lists the host group name and hosts for an individual host group.
list -a *array-name* [**-T** *wwn* | *initiator_name*] **initiator** [*initiator-id,...*]	Lists initiators and provides a description of each.
list -a *array-name* **jobs** [*jobs-id,...*]	Lists all outstanding jobs.
list -a *array-name* **license** [*license-name,...*]	Shows all licenses that are associated with the array, along with related licensing details.

TABLE B-1 Sun StorEdge 6130 Array Commands *(Continued)*

Command	Description
list [[**-s** { [*mmdd*] *HHMM* | *mmddHHMM* [*cc*] *yy* } [*.SS*]] [**-f** { [*mmdd*] *HHMM* | *mmddHHMM* [*cc*] *yy* } [*.SS*]] [**-t** *number-of-messages*]	Lists log messages for the software.
list -a *array-name,...* **-T performance** **list -a** *array-name,...* **-t array_stats** | **controller_stats** | **volume_stats** [**-c A** | **B**] [**-h** *host-name,...*] [**-g** *host-group-name,...*] [**-v** *volumename,...*] [**-s name** | **total_iops** | **read_percent** | **write_percent** |**total_data** | **avg_read_size** | **avg_read_rate** | **peak_read_rate** | **avg_write_size** | **avg_write_rate** | **peak_write_rate**] **performance**	Shows detailed performance statistics.
list -a *array-name* **pool** [*pool-name,...*]	Lists storage pool information.
list -a *array-name* **profile** *profile-name,...*	Lists the named storage profiles.
list -a *array-name,...* **registeredarray**	Lists registered array information.
list -a *array-name* **snapshot** *snapshot-name,...*	Lists the specified snapshot or snapshots associated with this array.
list -a *array-name* **tray** [*tray-id,...*]	Lists information about one or more storage trays in the array.
list userrole [**storage** | **guest**]	Lists the user name and user role information.
list -a *array-name* **vdisk** [*vdisk-name,...*]	Lists virtual disk information associated with this array.
list -a *array-name* [**-p** *pool-name*] [**-v** *vdisk-name*] **volume** *volumename,...*]	Lists volume information.
list -a *array-name* [**-s** *source-volume-name,...*] [**-t** *target-volumename,...*] **volume-copy**	Lists volume copy information.
login -u storage -h *host-name*	Logs you in to the `sscs` command-line interface on the specified host system.
logout	Logs you out of the `sscs` command-line interface.
map -a *array-name* [**-v** *volume-name,...*] [**-s** *snapshot-volume-name,...*] [**-l** *0..255*] **host** *host-name*	Maps one or more volumes to a host.

TABLE B-1 Sun StorEdge 6130 Array Commands *(Continued)*

Command	Description
map -a *array-name* **-v** *volume-name,...*[**-s** *snapshot-volume-name,...*] [**-l** *0..255*] **hostgroup** *host-group-name*	Maps one or more volumes to a host group.
map -a *array-name* [**-h** *host-name* | **-g** *host-group-name*] [**-l** *0..255*] **snapshot** *snapshot-name,...*	Maps one or more snapshots to a host or host group.
map -a *array-name* [**-h** *host-name* | **-g** *host-group*] **-l** *0..255* **volume** *volume-name,...*	Removes any previous mappings for the given volumes.
modify -o solaris_dmp | **solaris** | **aix** | **hpux** | **linux** | **irix** | **ptx** | **netware_failover** | **netware_non_failover** | **win2k_clustered** | **win2k_non_clustered** | **winnt** | **winnt_non_clustered** [**-b 4K** | **16K**][**-s** *0..100*] [**-S** *0..100*] [**-k disable** | *1..30*][**- f** *1..60*][**-h** *0..8*] [**-T** *wwn* / *array_name*] [**-N** *new-array-name*] [**-p** *password*] **array** *array-id* **modify** [**-r**] [**-T** *wwn* / *array_name*] **array** *array-id* **modify** [**-R**] [**-T** *wwn* / *array_name*] **array** *array-id*	Modifies the configuration of the specified array.
modify -a *array-name* [**-g** *gateway-address*] [**-i** *ip-address*] [**-m** *netmask*] **controller A** | **B**	Modifies the controller settings.
modify -a *array-name* [**-G true** | **false**] **date** [**-s** [[*mmdd*] *HHMM* | *mmddHHMM* [*cc*] *yy*]] [*.SS*]	Modifies the date on the array.
modify -a *array-name* **-h true** | **false disk** *disk-name*	Specifies the disk role.
modify -a *array-name* **-c A** | **B -l** *0..127* **fcport** *fcport-id*	Modifies the Fibre Channel port settings on the specified array.
modify -a *array-name* [**-N** *host-name*] [**-g** *host-group-name*] **host** *host-name*	Modifies the host name.
modify -a *array-name* **-N** *host-group-name* **hostgroup** *host-groupname*	Modifies the host group name.
modify -a *array-name* [**-h** *host-name*] [**-N** *initiator-name*] [**-T** *wwn* / *initiator_name*] [**-o solaris_dmp** | **solaris** | **aix** | **hpux** | **linux** | **irix** | **ptx** | **netware_failover** | **netware_non_failover** | **win2k_clustered** | **win2k_non_clustered** | **winnt** | **winnt_non_clustered**] **initiator** *initiator-id*	Modifies the initiator.
modify -a *array-name* [**-k**] [**-p lowest** | **low** | **medium** | **high** | **highest**] **jobs** [*job-id*]	Cancels or prioritizes a running or outstanding job using the job identification number.
modify -a *array-name* [**-S on** | **off**] [**-p 1** | **5** | **15**] [**-r forever** | **1HR** | **2HR** | **4HR** | **1DAY**] **performance**	Modifies performance settings and values for an array.

TABLE B-1 Sun StorEdge 6130 Array Commands *(Continued)*

Command	Description
modify -a *array-name* [**-N** *new-pool-name*] [**-d** *description*] [**-p** *newprofile-name*] **pool** *pool-name*	Modifies the name or description of the specified storage pool or of the profile with which this pool is associated.
modify -a *array-name* [**-r 0** | **1** | **3** | **5**] [**-s 8K** | **16K** | **32K** | **64K** | **128K** | **256 K** | **512 K**] [**-N** *new-profile-name*] [**-d** *profile-description*] [**-h on** | **off**] [**-n variable** | **2** | **3** |…| **30**] [**-D** disk-type] **profile** *profile-name*	Modifies a storage profile on the array.
modify -a *array-name* **-q registeredarray**	Modifies the locally stored password for a registered array.
modify -a *array-name* [**-N** *new-snapshot-name*] [**-e** *extend-size* **KB** | **MB** | **GB** | **TB**] [**-S**] [**-R**] [**-f failbasewrite** | **failsnapshot**] [**-w** [*0..100*]] [**-m** *reserve-volume-name*] [**-c A** | **B**] [**-W enable** | **disable**] [**-M enable** | **disable**] [**-b enable** | **disable**] [**-k enable** | **disable**] [**-r enable** | **disable**] **snapshot** *snapshot-name*	Modifies the specified snapshot.
modify -a *array-name* **[-d** *disk-name,...*] [**-f**] **vdisk** *vdisk-name*	Modifies the specified virtual disk.
modify -a *array-name* [**-p** *pool-name*] [**-e** *extend-size* **MB** | **GB** | **TB** | **B**] [**-N** *new-volume-name*] [**-c A** | **B**] [**-m** *modification-priority* **lowest** | **low** | **medium** | **high** | **highest**] [**-W enable** | **disable**] [**-M enable** | **disable**] [**-b enable** | **disable**] [**-k enable** | **disable**] [**-r enable** | **disable**] **volume** *volume-name*	Modifies a volume's attributes.
modify -a *array-name* **-s** [*source-volume-name*] **-t** [*target-volumename*] [**-p lowest** | **low** | **medium** | **high** | **highest**] [**-r enable** | **disable**] [**-R**] [**-S**] **volume-copy**	Modifies a volume copy.
remove [**-f** *device-type*] [**-s 1** | **2** | **3**] [**-A**] **alarm**	Removes current alarms.
remove -a *array-name* **-h** *host-name,...* **hostgroup** *host-group-name*	Removes one or more hosts from a host group.
remove -a *array-name* **license** *license-name*	Removes a license from the specified array.
remove [**-e** *email-address ...*] [**-i** *ip-address, ...*] [**-t 1** | **2** | **3** | **4** | **5**] **notification local_email** | **nscc_email** | **netconnect** | **trap**	Removes a local or remote notification provider.
remove -a *array-name,...* **registeredarray**	Removes an array from the list of registered arrays.
remove -u *username,...* **userrole storage** | **guest**	Removes user names from a user role (storage and guest).

TABLE B-1 Sun StorEdge 6130 Array Commands *(Continued)*

Command	Description
unmap -a *array-name* [**-s** *snapshot-name,...*] [**-v** *volume-name,...*] **host** *host-name*	Unmaps one or more volumes from a host.
unmap -a *array-name* [**-s** *snapshot-name,...*] **-v** *volume-name,...***hostgroup** *host-group-name*	Unmaps one or more volumes from a host group.
unmap -a *array-name* [**-h** *host-name*] [**-g** *host-group-name*] **snapshot** [*snapshot-name,...*]	Unmaps one or more snapshots from a host or host group.
unmap -a *array-name* [**-h** *host-name* | **-g** *host-group-name*] **volume** *volume-name,...*	Unmaps one or more volumes from a host or host group.

Storage Automated Diagnostic Environment CLI Commands

The Storage Automated Diagnostic Environment CLI commands that are available for use with the Sun StorEdge 6130 array are listed in the *Storage Automated Diagnostic Environment Enterprise Edition 2.4 Release Notes*. The associated man pages contain details on their use.

Glossary

A

agent A Storage Automated Diagnostic Environment program that runs on a management host, monitoring its storage elements and diagnosing any problems.

alarm A warning of an existing or approaching alert. See also *event*.

alert A subtype of an event that requires user intervention. The term *actionable event* often describes an alert. See also *event*.

array A disk subsystem, made up of multiple disk drives, that functions as a single large device. A high-availability (HA) array configuration has redundant controllers and expansion trays of disk drives.

array hot-spare A disk that serves as a hot-spare within an array as part of the storage pool; a reserve disk that can be made available to all virtual disks within an array. See also *hot-spare*.

B

block The amount of data sent or received by the host per I/O operation; the size of a data unit.

C

capacity The amount of storage you must allocate to storage elements, including volumes, pools, and virtual disks. Capacity planning should include allocations for volume snapshots and volume copies.

CLI Command-line interface. The SSCS command-line interface is available from the remote CLI client or through an SSCS directory on the Solaris Operating System management software station.

controller module A tray with an installed redundant RAID controller pair. In a Sun StorEdge 6130 array, 1x1, 1x2, 1x3, and 1x8 array types are available.

control path The route used for communication of system management information, usually an out-of-band connection.

customer LAN See *site LAN*.

D

DAS See *direct access storage (DAS)*.

data host Any host that uses the system for storage. A data host can be connected directly to the array or can be connected to an external switch that supports multiple data hosts (SAN). See also *host*.

data path The route taken by a data packet between a data host and the storage device.

direct access storage (DAS) A storage architecture in which one or two hosts that access data are connected physically to a storage array.

disk A physical drive component that stores data.

E

event A notification of something that happened on a device. There are many types of events, and each type describes a separate occurrence. See also *alarm* and *alert*.

expansion module A module that does not have a RAID controller, used to expand the capacity of an array. This type of tray must be attached to a controller module to function.

extent A set of contiguous blocks with consecutive logical addresses on a physical or virtual disk.

F

failover and recovery The process of changing the data path automatically to an alternate path.

fault coverage The percentage of faults detected against all possible faults or against all faults of a given type.

FC See *Fibre Channel (FC)*.

Fibre Channel (FC) A 2-gigabit bi-directional serial data-transfer protocol, deployed across a wide range of storage hardware and commonly used for storage area network (SAN) configurations.

Fibre Channel switch A networking device that can send packets directly to a port associated with a given network address in a Fibre Channel SAN. The Fibre Channel switches are used to expand the number of servers that can connect to a particular storage port. Each switch is managed by its own management software.

field-replaceable unit (FRU) An assembly component that is designed to be replaced on site, without the system having to be returned to the manufacturer for repair. Servicing FRUs is documented in the Service Advisor software.

FRU See *field-replaceable unit (FRU)*.

G

GUI Graphical user interface. Users access the GUI through a web browser.

H

HBA See *host bus adapter (HBA)*.

host As a function of the Sun StorEdge 6130 array configuration, a host represents a data host and is mapped to initiators and volumes to create a storage domain. See also *data host*, *initiator*.

host bus adapter (HBA) A controller board on the server that allows the server to attach to external storage. See also *initiator*.

host group A group of hosts with common storage characteristics that can be mapped to volumes. See also *host*.

hot-spare The drive used by a controller to replace a failed disk. See also *array hot-spare*.

I

in-band traffic System management traffic that uses the data path between a data host and a storage device. See also *out-of-band traffic*.

initiator On a Fibre Channel network, a host that requests transactions with storage elements. Each connection represents a separate initiator, so if a host is connected to the system through two host bus adapters (HBAs), the system identifies two different initiators. Initiators can be grouped into host groups. Sun's MPxIO software provides a round-robin mode, where multiple HBAs are grouped together and the system identifies the group of HBAs as one initiator.

IOPS A measure of transaction speed, representing the number of input and output transactions per second.

L

LAN Local area network.

logical unit (LUN) The identifier for a volume as it is recognized by a particular host. The same volume can be represented by a different LUN to a different host.

LUN See *logical unit (LUN)*.

LUN map set See *storage domain*.

M

MAC address See *media access control (MAC) address*.

management host A Solaris host serving the configuration, management, and monitoring software for the Sun StorEdge 6130 array. The software on the station can be accessed with a browser to run the GUI or with a remote thin-scripting client to access the SSCS CLI commands.

master / alternate master A design for reliability that uses redundant configuration. Array configurations share master/alternate master configurations: each array configuration has two controller trays that are grouped as one host. In each case, the master component uses the IP address and name. If the master fails, the alternate master assumes the IP address and name and takes over the master's functions.

media access control (MAC) address The physical address identifying an Ethernet controller board. The MAC address, also called an Ethernet address, is set at the factory and must be mapped to the IP address of the device.

multipathing A design for redundancy that provides at least two physical paths to a target.

O

out-of-band traffic System management traffic outside of the primary data path that uses an Ethernet network. See also *in-band traffic*.

P

PDU See *power distribution unit (PDU)*.

pool See *storage pool*.

power distribution unit (PDU) The assembly that provides power management for the system. The redundant design uses two PDUs in each system so that the system's data path continues to function if one of the PDUs fails.

profile See *storage profile*.

provisioning The process of assigning storage to hosts.

R

RAID Redundant array of independent disks. A configuration in which several drives are combined into a single virtual drive to improve data availability. Also called a RAID set or a RAID group.

RAS Reliability, availability, and serviceability.

remote CLI client Also called the thin-scripting client, the remote CLI client runs the SSCS command-line interface on any qualified host in the network. The client communicates with the management software through a secure out-of-band interface, HTTPS.

The client must be installed on a host that has network access to the system. The available clients are for the Solaris, Microsoft Windows 2000 and Windows 2003, Linux, HP-UX, IBM AIX, SGI, and Novell operating environments.

remote monitoring Monitoring of the functions and performance of a hardware system from a location other than where the hardware resides.

remote support The software management host uses Sun Remote Services Net Connect 3.1 software to communicate problems with Sun service.

S

SAN See *storage area network (SAN)*.

site LAN The local area network at your site. When the system is connected to your LAN, the system can be managed through a browser from any host on the LAN.

snapshot A copy of a volume's data at a specific point in time.

SSCS Sun Storage Command System, the CLI that can be used to manage the array.

storage area network (SAN) An architecture in which the storage hosts are connected to each other to increase data availability and storage utilization.

storage domain A storage partition created through the mapping of initiators to hosts and the mapping of volumes to hosts or host groups. Also called a LUN map set.

storage pool A collection of volumes with a common configuration, availability, and performance. You assign a profile to a pool to define the attributes of the pool.

storage profile A set of storage pool attributes that optimize the storage pool for a particular access pattern and level of data protection. You assign a profile to a pool to define the attributes of the pool.

storage tray An enclosure containing disks. A tray with dual RAID controllers is called a controller module; a tray without controllers is called an expansion module.

stripe size The total amount of data in a stripe, representing the block size multiplied by the number of disks in the stripe. See also *striping*.

striping A storage allocation method in which data is stored over a series of disks or virtual disks, improving performance.

T

target The recipient of initiator commands, usually a volume.

thin-scripting client See *remote CLI client*.

tray See *storage tray*.

V

virtual disk A collection of physical disks or logical extents that acts as one disk to the hosts and initiators that have access to it. All storage on the disk must share the same storage characteristics as defined by profiles.

volume A fixed amount of storage, not limited by the physical device. A disk can have more than one volume, and a volume can span more than one disk. Applications that use volumes do not need to be aware of physical storage locations, because the management software maps the virtual address to the physical address.

volume snapshot See *snapshot*.

W

WWN Worldwide name. A unique 64-bit number assigned by a recognized naming authority such as the IEEE that identifies a connection (device) or a set of connections to the network. The WWN is constructed from the number that identifies the naming authority, the number that identifies the manufacturer, and a unique number for the specific connection.

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V