

Oracle® Solaris Cluster 3.3 with StorageTek RAID Arrays Manual

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Preface

The *Oracle Solaris Cluster 3.3 with StorageTek RAID Arrays Manual* provides procedures that are specific to StorageTek RAID arrays that are placed in an Oracle Solaris Cluster environment.

Use this manual with any version of Oracle Solaris Cluster 3.3 software on SPARC based clusters or x86 based clusters. See the [“Revision History” on page 6](#) for a list of changes to this manual.

Note – This Oracle Solaris Cluster release supports systems that use the SPARC and x86 families of processor architectures: UltraSPARC, SPARC64, AMD64, and Intel 64. In this document, x86 refers to the larger family of 64-bit x86 compatible products. Information in this document pertains to all platforms unless otherwise specified.

This book assumes that you are performing one or more of the following tasks:

- You want to replace an array component to *prevent* a failure.
- You want to replace an array component because you have an *existing* failure.
- You want to add (to an *established* cluster) or install (to a *new* cluster) a storage array.

Who Should Use This Book

This book is for Oracle representatives who are performing the initial installation of an Oracle Solaris Cluster configuration and for system administrators who are responsible for maintaining the system.

This document is intended for experienced system administrators with extensive knowledge of Oracle software and hardware. Do not use this document as a planning or presales guide. You should have already determined your system requirements and purchased the appropriate equipment and software before reading this document.

How This Book Is Organized

This book contains the following chapters:

- [Chapter 1, “Restrictions and Requirements,”](#) lists limitations of your use of StorageTek storage arrays in an Oracle Solaris Cluster environment.
- [Chapter 2, “Installing and Configuring a StorageTek Array,”](#) discusses how to install StorageTek storage arrays and how to configure logical units on them.
- [Chapter 3, “Maintaining a StorageTek Array,”](#) describes how to maintain StorageTek storage arrays in a running cluster.

Revision History

The following table lists the information that has been revised or added since the initial release of this documentation. The table also lists the revision date for these changes.

TABLE P-1 Oracle Solaris Cluster 3.3 with StorageTek RAID Arrays Manual

Revision Date	New Information
May 2008	General edits to make the guide generic to all types of RAID arrays.
March 2008	Replaced outdated information about SunSolve with information about Sun Connection Update Manager .
September 2010	Updated book with new product name and removed old CLI commands.

Related Documentation

The following books provide conceptual information or procedures to administer hardware and applications. If you plan to use this documentation in a hardcopy format, ensure that you have these books available for your reference.

The following books support the Oracle Solaris Cluster 3.3 release. You can also access the documentation for the Sun Cluster 3.1 and 3.2 releases. All Sun Cluster and Oracle Solaris Cluster documentation is available at <http://docs.sun.com>. Documentation that is not available at <http://docs.sun.com> is listed with the appropriate URL.

Refer to your storage array's documentation on docs.sun.com for detailed information on each storage array. For the StorageTek array, refer to the online product documentation

TABLE P-2 Oracle Solaris Cluster and Sun Cluster Documentation

Documentation

[Oracle Solaris Cluster 3.3](#)
[Sun Cluster 3.2](#)
[Sun Cluster 3.1](#)

Using UNIX Commands

This document contains information about commands that are used to install, configure, or upgrade an Oracle Solaris Cluster configuration. This document might not contain complete information about basic UNIX commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following sources for this information:

- Online documentation for the Oracle Solaris Operating System (Oracle Solaris OS)
- Other software documentation that you received with your system
- Oracle Solaris Operating System man pages

Getting Help

If you have problems installing or using Oracle Solaris Cluster, contact your service provider and provide the following information.

- Your name and email address (if available)
- Your company name, address, and phone number
- The model number and serial number of your systems
- The release number of the operating environment (for example, Oracle Solaris 10)
- The release number of Oracle Solaris Cluster (for example, Oracle Solaris Cluster 3.3)

Use the following commands to gather information about your system for your service provider.

Command	Function
<code>prtconf -v</code>	Displays the size of the system memory and reports information about peripheral devices
<code>psrinfo -v</code>	Displays information about processors

Command	Function
showrev -p	Reports which patches are installed
prtdiag -v	Displays system diagnostic information
/usr/cluster/bin/clnode show-rev	Displays Oracle Solaris Cluster release and package version information for each node

Also have available the contents of the `/var/adm/messages` file.

Documentation, Support, and Training

See the following web sites for additional resources:

- [Documentation \(http://docs.sun.com\)](http://docs.sun.com)
- [Support \(http://www.oracle.com/us/support/systems/index.html\)](http://www.oracle.com/us/support/systems/index.html)
- [Training \(http://education.oracle.com\)](http://education.oracle.com) – Click the Sun link in the left navigation bar.

Oracle Welcomes Your Comments

Oracle welcomes your comments and suggestions on the quality and usefulness of its documentation. If you find any errors or have any other suggestions for improvement, go to <http://docs.sun.com> and click Feedback. Indicate the title and part number of the documentation along with the chapter, section, and page number, if available. Please let us know if you want a reply.

[Oracle Technology Network \(http://www.oracle.com/technetwork/index.html\)](http://www.oracle.com/technetwork/index.html) offers a range of resources related to Oracle software:

- Discuss technical problems and solutions on the [Discussion Forums \(http://forums.oracle.com\)](http://forums.oracle.com).
- Get hands-on step-by-step tutorials with [Oracle By Example \(http://www.oracle.com/technology/obe/start/index.html\)](http://www.oracle.com/technology/obe/start/index.html).
- Download [Sample Code \(http://www.oracle.com/technology/sample_code/index.html\)](http://www.oracle.com/technology/sample_code/index.html).

Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P-3 Typographic Conventions

Typeface	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name%</code> you have mail.
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name%</code> su Password:
<i>aabbcc123</i>	Placeholder: replace with a real name or value	The command to remove a file is <i>rm filename</i> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . <i>A cache</i> is a copy that is stored locally. Do <i>not</i> save the file. Note: Some emphasized items appear bold online.

Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for shells that are included in the Oracle Solaris OS. Note that the default system prompt that is displayed in command examples varies, depending on the Oracle Solaris release.

TABLE P-4 Shell Prompts

Shell	Prompt
Bash shell, Korn shell, and Bourne shell	\$
Bash shell, Korn shell, and Bourne shell for superuser	#
C shell	<code>machine_name%</code>
C shell for superuser	<code>machine_name#</code>

Restrictions and Requirements

This chapter includes only restrictions and requirements that have a direct impact on the procedures in this book. For general support information, contact your Oracle service provider.

Requirements

If you are replacing a Host Bus Adapter (HBA), you must re-mask the HBA's World Wide Name (WWN) numbers to the respective Logical Unit Numbers (LUNs) on the array.

Restrictions

When using arrays that support storage-based replication (for example, Oracle's StorageTek 9900 array), do not configure a replicated volume as a quorum device. Locate any quorum devices on an unreplicated volume. See [“Using Storage-Based Data Replication Within a Cluster”](#) in *Oracle Solaris Cluster System Administration Guide* for more information on storage-based replication.

Installing and Configuring a StorageTek Array

This chapter contains the procedures about how to install and configure Oracle's StorageTek RAID arrays. These procedures are specific to an Oracle Solaris Cluster environment.

This chapter contains the following main topics:

- “Installing Storage Arrays” on page 13
- “Configuring Storage Arrays” on page 18

For detailed information about storage array architecture, features, configuration utilities, and installation, see “Related Documentation” on page 6.

Installing Storage Arrays

This section contains the procedures listed in [Table 2-1](#).

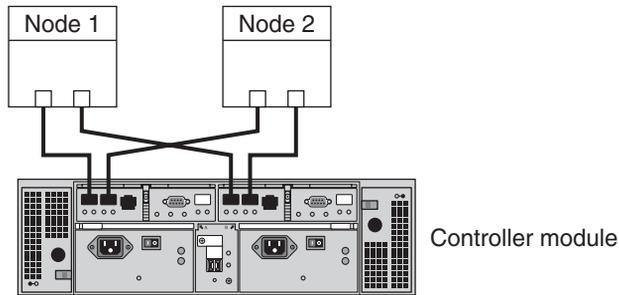
TABLE 2-1 Task Map: Installing Storage Arrays

Task	Information
Install a storage array in a new cluster, before the OS and Oracle Solaris Cluster software are installed.	“How to Install Storage Arrays in a New Cluster” on page 16
Add a storage array to an existing cluster.	“How to Add Storage Arrays to an Existing Cluster” on page 17

Storage Array Cabling Configurations

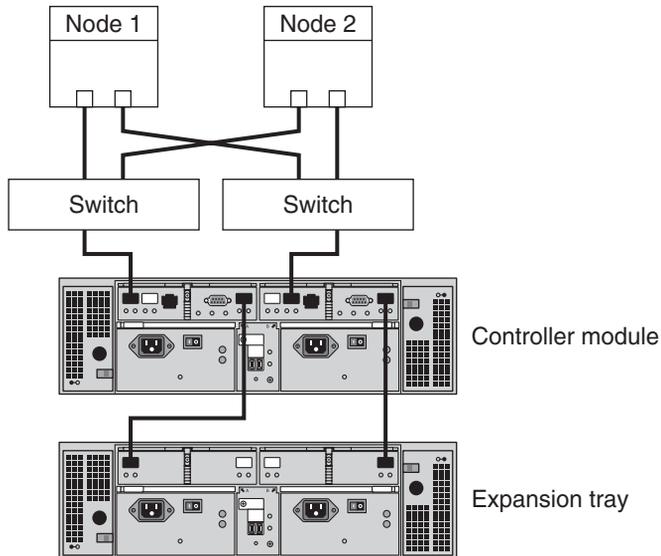
You can install your storage array in several different configurations; see [Figure 2-1](#) through [Figure 2-4](#) for examples.

FIGURE 2-1 StorageTek Array Direct-Connect Configuration



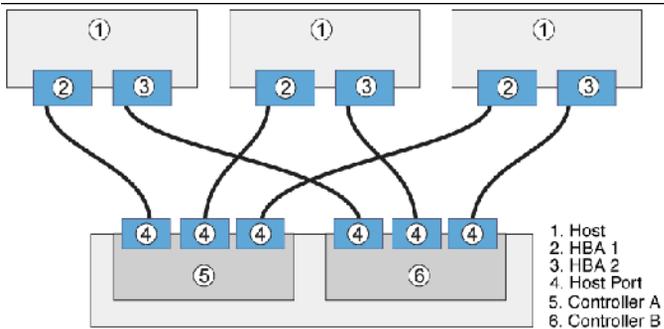
Oracle's StorageTek 6140 array houses two controllers; each controller has four host ports. The cabling approach is the same as shown in [Figure 2-1](#), but it can support up to four nodes in a direct-attach configuration.

FIGURE 2-2 StorageTek Array Switched Configuration



[Figure 2-2](#) shows a switched configuration for a two-node storage array.

FIGURE 2-3 Direct Connections from Three Data Hosts with Dual HBAs



You can connect one or more hosts to a storage array. Figure 2-3 shows an example of a direct host connection from each data host with dual HBAs.

Note – For maximum hardware redundancy, you should install a minimum of two HBAs in each host and distribute I/O paths between these HBAs. A single, dual-port HBA can provide both data paths to the storage array but does not ensure redundancy if the HBA fails.

FIGURE 2-4 Mixed Topology-Three Hosts Connected Through a Switch or Connected Directly

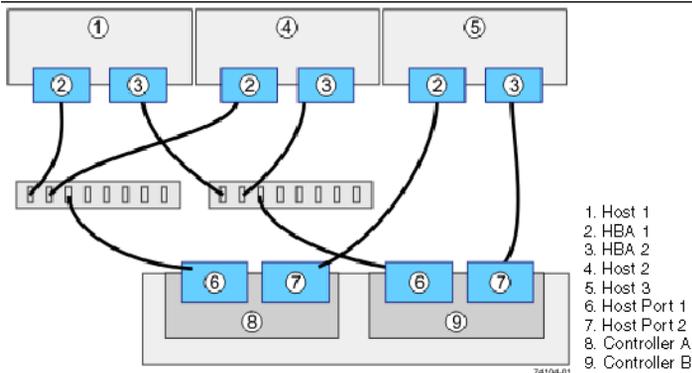


Figure 2-4 shows that three hosts can be connected directly or through a switch.

How to Install Storage Arrays in a New Cluster

Use this procedure to install a storage array in a new cluster. To add a storage array to an existing cluster, use the procedure in “[How to Replace a Host Adapter](#)” in *Oracle Solaris Cluster 3.3 With Sun StorEdge A3500FC System Manual*.

This procedure relies on the following assumptions:

- You have *not* installed the Oracle Solaris Operating System.
- You have *not* installed the Oracle Solaris Cluster software.
- You have enough host adapters to connect the nodes and the storage array.

▼ Install and Cable the Hardware

1 Unpack, place, and level the storage array.

For instructions, see the StorageTek online documentation.

2 If necessary, install the Fibre Channel (FC) switch for the storage array (if the switch is not already installed).

For the procedure about how to install an FC switch, see the documentation that shipped with your FC switch hardware.

3 Connect the nodes to the storage array.

- **SAN Configuration — Connect the FC switches to the storage array**
- **Direct-Attached Configuration — Connect each node directly to the storage array**
- **SAS Direct-Attached Configuration**
- **iSCSI Direct-Attached Configuration**
- **iSCSI Switched Configuration**

For instructions, see your storage array documentation and the “[Related Documentation](#)” on [page 6](#) section.

4 Hook up the cards for the storage array.

For instructions, see your storage array documentation.

5 Power on the storage array and the nodes.

For instructions, see your storage array documentation.

6 Configure the storage array, if needed.

For instructions, see [“Configuring Storage Arrays” on page 18](#) and consult your storage array documentation.

▼ Install the Oracle Solaris OS

1 On all nodes, install the Oracle Solaris operating system and any required patches for Oracle Solaris Cluster software and storage array support.

For the procedure about how to install the Oracle Solaris operating environment, see [“How to Install Solaris Software” in *Oracle Solaris Cluster Software Installation Guide*](#).

2 Oracle Solaris 10 automatically installs Solaris I/O multipathing. Verify that the paths to the storage device are functioning.

- See Also**
- To create a logical volume, see [“How to Create a Logical Volume” on page 19](#).
 - To continue with Oracle Solaris Cluster software installation tasks, see your Oracle Solaris Cluster software installation documentation.

▼ How to Add Storage Arrays to an Existing Cluster

Use this procedure to add a new storage array to a *running* cluster. To install a new storage array in an Oracle Solaris Cluster configuration that is not running (the nodes are in noncluster mode), use the procedure in [“How to Install Storage Arrays in a New Cluster” on page 16](#).

Before You Begin This procedure relies on the following assumptions:

- (*Veritas Volume Manager Only*) You have a version of Veritas Volume Manager that includes Array Support Library (ASL).
- You have enough host adapters to connect the nodes and the storage array.
If you need to install host adapters, see [“How to Replace a Host Adapter” in *Oracle Solaris Cluster 3.3 With Sun StorEdge A3500FC System Manual*](#). When this procedure asks you to replace the failed host adapter, install the new host adapter instead.
- All cluster nodes have joined the cluster.
If you need to add a node to your cluster, see your Oracle Solaris Cluster system administration documentation. Ensure that you install the required Solaris patches for storage array support.

1 Unpack, place, and level the storage array.

For instructions, see the StorageTek online documentation.

- 2 **If necessary, install the Fibre Channel (FC) switch for the storage array (if the switch is not already installed).**

For the procedure about how to install an FC switch, see the documentation that shipped with your FC switch hardware.

- 3 **Connect the nodes to the storage array.**

- **SAN Configuration — Connect the FC switches to the storage array**
- **Direct-Attached Configuration — Connect each node directly to the storage array**
- **SAS Direct-Attached Configuration**
- **iSCSI Direct-Attached Configuration**
- **iSCSI Switched Configuration**

For instructions, see your storage array documentation and the [“Related Documentation” on page 6](#) section.

- 4 **Hook up the cards for the storage array.**

For instructions, see your storage array documentation.

- 5 **Power on the storage array and the nodes.**

For instructions, see your storage array documentation.

- 6 **Configure the storage array, if needed.**

For instructions, see [“Configuring Storage Arrays” on page 18](#) and consult your storage array documentation.

See Also ▪ To create a logical volume, see [“How to Create a Logical Volume” on page 19](#).

Configuring Storage Arrays

This section contains the procedures to configure a storage array in a running cluster. [Table 2–2](#) lists these procedures.

TABLE 2–2 Task Map: Configuring a Storage Array

Task	Information
Create a logical volume	“How to Create a Logical Volume” on page 19

TABLE 2-2 Task Map: Configuring a Storage Array (Continued)

Task	Information
Remove a logical volume	“How to Remove a Logical Volume” on page 21

The following is a list of administrative tasks that do not require cluster-specific procedures. See the storage array's documentation [“Related Documentation” on page 6](#) for the following procedures.

- Creating a storage pool
- Removing a storage pool
- Creating a volume group
- Removing a volume group
- Creating an initiator group
- Adding an initiator group
- Removing an initiator group

▼ How to Create a Logical Volume

Use this procedure to create a logical volume from unassigned storage capacity.

Note – Oracle's Sun storage documentation uses the following terms:

- Logical volume
- Logical device
- Logical unit number (LUN)

This manual uses *logical volume* to refer to all such logical constructs.

Before You Begin This procedure relies on the following prerequisites and assumptions.

- All nodes are booted in cluster mode and attached to the storage device.
- The storage device is installed and configured. If you are using multipathing, the storage device is configured as described in the installation procedure.
- If you are using Solaris I/O multipathing (MPxIO) for the Oracle Solaris 10 OS, previously called Sun StorEdge Traffic Manager in the Solaris 9 OS, verify that the paths to the storage device are functioning. To configure multipathing, see the [Solaris Fibre Channel Storage Configuration and Multipathing Support Guide](#).

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

- 1 **Become superuser or assume a role that provides `solaris.cluster.modify` role-based access control (RBAC) authorization.**
- 2 **Follow the instructions in your storage device's documentation to create and map the logical volume. For a URL to this storage documentation, see ["Related Documentation" on page 6](#).**
 - Completely set up the logical volume. When you are finished, the volume must be created, mapped, mounted, and initialized.
 - If necessary, partition the volume.
 - To allow multiple clusters and nonclustered nodes to access the storage device, create initiator groups by using LUN masking.
- 3 **If you are not using multipathing, skip to [Step 5](#).**
- 4 **If you are using multipathing, and if any devices that are associated with the volume you created are at an unconfigured state, configure the multipathing paths on each node that is connected to the storage device.**

To determine whether any devices that are associated with the volume you created are at an unconfigured state, use the following command.

```
# cfmadm -al | grep disk
```

Note – To configure the Oracle Solaris I/O multipathing paths on each node that is connected to the storage device, use the following command.

```
# cfmadm -o force_update -c configure controllerinstance
```

To configure multipathing, see the [Solaris Fibre Channel Storage Configuration and Multipathing Support Guide](#).

- 5 **On one node that is connected to the storage device, use the `format` command to label the new logical volume.**
- 6 **From any node in the cluster, update the global device namespace.**

```
# cldevice populate
```

Note – You might have a volume management daemon such as `vold` running on your node, and have a DVD drive connected to the node. Under these conditions, a device busy error might be returned even if no disk is inserted in the drive. This error is expected behavior. You can safely ignore this error message.

- 7 **To manage this volume with volume management software, use Solaris Volume Manager or Veritas Volume Manager commands to update the list of devices on all nodes that are attached to the new volume that you created.**

For more information, see your Solaris Volume Manager or Veritas Volume Manager documentation.

- See Also**
- To configure a logical volume as a quorum device, see [Chapter 6, “Administering Quorum,” in *Oracle Solaris Cluster System Administration Guide*](#).
 - To create a new resource or configure a running resource to use the new logical volume, see [Chapter 2, “Administering Data Service Resources,” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*](#).

▼ How to Remove a Logical Volume

Use this procedure to remove a logical volume. This procedure defines Node A as the node with which you begin working.

Note – Sun storage documentation uses the following terms:

- Logical volume
- Logical device
- Logical unit number (LUN)

This manual uses *logical volume* to refer to all such logical constructs.

Before You Begin This procedure relies on the following prerequisites and assumptions.

- All nodes are booted in cluster mode and attached to the storage device.
- The logical volume and the path between the nodes and the storage device are both operational.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

- 1 **Become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.**
- 2 **Identify the logical volume that you are removing.**

Refer to your Solaris Volume Manager or Veritas Volume Manager documentation for more information.

- 3 **(Optional) Migrate all data off the logical volume that you are removing. Alternatively, back up that data.**

- 4 **If the LUN that you are removing is configured as a quorum device, choose and configure another device as the quorum device. Then remove the old quorum device.**

To determine whether the LUN is configured as a quorum device, use the following command.

```
# clquorum show
```

For procedures about how to add and remove quorum devices, see [Chapter 6, “Administering Quorum,”](#) in *Oracle Solaris Cluster System Administration Guide*.

- 5 **If you are using volume management software, use that software to update the list of devices on all nodes that are attached to the logical volume that you are removing.**

For instructions about how to update the list of devices, see your Solaris Volume Manager or Veritas Volume Manager documentation.

- 6 **If you are using volume management software, run the appropriate Solaris Volume Manager or Veritas Volume Manager commands to remove the logical volume from any diskset or disk group.**

For more information, see your Solaris Volume Manager or Veritas Volume Manager documentation.

Note – Volumes that were managed by Veritas Volume Manager must be completely removed from Veritas Volume Manager control before you can delete them from the Oracle Solaris Cluster environment. After you delete the volume from any disk group, use the following commands on both nodes to remove the volume from Veritas Volume Manager control.

```
# vxdisk offline Accessname
# vxdisk rm Accessname
```

Accessname Disk access name

- 7 **If you are using multipathing, unconfigure the volume in Solaris I/O multipathing.**

```
# cfgadm -o force_update -c unconfigure Logical_Volume
```

- 8 **Access the storage device and remove the logical volume.**

To remove the volume, see your storage documentation. For a list of storage documentation, see [“Related Documentation”](#) on page 6.

- 9 **Determine the resource groups and device groups that are running on all nodes.**

Record this information because you use it in [Step 14](#) and [Step 15](#) of this procedure to return resource groups and device groups to these nodes.

Maintaining a StorageTek Array

This chapter contains the procedures about how to maintain a StorageTek array. These procedures are specific to an Oracle Solaris Cluster environment.

This chapter contains the following procedures:

- “How to Upgrade Storage Array Firmware” on page 26
- “How to Remove a Storage Array” on page 27

For detailed information about storage array architecture, features, and configuration utilities, see the StorageTek documentation listed in “[Related Documentation](#)” on page 6.

FRUs That *Do Not* Require Oracle Solaris Cluster Maintenance Procedures

In general, the following is a list of administrative tasks that require no cluster-specific procedures. See the base-product documentation for these procedures. Refer to your documentation for components not listed below.

Depending on your configuration type and the state of your cluster, a few of the following FRUs might require cluster-specific steps. Some FRUs include the DSP and the storage array.

- Adding a disk drive
- Replacing a storage array's chassis
- Replacing an Ethernet cable
- Replacing a power supply
- Replacing the power cable on the storage array
- Replacing a power and cooling unit (PCU)
- Replacing a controller

Maintaining Storage Arrays

This section contains the procedures about how to maintain a storage system in a running cluster. [Table 3-1](#) lists these procedures.

TABLE 3-1 Task Map: Maintaining a Storage System

Task	Information
Remove a storage array	“How to Remove a Storage Array” on page 27
Upgrade storage array firmware	“How to Upgrade Storage Array Firmware” on page 26
Replace a node-to-switch component	“How to Replace a Node-to-Switch Component in a Cluster Without Multipathing” in <i>Oracle Solaris Cluster 3.3 With Sun StorEdge 9900 Series Storage Device Manual</i>
Replace a node's host adapter	“How to Replace a Host Adapter” in <i>Oracle Solaris Cluster 3.3 With Sun StorEdge A3500FC System Manual</i>
Replace a disk drive	“How to Replace a Failed Disk Drive in a Running Cluster” in <i>Oracle Solaris Cluster 3.3 With Sun StorEdge A3500FC System Manual</i>
Add a node to the storage array	Oracle Solaris Cluster system administration documentation
Remove a node from the storage array	Oracle Solaris Cluster system administration documentation

Note – Most storage arrays are maintained through common array management software. For example, see [Sun StorageTek Common Array Manager Software](#).

▼ How to Upgrade Storage Array Firmware

Use this procedure to upgrade storage array firmware in a running cluster. Storage array firmware includes controller firmware, unit interconnect card (UIC) firmware, EPROM firmware, and disk drive firmware.

Note – When you upgrade firmware on a storage device or on an enclosure, redefine the stripe size of a LUN, or perform other LUN operations, a device ID might change unexpectedly. When you perform a check of the device ID configuration by running the `cldevice check` command, the following error message appears on your console if the device ID changed unexpectedly.

```
device id for nodename:/dev/rdisk/cXtYdZsN does not match physical
device's id for ddecimalnumber, device may have been replaced.
```

To fix device IDs that report this error, run the `cldevice repair` command for each affected device.

- 1 **Stop all I/O to the storage arrays you are upgrading.**
- 2 **Apply the controller, disk drive, and loop-card firmware patches by using the arrays' GUI tools.**
For specific instructions, see your storage array's documentation.
- 3 **Confirm that all storage arrays that you upgraded are visible to all nodes.**
`# luxadm probe`
- 4 **Restart all I/O to the storage arrays.**
You stopped I/O to these storage arrays in [Step 1](#).

▼ How to Remove a Storage Array

Use this procedure to permanently remove a storage array from a running cluster.



Caution – During this procedure, you lose access to the data that resides on the storage array that you are removing. Back up the data before you proceed.

- 1 **If you are using Oracle Solaris Cluster Geographic Edition, you might need to back up all database tables, data services, and volumes that are associated with each partner group that is affected.**
- 2 **Remove references to the volumes that reside on the storage array that you are removing. For instructions, see [“How to Remove a Volume From a Device Group \(Veritas Volume Manager\)” in Oracle Solaris Cluster System Administration Guide](#).**
For more information, see your Solaris Volume Manager or Veritas Volume Manager documentation.
- 3 **If you have a Fibre Channel array, disconnect the cables that connected Node N to the FC switches in your storage array.**

- 4 On all nodes, remove the obsolete Oracle Solaris links and device IDs.

```
# devfsadm -C  
# cldevice clear
```
- 5 Repeat [Step 3](#) and [Step 4](#) for each node that is connected to the storage array.

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