Sun Cluster 3.0 5/02 Supplement

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Preface

The *Sun Cluster 3.0 5/02 Supplement* documents new features and changes to Sun™ Cluster 3.0 software since the Sun Cluster 3.0 12/01 release. This document is a supplement to the Sun Cluster 3.0 12/01 documentation set.

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

The instructions in this document assume knowledge of the Solaris™ operating environment and expertise with the volume manager software used with Sun Cluster software.

Using UNIX Commands

This document contains information on commands used to install, configure, or upgrade a Sun Cluster configuration. This document might not contain complete information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

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

- AnswerBook2™ online documentation for the Solaris software environment
- Other software documentation that you received with your system
- Solaris operating environment man pages

Typographic Conventions

Typeface or Symbol	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, contrasted with on-screen computer output	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type `rm` *filename*.

Shell Prompts

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

Related Documentation

Application	Title	Part Number
Software Installation	*Sun Cluster 3.0 12/01 Software Installation Guide*	816-2022
Hardware	*Sun Cluster 3.0 12/01 Hardware Guide*	816-2023
Data Services	*Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*	816-2024
API Development	*Sun Cluster 3.0 12/01 Data Services Developer's Guide*	816-2025
Administration	*Sun Cluster 3.0 12/01 System Administration Guide*	816-2026
Concepts	*Sun Cluster 3.0 12/01 Concepts*	816-2027
Error Messages	*Sun Cluster 3.0 5/02 Error Messages Guide*	816-3379
Release Notes	*Sun Cluster 3.0 5/02 Release Notes*	816-3378

Accessing Sun Documentation Online

A broad selection of Sun system documentation is located at the following URL.

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

A complete set of Solaris documentation and many other titles are located at the following URL.

`http://docs.sun.com`

Getting Help

If you have problems installing or using Sun 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, Solaris 8)
- The release number of Sun Cluster (for example, Sun Cluster 3.0)

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

Command	Function
`prtconf -v`	Displays the size of the system memory and reports information about peripheral devices
`psrinfo -v`	Displays information about processors
`showrev -p`	Reports which patches are installed
`prtdiag -v`	Displays system diagnostic information
`/usr/cluster/bin/scinstall -pv`	Displays Sun Cluster release and package version information

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

CHAPTER 1

What's New at a Glance

The *Sun Cluster 3.0 5/02 Supplement* highlights new information that has been added to the Sun Cluster 3.0 documentation since the Sun Cluster 3.0 12/01 update release.

The *Sun Cluster 3.0 5/02 Supplement* covers the following topics:

- "Concepts" on page 2
- "Hardware" on page 3
- "Installation" on page 4
- "Data Services" on page 6
- "System Administration" on page 8
- "Data Services Development" on page 10

Concepts

This section provides new conceptual information for the Sun Cluster 3.0 5/02 update release.

TABLE 1-1 New Conceptual Information

Location	Description	Release Date
"Key Concepts – Hardware Service Providers" on page 12		
Appendix A	Support for campus clustering	5/02
"Cluster Administration and Application Development" on page 13		
"HAStoragePlus Resource Type (5/02)" on page 13	Description of new resource type, HAStoragePlus	5/02
"The Syncdir Mount Option (5/02)" on page 13	Statement that VxFS has no equivalent to `syncdir`	5/02
"Resources, Resource Groups, and Resource Types (5/02)" on page 14	Description of HAStorage and HAStoragePlus resource types	5/02

Hardware

This section provides new hardware information for the Sun Cluster 3.0 5/02 update release.

TABLE 1-2 New Hardware Information

Location	Description	Release Date
"Sun Cluster 3.0 12/01 Hardware Guide New Information and Corrections" on page 17		
"Dynamic Reconfiguration Operations For Sun Cluster Nodes (5/02)" on page 17	Procedure amendment for replacing host adapters in a DR-enabled server.	2/02
"Sun Netra st D1000 Documentation Coverage (5/02)" on page 18	Documentation support statement.	1/02
"Sun StorEdge T3/T3+ Partner-Group Configuration Quorum Restriction Removed (5/02)" on page 19	Quorum device support statement for Sun StorEdge™ T3/T3+ arrays in a partner-group configuration.	1/02
"How To Upgrade a StorEdge T3 Controller to a StorEdge T3+ Controller (5/02)" on page 19	Correction and procedure for upgrading controllers in Sun StorEdge T3/T3+ arrays in a single-controller configuration.	1/02
"Installing and Maintaining a Sun StorEdge 9910 or StorEdge 9960 Array" on page 187	Hardware procedures to support the Sun StorEdge 9910/9960 array in a cluster environment.	1/02
"Installing and Maintaining Sun StorEdge A1000 or Netra st A1000 Arrays" on page 201	Hardware procedures to support the Sun StorEdge A1000 or Netra™ st A1000 array in a cluster environment.	2/02
"Installing and Maintaining a Sun StorEdge 3900 or 6900 Series System" on page 237	Hardware procedures to support the Sun StorEdge 3900 or 6900 Series systems in a cluster environment.	1/02

Installation

This section provides new installation information for the Sun Cluster 3.0 5/02 update release. For new information about data service installation, see "Data Services" on page 6.

TABLE 1-3 New Installation Information (Sheet 1 of 2)

Location	Description	Release Date
"Planning the Solaris Operating Environment" on page 22		
"System Disk Partitions (5/02)" on page 22	New partition size for Solaris Volume Manager	
"Planning the Global Devices and Cluster File Systems" on page 23		
"Mount Information for Cluster File Systems (5/02)" on page 23	New VxFS mount requirement	5/02
"Guidelines for Solstice DiskSuite Software (5/02)" on page 23	Correction to maximum number of metadevice names per diskset and maximum number of disksets per cluster	5/02
"Installing the Software" on page 24		
"How to Install Cluster Control Panel Software on the Administrative Console (5/02)" on page 24	New CD-ROM path	5/02
"How to Install Solaris Software (5/02)" on page 24	• New CD-ROM path • New step to install Apache software packages to support SunPlex™ Manager installation • New partition size for Solaris Volume Manager	5/02
"How to Install Sun Cluster Software on the First Cluster Node (scinstall) (5/02)" on page 30	• New CD-ROM path • New step to verify that Apache software packages are installed to support SunPlex Manager installation	5/02
"How to Install Sun Cluster Software on Additional Cluster Nodes (scinstall) (5/02)" on page 31	• New CD-ROM path • New step to verify that Apache software packages are installed to support SunPlex Manager installation	5/02
"Using SunPlex Manager to Install Sun Cluster Software (5/02)" on page 31	• New requirements and functionality for Solaris 9 • New SunPlex Manager names for default metasets	5/02

TABLE 1-3 New Installation Information (Sheet 2 of 2)

Location	Description	Release Date
"How to Install SunPlex Manager Software (5/02)" on page 32	New Solaris 9 CD-ROM path	5/02
"How to Install Solaris and Sun Cluster Software (JumpStart) (5/02)" on page 32	• New CD-ROM path • New step to install Apache software packages to support SunPlex Manager installation	5/02
"How to Set Up the Root Environment (5/02)" on page 47	New VxVM MANPATH	5/02
"How to Uninstall Sun Cluster Software To Correct Installation Problems (5/02)" on page 48	New procedure to uninstall Sun Cluster software	5/02
"Configuring the Cluster" on page 50		
"How to Add Cluster File Systems (5/02)" on page 50	• New step to correct the stack size setting after VxFS installation • New instruction to mount VxFS cluster file systems	5/02
"How to Update Network Time Protocol (NTP) (5/02)" on page 55	Procedure revised to reflect new name and functionality changes in Sun Cluster-created NTP configuration file	5/02
"How to Start Sun Management Center (5/02)" on page 57	New step to ensure that the `scsymon_srv` daemon is running	5/02
"Upgrading From Sun Cluster 2.2 to Sun Cluster 3.0 Update 2 Software" on page 58		
"How to Upgrade Cluster Software Packages (5/02)" on page 58	New CD-ROM path	5/02
"How to Finish Upgrading Cluster Software (5/02)" on page 58	New CD-ROM path	5/02
"Installing and Configuring Solstice DiskSuite Software" on page 59		
"How to Set the Number of Metadevice Names and Disksets (5/02)" on page 59	Correction to the maximum number of metadevice names per diskset	5/02
"How to Create a Diskset (5/02)" on page 60	New steps to support more than three disksets in a cluster	5/02
"Installing and Configuring VxVM Software" on page 64		
"How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk (5/02)" on page 64	Change to the steps for setting the `vxio` major number	5/02
"How to Install VERITAS Volume Manager Software Only (5/02)" on page 68	Change to the steps for setting the `vxio` major number	5/02

Data Services

This section provides new data service information for the Sun Cluster 3.0 5/02 update release. For new information about Sun Cluster framework installation, see "Installation" on page 4.

TABLE 1-4 New Data Services Information (Sheet 1 of 2)

Location	Description	Release Date
"Installing and Configuring Sun Cluster HA for SAP" on page 74	• Updates to procedures that support SAP as a scalable data service • Updates to procedures to set up a lock file	5/02
"Synchronizing the Startups Between Resource Groups and Disk Device Groups" on page 74	Update to information to include the HAStorage and HAStoragePlus resource types	5/02
"Enabling Highly Available Local File Systems" on page 75		
"How to Set Up HAStoragePlus Resource Type (5/02)" on page 75	New procedure to add the HAStoragePlus resource type	5/02
"Registering and Configuring Sun Cluster HA for Oracle" on page 78		
"How to Register and Configure Sun Cluster HA for Oracle (5/02)" on page 78	Update to procedure to include the HAStoragePlus resource type	5/02
"Registering and Configuring Sun Cluster HA for Sybase ASE" on page 85		
"How to Register and Configure Sun Cluster HA for Sybase ASE (5/02)" on page 85	Update to procedure to include the HAStoragePlus resource type	5/02
"Configuration Guidelines for Sun Cluster Data Services" on page 90		
"Determining the Location of the Application Binaries (5/02)" on page 90	Update to information to include the HAStoragePlus resource type	5/02
"Planning the Cluster File System Configuration (5/02)" on page 90	Update to information to include the HAStoragePlus resource type	5/02
"Relationship Between Resource Groups and Disk Device Groups" on page 91		
"HAStorage and HAStoragePlus Resource Types (5/02)" on page 91	Update to information to include the HAStoragePlus resource type	5/02
"Recommendations (5/02)" on page 91	Update to information to include the HAStoragePlus resource type	5/02

TABLE 1-4 New Data Services Information (Sheet 2 of 2)

Location	Description	Release Date
"Freeing Node Resources by Off-Loading Non-Critical Resource Groups" on page 93		
"How to Set Up an RGOffload Resource (5/02)" on page 93	New procedure to add the RGOffload resource type	5/02
"Configuring RGOffload Extension Properties (5/02)" on page 96	New procedure to configure RGOffload extension properties	5/02
"Fault Monitor (5/02)" on page 98	New overview	5/02
"Installing and Configuring iPlanet Directory Server" on page 99		
"How to Install iPlanet Directory Server for Solaris 9 (5/02)" on page 99	New procedure to install iPlanet™ Directory Server for Solaris 9	5/02
"Installing and Configuring an iPlanet Web Server" on page 101		
"How to Configure an iPlanet Web Server (5/02)" on page 101	Correction to procedure for configuring iPlanet Web Server	5/02
"Resource Group Properties" on page 104	New new resource group property, `auto_start_on_new_cluster`	5/02

System Administration

This section provides new system administration information for the Sun Cluster 3.0 5/02 update release.

TABLE 1-5 New System Administration Information (Sheet 1 of 2)

Location	Description	Release Date
"Administering Disk Device Groups" on page 106		
"VERITAS Volume Manager Administration Considerations (5/02)" on page 106	Added new guideline for VxVM	5/02
"How to Remove a Node From All Disk Device Groups (5/02)" on page 106	New procedure	5/02
"How to Remove a Node From a Disk Device Group (Solstice DiskSuite) (5/02)" on page 108	Different command used to determine membership in disk device groups, removed `-f` option of `metaset` command	5/02
"How to Remove a Node From a Disk Device Group (VERITAS Volume Manager) (5/02)" on page 110	Different command used to determine membership in disk device groups	5/02
"How to Remove a Node From a Raw Disk Device Group (5/02)" on page 112	New procedure	5/02
"How to Create More Than Three Disksets in a Cluster (5/02)" on page 114	New procedure	5/02
"Administering Cluster File Systems Overview" on page 116		
"Guidelines to Support VxFS (5/02)" on page 116	Added guidelines for support of VxFS with Sun Cluster	5/02
"How to Add a Cluster File System (5/02)" on page 117	Added a note regarding use of the `newfs`(1M) command	5/02

TABLE 1-5 New System Administration Information (Sheet 2 of 2)

Location	Description	Release Date
"Adding and Removing a Cluster Node" on page 118		
Task Map: Removing a Cluster Node (5/02)	Revised Task Map for removing a cluster node	5/02
"How to Remove a Node From the Cluster Software Configuration (5/02)" on page 119	• Moved instructions to remove a node from a raw disk device group into a separate procedure (see "How to Remove a Node From a Raw Disk Device Group (5/02)" on page 112) • New option to uninstall Sun Cluster software after a node is removed from the cluster (see "How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120)	5/02
"How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120	New procedure	5/02

Data Services Development

This section provides new data services development information for the Sun Cluster 3.0 5/02 update release.

TABLE 1-6 New Data Services Development Information

Location	Description	Release Date
"Data Services Development Library (DSDL)" on page 126		
"Enabling Highly Available Local File Systems (5/02)" on page 126	Update to information to include the HAStoragePlus resource type	5/02
"Designing Resource Types" on page 127		
"The VALIDATE Method (5/02)" on page 127	Update to information to include the HAStoragePlus resource type	5/02
"DSDL Reference" on page 128		
"General Purpose Functions (5/02)" on page 128	New function for `SUNW.HAStoragePlus` resources	5/02
"Standard Properties" on page 129		
"General Purpose Functions (5/02)" on page 129	New auto-start resource group property	5/02
"Generic Data Service" on page 269	Procedures to support the generic data service (GDS)	5/02

CHAPTER 2

Concepts

This chapter provides new conceptual information that has been added to the Sun Cluster 3.0 5/02 update release. This information supplements *Sun Cluster 3.0 12/01 Concepts*.

This chapter contains new information for the following topics.

- "Key Concepts – Hardware Service Providers" on page 12
- "Cluster Administration and Application Development" on page 13

Key Concepts – Hardware Service Providers

The following information applies to this update release and all subsequent updates.

Campus Clustering with Sun Cluster 3.0 Software - Concepts (5/02)

This feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software. See Appendix A.

Cluster Administration and Application Development

The following information applies to this update release and all subsequent updates.

HAStoragePlus Resource Type (5/02)

This feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The HAStoragePlus resource type is designed to make non-global file system configurations such as UFS and VxFS highly available. Use HAStoragePlus to integrate your local file system into the Sun Cluster environment and make the file system highly available. HAStoragePlus provides additional file system capabilities such as checks, mounts, and forced unmounts that enable Sun Cluster to fail over local file systems. In order to fail over, the local file system must reside on global disk groups with affinity switchovers enabled.

See the individual data service chapters or "Enabling Highly Available Local File Systems" on page 75 for information on how to use the HAStoragePlus resource type.

You can also use HAStoragePlus to synchronize the startup of resources and disk device groups upon which the resources depend. For more information, see "Resources, Resource Groups, and Resource Types (5/02)" on page 14.

The Syncdir Mount Option (5/02)

This information was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

VxFS does not have a mount-option equivalent to the `syncdir` mount option for UFS. VxFS behavior is the same as for UFS when the `syncdir` mount option is not specified.

Resources, Resource Groups, and Resource Types (5/02)

Data services utilize several types of *resources*: applications such as Apache Web Server or iPlanet Web Server utilize network addresses (logical hostnames and shared addresses) upon which the applications depend. Application and network resources form a basic unit that is managed by the RGM.

Data services are resource types. For example, Sun Cluster HA for Oracle is the resource type `SUNW.oracle-server` and Sun Cluster HA for Apache is the resource type `SUNW.apache`.

A resource is an instantiation of a *resource type* that is defined cluster wide. There are several resource types defined.

Network resources are either `SUNW.LogicalHostname` or `SUNW.SharedAddress` resource types. These two resource types are pre-registered by the Sun Cluster software.

The HAStorage and HAStoragePlus resource types are used to synchronize the startup of resources and disk device groups upon which the resources depend. It ensures that before a data service starts, the paths to cluster file system mount points, global devices, and device group names are available. For more information, see "Synchronizing the Startups Between Resource Groups and Disk Device Groups" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*. (The HAStoragePlus resource type became available in Sun Cluster 3.0 5/02 and added another feature, enabling local file systems to be highly available. For more information on this feature, see "Enabling Highly Available Local File Systems" on page 75.)

RGM-managed resources are placed into groups, called *resource groups*, so that they can be managed as a unit. A resource group is migrated as a unit if a failover or switchover is initiated on the resource group.

Note – When you bring a resource group containing application resources online, the application is started. The data service start method waits until the application is up and running before exiting successfully. The determination of when the application is up and running is accomplished the same way the data service fault monitor determines that a data service is serving clients. Refer to the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for more information on this process.

CHAPTER 3

Hardware

This chapter provides new hardware information that has been added to the Sun Cluster 3.0 5/02 update release. This information supplements the *Sun Cluster 3.0 12/01 Hardware Guide*.

This chapter contains new information for the following topics.

- "Installing and Maintaining a Sun StorEdge 9910 or StorEdge 9960 Array" on page 16
- "Installing and Maintaining a Sun StorEdge A1000 and Netra st A1000 Arrays" on page 16
- "Installing and Maintaining a Sun StorEdge 3900 or 6900 Series System" on page 16
- "Sun Cluster 3.0 12/01 Hardware Guide New Information and Corrections" on page 17

Installing and Maintaining a Sun StorEdge 9910 or StorEdge 9960 Array

Support for this product was added to the Sun Cluster 3.0 12/01 update release and applies to the Sun Cluster 3.0 5/02 update release and all subsequent updates to Sun Cluster 3.0 software. See Appendix C.

Installing and Maintaining a Sun StorEdge A1000 and Netra st A1000 Arrays

Support for these products was added to the Sun Cluster 3.0 12/01 update release and applies to the Sun Cluster 3.0 5/02 update release and all subsequent updates to Sun Cluster 3.0 software. See Appendix D.

Installing and Maintaining a Sun StorEdge 3900 or 6900 Series System

Support for these products was added to the Sun Cluster 3.0 12/01 update release and applies to the Sun Cluster 3.0 5/02 update release and all subsequent updates to Sun Cluster 3.0 software. See Appendix E.

Sun Cluster 3.0 12/01 Hardware Guide New Information and Corrections

The following sections describe new information and corrections to errors or omissions in the *Sun Cluster 3.0 12/01 Hardware Guide*.

Dynamic Reconfiguration Operations For Sun Cluster Nodes (5/02)

The Sun Cluster 3.0 5/02 release supports Solaris 8 dynamic reconfiguration (DR) operations on qualified servers. The current *Sun Cluster 3.0 12/01 Hardware Guide* does not specifically consider scenarios in which the cluster nodes have been enabled with the DR feature.

In the *Sun Cluster 3.0 12/01 Hardware Guide*, some procedures require that the user add or remove host adapters or public network adapters in a cluster node. The storage arrays in the *Sun Cluster 3.0 12/01 Hardware Guide* that are currently qualified for use with the Solaris 8 DR feature are listed here.

- Sun StorEdge A5x00
- Sun StorEdge A3500FC
- Sun StorEdge T3 (single-controller configuration)
- Sun StorEdge 99x0 (direct-attach configuration)

Note – Review the documentation for the Solaris 8 DR feature on your hardware platform *before* using the DR feature with Sun Cluster software. All of the requirements, procedures, and restrictions that are documented for the Solaris 8 DR feature also apply to Sun Cluster 3.0 12/01 DR support (except for the operating environment quiescence operation).

Documentation for DR on currently qualified server platforms are listed here.

- *Sun Enterprise 10000 Dynamic Reconfiguration User Guide*
- *Sun Enterprise 10000 Dynamic Reconfiguration Reference Manual*
- *Sun Fire 6800, 4810, 4800, and 3800 Systems Dynamic Reconfiguration User Guide*
- *Sun Fire 6800, 4810, 4800, and 3800 Systems Dynamic Reconfiguration Release Notes*

DR Operations in a Cluster With DR-Enabled Servers

Some procedures in the current *Sun Cluster 3.0 12/01 Hardware Guide* instruct the user to shut down and power off a cluster node before adding, removing, or replacing a host adapter or a public network adapter (PNA).

However, if the node is a server that is enabled with the DR feature, the user does *not* have to power off the node before adding, removing, or replacing the host adapter or PNA. Instead, do the following:

1. **Follow the procedure steps in the Hardware Guide, including any steps for disabling and removing the host adapter or PNA from the active cluster interconnect.**

   See the *Sun Cluster 3.0 12/01 System Administration Guide* for instructions on removing cluster host adapters (transport adapters) or PNAs from the cluster configuration.

2. **Skip any step that instructs you to power off the node, where the purpose of the power-off is to add, remove, or replace a host adapter or PNA.**

3. **Perform the DR operation (add, remove, or replace) on the host adapter or PNA.**

4. **Continue with the next step of the procedure in the Hardware Guide.**

   For conceptual information about Sun Cluster 3.0 12/01 support of the DR feature, see the *Sun Cluster 3.0 12/01 Concepts* document.

Sun Netra st D1000 Documentation Coverage (5/02)

The Netra st D1000 has been qualified for use with Sun Cluster 3.0, but maintenance procedures do not yet exist in the *Sun Cluster 3.0 12/01 Hardware Guide* specifically for the Netra st D1000. However, you can use the existing *Sun Cluster 3.0 12/01 Hardware Guide* procedures for the StorEdge D1000 to maintain a Netra st D1000 in a cluster environment. Substitute the following document references in place of the StorEdge D1000 document references if you are maintaining a Netra st D1000.

- *Netra st A1000 and Netra st D1000 Installation and Maintenance Manual* (805-7147)
- *Netra st A1000 and Netra st D1000 Product Notes* (805-7148)

Sun StorEdge T3/T3+ Partner-Group Configuration Quorum Restriction Removed (5/02)

When the *Sun Cluster 3.0 12/01 Hardware Guide* was published, it noted a restriction against using Sun StorEdge T3/T3+ arrays as quorum devices, when the arrays are used in a partner-group configuration.

That restriction has since been removed. That is, you **can** use Sun StorEdge T3/T3+ arrays as quorum devices, whether the arrays are used in a partner-group configuration or a single-controller configuration.

Sun StorEdge T3/T3+ Single-Controller Configuration (5/02)

The *Sun Cluster 3.0 12/01 Hardware Guide* chapter "Installing and Maintaining a Sun StorEdge T3 or T3+ Array Single-Controller Configuration" incorrectly indicates that the procedure for upgrading a Sun StorEdge T3 array controller to a Sun StorEdge T3+ array controller does not require any cluster-specific steps. The correct procedure should be as follows.

▼ How To Upgrade a StorEdge T3 Controller to a StorEdge T3+ Controller (5/02)

Caution – Perform this procedure on one array at a time. This procedure requires that you take the array in which you are upgrading the controller offline. If you take more than one array offline, your cluster will lose access to data, if the arrays are submirrors of each other.

1. **On one node attached to the StorEdge T3 array in which you are upgrading the controller, detach that array's submirrors.**

   For more information, see your Solstice DiskSuite™ or VERITAS Volume Manager documentation.

2. **Upgrade the StorEdge T3 array controller to a StorEdge T3+ array controller.**

   See the *Sun StorEdge T3 Array Controller Upgrade Manual* for instructions.

3. **Reattach the submirrors to resynchronize them.**

   For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

CHAPTER 4

Installation

This chapter provides new installation information that has been added to the Sun Cluster 3.0 5/02 update release. This information supplements the *Sun Cluster 3.0 12/01 Software Installation Guide*. For new data services installation information, see "Data Services" on page 73.

This chapter contains new information for the following topics.

- "Planning the Solaris Operating Environment" on page 22
- "Planning the Global Devices and Cluster File Systems" on page 23
- "Installing the Software" on page 24
- "Configuring the Cluster" on page 50
- "Upgrading From Sun Cluster 2.2 to Sun Cluster 3.0 Update 2 Software" on page 58
- "Installing and Configuring Solstice DiskSuite Software" on page 59
- "Installing and Configuring VxVM Software" on page 64

Planning the Solaris Operating Environment

The following information applies to this update release and all subsequent updates.

System Disk Partitions (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

For Solaris 9, create a 20-Mbyte partition for volume manager use on a slice at the end of the disk (slice 7) to accommodate use by Solaris Volume Manager software.

Planning the Global Devices and Cluster File Systems

The following information applies to this update release and all subsequent updates.

Mount Information for Cluster File Systems (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

- **VxFS mount requirement –** Globally mount and unmount a VxFS file system from the primary node (the node that masters the disk on which the VxFS file system resides) to ensure that the operation succeeds. A VxFS file system mount or unmount operation that is performed from a secondary node might fail.

Guidelines for Solstice DiskSuite Software (5/02)

The following corrections were introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

- `/kernel/drv/md.conf` **settings –**
  - `nmd` – The maximum number of metadevices allowed per Solstice DiskSuite diskset is 1024. The maximum number of metadevices allowed per Solaris Volume Manager diskset is 8192.
  - `md_nsets` – The maximum number of disksets allowed per cluster is 31, not including the one for private disk management.

Installing the Software

The following information applies to this update release and all subsequent updates.

▼ How to Install Cluster Control Panel Software on the Administrative Console (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

CD-ROM path – Change all occurrences of the CD-ROM path to `/cdrom/suncluster_3_0_u3`. This applies to the Sun Cluster 3.0 5/02 CD-ROM for both Solaris 8 and Solaris 9.

▼ How to Install Solaris Software (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

If you do not use the `scinstall`(1M) custom JumpStart™ installation method to install software, perform this task to install the Solaris operating environment on each node in the cluster.

Note – If your nodes are already installed with the Solaris operating environment, you must still reinstall the Solaris software as described in this procedure to ensure successful installation of Sun Cluster software.

---

1. **Ensure that the hardware setup is complete and connections are verified before you install Solaris software.**

   See the *Sun Cluster 3.0 12/01 Hardware Guide* and your server and storage device documentation for details.

2. **Ensure that your cluster configuration planning is complete.**

   See "How to Prepare for Cluster Software Installation" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for requirements and guidelines.

3. **Have available your completed "Local File System Layout Worksheet" from the** *Sun Cluster 3.0 Release Notes***.**

4. **Are you using a naming service?**
   - If no, go to Step 5. You will set up local hostname information in Step 16.
   - If yes, add address-to-name mappings for all public hostnames and logical addresses to any naming services (such as NIS or DNS) used by clients for access to cluster services. See "IP Addresses" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for planning guidelines. See your Solaris system administrator documentation for information about using Solaris naming services.

5. **If you are using a cluster administrative console, display a console screen for each node in the cluster.**

   If Cluster Control Panel (CCP) is installed and configured on your administrative console, you can use the `cconsole`(1M) utility to display the individual console screens. CCP also opens a master window from which you can send your input to all individual console windows at the same time.

   If you do not use CCP, connect to the consoles of each node individually.

Tip – To save time, you can install the Solaris operating environment on each node at the same time.

---

6. **On each node of the cluster, determine whether the `local-mac-address` variable is correctly set to `false`.**

   Sun Cluster software does not support the `local-mac-address` variable set to `true`.

   a. Display the value of the `local-mac-address` variable.

   - If the node is preinstalled with Solaris software, as superuser run the following command.

```
# /usr/sbin/eeprom local-mac-address?
```

   - If the node is not yet installed with Solaris software, run the following command from the `ok` prompt.

```
ok printenv local-mac-address?
```

   b. Does the command return `local-mac-address?=false` on each node?

   - If yes, the variable settings are correct. Go to Step 7.

- If no, change the variable setting on any node that is not set to `false`.
  - If the node is preinstalled with Solaris software, as superuser run the following command.

```
# /usr/sbin/eeprom local-mac-address?=false
```

  - If the node is not yet installed with Solaris software, run the following command from the `ok` prompt.

```
ok setenv local-mac-address? false
```

c. Repeat Step a to verify any changes you made in Step b.

The new setting becomes effective at the next system reboot.

7. Install the Solaris operating environment as instructed in the Solaris installation documentation.

Note – You must install all nodes in a cluster with the same version of the Solaris operating environment.

You can use any method normally used to install the Solaris operating environment to install the software on new nodes to be installed into a clustered environment. These methods include the Solaris interactive installation program, Solaris JumpStart, and Solaris Web Start.

During Solaris software installation, do the following.

a. Install at least the End User System Support software group.

- If you intend to use the Remote Shared Memory Application Programming Interface (RSMAPI) or use PCI-SCI adapters for the interconnect transport, the required RSMAPI software packages (`SUNWrsm`, `SUNWrsmx`, `SUNWrsmo`, and `SUNWrsmox`) are included with the higher-level software groups. If you install the End User System Support software group, you must install the `SUNWrsm*` packages manually from the Solaris CD-ROM at Step 12.
- If you intend to use SunPlex Manager, the required Apache software packages (`SUNWapchr` and `SUNWapchu`) are included with the higher-level software groups. If you install the End User System Support software group, you must install the `SUNWapch*` packages manually from the Solaris CD-ROM at Step 13.

  See "Solaris Software Group Considerations" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for information about additional Solaris software requirements.

b. Choose Manual Layout to set up the file systems.

- Create a file system of at least 100 MBytes for use by the global-devices subsystem. If you intend to use SunPlex Manager to install Sun Cluster software, you must create the file system with a mount point of `/globaldevices`. This mount point is the default used by `scinstall`.

Note – A global-devices file system is required for Sun Cluster software installation to succeed.

- If you intend to use SunPlex Manager to install Solstice DiskSuite software (Solaris 8), configure Solaris Volume Manager software (Solaris 9), or install Sun Cluster HA for NFS or Sun Cluster HA for Apache in addition to installing Sun Cluster software, create a file system on slice 7 with a mount point of `/sds`. For Solstice DiskSuite, make the slice at least 10 Mbytes. For Solaris Volume Manager, make the slice at least 20 Mbytes. Otherwise, create any file system partitions needed to support your volume manager software as described in "System Disk Partitions" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

c. Choose auto reboot.

Note – Solaris software is installed and the node reboots before the next prompts display.

---

d. For ease of administration, set the same root password on each node.

e. Answer `no` when asked whether to enable automatic power-saving shutdown.

You must disable automatic shutdown in Sun Cluster configurations. See the `pmconfig`(1M) and `power.conf`(4) man pages for more information.

Note – The Solaris interface groups feature is disabled by default during Solaris software installation. Interface groups are not supported in a Sun Cluster configuration and should not be enabled. See the `ifconfig`(1M) man page for more information about Solaris interface groups.

---

8. Are you installing a new node to an existing cluster?

- If yes, go to Step 9.
- If no, skip to Step 12.

9. **Have you added the new node to the cluster's authorized-node list?**
   - If yes, go to Step 10.
   - If no, run `scsetup`(1M) from another, active cluster node to add the new node's name to the list of authorized cluster nodes. See "How to Add a Cluster Node to the Authorized Node List" in the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures.

10. **Create a mount point on the new node for each cluster file system in the cluster.**

    a. **From another, active node of the cluster, display the names of all cluster file systems.**

    ```
    % mount | grep global | egrep -v node@ | awk '{print $1}'
    ```

    b. **On the new node, create a mount point for each cluster file system in the cluster.**

    ```
    % mkdir -p mountpoint
    ```

    For example, if the mount command returned the file system name `/global/dg-schost-1`, run `mkdir -p /global/dg-schost-1` on the new node you are adding to the cluster.

11. **Is VERITAS Volume Manager (VxVM) installed on any nodes that are already in the cluster?**
    - If yes, ensure that the same `vxio` number is used on the VxVM-installed nodes and that the `vxio` number is available for use on each of the nodes that do not have VxVM installed.

    ```
    # grep vxio /etc/name_to_major
    vxio NNN
    ```

    If the `vxio` number is already in use on a node that does not have VxVM installed, free the number on that node by changing the `/etc/name_to_major` entry to use a different number.
    - If no, go to Step 12.

12. **Do you intend to use the Remote Shared Memory Application Programming Interface (RSMAPI) or use PCI-SCI adapters for the interconnect transport?**

    - If yes **and** you installed the End User System Support software group, install the `SUNWrsm*` packages from the Solaris CD-ROM.

```
# pkgadd -d . SUNWrsm SUNWrsmx SUNWrsmo SUNWrsmox
```

    - If no, or if you installed a higher-level software group, go to Step 13.

13. **Do you intend to use SunPlex Manager?**

    - If yes **and** you installed the End User System Support software group, install the `SUNWapch*` packages from the Solaris CD-ROM.

```
# pkgadd -d . SUNWapchr SUNWapchu
```

    - If no, or if you installed a higher-level software group, go to Step 14.

    Apache software packages must already be installed before SunPlex Manager is installed.

14. **Install any Solaris software patches.**

    See the *Sun Cluster 3.0 5/02 Release Notes* for the location of patches and installation instructions. If necessary, view the `/etc/release` file to see the exact version of Solaris software that is installed on a node.

15. **Install any hardware-related patches and download any needed firmware contained in the hardware patches.**

    See the *Sun Cluster 3.0 5/02 Release Notes* for the location of patches and installation instructions.

16. **Update the `/etc/inet/hosts` file on each node with all public hostnames and logical addresses for the cluster.**

    Perform this step regardless of whether you are using a naming service.

17. **Do you intend to use dynamic reconfiguration?**

Note – To use dynamic reconfiguration in your cluster configuration, the servers must be supported to use dynamic reconfiguration with Sun Cluster software.

- If yes, on each node add the following entry to the `/etc/system` file.

```
set kernel_cage_enable=1
```

  This entry becomes effective after the next system reboot. See the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures to perform dynamic reconfiguration tasks in a Sun Cluster configuration. See your server documentation for more information about dynamic reconfiguration.

- If no, go to Step 18.

18. **Install Sun Cluster software on your cluster nodes.**
    - To use SunPlex Manager, go to "Using SunPlex Manager to Install Sun Cluster Software" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.
    - To use `scinstall`, go to "How to Install Sun Cluster Software on the First Cluster Node (scinstall) (5/02)" on page 30.

▼ How to Install Sun Cluster Software on the First Cluster Node (`scinstall`) (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

After Step 1 – Perform the following step after Step 1 as the new Step 2. The original Step 2 becomes Step 3.

- **Do you intend to use SunPlex Manager?**
  - If yes, ensure that the Apache software packages are installed on the node. If you installed the Solaris End User System Support software group, install the `SUNWapch*` packages from the Solaris CD-ROM.

```
# pkgadd -d . SUNWapchr SUNWapchu
```

    The Apache software packages are automatically installed if you installed a higher-level Solaris software group.

  - If no, go to Step 3.

▼ How to Install Sun Cluster Software on Additional Cluster Nodes (`scinstall`) (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

After Step 2 – Perform the following step after Step 2 as the new Step 3. The original Step 3 becomes Step 4.

- **Do you intend to use SunPlex Manager?**
  - If yes, ensure that the Apache software packages are installed on the node. If you installed the Solaris End User System Support software group, install the `SUNWapch*` packages from the Solaris CD-ROM.

```
# pkgadd -d . SUNWapchr SUNWapchu
```

    The Apache software packages are automatically installed if you installed a higher-level Solaris software group.

  - If no, go to Step 4.

Using SunPlex Manager to Install Sun Cluster Software (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Solaris Volume Manager – For Solaris 9, Solaris Volume Manager software is already installed as part of Solaris software installation. You can use SunPlex Manager to configure up to three metasets and associated metadevices, and to create and mount cluster file systems for each.

To use SunPlex Manager to install the Sun Cluster HA for NFS data service or the Sun Cluster HA for Apache scalable data service, you must also use SunPlex Manager to configure Solaris Volume Manager mirrored disksets.

The `/sds` partition required by SunPlex Manager must be at least 20 Mbytes to support Solaris Volume Manager.

Metaset names – The names of two of the three metaset names that SunPlex Manager creates have been changed.

- The `stripe-1` metaset is now named `mirror-2`.
- The `concat-1` metaset is now named `mirror-3`.

The following table lists each metaset name and cluster file system mount point created by SunPlex Manager, depending on the number of shared disks connected to the node.

TABLE 4-1 Metasets Installed by SunPlex Manager

Shared Disks	Metaset Name	Cluster File System Mount Point	Purpose
First pair of shared disks	`mirror-1`	`/global/mirror-1`	Sun Cluster HA for NFS or Sun Cluster HA for Apache scalable data service, or both
Second pair of shared disks	`mirror-2`	`/global/mirror-2`	unused
Third pair of shared disks	`mirror-3`	`/global/mirror-3`	unused

▼ How to Install SunPlex Manager Software (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Step 3 – To install Apache software packages from the Solaris 9 Software CD-ROM, change to the `/cdrom/cdrom0/Solaris_9/Product` directory.

▼ How to Install Solaris and Sun Cluster Software (JumpStart) (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

This procedure describes how to set up and use the `scinstall`(1M) custom JumpStart installation method. This method installs both Solaris and Sun Cluster software on all cluster nodes in a single operation and establish the cluster. You can also use this procedure to add new nodes to an existing cluster.

1. **Ensure that the hardware setup is complete and connections are verified before you install Solaris software.**

   See the *Sun Cluster 3.0 12/01 Hardware Guide* and your server and storage device documentation for details on how to set up the hardware.

2. **Ensure that your cluster configuration planning is complete.**

   See "How to Prepare for Cluster Software Installation" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for requirements and guidelines.

3. **Have available the following information.**
   - The Ethernet address of each cluster node
   - The following completed configuration planning worksheets from the *Sun Cluster 3.0 5/02 Release Notes*.
     - "Local File System Layout Worksheet"
     - "Cluster and Node Names Worksheet"
     - "Cluster Interconnect Worksheet"

   See "Planning the Solaris Operating Environment" and "Planning the Sun Cluster Environment" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for planning guidelines.

4. **Are you using a naming service?**
   - If no, go to Step 5. You will set up the necessary hostname information in Step 31.
   - If yes, add address-to-name mappings for all public hostnames and logical addresses, as well as the IP address and hostname of the JumpStart server, to any naming services (such as NIS or DNS) used by clients for access to cluster services. See "IP Addresses" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for planning guidelines. See your Solaris system administrator documentation for information about using Solaris naming services.

5. **Are you installing a new node to an existing cluster?**
   - If yes, run `scsetup`(1M) from another, active cluster node to add the new node's name to the list of authorized cluster nodes. See "How to Add a Cluster Node to the Authorized Node List" in the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures.
   - If no, go to Step 6.

6. **As superuser, set up the JumpStart install server for Solaris operating environment installation.**

   See the `setup_install_server`(1M) and `add_install_client`(1M) man pages and the *Solaris Advanced Installation Guide* for instructions on how to set up a JumpStart install server.

   When you set up the install server, ensure that the following requirements are met.
   - The install server is on the same subnet as the cluster nodes, but is not itself a cluster node.
   - The install server installs the release of the Solaris operating environment required by the Sun Cluster software.
   - A custom JumpStart directory exists for JumpStart installation of Sun Cluster. This *jumpstart-dir* directory must contain a copy of the `check`(1M) utility and be NFS exported for reading by the JumpStart install server.
   - Each new cluster node is configured as a custom JumpStart install client that uses the custom JumpStart directory set up for Sun Cluster installation.

7. **Create a directory on the JumpStart install server to hold your copy of the Sun Cluster 3.0 5/02 CD-ROM, if one does not already exist.**

   In the following example, the `/export/suncluster` directory is created for this purpose.

```
# mkdir -m 755 /export/suncluster
```

8. **Copy the Sun Cluster CD-ROM to the JumpStart install server.**

   a. **Insert the Sun Cluster 3.0 5/02 CD-ROM into the CD-ROM drive on the JumpStart install server.**

      If the Volume Management daemon `vold`(1M) is running and configured to manage CD-ROM devices, it automatically mounts the CD-ROM on the `/cdrom/suncluster_3_0_u3` directory.

   b. **Change to the `/cdrom/suncluster_3_0_u3/SunCluster_3.0/Tools` directory.**

```
# cd /cdrom/suncluster_3_0_u3/SunCluster_3.0/Tools
```

   c. **Copy the CD-ROM to a new directory on the JumpStart install server.**

      The `scinstall` command creates the new installation directory as it copies the CD-ROM files. The installation directory name `/export/suncluster/sc30` is used here as an example.

```
# ./scinstall -a /export/suncluster/sc30
```

   d. **Eject the CD-ROM.**

```
# cd /
# eject cdrom
```

   e. **Ensure that the Sun Cluster 3.0 5/02 CD-ROM image on the JumpStart install server is NFS exported for reading by the JumpStart install server.**

      See the *NFS Administration Guide* and the `share`(1M) and `dfstab`(4) man pages for more information about automatic file sharing.

9. **Are you installing a new node to an existing cluster?**

   - If yes, go to Step 10.
   - If no, skip to Step 11.

10. Have you added the node to the cluster's authorized-node list?

- If yes, go to Step 11.
- If no, run `scsetup`(1M) from any existing cluster node to add the new node's name to the list of authorized cluster nodes. See "How to Add a Cluster Node to the Authorized Node List" in the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures.

11. From the JumpStart install server, start the `scinstall`(1M) utility.

The path `/export/suncluster/sc30` is used here as an example of the installation directory you created.

```
# cd /export/suncluster/sc30/SunCluster_3.0/Tools
# ./scinstall
```

Follow these guidelines to use the interactive `scinstall` utility.

- Interactive `scinstall` enables you to type ahead. Therefore, do not press Return more than once if the next menu screen does not appear immediately.
- Unless otherwise noted, you can press Control-D to return to either the start of a series of related questions or to the Main Menu. If you press Control-D to abort the session after Sun Cluster software is installed, `scinstall` asks you whether you want it to de-install those packages.
- Your session answers are stored as defaults for the next time you run this menu option. Default answers display between brackets ([ ]) at the end of the prompt.

12. **From the Main Menu, type 3 (Configure a cluster to be JumpStarted from this install server).**

    This option is used to configure customer JumpStart finish scripts. JumpStart uses these finish scripts to install the Sun Cluster software.

```
 *** Main Menu ***

    Please select from one of the following (*) options:

        1) Establish a new cluster using this machine as the first node
        2) Add this machine as a node in an established cluster
      * 3) Configure a cluster to be JumpStarted from this install server
        4) Add support for new data services to this cluster node
        5) Print release information for this cluster node

      * ?) Help with menu options
      * q) Quit

    Option:  3

 *** Custom JumpStart ***
...
    Do you want to continue (yes/no) [yes]?
```

Note – If option 3 does not have an asterisk in front, the option is disabled because JumpStart setup is not complete or has an error. Exit the `scinstall` utility, repeat Step 6 through Step 8 to correct JumpStart setup, then restart the `scinstall` utility.

---

13. **Specify the JumpStart directory name.**

```
 >>> Custom JumpStart Directory <<<
....
    What is your JumpStart directory name?  jumpstart-dir
```

14. **Specify the name of the cluster.**

```
 >>> Cluster Name <<<
...
    What is the name of the cluster you want to establish?  clustername
```

15. **Specify the names of all cluster nodes.**

```
 >>> Cluster Nodes <<<
...
    Please list the names of all cluster nodes planned for the initial
    cluster configuration. You must enter at least two nodes. List one
    node name per line. When finished, type Control-D:

    Node name:   node1
    Node name:   node2
    Node name (Ctrl-D to finish): <Control-D>

    This is the complete list of nodes:
...
    Is it correct (yes/no) [yes]?
```

16. **Specify whether to use data encryption standard (DES) authentication.**

    By default, Sun Cluster software permits a node to connect to the cluster only if the node is physically connected to the private interconnect and if the node name was specified in Step 15. However, the node actually communicates with the sponsoring node over the public network, since the private interconnect is not yet fully configured. DES authentication provides an additional level of security at installation time by enabling the sponsoring node to more reliably authenticate nodes that attempt to contact it to update the cluster configuration.

    If you choose to use DES authentication for additional security, you must configure all necessary encryption keys before any node can join the cluster. See the `keyserv`(1M) and `publickey`(4) man pages for details.

```
 >>> Authenticating Requests to Add Nodes <<<
...
    Do you need to use DES authentication (yes/no) [no]?
```

17. **Specify the private network address and netmask.**

```
 >>> Network Address for the Cluster Transport <<<
...
    Is it okay to accept the default network address (yes/no) [yes]?
    Is it okay to accept the default netmask (yes/no) [yes]?
```

Note – You cannot change the private network address after the cluster is successfully formed.

18. **Specify whether the cluster uses transport junctions.**

    - If this is a two-node cluster, specify whether you intend to use transport junctions.

```
 >>> Point-to-Point Cables <<<
 ...
    Does this two-node cluster use transport junctions (yes/no) [yes]?
```

Tip – You can specify that the cluster uses transport junctions, regardless of whether the nodes are directly connected to each other. If you specify that the cluster uses transport junctions, you can more easily add new nodes to the cluster in the future.

    - If this cluster has three or more nodes, you must use transport junctions. Press Return to continue to the next screen.

```
 >>> Point-to-Point Cables <<<
 ...
    Since this is not a two-node cluster, you will be asked to configure
    two transport junctions.

Hit ENTER to continue:
```

19. **Does this cluster use transport junctions?**

    - If yes, specify names for the transport junctions. You can use the default names `switch`*N* or create your own names.

```
 >>> Cluster Transport Junctions <<<
 ...
    What is the name of the first junction in the cluster [switch1]?
    What is the name of the second junction in the cluster [switch2]?
```

    - If no, go to Step 20.

20. **Specify the first cluster interconnect transport adapter of the first node.**

```
 >>> Cluster Transport Adapters and Cables <<<
...
 For node "node1",
    What is the name of the first cluster transport adapter?  adapter
```

21. **Specify the connection endpoint of the first adapter.**

    - If the cluster does not use transport junctions, specify the name of the adapter on the second node to which this adapter connects.

```
...
    Name of adapter on "node2" to which "adapter" is connected? adapter
```

    - If the cluster uses transport junctions, specify the name of the first transport junction and its port.

```
...
 For node "node1",
    Name of the junction to which "adapter" is connected? switch
...
 For node "node1",
    Use the default port name for the "adapter" connection (yes/no) [yes]?
```

Note – If your configuration uses SCI adapters, do not accept the default when you are prompted for the adapter connection (the port name). Instead, provide the port name (`0`, `1`, `2`, or `3`) found on the Dolphin switch itself, to which the node is *physically* cabled. The following example shows the prompts and responses for declining the default port name and specifying the Dolphin switch port name `0`.

```
...
    Use the default port name for the "adapter" connection (yes/no) [yes]?  no
    What is the name of the port you want to use?  0
```

22. **Specify the second cluster interconnect transport adapter of the first node.**

```
...
 For node "node1",
    What is the name of the second cluster transport adapter?  adapter
```

23. **Specify the connection endpoint of the second adapter.**

    - If the cluster does not use transport junctions, specify the name of the adapter on the second node to which this adapter connects.

```
...
    Name of adapter on "node2" to which "adapter" is connected? adapter
```

- If the cluster uses transport junctions, specify the name of the second transport junction and its port.

```
...
 For node "node1",
    Name of the junction to which "adapter" is connected? switch
...
 For node "node1",
    Use the default port name for the "adapter" connection (yes/no) [yes]?
```

Note – If your configuration uses SCI adapters, do not accept the default when you are prompted for the adapter connection (the port name). Instead, provide the port name (`0`, `1`, `2`, or `3`) found on the Dolphin switch itself, to which the node is *physically* cabled. The following example shows the prompts and responses for declining the default port name and specifying the Dolphin switch port name `0`.

```
...
    Use the default port name for the "adapter" connection (yes/no) [yes]?  no
    What is the name of the port you want to use?  0
```

24. **Does this cluster use transport junctions?**
    - If yes, repeat Step 20 through Step 23 for each additional cluster node.
    - If no, go to Step 25.

25. **Specify the global devices file system name for each cluster node.**

```
 >>> Global Devices File System <<<
...
    The default is to use /globaldevices.

 For node "node1",
    Is it okay to use this default (yes/no) [yes]?

 For node "node2",
    Is it okay to use this default (yes/no) [yes]?
```

26. Accept or decline the generated `scinstall` commands.

The `scinstall` command generated from your input is displayed for confirmation.

```
 >>> Confirmation <<<

    Your responses indicate the following options to scinstall:
------------------------------------------
 For node "node1",
      scinstall -c jumpstart-dir -h node1  \
...
    Are these the options you want to use (yes/no) [yes]?
------------------------------------------
 For node "node2",
      scinstall -c jumpstart-dir -h node2  \
...
    Are these the options you want to use (yes/no) [yes]?
------------------------------------------
    Do you want to continue with JumpStart set up (yes/no) [yes]?
```

If you do not accept the generated commands, the `scinstall` utility returns you to the Main Menu. From there you can rerun menu option `3` and provide different answers. Your previous answers display as the defaults.

27. If necessary, make adjustments to the default `class` file, or profile, created by `scinstall`.

The `scinstall` command creates the following `autoscinstall.class` default `class` file in the *jumpstart-dir*`/autoscinstall.d/3.0` directory.

```
install_type    initial_install
system_type     standalone
partitioning    explicit
filesys         rootdisk.s0 free /
filesys         rootdisk.s1 750 swap
filesys         rootdisk.s3 100  /globaldevices
filesys         rootdisk.s7 10
cluster         SUNWCuser       add
package         SUNWman         add
```

The default `class` file installs the End User System Support software group (`SUNWCuser`) of Solaris software. If your configuration has additional Solaris software requirements, change the `class` file accordingly. See "Solaris Software Group Considerations" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for more information.

You can change the profile in one of the following ways.

- Edit the `autoscinstall.class` file directly. These changes are applied to all nodes in all clusters that use this custom JumpStart directory.
- Update the `rules` file to point to other profiles, then run the `check` utility to validate the `rules` file.

As long as the Solaris operating environment install profile meets minimum Sun Cluster file system allocation requirements, there are no restrictions on other changes to the install profile. See "System Disk Partitions" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for partitioning guidelines and requirements to support Sun Cluster 3.0 software. For more information about JumpStart profiles, see the *Solaris 8 Advanced Installation Guide* or the Solaris 9Advanced Installation Guide.

28. Do you intend to use the Remote Shared Memory Application Programming Interface (RSMAPI) or use PCI-SCI adapters for the interconnect transport?

- If yes **and** you install the End User System Support software group, add the following entries to the default `class` file as described in Step 27.

```
package          SUNWrsm          add
package          SUNWrsmx         add
package          SUNWrsmo         add
package          SUNWrsmox        add
```

  In addition, you must create or modify a post-installation finish script at Step 33 to install the Sun Cluster packages to support the RSMAPI and PCI-SCI adapters.

  If you install a higher software group than End User System Support, the `SUNWrsm*` packages are installed with the Solaris software and do not need to be added to the `class` file.

- If no, go to Step 29.

29. Do you intend to use SunPlex Manager?

- If yes **and** you install the End User System Support software group, add the following entries to the default `class` file as described in Step 27.

```
package          SUNWapchr        add
package          SUNWapchu        add
```

  If you install a higher software group than End User System Support, the `SUNWrsm*` packages are installed with the Solaris software and do not need to be added to the `class` file.

- If no, go to Step 30.

30. **Set up Solaris patch directories.**

    a. **Create** *jumpstart-dir*`/autoscinstall.d/nodes/`*node*`/patches` **directories on the JumpStart install server.**

    Create one directory for each node in the cluster, where *node* is the name of a cluster node. Alternately, use this naming convention to create symbolic links to a shared patch directory.

```
# mkdir jumpstart-dir/autoscinstall.d/nodes/node/patches
```

    b. **Place copies of any Solaris patches into each of these directories.**

    Also place copies of any hardware-related patches that must be installed after Solaris software is installed into each of these directories.

31. **Set up files to contain the necessary hostname information locally on each node.**

    a. **On the JumpStart install server, create files named** *jumpstart-dir*`/autoscinstall.d/nodes/`*node*`/archive/etc/inet/hosts`**.**

    Create one file for each node, where *node* is the name of a cluster node. Alternately, use this naming convention to create symbolic links to a shared `hosts` file.

    b. **Add the following entries into each file.**

- IP address and hostname of the NFS server that holds a copy of the Sun Cluster CD-ROM image. This could be the JumpStart install server or another machine.
- IP address and hostname of each node in the cluster.

32. **Do you intend to use the Remote Shared Memory Application Programming Interface (RSMAPI) or use PCI-SCI adapters for the interconnect transport?**

- If yes, follow instructions in Step 33 to set up a post-installation finish script to install the following additional packages. Install the appropriate packages from the `/cdrom/suncluster_3_0_u3/SunCluster_3.0/Packages` directory of the Sun Cluster 3.0 5/02 CD-ROM in the order given in the following table.

TABLE 4-2 Sun Cluster 3.0 Packages to Support the RSMAPI and PCI-SCI Adapters

Feature	Additional Sun Cluster 3.0 Packages to Install
RSMAPI	`SUNWscrif`
PCI-SCI adapters	`SUNWsci SUNWscid SUNWscidx`

- If no, go to Step 33 if you intend to add your own post-installation finish script. Otherwise, skip to Step 34.

33. **(Optional) Add your own post-installation finish script.**

Note – If you intend to use the Remote Shared Memory Application Programming Interface (RSMAPI) or use PCI-SCI adapters for the interconnect transport, you must modify the finish script into install the Sun Cluster `SUNWscrif` software package. This package is not automatically installed by `scinstall`.

You can add your own finish script, which is run after the standard finish script installed by the `scinstall` command. See the *Solaris 8 Advanced Installation Guide* or the *Solaris 9 Advanced Installation Guide* for information about creating a JumpStart finish script.

a. **Name your finish script** `finish`**.**

b. **Copy your finish script to the** *jumpstart-dir*`/autoscinstall.d/nodes/`*node* **directory, one directory for each node in the cluster.**

   Alternately, use this naming convention to create symbolic links to a shared finish script.

34. **If you use an administrative console, display a console screen for each node in the cluster.**

    If `cconsole`(1M) is installed and configured on your administrative console, you can use it to display the individual console screens. Otherwise, you must connect to the consoles of each node individually.

35. **From the** `ok` **PROM prompt on the console of each node, type the** `boot net - install` **command to begin the network JumpStart installation of each node.**

```
ok boot net - install
```

Note – The dash (-) in the command must be surrounded by a space on each side.

Sun Cluster installation output is logged in the `/var/cluster/logs/install/scinstall.log.`*pid* file, where *pid* is the process ID number of the `scinstall` instance.

Note – Unless you have installed your own `/etc/inet/ntp.conf` file, the `scinstall` command installs a default `ntp.conf` file for you. Because the default file is shipped with references to eight nodes, the `xntpd`(1M) daemon might issue error messages regarding some of these references at boot time. You can safely ignore these messages. See "How to Update Network Time Protocol (NTP) (5/02)" on page 55 for information on how to suppress these messages under otherwise normal cluster conditions.

When the installation is successfully completed, each node is fully installed as a new cluster node.

Note – The Solaris interface groups feature is disabled by default during Solaris software installation. Interface groups are not supported in a Sun Cluster configuration and should not be reenabled. See the `ifconfig`(1M) man page for more information about Solaris interface groups.

36. Are you installing a new node to an existing cluster?

- If no, go to Step 37.
- If yes, create mount points on the new node for all existing cluster file systems.

a. From another, active node of the cluster, display the names of all cluster file systems.

```
% mount | grep global | egrep -v node@ | awk '{print $1}'
```

b. On the node you added to the cluster, create a mount point for each cluster file system in the cluster.

```
% mkdir -p mountpoint
```

For example, if a file system name returned by the mount command is `/global/dg-schost-1`, run `mkdir -p /global/dg-schost-1` on the node being added to the cluster.

Note – The mount points become active after you reboot the cluster in Step 39.

c. Is VERITAS Volume Manager (VxVM) installed on any nodes that are already in the cluster?

- If yes, ensure that the same `vxio` number is used on the VxVM-installed nodes and that the `vxio` number is available for use on each of the nodes that do not have VxVM installed.

```
# grep vxio /etc/name_to_major
vxio NNN
```

If the `vxio` number is already in use on a node that does not have VxVM installed, free the number on that node by changing the `/etc/name_to_major` entry to use a different number.

- If no, go to Step 37.

37. Install any Sun Cluster software patches.

See the *Sun Cluster 3.0 5/02 Release Notes* for the location of patches and installation instructions.

38. Do you intend to use dynamic reconfiguration?

Note – To use dynamic reconfiguration in your cluster configuration, the servers must be supported to use dynamic reconfiguration with Sun Cluster software.

- If yes, on each node add the following entry to the `/etc/system` file.

```
set kernel_cage_enable=1
```

This entry becomes effective after the next system reboot. See the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures to perform dynamic reconfiguration tasks in a Sun Cluster configuration. See your server documentation for more information about dynamic reconfiguration.

- If no, go to Step 39.

39. Did you add a new node to an existing cluster, or install Sun Cluster software patches that require you to reboot the entire cluster, or both?

- If no, reboot the individual node if any patches you installed require a node reboot or if any other changes you made require a reboot to become active.

- If yes, perform a reconfiguration reboot as instructed in the following steps.

a. From one node, shut down the cluster.

```
# scshutdown
```

Note – Do not reboot the first-installed node of the cluster until *after* the cluster is shut down.

---

b. Reboot each node in the cluster.

```
ok boot
```

Until cluster install mode is disabled, only the first-installed node, which established the cluster, has a quorum vote. In an established cluster that is still in install mode, if the cluster is not shut down before the first-installed node is rebooted, the remaining cluster nodes cannot obtain quorum and the entire cluster shuts down. Cluster nodes remain in install mode until the first time you run the `scsetup`(1M) command, during the procedure "How to Perform Post-Installation Setup" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

40. Set up the name service look-up order.

Go to "How to Configure the Name Service Switch" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

▼ How to Set Up the Root Environment (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

For VERITAS Volume Manager, set your MANPATH to include the following path.

- For VxVM 3.1 and earlier, use `/opt/VRTSvxvm/man`.
- For VxVM 3.1.1 and later, use `/opt/VRTS/man`.

▼ How to Uninstall Sun Cluster Software To Correct Installation Problems (5/02)

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Perform this procedure if the installed node cannot join the cluster or if you need to correct configuration information, for example, the transport adapters.

Note – If the node has already joined the cluster and is no longer in install mode (see Step 11 of "How to Perform Post-Installation Setup" in the *Sun Cluster 3.0 12/01 Software Installation Guide*), do not perform this procedure. Instead, go to "How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120.

---

1. **Attempt to reinstall the node.**

   Certain failed installations can be corrected simply by repeating the Sun Cluster software installation on the node. If you have already tried to reinstall the node without success, proceed to Step 2 to uninstall Sun Cluster software from the node.

2. **Become superuser on an active cluster member other than the node you will uninstall.**

3. **From the active cluster member, add the node you intend to uninstall to the cluster's node authentication list.**

```
# /usr/cluster/bin/scconf -a -T node=nodename
```

`-a`	Add
`-T`	Specifies authentication options
`node=`*nodename*	Specifies the name of the node to add to the authentication list

   Alternately, you can use the `scsetup`(1M) utility. See "How to Add a Cluster Node to the Authorized Node List" in the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures.

4. **Become superuser on the node you intend to uninstall.**

5. **Reboot the node into non-cluster mode.**

```
# shutdown -g0 -y -i0
ok boot -x
```

6. **Uninstall the node.**

```
# cd /
# /usr/cluster/bin/scinstall -r
```

See the `scinstall`(1M) man page for more information.

7. **Reinstall Sun Cluster software on the node.**

Refer to TABLE 2-1 in the *Sun Cluster 3.0 12/01 Software Installation Guide* for the list of all installation tasks and the order in which to perform them.

Configuring the Cluster

The following information applies to this update release and all subsequent updates.

▼ How to Add Cluster File Systems (5/02)

The following changes to Step 2, Step 4, and Step 8 were introduced in the Sun Cluster 3.0 5/02 update release and apply to this update and all subsequent updates to Sun Cluster 3.0 software.

Perform this procedure for each cluster file system you add.

Caution – Any data on the disks is destroyed when you create a file system. Be sure you specify the correct disk device name. If you specify the wrong device name, you will erase data that you might not intend to delete.

If you used SunPlex Manager to install data services, one or more cluster file systems already exist if there were sufficient shared disks on which to create the cluster file systems.

1. **Ensure that volume manager software is installed and configured.**

   For volume manager installation procedures, see "Installing and Configuring Solstice DiskSuite Software" or "Installing and Configuring VxVM Software" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

2. **Do you intend to install VERITAS File System (VxFS) software?**

   - If no, go to Step 3.
   - If yes, perform the following steps.

   a. **Follow the procedures in your VxFS installation documentation to install VxFS software on each node of the cluster.**

   b. **In the `/etc/system` file on each node, change the setting value for the following entry from `0x4000` to `0x6000`.**

```
set rpcmod:svc_default_stksize=0x6000
```

   Sun Cluster software requires a minimum default stack size setting of `0x6000`. Because VxFS installation changes this setting to `0x4000`, you must manually change it back to `0x6000` after VxFS installation is complete.

3. **Become superuser on any node in the cluster.**

Tip – For faster file system creation, become superuser on the current primary of the global device you create a file system for.

---

4. **Create a file system.**
   - For a VxFS file system, follow procedures provided in your VxFS documentation.
   - For a UFS file system, use the `newfs`(1M) command.

```
# newfs raw-disk-device
```

The following table shows examples of names for the *raw-disk-device* argument. Note that naming conventions differ for each volume manager.

TABLE 4-3 Sample Raw Disk Device Names

Volume Manager	Sample Disk Device Name	Description
Solstice DiskSuite	`/dev/md/oracle/rdsk/d1`	Raw disk device `d1` within the `oracle` diskset
VERITAS Volume Manager	`/dev/vx/rdsk/oradg/vol01`	Raw disk device `vol01` within the `oradg` disk group
None	`/dev/global/rdsk/d1s3`	Raw disk device `d1s3`

5. **On each node in the cluster, create a mount-point directory for the cluster file system.**

   A mount point is required *on each node*, even if the cluster file system will not be accessed on that node.

Tip – For ease of administration, create the mount point in the `/global/`*device-group* directory. This location enables you to easily distinguish cluster file systems, which are globally available, from local file systems.

```
# mkdir -p /global/device-group/mountpoint
```

device-group Name of the directory that corresponds to the name of the device group that contains the device

mountpoint Name of the directory on which to mount the cluster file system

6. **On each node in the cluster, add an entry to the `/etc/vfstab` file for the mount point.**

   a. **Use the following required mount options.**

      Logging is required for all cluster file systems.

      - **Solaris UFS logging –** Use the `global,logging` mount options. See the `mount_ufs`(1M) man page for more information about UFS mount options.

      Note – The `syncdir` mount option is not required for UFS cluster file systems. If you specify `syncdir`, you are guaranteed POSIX-compliant file system behavior for the `write()` system call, in the sense that if a `write()` succeeds you are guaranteed that there is space on disk. If you do not specify `syncdir`, you will have the same behavior that is seen with UFS file systems. When you do not specify `syncdir`, performance of writes that allocate disk blocks, such as when appending data to a file, can significantly improve. However, in some cases, without `syncdir` you would not discover an out-of-space condition (`ENOSPC`) until you close a file. The case in which you will see `ENOSPC` on close is only during a very short time period after a failover. With `syncdir` (and POSIX behavior), the out-of-space condition would be discovered before the close.

      - **Solstice DiskSuite trans metadevice –** Use the `global` mount option (do not use the `logging` mount option). See your Solstice DiskSuite documentation for information about setting up trans metadevices.
      - **VxFS logging –** Use the `global, log` mount options. See the `mount_vxfs`(1M) man page for more information about VxFS mount options.

   b. **To automatically mount the cluster file system, set the `mount at boot` field to `yes`.**

   c. **Ensure that, for each cluster file system, the information in its `/etc/vfstab` entry is identical on each node.**

   d. **Ensure that the entries in each node's `/etc/vfstab` file list devices in the same order.**

   e. **Check the boot order dependencies of the file systems.**

      For example, consider the scenario where `phys-schost-1` mounts disk device `d0` on `/global/oracle`, and `phys-schost-2` mounts disk device `d1` on `/global/oracle/logs`. With this configuration, `phys-schost-2` can boot and mount `/global/oracle/logs` only after `phys-schost-1` boots and mounts `/global/oracle`.

   See the `vfstab`(4) man page for details.

7. **On any node in the cluster, verify that mount points exist and `/etc/vfstab` file entries are correct on all nodes of the cluster.**

```
# sccheck
```

If no errors occur, nothing is returned.

8. **From any node in the cluster, mount the cluster file system.**

```
# mount /global/device-group/mountpoint
```

Note – For VERITAS File System (VxFS), mount the file system from the current master of *device-group* to ensure that the file system mounts successfully. In addition, unmount a VxFS file system from the current master of *device-group* to ensure that the file system unmounts successfully.

---

9. **On each node of the cluster, verify that the cluster file system is mounted.**

You can use either the `df`(1M) or `mount`(1M) command to list mounted file systems.

To manage a VxFS cluster file system in a Sun Cluster environment, run administrative commands only from the primary node on which the VxFS cluster file system is mounted.

10. **Are your cluster nodes connected to more than one public subnet?**

- If yes, go to "How to Configure Additional Public Network Adapters" in the *Sun Cluster 3.0 12/01 Software Installation Guide* to configure additional public network adapters.
- If no, go to "How to Configure Public Network Management (PNM)" in the *Sun Cluster 3.0 12/01 Software Installation Guide*to configure PNM and set up NAFO groups.

Example—Creating a Cluster File System

The following example creates a UFS cluster file system on the Solstice DiskSuite metadevice `/dev/md/oracle/rdsk/d1`.

```
# newfs /dev/md/oracle/rdsk/d1
...

(on each node)
# mkdir -p /global/oracle/d1
# vi /etc/vfstab
#device           device        mount   FS      fsck    mount   mount
#to mount         to fsck       point   type    pass    at boot options
#
/dev/md/oracle/dsk/d1 /dev/md/oracle/rdsk/d1 /global/oracle/d1 ufs 2 yes
global,logging
(save and exit)

(on one node)
# sccheck
# mount /global/oracle/d1
# mount
...
/global/oracle/d1 on /dev/md/oracle/dsk/d1 read/write/setuid/global/logging/
largefiles on Sun Oct 3 08:56:16 2000
```

▼ How to Update Network Time Protocol (NTP) (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Perform this task to create or modify the NTP configuration file after you install Sun Cluster software. You must also modify the NTP configuration file when you add a node to an existing cluster and when you change the private hostname of a node in the cluster.

Note – The primary requirement when you configure NTP, or any time synchronization facility within the cluster, is that all cluster nodes must be synchronized to the same time. Consider accuracy of time on individual nodes to be of secondary importance to the synchronization of time among nodes. You are free to configure NTP as best meets your individual needs, as long as this basic requirement for synchronization is met. See *Sun Cluster 3.0 12/01 Concepts* for further information about cluster time. See the `/etc/inet/ntp.cluster` template file for additional guidelines on how to configure NTP for a Sun Cluster configuration.

---

1. **Did you install your own `/etc/inet/ntp.conf` file before you installed Sun Cluster software?**
   - If yes, you do not need to modify your `ntp.conf` file. Skip to Step 8.
   - If no, go to Step 2.
2. **Become superuser on a cluster node.**
3. **Do you have your own `/etc/inet/ntp.conf` file to install on the cluster nodes?**
   - If yes, copy your `/etc/inet/ntp.conf` file to **each** node of the cluster, then skip to Step 6.

   Note – All cluster nodes must be synchronized to the same time.

   - If no, go to Step 4 to edit the `/etc/inet/ntp.conf.cluster` file. Sun Cluster software creates this file as the NTP configuration file if an `/etc/inet/ntp.conf` file is not found during Sun Cluster installation. Do not rename the `ntp.conf.cluster` file as `ntp.conf`.
4. **On one node of the cluster, edit the private hostnames in the `/etc/inet/ntp.conf.cluster` file.**

   If `/etc/inet/ntp.conf.cluster` does not exist on the node, you might have an `/etc/inet/ntp.conf` file from an earlier installation of Sun Cluster software. If so, perform the following edits on that `ntp.conf` file.

a. Ensure that an entry exists for the private hostname of each cluster node.

b. Remove any unused private hostnames.

If the `ntp.conf.cluster` file contains non-existent private hostnames, when a node is rebooted the system will generate error messages when the node attempts to contact those non-existent private hostnames.

c. If you changed a node's private hostname, ensure that the NTP configuration file contains the new private hostname.

d. If necessary, make other modifications to meet your NTP requirements.

5. Copy the NTP configuration file to all nodes in the cluster.

The contents of the `ntp.conf.cluster` file must be identical on all cluster nodes.

6. Stop the NTP daemon on each node.

Wait for the stop command to complete successfully on each node before you proceed to Step 7.

```
# /etc/init.d/xntpd stop
```

7. Restart the NTP daemon on each node.

- For `ntp.conf.cluster`, run the following command.

```
# /etc/init.d/xntpd.cluster start
```

The `xntpd.cluster` startup script first looks for the `/etc/inet/ntp.conf` file. If that file exists, the script exits immediately without starting the NTP daemon. If `ntp.conf` does not exist but `ntp.conf.cluster` does exist, the NTP daemon is started using `ntp.conf.cluster` as the NTP configuration file.

- For `ntp.conf`, run the following command.

```
# /etc/init.d/xntpd start
```

8. Do you intend to use Sun Management Center to configure resource groups or monitor the cluster?

- If yes, go to "Installing the Sun Cluster Module for Sun Management Center" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.
- If no, install third-party applications, register resource types, set up resource groups, and configure data services. See the documentation supplied with the application software and the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.

▼ How to Start Sun Management Center (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

After Step 2 – Perform the following step after Step 2, as the new Step 3. The original Step 3 becomes the new Step 4.

- **On each Sun Management Center agent machine (cluster node), ensure that the `scsymon_srv` daemon is running.**

```
# ps -ef | grep scsymon_srv
```

If any cluster node is not already running the `scsymon_srv` daemon, start the daemon on that node.

```
# /usr/cluster/lib/scsymon/scsymon_srv
```

Upgrading From Sun Cluster 2.2 to Sun Cluster 3.0 Update 2 Software

The following information applies to this update release and all subsequent updates.

▼ How to Upgrade Cluster Software Packages (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

CD-ROM path – Change all occurrences of the framework CD-ROM path to `/cdrom/suncluster_3_0_u3`. This applies to the Sun Cluster 3.0 5/02 CD-ROM.

▼ How to Finish Upgrading Cluster Software (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

CD-ROM path – Change all occurrences of the data services CD-ROM path to `/cdrom/scdataservices_3_0_u3`. This applies to the Sun Cluster 3.0 Agents 5/02 CD-ROM.

Installing and Configuring Solstice DiskSuite Software

The following information applies to this update release and all subsequent updates.

Note – For Sun Cluster 3.0 5/02 on the Solaris 9 operating environment, information and procedures for Solstice DiskSuite software apply as well to Solaris Volume Manager software unless alternative information for Solaris 9 is specified.

▼ How to Set the Number of Metadevice Names and Disksets (5/02)

The following changes were introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Metadevice-name maximum – The following are corrections to Step 1 and Step 2. The correct maximum number of metadevice names each Solstice DiskSuite (Solaris 8) diskset can have is 1024. For Solaris Volume Manager (Solaris 9), the maximum is 8192 metadevice names per diskset, as documented in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

1. **Calculate the largest metadevice name you need for any diskset in the cluster.**

   Each diskset can have a maximum of 1024 metadevice names. You will supply this calculated value for the `nmd` field.

   a. **Calculate the quantity of metadevice names you need for each diskset.**

      If you use local metadevices, ensure that each local metadevice name is unique throughout the cluster and does not use the same name as any device ID (DID) in the cluster.

Tip – Choose a range of numbers to use exclusively for DID names and a range for each node to use exclusively for its local metadevice names. For example, DIDs would use names in the range from `d1` to `d100`, local metadevices on node 1 would use names in the range from `d100` to `d199`, local metadevices on node 2 would use `d200` to `d299`, and so on.

---

b. Determine the largest of the metadevice names to be used in any diskset.

The quantity of metadevice names to set is based on the metadevice name *value* rather than on the *actual quantity*. For example, if your metadevice names range from `d950` to `d1000`, Solstice DiskSuite software requires 1000 names, not 50.

2. Calculate the total expected number of disksets in the cluster, then add one for private disk management.

The cluster can have a maximum of 31 disksets, not including the diskset for private disk management. The default number of disksets is 4. You will supply this calculated value for the `md_nsets` field.

▼ How to Create a Diskset (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Perform this procedure for each diskset you create.

Note – If you used SunPlex Manager to install Solstice DiskSuite, one to three disksets might already exist. See "Using SunPlex Manager to Install Sun Cluster Software (5/02)" on page 31 for information about the metasets created by SunPlex Manager.

---

1. Do you intend to create more than three disksets in the cluster?

- If yes, go to Step 2 to prepare the cluster for more than three disksets. Do this regardless of whether you are installing disksets for the first time or you are adding more disksets to a fully configured cluster.
- If no, go to Step 6.

2. Ensure that the value of the `md_nsets` variable is set high enough to accommodate the total number of disksets you intend to create in the cluster.

a. On any node of the cluster, check the value of the `md_nsets` variable in the `/kernel/drv/md.conf` file.

b. If the total number of disksets in the cluster will be greater than the existing value of `md_nsets` minus one, on each node increase the value of `md_nsets` to the desired value.

The maximum permissible number of disksets is one less than the value of `md_nsets`. The maximum possible value of `md_nsets` is 32.

c. Ensure that the `/kernel/drv/md.conf` file is identical on each node of the cluster.

Caution – Failure to follow this guideline can result in serious Solstice DiskSuite errors and possible loss of data.

d. From one node, shut down the cluster.

```
# scshutdown -g0 -y
```

e. Reboot each node of the cluster.

```
ok> boot
```

3. **On each node in the cluster, run the `devfsadm`(1M) command.**

   You can run this command on all nodes in the cluster at the same time.

4. **From one node of the cluster, run the `scgdevs`(1M) command.**

5. **On each node, verify that the `scgdevs` command has completed before you attempt to create any disksets.**

   The `scgdevs` command calls itself remotely on all nodes, even when the command is run from just one node. To determine whether the `scgdevs` command has completed processing, run the following command on each node of the cluster.

   ```
   % ps -ef | grep scgdevs
   ```

6. **Ensure that the diskset you intend to create meets one of the following requirements.**

   - If configured with exactly two disk strings, the diskset must connect to exactly two nodes and use exactly two mediator hosts, which must be the same two hosts used for the diskset. See "Mediators Overview" in the *Sun Cluster 3.0 12/01 Software Installation Guide* for details on how to set up mediators.
   - If configured with more than two disk strings, ensure that for any two disk strings S1 and S2, the sum of the number of disks on those strings exceeds the number of disks on the third string S3. Stated as a formula, the requirement is that count(S1) + count(S2) > count(S3).

7. **Ensure that `root` is a member of group 14.**

```
# vi /etc/group
...
sysadmin::14:root
...
```

8. **Ensure that the local metadevice state database replicas exist.**

   For instructions, see "How to Create Metadevice State Database Replicas" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

9. **Become superuser on the cluster node that will master the diskset.**

10. **Create the diskset.**

    This command also registers the diskset as a Sun Cluster disk device group.

```
# metaset -s setname -a -h node1 node2
```

`-s` *setname*	Specifies the diskset name
`-a`	Adds (creates) the diskset
`-h` *node1*	Specifies the name of the primary node to master the diskset
node2	Specifies the name of the secondary node to master the diskset

11. **Verify the status of the new diskset.**

```
# metaset -s setname
```

12. **Add drives to the diskset.**

    Go to "Adding Drives to a Diskset" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

Example—Creating a Diskset

The following command creates two disksets, `dg-schost-1` and `dg-schost-2`, with the nodes `phys-schost-1` and `phys-schost-2` assigned as the potential primaries.

```
# metaset -s dg-schost-1 -a -h phys-schost-1 phys-schost-2
# metaset -s dg-schost-2 -a -h phys-schost-1 phys-schost-2
```

Installing and Configuring VxVM Software

The following information applies to this update release and all subsequent updates.

▼ How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

This procedure uses the `scvxinstall`(1M) command to install VxVM software and encapsulate the root disk in one operation.

Note – If you intend to create the `rootdg` disk group on local, non-root disks, go instead to "How to Install VERITAS Volume Manager Software Only (5/02)" on page 68.

Perform this procedure on each node that you intend to install with VxVM. You can install VERITAS Volume Manager (VxVM) on all nodes of the cluster, or on only those nodes that are physically connected to the storage device(s) VxVM will manage.

1. **Ensure that the cluster meets the following prerequisites.**
   - All nodes in the cluster are running in cluster mode.
   - The root disk of the node you install has two free (unassigned) partitions.
2. **Become superuser on a node you intend to install with VxVM.**
3. **Add all nodes in the cluster to the cluster node authentication list.**

   a. **Start the `scsetup`(1M) utility.**

   ```
   # scsetup
   ```

   The Main Menu is displayed.

   b. **To access the New Nodes Menu, type `6` at the Main Menu.**

c. **To add a node to the authorized list, type `3` at the New Nodes Menu.**

d. **Specify the name of a machine which may add itself.**

Follow the prompts to add the node's name to the cluster. You will be asked for the name of the node to be added.

e. **Verify that the task has been performed successfully.**

The `scsetup` utility prints a `Command completed successfully` message if it completes the task without error.

f. **Repeat Step c through Step e for each node of the cluster until all cluster nodes are added to the node authentication list.**

g. **Quit the `scsetup` utility.**

4. **Insert the VxVM CD-ROM into the CD-ROM drive on the node.**

5. **Start `scvxinstall` in interactive mode.**

Press Control-C at any time to abort the `scvxinstall` command.

```
# scvxinstall
```

See the `scvxinstall`(1M) man page for more information.

6. **When prompted whether to encapsulate root, type `yes`.**

```
Do you want Volume Manager to encapsulate root [no]? y
```

7. **When prompted, provide the location of the VxVM CD-ROM.**

- If the appropriate VxVM CD-ROM is found, the location is displayed as part of the prompt within brackets. Press Enter to accept this default location.

```
Where is the volume manager cdrom [default]?
```

- If the VxVM CD-ROM is not found, the prompt is displayed without a default location. Type the location of the CD-ROM or CD-ROM image.

```
Where is the volume manager cdrom?
```

8. **When prompted, type your VxVM license key.**

```
Please enter license key:  license
```

The `scvxinstall` command automatically performs the following tasks.

- Disables Dynamic Multipathing (DMP)

Note – Although the `scvxinstall` utility disables Dynamic Multipathing (DMP) at the start of installation processing, DMP is automatically re-enabled by VxVM version 3.1.1 or later when the VRTSvxvm package is installed. Earlier versions of VxVM must still run with DMP disabled.

- Installs the `VRTSvxvm`, `VRTSvmdev`, and `VRTSvmman` packages, and installs the `VRTSlic` package if installing VxVM 3.2 or later
- Selects a cluster-wide `vxio` driver major number
- Creates a `rootdg` disk group by encapsulating the root disk
- Updates the `/global/.devices` entry in the `/etc/vfstab` file

See the `scvxinstall`(1M) man page for further details.

Note – During installation there are two automatic reboots. After all installation tasks are completed, `scvxinstall` automatically reboots the node the second time unless you press Control-C when prompted. If you press Control-C to abort the second reboot, you must reboot the node later to complete VxVM installation.

---

9. **If you intend to enable the VxVM cluster feature, run the `vxlicense` command to supply the cluster feature license key.**

   See your VxVM documentation for information about the `vxlicense` command.

10. **(Optional) Install the VxVM GUI.**

```
# pkgadd VRTSvmsa
```

See your VxVM documentation for information about the VxVM GUI.

11. **Eject the CD-ROM.**

12. **Install any VxVM patches.**

See the *Sun Cluster 3.0 5/02 Release Notes* for the location of patches and installation instructions.

13. **(Optional) If you prefer not to have VxVM man pages reside on the cluster node, remove the man-page package.**

```
# pkgrm VRTSvmman
```

14. **Do you intend to install VxVM on another node?**
    - If yes, repeat Step 2 through Step 13.
    - If no, go to Step 15.

15. **Are there one or more nodes that you do *not* intend to install with VxVM?**

Note – If you intend to enable the VxVM cluster feature, you *must* install VxVM on all nodes of the cluster.

    - If yes, go to Step 16.
    - If no, go to Step 17.

16. **Modify the `/etc/name_to_major` file on each non-VxVM node.**

    a. **On a node installed with VxVM, determine the `vxio` major number setting.**

```
# grep vxio /etc/name_to_major
```

    b. **Become superuser on a node that you do *not* intend to install with VxVM.**

    c. **Edit the `/etc/name_to_major` file and add an entry to set the `vxio` major number to *NNN*, the number derived in Step a.**

```
# vi /etc/name_to_major
vxio NNN
```

    d. **Initialize the `vxio` entry.**

```
# drvconfig -b -i vxio -m NNN
```

    e. **Repeat Step b through Step d on all other nodes that you do *not* intend to install with VxVM.**

    When you finish, each node of the cluster should have the same `vxio` entry in its `/etc/name_to_major` file.

17. **Prevent any new machines from being added to the cluster.**

a. Start the `scsetup`(1M) utility.

```
# scsetup
```

The Main Menu is displayed.

b. To access the New Nodes Menu, type `6` at the Main Menu.

c. Type `1` at the New Nodes Menu.

Follow the `scsetup` prompts. This option tells the cluster to ignore all requests coming in over the public network from any new machine that tries to add itself to the cluster.

d. Quit the `scsetup` utility.

18. Do you intend to mirror the encapsulated root disk?

- If yes, go to "How to Mirror the Encapsulated Root Disk" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.
- If no, go to "How to Create and Register a Disk Group" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

Note – If you later need to unencapsulate the root disk, follow the procedures in "How to Unencapsulate the Root Disk" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

▼ How to Install VERITAS Volume Manager Software Only (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

This procedure uses the `scvxinstall` command to install VERITAS Volume Manager (VxVM) software only.

Note – To create the `rootdg` disk group by encapsulating the root disk, do not use this procedure. Instead, go to "How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk (5/02)" on page 64 to install VxVM software and encapsulate the root disk in one operation.

Perform this procedure on each node that you want to install with VxVM. You can install VxVM on all nodes of the cluster, or on only those nodes that are physically connected to the storage device(s) VxVM will manage.

1. **Ensure that all nodes in the cluster are running in cluster mode.**
2. **Become superuser on a cluster node you intend to install with VxVM.**
3. **Add all nodes in the cluster to the cluster node authentication list.**

   a. **Start the `scsetup`(1M) utility.**

   ```
   # scsetup
   ```

   The Main Menu is displayed.

   b. **To access the New Nodes Menu, type `6` at the Main Menu.**

   c. **To add a node to the authorized list, type `3` at the New Nodes Menu.**

   d. **Specify the name of a machine which may add itself.**

   Follow the prompts to add the node's name to the cluster. You will be asked for the name of the node to be added.

   e. **Verify that the task has been performed successfully.**

   The `scsetup` utility prints a `Command completed successfully` message if it completes the task without error.

   f. **Repeat Step c through Step e for each node of the cluster until all cluster nodes are added to the node authentication list.**

   g. **Quit the `scsetup` utility.**

4. **Insert the VxVM CD-ROM into the CD-ROM drive on the node.**
5. **Start `scvxinstall` in interactive installation mode.**

   ```
   # scvxinstall -i
   ```

The `scvxinstall` command automatically performs the following tasks.

- Disables Dynamic Multipathing (DMP)

Note – Although the `scvxinstall` utility disables Dynamic Multipathing (DMP) at the start of installation processing, DMP is automatically re-enabled by VxVM version 3.1.1 or later when the VRTSvxvm package is installed. Earlier versions of VxVM must still run with DMP disabled.

- Installs the `VRTSvxvm`, `VRTSvmdev`, and `VRTSvmman` packages, and installs the `VRTSlic` package if installing VxVM 3.2 or later
- Selects a cluster-wide `vxio` driver major number

See the `scvxinstall`(1M) man page for information.

6. **(Optional) Install the VxVM GUI.**

```
# pkgadd VRTSvmsa
```

See your VxVM documentation for information about the VxVM GUI.

7. **Eject the CD-ROM.**

8. **Install any VxVM patches.**

See the *Sun Cluster 3.0 5/02 Release Notes* for the location of patches and installation instructions.

9. **(Optional) If you prefer not to have VxVM man pages reside on the cluster node, remove the man page package.**

```
# pkgrm VRTSvmman
```

10. **Do you intend to install VxVM on another node?**

- If yes, repeat Step 2 through Step 9.
- If no, go to Step 11.

11. **Are there one or more nodes that you do *not* intend to install with VxVM?**

Note – If you intend to enable the VxVM cluster feature, you *must* install VxVM on all nodes of the cluster.

- If yes, go to Step 12.
- If no, go to Step 13.

12. **Modify the `/etc/name_to_major` file on each non-VxVM node.**

    a. **On a node installed with VxVM, determine the `vxio` major number setting.**

```
# grep vxio /etc/name_to_major
```

    b. **Become superuser on a node that you do *not* intend to install with VxVM.**

    c. **Edit the `/etc/name_to_major` file and add an entry to set the `vxio` major number to *NNN*, the number derived in Step a.**

```
# vi /etc/name_to_major
vxio NNN
```

    d. **Initialize the `vxio` entry.**

```
# drvconfig -b -i vxio -m NNN
```

    e. **Repeat Step a through Step c on all other nodes that you do *not* intend to install with VxVM.**

    When you finish, each node of the cluster should have the same `vxio` entry in its `/etc/name_to_major` file.

13. **Prevent any new machines from being added to the cluster.**

    a. **Start the `scsetup`(1M) utility.**

```
# scsetup
```

    The Main Menu is displayed.

    b. **To access the New Nodes Menu, type `6` at the Main Menu.**

    c. **Type `1` at the New Nodes Menu.**

    Follow the `scsetup` prompts. This option tells the cluster to ignore all requests coming in over the public network from any new machine that tries to add itself to the cluster.

    d. **Quit the `scsetup` utility.**

14. **Create a `rootdg` disk group.**

    Go to "How to Create a rootdg Disk Group on a Non-Root Disk" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

CHAPTER 5

Data Services

This chapter provides new data services installation and configuration information that has been added to the Sun Cluster 3.0 5/02 update release. This information supplements the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*. For new cluster framework installation information, see "Installation" on page 21.

This chapter contains new information for the following topics.

- "Installing and Configuring Sun Cluster HA for SAP" on page 74
- "Synchronizing the Startups Between Resource Groups and Disk Device Groups" on page 74
- "Enabling Highly Available Local File Systems" on page 75
- "Registering and Configuring Sun Cluster HA for Oracle" on page 78
- "Registering and Configuring Sun Cluster HA for Sybase ASE" on page 85
- "Configuration Guidelines for Sun Cluster Data Services" on page 90
- "Relationship Between Resource Groups and Disk Device Groups" on page 91
- "Freeing Node Resources by Off-Loading Non-Critical Resource Groups" on page 93
- "Installing and Configuring iPlanet Directory Server" on page 99
- "Installing and Configuring an iPlanet Web Server" on page 101
- "Resource Group Properties" on page 104

Installing and Configuring Sun Cluster HA for SAP

The following information applies to this update release and all subsequent updates.

- Updated Sun Cluster HA for SAP chapter that includes procedures that support SAP as a scalable data service. See "Installing and Configuring Sun Cluster HA for SAP" on page 149.
- Updated Sun Cluster HA for SAP chapter that includes procedures on how to set up a lock file. See "Setting Up a Lock File" on page 180.

Synchronizing the Startups Between Resource Groups and Disk Device Groups

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

After a cluster boots up or services fail over to another node, global devices and cluster file systems might require time to become available. However, a data service can run its `START` method before global devices and cluster file systems—on which the data service depends—come online. In this instance, the `START` method times out, and you must reset the state of the resource groups that the data service uses and restart the data service manually.

The resource types HAStorage and HAStoragePlus monitor the global devices and cluster file systems and cause the `START` method of the other resources in the same resource group to wait until they become available. (To determine which resource type to use, see "Recommendations" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.) To avoid additional administrative tasks, set up HAStorage or HAStoragePlus for all of the resource groups whose data service resources depend on global devices or cluster file systems.

To create an HAStoragePlus resource type, see "How to Set Up HAStoragePlus Resource Type (5/02)" on page 75.

Enabling Highly Available Local File Systems

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The HAStoragePlus resource type can be used to make a local file system highly available within a Sun Cluster environment. The local file system partitions must reside on global disk groups with affinity switchovers enabled and the Sun Cluster environment must be configured for failover. This enables the user to make any file system on multi-host disks accessible from any host directly connected to those multi-host disks. (You cannot use HAStoragePlus to make a root file system highly available.)

Using a highly available local file system is strongly recommended for some I/O intensive data services, and configuring the HAStoragePlus resource type has been added to the Registration and Configuration procedures for these data services. For procedures on how to set up the HAStoragePlus resource type for these data services, see the following sections in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.

- "Registering and Configuring Sun Cluster HA for Oracle" on page 78
- "Registering and Configuring Sun Cluster HA for Sybase ASE" on page 85

For the procedure to set up HAStoragePlus resource type for other data services, see "How to Set Up HAStoragePlus Resource Type (5/02)" on page 75.

▼ How to Set Up HAStoragePlus Resource Type (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The HAStoragePlus resource type was introduced in Sun Cluster 3.0 5/02. This new resource type performs the same functions as HAStorage, and synchronizes the startups between resource groups and disk device groups. The HAStoragePlus resource type has an additional feature to make a local file system highly available. (For background information on making a local file system highly available, see "Enabling Highly Available Local File Systems" on page 75.) To use both of these features, set up the HAStoragePlus resource type.

To set up HAStoragePlus, the local file system partitions must reside on global disk groups with affinity switchovers enabled and the Sun Cluster environment must be configured for failover.

The following example uses a simple NFS service that shares out home directory data from a locally mounted directory `/global/local-fs/nfs/export/home`. The example assumes the following:

- The mount point `/global/local-fs/nfs` will be used to mount a UFS local file system on a Sun Cluster global device partition.
- The `/etc/vfstab` entry for the `/global/local-fs/nfs` file system should specify that it is a local file system and the mount boot flag is no.
- The PathPrefix directory (the directory used by HA-NFS to maintain administrative and status information) is on the root directory of the same file system to be mounted (for example, `/global/local-fs/nfs`).

1. **Become superuser on a cluster member.**

2. **Determine whether the resource type is registered.**

   The following command prints a list of registered resource types.

```
# scrgadm -p | egrep Type
```

3. **If you need to, register the resource type.**

```
# scrgadm -a -t SUNW.nfs
```

4. **Create the failover resource group nfs-r**

```
# scrgadm -a -g nfs-rg -y PathPrefix=/global/local-fs/nfs
```

5. **Create a logical host resource of type `SUNW.LogicalHostname`.**

```
# scrgadm -a -j nfs-lh-rs -g nfs-rg -L -l log-nfs
```

6. **Register the HAStoragePlus resource type with the cluster.**

```
# scrgadm -a -t SUNW.HAStoragePlus
```

7. **Create the resource `nfs-hastp-rs` of type `SUNW.HAStoragePlus`.**

```
# scrgadm -a -j nfs-hastp-rs -g nfs-rg -t SUNW.HAStoragePlus \
-x FilesystemMountPoints=/global/local-fs/nfs \
-x AffinityOn=TRUE
```

8. **Bring the resource group `nfs-rg` online on a cluster node.**

   This node will become the primary node for the `/global/local-fs/nfs` file system's underlying global device partition. The file system `/global/local-fs/nfs` will then be locally mounted on this node.

```
# scswitch -Z -g nfs-rg
```

9. **Register the `SUNW.NFS` resource type with the cluster. Create the resource `nfs-rs` of type `SUNW.nfs` and specify its resource dependency on the resource `nfs-hastp-rs`.**

   `dfstab.nfs-rs` will be present in `/global/local-fs/nfs/SUNW.nfs`.

```
# scrgadm -a -t SUNW.nfs
# scrgadm -a -g nfs-rg -j nfs-rs -t SUNW.nfs \
-y Resource_dependencies=nfs-hastp-rs
```

Note – The `nfs-hastp-rs` resource must be online before you can set the dependency in the nfs resource.

---

10. **Bring the resource `nfs-rs` online.**

```
# scswitch -Z -g nfs-rg
```

Now whenever the service is migrated to a new node, the primary I/O path for `/global/local-fs/nfs` will always be online and collocated with the NFS servers. The file system `/global/local-fs/nfs` will be locally mounted before starting the NFS server.

Registering and Configuring Sun Cluster HA for Oracle

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Register and configure Sun Cluster HA for Oracle as a failover data service. You must register the data service and configure resource groups and resources for the Oracle server and listener. See "Planning for Sun Cluster Data Services" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* and the *Sun Cluster 3.0 12/01 Concepts* document for details on resources and resource groups.

▼ How to Register and Configure Sun Cluster HA for Oracle (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

This procedure describes how to use the `scrgadm` command to register and configure Sun Cluster HA for Oracle.

This procedure includes creating the HAStoragePlus resource type. This resource type synchronizes actions between HAStoragePlus and the data service and enables you to use a highly available local file system. Sun Cluster HA for Oracle is disk-intensive, and therefore you should configure the HAStoragePlus resource type.

See the `SUNW.HAStoragePlus`(5) man page and "Relationship Between Resource Groups and Disk Device Groups" on page 5 for background information.

Note – Other options also enable you to register and configure the data service. See "Tools for Data Service Resource Administration" on page 10 for details about these options.

You must have the following information to perform this procedure.

- The names of the cluster nodes that master the data service.
- The network resource that clients use to access the data service. Normally, you set up this IP address when you install the cluster. See the *Sun Cluster 3.0 12/01 Concepts* document for details on network resources.
- The path to the Oracle application binaries for the resources that you plan to configure.

Note – Perform this procedure on any cluster member.

1. **Become superuser on a cluster member.**

2. **Run the `scrgadm` command to register the resource types for the data service.**

   For Sun Cluster HA for Oracle, you register two resource types, `SUNW.oracle_server` and `SUNW.oracle_listener`, as follows.

```
# scrgadm -a -t SUNW.oracle_server
# scrgadm -a -t SUNW.oracle_listener
```

`-a`	Adds the data service resource type.
`-t SUNW.oracle_`*type*	Specifies the predefined resource type name for your data service.

3. **Create a failover resource group to hold the network and application resources.**

   You can optionally select the set of nodes on which the data service can run with the `-h` option, as follows.

```
# scrgadm -a -g resource-group [-h nodelist]
```

`-g` *resource-group*	Specifies the name of the resource group. This name can be your choice but must be unique for resource groups within the cluster.
`-h` *nodelist*	Specifies an optional comma-separated list of physical node names or IDs that identify potential masters. The order here determines the order in which the nodes are considered as primary during failover.

Note – Use the `-h` option to specify the order of the node list. If all of the nodes that are in the cluster are potential masters, you do not need to use the `-h` option.

4. **Verify that all of the network resources that you use have been added to your name service database.**

   You should have performed this verification during the Sun Cluster installation.

Note – Ensure that all of the network resources are present in the server's and client's `/etc/hosts` file to avoid any failures because of name service lookup.

---

5. **Add a network resource to the failover resource group.**

```
# scrgadm -a -L -g resource-group -l logical-hostname [-n netiflist]
```

`-l` *logical-hostname*	Specifies a network resource. The network resource is the logical hostname or shared address (IP address) that clients use to access Sun Cluster HA for Oracle.
[`-n` *netiflist*]	Specifies an optional, comma-separated list that identifies the NAFO groups on each node. All of the nodes in *nodelist* of the resource group must be represented in the *netiflist*. If you do not specify this option, `scrgadm`(1M) attempts to discover a net adapter on the subnet that the *hostname* list identifies for each node in *nodelist*. For example, `-n` *nafo0@nodename, nafo0@nodename2*.

6. **Register the HAStoragePlus resource type with the cluster.**

```
# scrgadm -a -t SUNW.HAStoragePlus
```

7. **Create the resource `oracle-hastp-rs` of type HAStoragePlus.**

```
# scrgadm -a -j oracle-hastp-rs -g oracle-rg -t SUNW.HAStoragePlus \

[If your database is on a raw device, specify the global device path.]
-x GlobalDevicePaths=ora-set1,/dev/global/dsk/dl \

[If your database in on a Cluster File Service, specify the global filesystem
mount points.]
-x FilesystemMountPoints=/global/ora-inst,/global/ora-data/logs \

[If your database is on a highly available local file system, secify the local
filesystem mount points.]
-x FilesystemMountPoints=/local/ora-data \

[Set AffinityOn to true.]
-x AffinityOn=TRUE
```

Note – AffinityOn must be set to TRUE and the local file system must reside on global disk groups to be failover.

---

8. **Run the `scrgadm` command to complete the following tasks and bring the resource group `oracle-rg` online on a cluster node.**
   - Move the resource group into a managed state.
   - Bring the resource group online.

   This node will be made the primary for device group `ora-set1` and raw device `/dev/global/dsk/d1`. Device groups associated with file systems such as `/global/ora-inst` and `/global/ora-data/logs` will also be made primaries on this node.

```
# scrgadm -Z -g oracle-rg
```

9. Create Oracle application resources in the failover resource group.

```
# scrgadm -a -j resource -g resource-group \
-t SUNW.oracle_server \
-x Connect_string=user/passwd \
-x ORACLE_SID=instance \
-x ORACLE_HOME=Oracle-home \
-x Alert_log_file=path-to-log \
-y resource_dependencies=storageplus-resource


# scrgadm -a -j resource -g resource-group \
-t SUNW.oracle_listener \
-x LISTENER_NAME=listener \
-x ORACLE_HOME=Oracle-home \
-y resource_dependencies=storageplus-resource
```

`-j` *resource*	Specifies the name of the resource to add.
`-g` *resource-group*	Specifies the name of the resource group into which the resources are to be placed.
`-t SUNW.oracle_server/listener`	Specifies the type of the resource to add.
`-x Alert_log_file=`*path-to-log*	Sets the path under `$ORACLE_HOME` for the server message log.
`-x Connect_string=`*user/passwd*	Specifies the user and password that the fault monitor uses to connect to the database. These settings must agree with the permissions that you set up in "How to Set Up Oracle Database Permissions" on page 23 in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*. If you use Solaris authorization, type a slash (`/`) instead of the user name and password.
`-x ORACLE_SID=`*instance*	Sets the Oracle system identifier.
`-x LISTENER_NAME=`*listener*	Sets the name of the Oracle listener instance. This name must match the corresponding entry in `listener.ora`.
`-x ORACLE_HOME=`*Oracle-home*	Sets the path to the Oracle home directory.

Note – When a fault occurs in an Oracle server resource and causes a restart, the whole resource group is restarted. Any other resources (such as Apache or DNS) in the resource group are restarted, even if they did not have a fault. To prevent other resources from being restarted along with an Oracle server resource, put them in a separate resource group.

Note – Optionally, you can set additional extension properties that belong to the Oracle data service to override their default values. See "Configuring Sun Cluster HA for Oracle Extension Properties" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for a list of extension properties.

10. Run the `scswitch` command to complete the following task.

- Enable the resource and fault monitoring.

```
# scswitch -Z -g resource-group
```

`-Z`	Enables the resource and monitor, moves the resource group to the managed state, and brings it online.
`-g` *resource-group*	Specifies the name of the resource group.

Example – Registering Sun Cluster HA for Oracle

The following example shows how to register Sun Cluster HA for Oracle on a two-node cluster.

```
Cluster Information
Node names: phys-schost-1, phys-schost-2
Logical Hostname: schost-1
Resource group: resource-group-1 (failover resource group)
Oracle Resources: oracle-server-1, oracle-listener-1
Oracle Instances: ora-lsnr (listener), ora-srvr (server)

(Add the failover resource group to contain all of the resources.)
# scrgadm -a -g resource-group-1

(Add the logical hostname resource to the resource group.)
# scrgadm -a -L -g resource-group-1 -l schost-1

(Register the Oracle resource types)
# scrgadm -a -t SUNW.oracle_server
# scrgadm -a -t SUNW.oracle_listener

(Add the Oracle application resources to the resource group.)
# scrgadm -a -j oracle-server-1 -g resource-group-1 \
-t SUNW.oracle_server -x ORACLE_HOME=/global/oracle \
-x Alert_log_file=/global/oracle/message-log \
-x ORACLE_SID=ora-srvr -x Connect_string=scott/tiger

# scrgadm -a -j oracle-listener-1 -g resource-group-1 \
-t SUNW.oracle_listener -x ORACLE_HOME=/global/oracle \
-x LISTENER_NAME=ora-lsnr

(Bring the resource group online.)
# scswitch -Z -g resource-group-1
```

Registering and Configuring Sun Cluster HA for Sybase ASE

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Use the procedures in this section to register and configure the Sun Cluster HA for Sybase ASE data service. Register and configure Sun Cluster HA for Sybase ASE as a failover data service.

▼ How to Register and Configure Sun Cluster HA for Sybase ASE (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

This procedure describes how to use the `scrgadm`(1M) command to register and configure Sun Cluster HA for Sybase ASE.

This procedure includes creating the `HAStoragePlus` resource type. This resource type synchronizes actions between HAStorage and Sun Cluster HA for Sybase ASE and enables you to use a highly available local file system. Sun Cluster HA for Sybase ASE is disk-intensive, and therefore you should configure the `HAStoragePlus` resource type.

See the `SUNW.HAStoragePlus`(5) man page and "Relationship Between Resource Groups and Disk Device Groups" on page 5 for more information about the `HAStoragePlus` resource type.

Note – Other options also enable you to register and configure the data service. See "Tools for Data Service Resource Administration" on page 10 for details about these options.

To perform this procedure, you must have the following information.

- The names of the cluster nodes that master the data service.
- The network resource that clients use to access the data service. You typically configure the IP address when you install the cluster. See the sections in the *Sun Cluster 3.0 12/01 Software Installation Guide* on planning the Sun Cluster environment and on how to install the Solaris operating environment for details.
- The path to the Sybase ASE application installation.

Note – Perform the following steps on one cluster member.

1. **Become superuser on a cluster member.**

2. **Run the `scrgadm` command to register resource types for Sun Cluster HA for Sybase ASE.**

```
# scrgadm -a -t SUNW.sybase
```

`-a`	Adds the resource type for the data service.
`-t SUNW.sybase`	Specifies the resource type name that is predefined for your data service.

3. **Create a failover resource group to hold the network and application resources.**

   You can optionally select the set of nodes on which the data service can run with the `-h` option, as follows.

```
# scrgadm -a -g resource-group [-h nodelist]
```

`-g` *resource-group*	Specifies the name of the resource group. This name can be your choice but must be unique for resource groups within the cluster.
`-h` *nodelist*	Specifies an optional comma-separated list of physical node names or IDs that identify potential masters. The order here determines the order in which the nodes are considered as primary during failover.

Note – Use the `-h` option to specify the order of the node list. If all of the nodes that are in the cluster are potential masters, you do not need to use the `-h` option.

4. **Verify that all of the network resources that you use have been added to your name service database.**

   You should have performed this verification during the Sun Cluster installation.

Note – Ensure that all of the network resources are present in the server's and client's `/etc/hosts` file to avoid any failures because of name service lookup.

5. **Add a network resource to the failover resource group.**

```
# scrgadm -a -L -g resource-group -l logical-hostname [-n netiflist]
```

`-l` *logical-hostname*	Specifies a network resource. The network resource is the logical hostname or shared address (IP address) that clients use to access Sun Cluster HA for Oracle.
[`-n` *netiflist*]	Specifies an optional, comma-separated list that identifies the NAFO groups on each node. All of the nodes in *nodelist* of the resource group must be represented in the *netiflist*. If you do not specify this option, `scrgadm`(1M) attempts to discover a net adapter on the subnet that the *hostname* list identifies for each node in *nodelist*. For example, `-n` *nafo0@nodename, nafo0@nodename2*.

6. **Register the HAStoragePlus resource type with the cluster.**

```
# scrgadm -a -t SUNW.HAStoragePlus
```

7. **Create the resource** `sybase-hastp-rs` **of type HAStoragePlus.**

```
# scrgadm -a -j sybase-hastp-rs -g sybase-rg \
-t SUNW.HAStoragePlus \
-x GlobalDevicePaths=sybase-set1,/dev/global/dsk/dl \
-x FilesystemMountPoints=/global/sybase-inst \
-x AffinityOn=TRUE
```

Note – AffinityOn must be set to TRUE and the local file system must reside on global disk groups to be failover.

8. **Run the `scrgadm` command to complete the following tasks and bring the resource group `sybase-rg` online on a cluster node.**

   - Move the resource group into a managed state.
   - Bring the resource group online

   This node will be made the primary for device group `sybase-set1` and raw device `/dev/global/dsk/d1`. Device groups associated with file systems such as `/global/sybase-inst` will also be made primaries on this node.

```
# scrgadm -Z -g sybase-rg
```

9. **Create Sybase ASE application resources in the failover resource group.**

```
# scrgadm -a -j resource -g resource-group \
-t SUNW.sybase \
-x Environment_File=environment-file-path \
-x Adaptive_Server_Name=adaptive-server-name \
-x Backup_Server_Name=backup-server-name \
-x Text_Server_Name=text-server-name \
-x Monitor_Server_Name=monitor-server-name \
-x Adaptive_Server_Log_File=log-file-path \
-x Stop_File=stop-file-path \
-x Connect_string=user/passwd \
-y resource_dependencies=storageplus-resource
```

`-j` *resource*	Specifies the resource name to add.
`-g` *resource-group*	Specifies the name of the resource group into which the RGM places the resources.
`-t SUNW.sybase`	Specifies the resource type to add.
`-x Environment_File=`*environment-file*	Sets the name of the environment file.
`-x Adaptive_Server_Name=` *adaptive-server-name*	Sets the name of the adaptive server.
`-x Backup_Server_Name=` *backup-server-name*	Sets the name of the backup server.
`-x Text_Server_Name=` *text-server-name*	Sets the name of the text server.
`-x Monitor_Server_Name=` *monitor-server-name*	Sets the name of the monitor server.

`-x Adaptive_Server_Log_File=`*monitor-server-name*	Sets the path to the log file for the adaptive server.
`-x Stop_File=`*stop-file-path*	Sets the path to the stop file.
`-x Connect_string=`*user/passwd*	Specifies the user and password that the fault monitor uses to connect to the database.

You do not have to specify extension properties that have default values. See "Configuring Sun Cluster HA for Sybase ASE Extension Properties" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for more information.

10. Run the `scswitch`(1M) command to complete the following task.

- Enable the resource and fault monitoring..

```
# scswitch -Z -g resource-group
```

Where to Go From Here

After you register and configure Sun Cluster HA for Sybase ASE, go to "How to Verify the Sun Cluster HA for Sybase ASE Installation" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.

Configuration Guidelines for Sun Cluster Data Services

The following information applies to this update release and all subsequent updates.

Determining the Location of the Application Binaries (5/02)

This following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

- **Highly available local file system** - Using HAStoragePlus, you can integrate your local file system into the Sun Cluster environment making the local file system highly available. HAStoragePlus provides additional file system capabilities such as checks, mounts, and unmounts enabling Sun Cluster to fail over local file systems. In order to failover, the local file system must reside on global disk groups with affinity switchovers enabled.

  See the individual data service chapters or "Enabling Highly Available Local File Systems" on page 75 for information on how to use the HAStoragePlus resource type.

Planning the Cluster File System Configuration (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The resource type HAStoragePlus enables you to use a highly available local file system in a Sun Cluster environment configured for failover. This resource type is supported in Sun Cluster 3.0 5/02. See "Enabling Highly Available Local File Systems" on page 75 for information on setting up the HAStoragePlus resource type.

See the planning chapter of the *Sun Cluster 3.0 12/01 Software Installation Guide* for information on how to create cluster file systems.

Relationship Between Resource Groups and Disk Device Groups

The following information applies to this update release and all subsequent releases.

HAStorage and HAStoragePlus Resource Types (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The resource types HAStorage and the HAStoragePlus can be used to configure the following options.

- Coordinate the boot order of disk devices and resource groups by causing the `START` methods of the other resources in the same resource group that contains the HAStorage or HAStoragePlus resource to wait until the disk device resources become available
- With `AffinityOn` set to `True`, enforce colocation of resource groups and disk device groups on the same node, thus enhancing the performance of disk-intensive data services

In addition, HAStoragePlus is capable of mounting any cluster file system found to be in an unmounted state. See "Planning the Cluster File System Configuration" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for more information.

Note – If the device group is switched to another node while the HAStorage or HAStoragePlus resource is online, `AffinityOn` has no effect and the resource group does **not** migrate along with the device group. On the other hand, if the resource group is switched to another node, `AffinityOn` being set to `True` causes the device group to follow the resource group to the new node.

Recommendations (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

To determine whether to create HAStorage or HAStoragePlus resources within a data service resource group, consider the following criteria.

- Determine whether to use HAStorage or HAStoragePlus.
  - Use HAStorage if you are using Sun Cluster 3.0 12/01 software release or earlier.
  - Use HAStoragePlus if you are using Sun Cluster 3.0 5/02 software release. (If you want to integrate any file system locally into a Sun Cluster configured for failover, you must upgrade to Sun Cluster 3.0 5/02 and use the HAStoragePlus resource type. See "Planning the Cluster File System Configuration" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for more information.)
- In cases where a data service resource group has a node list in which some of the nodes are not directly connected to the storage, you must configure HAStorage or HAStoragePlus resources in the resource group and set the dependency of the other data service resources to the HAStorage or HAStoragePlus resource. This requirement coordinates the boot order between the storage and the data services.
- If your data service is disk intensive, such as Sun Cluster HA for Oracle and Sun Cluster HA for NFS, ensure that you perform the following tasks.
  - Add a HAStorage or HAStoragePlus resource to your data service resource group.
  - Switch the HAStorage or HAStoragePlus resource online.
  - Set the dependency of your data service resources to the HAStorage or HAStoragePlus resource.
  - Set `AffinityOn` to `True`.

    When you perform these tasks, the resource groups and disk device groups are collocated on the same node.
- If your data service is **not** disk intensive—such as one that reads all of its files at startup (for example, Sun Cluster HA for DNS)—configuring the HAStorage or HAStoragePlus resource type is optional.

See the individual chapters on data services in this book for specific recommendations.

See "Synchronizing the Startups Between Resource Groups and Disk Device Groups" on page 74 for information about the relationship between disk device groups and resource groups. The `SUNW.HAStorage`(5) and `SUNW.HAStoragePlus`(5) man pages provides additional details.

See "Enabling Highly Available Local File Systems" on page 75 for procedures for mounting of file systems such as VxFS in a local mode. The `SUNW.HAStoragePlus` man page provides additional details.

Freeing Node Resources by Off-Loading Non-Critical Resource Groups

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Prioritized Service Management (RGOffload) allows your cluster to automatically free a node's resources for critical data services. RGOffload is used when the startup of a critical failover data service requires a Non-Critical, scalable or failover data service to be brought offline. RGOffload is used to off-load resource groups containing non-critical data services.

Note – The critical data service must be a failover data service. The data service to be off-loaded can be a failover or scalable data service.

▼ How to Set Up an RGOffload Resource (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

1. **Become superuser on a cluster member.**
2. **Determine whether the RGOffload resource type is registered.**

   The following command prints a list of resource types.

   ```
   # scrgadm -p|egrep SUNW.RGOffload
   ```

3. **If needed, register the resource type.**

   ```
   # scrgadm -a -t SUNW.RGOffload
   ```

4. **Set the `Desired_primaries` to zero in each resource group to be offloaded by the RGOffload resource.**

   ```
   # scrgadm -c -g offload-rg -y Desired_primaries=0
   ```

5. **Add the RGOffload resource to the critical failover resource group and set the extension properties.**

Caution – Do not place a resource group on more than one resource's `rg_to_offload` list. Placing a resource group on multiple `rg_to_offload` lists may cause the resource group to be taken offline and brought back online repeatedly.

See "Configuring RGOffload Extension Properties (5/02)" on page 96 for extension property descriptions.

```
# scrgadm -aj rgoffload-resource -t SUNW.RGOffload -g critical-rg \
-x rg_to_offload=offload-rg-1, offload-rg-2, ... \
-x continue_to_offload=TRUE -x max_offload_retry=15
```

Note – Extension properties other than `rg_to_offload` are shown with default values here. `rg_to_offload` is a comma-separated list of resource groups that are not dependent on each other. This list cannot include the resource group to which the RGOffload resource is being added.

6. **Enable the RGOffload resource.**

```
# scswitch -ej rgoffload-resource
```

7. **Set the dependency of the critical failover resource on the RGOffload resource.**

```
# scrgadm -c -j critical-resource \
-y Resource_dependencies=rgoffload-resource
```

`Resource_dependencies_weak` may also be used. Using `Resource_dependencies_weak` on the RGOffload resource type will allow the critical failover resource to start up even if errors are encountered during offload of `offload-rg`.

8. **Bring the resource groups to be offloaded online.**

```
# scswitch -z -g offload-rg, offload-rg-2, ... -h nodelist
```

The resource group remains online on all nodes where the critical resource group is offline. The fault monitor prevents the resource group from running on the node where the critical resource group is online.

Because `Desired_primaries` for resource groups to be offloaded is set to 0 (see Step 4), the `-Z` option will not bring these resource groups online.

9. **If the critical failover resource group is not online, bring it online.**

```
# scswitch -Z -g critical-rg
```

Example – Configuring an RGOffload Resource

This example describes how to configure an RGOffload resource (`rgofl`), the critical resource group that contains the RGOffload resource (`oracle_rg`), and scalable resource groups that are off-loaded when the critical resource group comes online (`IWS-SC`, `IWS-SC-2`). The critical resource in this example is `oracle-server-rs`.

In this example, `oracle_rg`, `IWS-SC`, and `IWS-SC-2` can be mastered on any node of cluster `triped`: `phys-triped-1`, `phys-triped-2`, `phys-triped-3`.

```
[Determine whether the SUNW.RGOffload resource type is registered.]
# scrgadm -p|egrep SUNW.RGOffload

[If needed, register the resource type.]
# scrgadm -a -t SUNW.RGOffload

[Set the Desired_primaries to zero in each resource group to be offloaded by
the RGOffload resource.]
# scrgadm -c -g IWS-SC-2 -y Desired_primaries=0
# scrgadm -c -g IWS-SC -y Desired_primaries=0

[Add the RGOffload resource to the critical resource group and set the extension
properties.]
# scrgadm -aj rgofl -t SUNW.RGOffload -g oracle_rg \
-x rg_to_offload=IWS-SC,IWS-SC-2 -x continue_to_offload=TRUE \
-x max_offload_retry=15

[Enable the RGOffload resource.]
# scswitch -ej rgofl

[Set the dependency of the critical failover resource to the RGOffload
resource.]
# scrgadm -c -j oracle-server-rs -y Resource_dependencies=rgofl

[Bring the resource groups to be offloaded online on all nodes.]
# scswitch -z -g IWS-SC,IWS-SC-2 -h phys-triped-1,phys-triped-2,phys-triped-3

[If the critical failover resource group is not online, bring it online.]
# scswitch -Z -g oracle_rg
```

Configuring RGOffload Extension Properties (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Typically, you use the command line `scrgadm -x` *parameter=value* to configure extension properties when you create the RGOffload resource. See "Standard Properties" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for details on all of the Sun Cluster standard properties.

TABLE 5-1 describes extension properties that you can configure for RGOffload. The Tunable entries indicate when you can update the property.

TABLE 5-1 RGOffload Extension Properties

Name/Data Type	Default
`rg_to_offload` (string)	A comma-separated list of resource groups that need to be offloaded on a node when a critical failover resource group starts up on that node. This list should not contain resource groups that depend upon each other. This property has no default and must be set. RGOffload does not check for dependency loops in the list of resource groups set in the `rg_to_offload` extension property. For example, if resource group `RG-B` depends in some way on `RG-A`, then both `RG-A` and `RG-B` should not be included in `rg_to_offload`. **Default:** `None` **Tunable:** Any time
continue_to_offload (Boolean)	A Boolean to indicate whether to continue offloading the remaining resource groups in the `rg_to_offload` list after an error in offloading a resource group occurs. This property is only used by the START method. **Default:** `True` **Tunable:** Any time
`max_offload_retry` (integer)	The number of attempts to offload a resource group during startup in case of failures due to cluster or resource group reconfiguration. There is an interval of 10 seconds between successive retries. Set the `max_offload_retry` so that (the number of resource groups to be offloaded * `max_offload_retry` * 10 seconds) is less than the `Start_timeout` for the RGOffload resource. If this number is close to or more than the `Start_timeout` number, the START method of RGOffload resource may time out before maximum offload attempts are completed. This property is only used by the START method. **Default:** `15` **Tunable:** Any time

Fault Monitor (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The Fault Monitor probe for RGOffload resource is used to keep resource groups specified in the `rg_to_offload` extension property offline on the node mastering the critical resource. During each probe cycle, Fault Monitor verifies that resource groups to be off-loaded (`offload-rg`) are offline on the node mastering the critical resource. If the `offload-rg` is online on the node mastering the critical resource, the Fault Monitor attempts to start `offload-rg` on nodes other than the node mastering the critical resource, thereby bringing `offload-rg` offline on the node mastering the critical resource.

Because `desired_primaries` for `offload-rg` is set to 0, off-loaded resource groups are not restarted on nodes that become available later. Therefore, the RGOffload Fault Monitor attempts to start up `offload-rg` on as many primaries as possible, until `maximum_primaries` limit is reached, while keeping `offload-rg` offline on the node mastering the critical resource.

RGOffload attempts to start up all off-loaded resource groups unless they are in the maintenance or unmanaged state. To place a resource group in an unmanaged state, use the `scswitch` command.

```
# scswitch -u -g resourcegroup
```

The Fault Monitor probe cycle is invoked after every `Thorough_probe_interval`.

Installing and Configuring iPlanet Directory Server

The following information applies to this update release and all subsequent updates.

▼ How to Install iPlanet Directory Server for Solaris 9 (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The iPlanet Directory Server is bundled with the Solaris 9 operating environment. If you are using Solaris 9, use the Solaris 9 CD-ROMs to install the iPlanet Directory Server.

1. **Install the iPlanet Directory Server packages on all the nodes of the cluster, if they are not already installed.**
2. **Identify a location on a cluster file system where you intend to keep all your directory servers (for example, `/global/nsldap`).**

   If you want to, you may create a separate directory for this file system.
3. **On all nodes, create a link to this directory from `/var/ds5`. If `/var/ds5` already exists on a node, remove it and create the link.**

```
# rmdir /var/ds5
# ln -s /global/nsldap /var/ds5
```

4. **On any one node, set up the directory server(s) in the usual way.**

```
# directoryserver setup
```

   On this node, a link, `/usr/iplanet/ds5/slapd-`*instance-name*, will be created automatically. On all other nodes, create the link manually

   In the following example, `dixon-1` is the name of the Directory Server.

```
# ln -s /var/ds5/slapd-dixon-1 /usr/iplanet/ds5/slapd-dixon-1
```

5. **Supply the logical hostname when the setup command prompts you for the server name.**

   This step is required for failover to work correctly.

Note – The logical host that you specify must be online on the node from which you run the `directoryserver setup` command. This state is necessary because at the end of the iPlanet Directory Server installation, iPlanet Directory Server automatically starts and will fail if the logical host is offline on that node.

---

6. **If prompted for the logical hostname, select the logical hostname along with your domain for the computer name, for example,** `phys-schost-1.example.com`**.**

   Supply the hostname that is associated with a network resource when the setup command prompts you for the full server name.

7. **If prompted for the IP address to be used as the iPlanet Directory Server Administrative Server, specify the IP address of the cluster node on which you are running** `directoryserver setup`**.**

   As part of the installation, you set up an iPlanet Directory Server Administrative Server. The IP address that you specify for this server must be that of a physical cluster node, not the name of the logical host that will fail over.

Where to Go From Here

After you configure and activate the network resources, go to "How to Configure iPlanet Directory Server" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.

Installing and Configuring an iPlanet Web Server

The following information applies to this update release and all subsequent updates.

▼ How to Configure an iPlanet Web Server (5/02)

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

This procedure describes how to configure an instance of the iPlanet Web server to be highly available. Use the Netscape™ browser to interact with this procedure.

Consider the following points before you perform this procedure.

- Before you start, ensure that you have installed the browser on a machine that can access the network on which the cluster resides. You can install the browser on a cluster node or on the administrative workstation for the cluster.
- Your configuration files can reside on either a local file system or on the cluster file system.
- Any certificates that are installed for the secure instances must be installed from all cluster nodes. This installation involves running the admin console on each node. Thus, if a cluster has nodes `n1`, `n2`, `n3`, and `n4`, the installation steps are as follows.

1. Run the admin server on node `n1`.
2. From your Web browser, connect to the admin server as `http://n1.`*domain*`:`*port*—for example, `http://n1.example.com:8888`—or whatever you specified as the admin server port. The port is typically `8888`.
3. Install the certificate.
4. Stop the admin server on node `n1` and run the admin server from node `n2`.
5. From the Web browser, connect to the new admin server as `http://n2.`*domain*`:`*port*, for example, `http://n2.example.com:8888`.
6. Repeat these steps for nodes `n3` and `n4`.

   After you have considered the preceding points, complete the following steps.

1. **Create a directory on the local disk of all the nodes to hold the logs, error files, and PID file that iPlanet Web Server manages.**

   For iPlanet to work correctly, these files must be located on each node of the cluster, not on the cluster file system.

   Choose a location on the local disk that is the same for all the nodes in the cluster. Use the `mkdir -p` command to create the directory. Make `nobody` the owner of this directory.

   The following example shows how to complete this step.

```
phys-schost-1# mkdir -p /var/pathname/http-instance/logs/
```

Note – If you anticipate large error logs and PID files, do not put them in a directory under `/var` because they will overwhelm this directory. Rather, create a directory in a partition with adequate space to handle large files.

---

2. **From the administrative workstation or a cluster node, start the Netscape browser.**

3. **On one of the cluster nodes, go to the directory `https-admserv`, then start the iPlanet admin server.**

```
# cd https-admserv
# ./start
```

4. **Enter the URL of the iPlanet admin server in the Netscape browser.**

   The URL consists of the physical hostname and port number that the iPlanet installation script established in Step 4 of the server installation procedure, for example, `n1.example.com:8888`. When you perform Step 2 of this procedure, the `./start` command displays the admin URL.

   When prompted, use the user ID and password you specified in Step 6 of the server installation procedure to log in to the iPlanet administration server interface.

5. **Using the administration server where possible and manual changes otherwise, complete the following:**
   - Verify that the server name is correct.
   - Verify that the server user is set as superuser.
   - Change the bind address field to one of the following addresses.
     - A logical hostname or shared address if you use DNS as your name service
     - The IP address associated with the logical hostname or shared address if you use NIS as your name service
   - Update the ErrorLog, PidLog, and Access Log entries to reflect the directory created in Step 1 of this section.
   - Save your changes.

Resource Group Properties

The following change was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

A new resource group property, `Auto_start_on_new_cluster`, has been added to the Resource Group Properties list.

TABLE 5-2 Resource Group Properties

Property Name	Description
Auto_start_on_new_cluster (Boolean)	This property can be used to disable automatic startup of the Resource Group when a new cluster is forming. The default is `TRUE`. If set to `TRUE`, the Resource Group Manager attempts to start the resource group automatically to achieve `Desired_primaries` when the cluster is rebooted. If set to `FALSE`, the Resource Group does not start automatically when the cluster is rebooted. **Category:** Optional **Default:** `True` **Tunable:** Any time

CHAPTER 6

System Administration

This chapter provides new system administration information that has been added to the Sun Cluster 3.0 5/02 update release. This information supplements the *Sun Cluster 3.0 12/01 System Administration Guide*.

This chapter contains new information for the following topics.

- "Administering Disk Device Groups" on page 106
- "Administering Cluster File Systems Overview" on page 116
- "Adding and Removing a Cluster Node" on page 118

Administering Disk Device Groups

The following information applies to this update release and all subsequent updates.

VERITAS Volume Manager Administration Considerations (5/02)

The following two items were added to this section in the Sun Cluster 3.0 5/02 update release and apply to this update and all subsequent updates to Sun Cluster 3.0 software.

- VxVM does not support the `chmod` command. To change global device permissions in VxVM, consult the VxVM administrator's guide.
- Sun Cluster 3.0 software does not support VxVM Dynamic Multipathing (DMP) to manage multiple paths from the same node.

▼ How to Remove a Node From All Disk Device Groups (5/02)

Use this procedure to remove a cluster node from all disk device groups that list the node in their lists of potential primaries.

1. **Become superuser on the node you want to remove as a potential primary of all disk device groups.**
2. **Determine the disk device group(s) of which the node to be removed is a member that are under volume management control.**

   Look for the node name in the `Device group node list` for each disk device group.

   ```
   # scconf -p | grep ¨Device group¨
   ```

3. **Are any of the disk device groups identified in Step 2 of the device group type `SDS`?**
   - If yes, perform the procedures in "How to Remove a Node From a Disk Device Group (Solstice DiskSuite) (5/02)" on page 108.
   - If no, go to Step 4.

4. **Are any of the disk device groups identified in Step 2 of the device group type `VxVM`?**
   - If yes, perform the procedures in "How to Remove a Node From a Disk Device Group (VERITAS Volume Manager) (5/02)" on page 110.
   - If no, go to Step 5.

5. **Determine the raw disk device groups of which the node to be removed is a member.**

   Note that the following command contains two "v"s in `-pvv`. The second "v" is needed to display raw disk device groups.

```
# scconf -pvv | grep ¨Device group¨
```

6. **Are any of the disk device groups listed in Step 5 of the device group types `Disk`, `Local_Disk`, or both?**
   - If yes, perform the procedures in "How to Remove a Node From a Raw Disk Device Group (5/02)" on page 112.
   - If no, go to Step 7.

7. **Verify that the node has been removed from the potential primaries list of all disk device groups.**

   The command returns nothing if the node is no longer listed as a potential primary of any disk device group.

```
# scconf -pvv | grep ¨Device group¨ | grep nodename
```

▼ How to Remove a Node From a Disk Device Group (Solstice DiskSuite) (5/02)

Use this procedure to remove a cluster node from the list of potential primaries of a Solstice DiskSuite disk device group. A node can belong to more than one disk device group at a time, so repeat the `metaset` command for each disk device group from which you want to remove the node.

1. **Determine the Solstice DiskSuite disk device group(s) of which the node to be removed is a member.**

   Device group type `SDS` indicates a Solstice DiskSuite disk device group.

   ```
   # scconf -p | grep Device
   ```

2. **Become superuser on the node that currently owns the disk device group you want to modify.**

3. **Delete the node's hostname from the disk device group.**

   ```
   # metaset -s setname -d -h nodelist
   ```

`-s` *setname*	Specifies the disk device group name
`-d`	Deletes from the disk device group the nodes identified with `-h`
`-h` *nodelist*	Removes the node from the list of nodes that can master the disk device group

   Note – The update can take several minutes to complete.

   If the command fails, add the `-f` (Force) option to the command.

   ```
   # metaset -s setname -d -f -h nodelist
   ```

4. **Repeat Step 3 for each disk device group from which the node is being removed as a potential primary.**

5. **Verify that the node has been removed from the disk device group.**

   The disk device group name will match the diskset name specified with `metaset`.

```
# scstat -D
```

Example—Removing a Node From a Disk Device Group (Solstice DiskSuite)

The following example shows the removal of the host name `phys-schost-2` from a disk device group configuration. This eliminates `phys-schost-2` as a potential primary for the designated disk device group. Verify removal of the node by running the `scstat -D` command and by checking that the removed node is no longer displayed in the screen text.

```
[Determine the Solstice DiskSuite disk device group(2) for the
node:]
# scconf -p | grep Device
  Device group name:                 dg-schost-1
    Device group type:               SDS
    Device group failback enabled:   no
    Device group node list:          phys-schost-1, phys-schost-2
    Device group ordered node list:  yes
    Device group diskset name:    dg-schost-1

[Determine the disk device group(s) for the node:]
# scstat -D
  -- Device Group Servers --
                       Device Group  Primary        Secondary
                       ------------  -------        ---------
  Device group servers: dg-schost-1  phys-schost-1  phys-schost-2

[Become superuser.]

[Remove the hostname from all disk device groups:]
# metaset -s dg-schost-1 -d -h phys-schost-2

[Verify removal of the node:]
# scstat -D
  -- Device Group Servers --
                       Device Group  Primary       Secondary
                       ------------  -------       ---------
  Device group servers: dg-schost-1  phys-schost-1  -
```

▼ How to Remove a Node From a Disk Device Group (VERITAS Volume Manager) (5/02)

Use this procedure to remove a cluster node from the list of potential primaries of a VERITAS Volume Manager (VxVM) disk device group (disk group).

1. **Determine the VxVM disk device group(s) of which the node to be removed is a member.**

   The device group type `VxVM` indicates a VxVM disk device group.

   ```
   # scconf -p | grep Device
   ```

2. **Become superuser on a current cluster member node.**

3. **Execute the `scsetup` utility.**

   ```
   # scsetup
   ```

   The Main Menu is displayed.

4. **To reconfigure a disk device group, type `4` (Device groups and volumes).**

5. **To remove the node from the VxVM disk device group, type `5` (Remove a node from a VxVM device group).**

   Follow the prompts to remove the cluster node from the disk device group. You will be asked for information about the following:

   - VxVM device group
   - Node name

6. **Verify that the node has been removed from the VxVM disk device group(s).**

   ```
   # scconf -p | grep Device
   ```

Example—Removing a Node From a Disk Device Group (VxVM)

This example shows removal of the node named `phys-schost-1` from the `dg1` VxVM disk device group.

```
[Determine the VxVM disk device group for the node:]
# scconf -p | grep Device
  Device group name:                 dg1
    Device group type:               VxVM
    Device group failback enabled:   no
    Device group node list:          phys-schost-1, phys-schost-2
    Device group diskset name:    dg1

[Become superuser and execute the scsetup utility:]
# scsetup

 Select Device groups and volumes>Remove a node from a VxVM device group.

Answer the questions when prompted.
You will need the following information.
  You Will Need:            Example:
  VxVM device group name    dg1
  node names                phys-schost-1

[Verify that the scconf command executed properly:]

scconf -r -D name=dg1,nodelist=phys-schost-1

    Command completed successfully.

Quit the scsetup Device Groups Menu and Main Menu.

[Verify that the node was removed:]
# scconf -p | grep Device
  Device group name:                 dg1
    Device group type:               VxVM
    Device group failback enabled:   no
    Device group node list:          phys-schost-2
    Device group diskset name:    dg1
```

▼ How to Remove a Node From a Raw Disk Device Group (5/02)

Use this procedure to remove a cluster node from the list of potential primaries of a raw disk device group.

1. **Become superuser on a node in the cluster other than the node to remove.**
2. **Identify the disk device groups that are connected to the node being removed.**

   Look for the node name in the `Device group node list` entry.

   ```
   # scconf -pvv | grep nodename | grep
   ```

3. **Determine which disk device groups identified in Step 2 are raw disk device groups.**

   Raw disk device groups are of the `Disk` or `Local_Disk` device group type.

   ```
   # scconf -pvv | grep ¨group type¨
   ```

4. **Disable the `localonly` property of each `Local_Disk` raw disk device group.**

   ```
   # scconf -c -D name=rawdisk-device-group,localonly=false
   ```

   See the `scconf_dg_rawdisk`(1M) man page for more information about the `localonly` property.

5. **Verify that you have disabled the `localonly` property of all raw disk device groups that are connected to the node being removed.**

   The `Disk` device group type indicates that the `localonly` property is disabled for that raw disk device group.

   ```
   # scconf -pvv | grep ¨group type¨
   ```

6. **Remove the node from all raw disk device groups identified in Step 2.**

   You must complete this step for each raw disk device group that is connected to the node being removed.

   ```
   # scconf -r -D name=rawdisk-device-group,nodelist=nodename
   ```

Example—Removing a Node From a Raw Disk Device Group

This example shows how to remove a node (`phys-schost-2`) from a raw disk device group. All commands are run from another node of the cluster (`phys-schost-1`).

```
[Identify the disk device groups connected to the node being
removed:]
phys-schost-1# scconf -pvv | grep phys-schost-2 | grep ¨Device
group node list¨
    (dsk/d4) Device group node list:  phys-schost-2
    (dsk/d2) Device group node list:  phys-schost-1, phys-schost-2
    (dsk/d1) Device group node list:  phys-schost-1, phys-schost-2

[Identify the are raw disk device groups:]
phys-schost-1# scconf -pvv | grep ¨group type¨
    (dsk/d4) Device group type:          Local_Disk
    (dsk/d8) Device group type:          Local_Disk

[Disable the localonly flag for each local disk on the node:]
phys-schost-1# scconf -c -D name=dsk/d4,localonly=false

[Verify that the localonly flag is disabled:]
phys-schost-1# scconf -pvv | grep ¨group type¨
    (dsk/d4) Device group type:          Disk
    (dsk/d8) Device group type:          Local_Disk

[Remove the node from all raw disk device groups:]
phys-schost-1# scconf -r -D name=dsk/d4,nodelist=phys-schost-2
phys-schost-1# scconf -r -D name=dsk/d2,nodelist=phys-schost-2
phys-schost-1# scconf -r -D name=dsk/d1,nodelist=phys-schost-2
```

▼ How to Create More Than Three Disksets in a Cluster (5/02)

The following procedure was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

If you intend to create more than three disksets in the cluster, perform the following steps before you create the disksets. Follow these steps regardless of whether you are installing disksets for the first time or you are adding more disksets to a fully configured cluster.

1. **Ensure that the value of the `md_nsets` variable is set high enough to accommodate the total number of disksets you intend to create in the cluster.**

   a. **On any node of the cluster, check the value of the `md_nsets` variable in the `/kernel/drv/md.conf` file.**

   b. **If the total number of disksets in the cluster will be greater than the existing value of `md_nsets` minus one, on each node increase the value of `md_nsets` to the desired value.**

      The maximum permissible number of disksets is one less than the value of `md_nsets`. The maximum possible value of `md_nsets` is 32.

   c. **Ensure that the `/kernel/drv/md.conf` file is identical on each node of the cluster.**

Caution – Failure to follow this guideline can result in serious Solstice DiskSuite errors and possible loss of data.

   d. **From one node, shut down the cluster.**

```
# scshutdown -g0 -y
```

   e. **Reboot each node of the cluster.**

```
ok> boot
```

2. **On each node in the cluster, run the `devfsadm`(1M) command.**

   You can run this command on all nodes in the cluster at the same time.

3. **From one node of the cluster, run the `scgdevs`(1M) command.**

4. **On each node, verify that the `scgdevs` command has completed before you attempt to create any disksets.**

   The `scgdevs` command calls itself remotely on all nodes, even when the command is run from just one node. To determine whether the `scgdevs` command has completed processing, run the following command on each node of the cluster.

```
% ps -ef | grep scgdevs
```

Administering Cluster File Systems Overview

The following information applies to this update release and all subsequent updates.

Guidelines to Support VxFS (5/02)

The following information was introduced in the Sun Cluster 3.0 12/01 update release and applies to that release and all subsequent updates to Sun Cluster 3.0 software.

The following VxFS features are not supported in a Sun Cluster 3.0 configuration.

- Quick I/O
- Snapshots
- Storage checkpoints
- Cache advisories (these can be used, but the effect will be observed on the given node only)
- VERITAS CFS (requires VERITAS cluster feature & VCS)
- VxFS-specific mount options
  - `convosync` (Convert `O_SYNC`)
  - `mincache`
  - `qlog`, `delaylog`, `tmplog`

All other VxFS features and options that are supported in a cluster configuration are supported by Sun Cluster 3.0 software. See VxFS documentation and man pages for details about VxFS options that are or are not supported in a cluster configuration.

The following guidelines for how to use VxFS to create highly available cluster file systems are specific to a Sun Cluster 3.0 configuration.

- Create a VxFS file system by following procedures in VxFS documentation.
- Globally mount and unmount a VxFS file system from the primary node (the node that masters the disk on which the VxFS file system resides) to ensure that the operation succeeds. A VxFS file system mount or unmount operation that is performed from a secondary node might fail.
- Perform all VxFS administration commands from the primary node of the VxFS cluster file system.

The following guidelines for how to administer VxFS cluster file systems are not specific to Sun Cluster 3.0 software. However, they are different from the way you administer UFS cluster file systems.

- You can access and administer files on a VxFS cluster file system from any node in the cluster, with the exception of ioctls, which you must issue only from the primary node. If you do not know whether an administration command involves ioctls, issue the command from the primary node.
- If a VxFS cluster file system fails over to a secondary node, all standard-system-call operations that were in progress during failover are re-issued transparently on the new primary. However, any ioctl-related operation in progress during the failover will fail. After a VxFS cluster file system failover, check the state of the cluster file system. There might be administrative commands that were issued on the old primary before failover that require corrective measures. See VxFS documentation for more information.

How to Add a Cluster File System (5/02)

The following note was added to Step 2 of this procedure in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Note – The `newfs`(1M) command is only valid for creating new UFS file systems. To create a new VxFS file system, follow procedures provided in your VxFS documentation

---

Adding and Removing a Cluster Node

The following information applies to this update release and all subsequent updates.

Task Map: Removing a Cluster Node (5/02)

The following task map was changed in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software. Referenced procedures that are not provided in this task map are located in the *Sun Cluster 3.0 12/01 System Administration Guide*.

TABLE 6-1 Task Map: Removing a Cluster Node (5/02) (Sheet 1 of 2)

Task	For Instructions, Go To
Remove node from all resource groups - Use `scrgadm`	*Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*: See the procedure for how to remove a node from an existing resource group.
Remove node from all disk device groups - Use `scconf`, `metaset`, and `scsetup`	"How to Remove a Node From All Disk Device Groups (5/02)" on page 106 • "How to Remove a Node From a Disk Device Group (Solstice DiskSuite) (5/02)" on page 108 • "How to Remove a Node From a Disk Device Group (VERITAS Volume Manager) (5/02)" on page 110 • "How to Remove a Node From a Raw Disk Device Group (5/02)" on page 112
Place node being removed into maintenance state - Use `scswitch`, `shutdown`, and `scconf`	"How to Put a Node Into Maintenance State"
Remove all logical transport connections to the node being removed - Use `scsetup`	"How to Remove Cluster Transport Cables, Transport Adapters, and Transport Junctions"
Remove all quorum devices shared with the node being removed - Use `scsetup`	"How to Remove a Quorum Device" or "How to Remove the Last Quorum Device From a Cluster"
Remove node from the cluster software configuration - Use `scconf`	"How to Remove a Node From the Cluster Software Configuration (5/02)" on page 119

TABLE 6-1 Task Map: Removing a Cluster Node (5/02) (Sheet 2 of 2)

Task	For Instructions, Go To
(Optional) Uninstall Sun Cluster software from the removed node - Use `scinstall`	"How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120
Disconnect required shared storage from the node and cluster - Follow the procedures in your volume manager documentation and hardware guide. To remove the physical hardware from the node, see the *Sun Cluster 3.0 12/01 Hardware Guide* section on installing and maintaining cluster interconnect and public network hardware.	Solstice DiskSuite or VxVM administration guide Hardware documentation *Sun Cluster 3.0 12/01 Hardware Guide*

▼ How to Remove a Node From the Cluster Software Configuration (5/02)

The following information was changed in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

- Steps to remove a node from a raw disk device group have been removed. Those instructions are now located in the new procedure "How to Remove a Node From a Raw Disk Device Group (5/02)" on page 112.
- After the node is removed from the cluster, you now have the option to uninstall Sun Cluster software from the removed node. To uninstall Sun Cluster software, go to "How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120.

▼ How to Uninstall Sun Cluster Software From a Cluster Node (5/02)

The following procedure was added in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

Perform this procedure to uninstall Sun Cluster software from a cluster node before you disconnect it from a fully established cluster configuration. You can use this procedure to uninstall software from the last remaining node of a cluster.

Note – To uninstall Sun Cluster software from a node that has not yet joined the cluster or is still in install mode, do not perform this procedure. Instead, go to "How to Uninstall Sun Cluster Software to Correct Installation Problems" in the *Sun Cluster 3.0 12/01 Software Installation Guide*.

---

1. **Be sure you have correctly completed all prerequisite tasks listed in the task map for removing a cluster node.**

   See "Adding and Removing a Cluster Node" in the *Sun Cluster 3.0 12/01 System Administration Guide*.

   Note – Be sure you have removed the node from all resource groups, device groups, and quorum device configurations, placed it in maintenance state, and removed it from the cluster before you continue with this procedure.

   ---

2. **Become superuser on an active cluster member other than the node you will uninstall.**

3. **From the active cluster member, add the node you intend to uninstall to the cluster's node authentication list.**

   ```
   # scconf -a -T node=nodename
   ```

`-a`	Add
`-T`	Specifies authentication options
`node=`*nodename*	Specifies the name of the node to add to the authentication list

   Alternately, you can use the `scsetup`(1M) utility. See "How to Add a Cluster Node to the Authorized Node List" in the *Sun Cluster 3.0 12/01 System Administration Guide* for procedures.

4. **Become superuser on the node to uninstall.**

5. **Reboot the node into non-cluster mode.**

```
# shutdown -g0 -y -i0
ok boot -x
```

6. **In the `/etc/vfstab` file, remove all globally mounted file system entries except the `/global/.devices` global mounts.**

7. **Uninstall Sun Cluster software from the node.**

```
# cd /
# scinstall -r
```

See the `scinstall`(1M) man page for more information. If `scinstall` returns error messages, see "Troubleshooting a Node Uninstallation" on page 121.

8. **Disconnect the transport cables and the transport junction, if any, from the other cluster devices.**

   a. **If the uninstalled node is connected to a storage device that uses a parallel SCSI interface, install a SCSI terminator to the open SCSI connector of the storage device after you disconnect the transport cables.**

      If the uninstalled node is connected to a storage device that uses Fibre Channel interfaces, no termination is necessary.

   b. **Follow the documentation that shipped with your host adapter and server for disconnection procedures.**

Troubleshooting a Node Uninstallation

This section describes error messages you might receive when you run the `scinstall -r` command and the corrective actions to take.

- "Unremoved Cluster File System Entries" on page 122
- "Unremoved Listing in Disk Device Groups" on page 122

Unremoved Cluster File System Entries

The following error messages indicate that the node you removed still has cluster file systems referenced in its `vfstab` file.

```
Verifying that no unexpected global mounts remain in /etc/vfstab ... failed
scinstall:  global-mount1 is still configured as a global mount.
scinstall:  global-mount1 is still configured as a global mount.
scinstall:  /global/dg1 is still configured as a global mount.

scinstall:  It is not safe to uninstall with these outstanding errors.
scinstall:  Refer to the documentation for complete uninstall instructions.
scinstall:  Uninstall failed.
```

To correct this error, return to "How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120 and repeat the procedure. Ensure that you successfully complete Step 6 in the procedure before you rerun the `scinstall -r` command.

Unremoved Listing in Disk Device Groups

The following error messages indicate that the node you removed is still listed with a disk device group.

```
Verifying that no device services still reference this node ... failed
scinstall:  This node is still configured to host device service "service".
scinstall:  This node is still configured to host device service "service2".
scinstall:  This node is still configured to host device service "service3".
scinstall:  This node is still configured to host device service "dg1".

scinstall:  It is not safe to uninstall with these outstanding errors.
scinstall:  Refer to the documentation for complete uninstall instructions.
scinstall:  Uninstall failed.
```

To correct this error, perform the following steps.

1. **Attempt to rejoin the node to the cluster.**

```
# boot
```

2. **Did the node successfully rejoin the cluster?**
   - If no, proceed to Step 3.
   - If yes, perform the following steps to remove the node from disk device groups.

   a. **If the node successfully rejoins the cluster, remove the node from the remaining disk device group(s).**

      Follow procedures in "How to Remove a Node From All Disk Device Groups (5/02)" on page 106.

   b. **After you remove the node from all disk device groups, return to "How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120 and repeat the procedure.**

3. **If the node could not rejoin the cluster, rename the node's `/etc/cluster/ccr` file to any other name you choose, for example, `ccr.old`.**

```
# mv /etc/cluster/ccr /etc/cluster/ccr.old
```

4. **Return to "How to Uninstall Sun Cluster Software From a Cluster Node (5/02)" on page 120 and repeat the procedure.**

CHAPTER 7

Data Services Development

This chapter provides new data services development information that has been added to the Sun Cluster 3.0 5/02 update release. This information supplements the *Sun Cluster 3.0 12/01 Data Services Developer's Guide*.

This chapter contains new information for the following topics.

- "Data Services Development Library (DSDL)" on page 126
- "Designing Resource Types" on page 127
- "DSDL Reference" on page 128
- "Standard Properties" on page 129
- "Generic Data Service" on page 130

Data Services Development Library (DSDL)

The following information applies to this update release and all subsequent updates.

Enabling Highly Available Local File Systems (5/02)

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The HAStoragePlus resource type can be used to make a local file system highly available within a Sun Cluster environment. The local file system partitions must reside on global disk groups with affinity switchovers enabled and the Sun Cluster environment must be configured for failover. This enables the user to make any file system on multi-host disks accessible from any host directly connected to those multi-host disks. Using a highly available local file system is strongly recommended for some I/O intensive data services, and configuring the HAStoragePlus resource type has been added to the Registration and Configuration procedures in the *Sun Cluster Data Services Installation and Configuration Guide*.

Designing Resource Types

The following information applies to this update release and all subsequent updates.

The VALIDATE Method (5/02)

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

If you are using local file systems managed by HAStoragePlus, you use the `scds_hasp_check` to check the state of the HAStoragePlus resource, This information is obtained from the state (online or otherwise) of all `SUNW.HAStoragePlus` resources that the resource depends upon using `Resource_dependencies` or `Resource_dependencies_weak` system properties defined for the resource. See `scds_hasp_check(3HA)` for a complete list of status codes returned from the `scds_hasp_check` call.

DSDL Reference

The following information applies to this update release and all subsequent updates.

General Purpose Functions (5/02)

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

The following function retrieves status information about the `SUNW.HAStoragePlus` resources used by a resource.

- `scds_hasp_check(3HA)` - retrieves status information about `SUNW.HAStoragePlus` resources used by a resource. This information is obtained from the state (online or otherwise) of all `SUNW.HAStoragePlus` resources that the resource depends upon using the `Resource_dependencies` or `Resource_dependencies_weak` system properties defined for the resource.

  See "Enabling Highly Available Local File System" in the *Sun Cluster Data Services Installation and Configuration Guide* for information on `SUNW.HAStoragePlus`.

Standard Properties

The following information applies to this update release and all subsequent updates.

General Purpose Functions (5/02)

The following feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software.

A new resource group property, `Auto_start_on_new_cluster`, has been added to the list of supported Resource Group properties.

TABLE 7-1 Resource Group Properties

Property Name	Description	Updatable	Category
`Auto_start_on_new_cluster`	This property can be used to disable automatic startup of the Resource Group when a new cluster is forming. The default is true. If set to true, the Resource Group Manager attempts to start the resource group automatically to achieve `Desired_primaries` when the cluster is rebooted. If set to FALSE, the Resource Group does not start automatically when the cluster reboots.	Y	Optional

Generic Data Service

This feature was introduced in the Sun Cluster 3.0 5/02 update release and applies to this update and all subsequent updates to Sun Cluster 3.0 software. See "Generic Data Service" on page 269.

APPENDIX **A**

Campus Clustering with Sun Cluster 3.0 Software — Concepts

This appendix introduces some of the basic concepts of campus clustering and provides some configuration and setup examples. It does not attempt to fully explain clustering, provide information on clustering administration, or to furnish details about hardware installation and configuration. For this information, see other Sun Cluster manuals, in particular the *Sun Cluster 3.0 12/01 Concepts* guide, the *Sun Cluster 3.0 12/01 System Administration Guide*, and the *Sun Cluster 3.0 12/01 Hardware Guide*, as well as manuals specifically referenced here.

Introduction

The only significant difference between traditional clustering and campus clustering is that of distance. In campus clustering, the nodes of a cluster configuration can be up to several kilometers apart. This increases the likelihood that, in the case of a catastrophe such as a fire or earthquake, at least one server and its storage will survive.

Sun Cluster software currently supports exactly two nodes in a campus cluster configuration. However, both two- and three-room configurations are supported. A **room** can be thought of as a functionally independent hardware grouping (such as a node and its attendant storage, or a quorum device physically separated from any nodes) that has been separated from other rooms to increase the likelihood of

failover and redundancy in case of accident or failure. The definition of a room therefore depends on the type of failures to be safeguarded against, as indicated by TABLE A-1.

TABLE A-1 Definitions of "Room"

Failure Scenario	Sample Definitions of Separate Rooms
Power line failure	Isolated and independent power supplies
Minor accidents, furniture collapse, seepage, etc.	Different parts of physical room
Small fire. Sprinklers (fire) starting	Different physical area s (for example, sprinkler zone)
Structural failure (building-wide fire, for example)	Different buildings
Large-scale natural disaster (for example, earthquake or flood)	Different corporate campuses up to several kilometers apart

Since all campus clusters are two-node clusters, each campus cluster must have a **quorum disk**. In two-room configurations, the quorum disk occupies the same room as one node (see "Example Two-Room Configuration" on page 134). In the case of a three-room configuration, the third room is used for the quorum disk ("Example Three-Room Configuration" on page 135).

The node that first acquires a reservation on the quorum disk takes over cluster services; the other node is forced offline by means of a kernel panic. In a two-room configuration, the quorum disk should be located in the room that is more likely to survive an accident or catastrophe in the event that all cluster transport and disk connectivity is lost between rooms. (If **only** cluster transport is lost, the node sharing a room with the quorum disk will not necessarily be the room that reserves the quorum disk first.)

The advantage to a three-room cluster is that, if any one of the three rooms is lost, automatic failover should typically be possible; whereas with a two-room cluster, if an entire room is lost, automatic failover is possible only if the surviving room contains the quorum disk. **Only a three-room configuration guarantees system availability in the event of complete loss of an entire room (in the absence of any other failures).**

Note – As with non-campus configurations, data integrity will be compromised if there are other unrecovered I/O failures present when a room is destroyed, and the most up-to-date submirror was in the destroyed room.

In a campus cluster configuration, each of the two rooms used for nodes should have an equal number of shared disks. (In a two-room configuration, one room can have a separate quorum disk, so the two rooms need not have the same number of **total** disks.) Mirroring of the shared disks must always be done between rooms, rather than within rooms. In other words, both submirrors of a two-way mirror should never be in the same room. Mirroring is required for all campus cluster configurations, since RAID-5 alone does not lend itself to providing data redundancy across rooms.

If you use Solstice DiskSuite as your volume manager for shared device groups, pay special consideration to the distribution of replicas. In two-room configurations, all disksets should be configured with an additional replica in the room that houses the cluster quorum disk. Further, all Solstice DiskSuite device groups should be configured to use the node in the quorum disk room as their default primary room. In three-room configurations, the third room should not only house the quorum disk, but also include at least one extra disk configured into each of the disksets. Each diskset should include a third-room disk with an extra Solstice DiskSuite replica per diskset. Quorum disks can be used as `metadb` replicas in a metaset. Sun Cluster software does not currently support using the third room for data storage.

Sun Cluster software supports campus cluster configurations with rooms up to 10km apart.

Campus Cluster Configuration Examples

This section provides examples of two- and three-room campus clustering configurations:

- FIGURE A-1 shows a two-room configuration using Sun StorEdge T3 partner groups.
- FIGURE A-2 shows a three-room campus cluster using Sun StorEdge A5x00 disk arrays.

Note – The examples in this chapter illustrate general configurations and are not intended to indicate required or recommended setups. The type of storage device shown, for example, is purely for illustrative purposes. For simplicity's sake, the diagrams and explanations concentrate only on features unique to understanding campus clustering, so that, for example, public-network Ethernet connections are not shown.

See "Additional Campus Cluster Configuration Examples" on page 141 for other example setups.

Example Two-Room Configuration

A two-room configuration is defined as follows:

- Two separate rooms
- Both rooms with one node each and disk subsystems
- Data mirrored across disk subsystems in these rooms
- At least one disk subsystem, attached to both hosts, used as a quorum device, located in one of the rooms

In the event of loss of the room containing the quorum disk, the system will be unable to recover automatically. Recovery will require operator intervention.

FIGURE A-1 shows a sample two-room configuration using a partner-group of Sun StorEdge T3/T3+ disk arrays in each room.

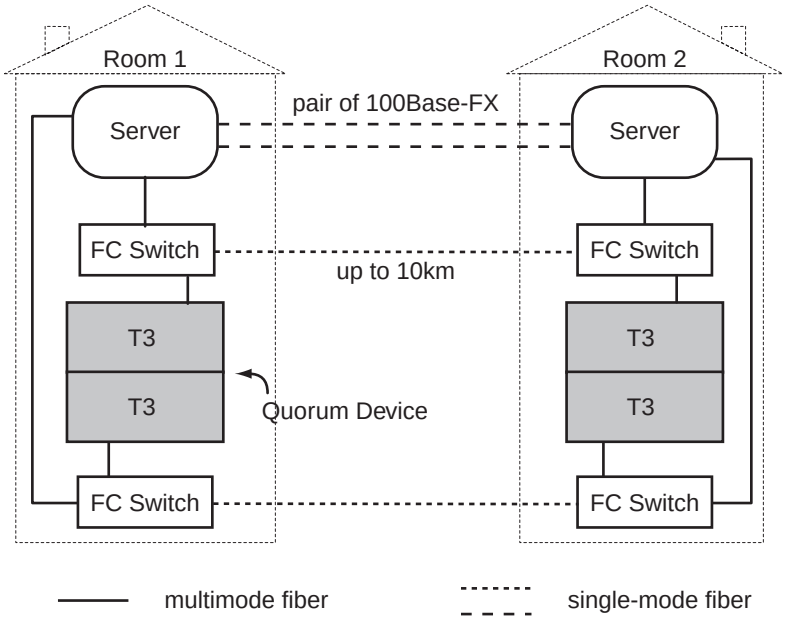

FIGURE A-1 Example Two-Room Campus Cluster

FIGURE A-1 is similar to a standard non-campus configuration; the most obvious difference is that Fibre Channel switches have been added to switch from multimode to single-mode fibers.

Although not so depicted in this chapter, campus clustering allows for configurations using multiple storage arrays. Where large storage environments are required, additional SAN switches for Sun StorEdge T3/T3+ arrays might be required.

Example Three-Room Configuration

A three-room configuration is defined as follows:

- Three separate rooms
- Two rooms with one node each and an equal number of disk arrays, in this case, Sun StorEdge A5x00 disk subsystems; data is mirrored across disk-subsystems in these rooms
- Third room with at least one disk subsystem attached to both hosts to be used as a quorum device

FIGURE A-2 shows this configuration using Sun StorEdge A5x00 disk arrays. Note that, unlike FIGURE A-1, which used Sun StorEdge T3 disk trays, this configuration does not use Fibre Channel switches to connect Sun StorEdge A5x00 disk arrays. (Switches are not needed, as long-wave GBICs are already present in the A5x00s and should also be present in the servers' host bus adapters.)

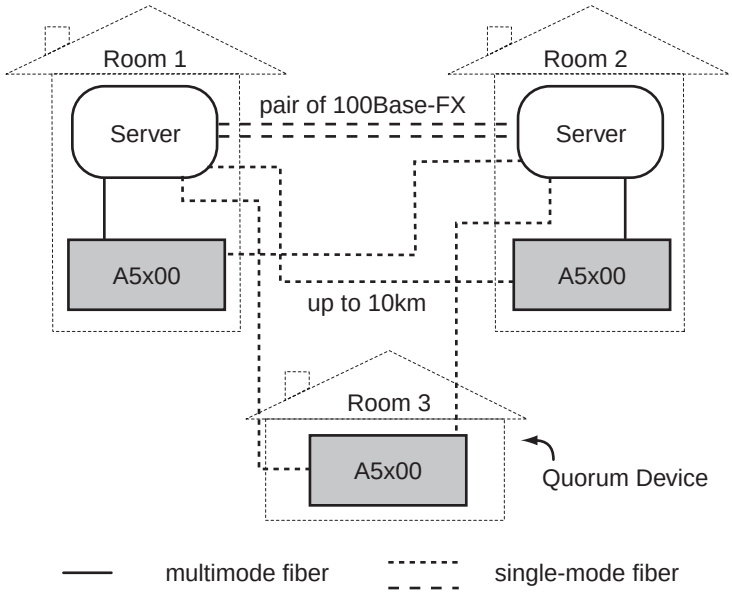

FIGURE A-2 Example Three-Room Configuration

In this configuration, as long as at least two rooms are up and communicating, recovery will be automatic. This is the only configuration in which loss of any one room is guaranteed to be automatically handled. Loss of two rooms requires the replacement or rebuilding of one room and typically requires SunService intervention.

Requirements

This section provides an overview of requirements for campus clustering. For specific information on supported and required software and hardware, see the *Sun Cluster 3.0 5/02 Release Notes* and consult your Sun sales representative.

Software

Campus clusters require the following software:

- Sun Cluster 3.0 Release 12/01 or later
- Solaris 8
- Volume management software (such as Solstice DiskSuite)

Servers

See the *Sun Cluster 3.0 5/02 Release Notes* or contact your sales representative for a list of Sun Cluster-certified servers.

Fibre Channel Switches, Fibers, and Host Adapters

Fibre Channel switches. Sun StorEdge T3/T3+ disk arrays do not connect directly to single-mode fiber, so a cluster using these devices requires Fibre Channel switches with long-wave GBICs installed in order to connect single-mode fibers to multimode fibers coming from disk arrays, hosts, and host bus adapters. (See FIGURE A-1.)

Storage fiber connections. For long-distance connections (up to 10km) between rooms, use 9/125-micron single-mode fiber.

When connecting Sun StorEdge T3/T3+ disk trays to Fibre Channel switches, use 50/125-micron multimode fibers at distances not exceeding 500m.

Host adapters. Connect Sun StorEdge A5x00 disk arrays using SOC+-based SBus host adapters.

With Sun StorEdge T3/T3+ disk trays, use a SAN-capable host adapter. Examples include the Sun StorEdge SBus Dual Fibre Channel Network Adapter, the Sun StorEdge PCI Single Fibre Channel Network Adapter, the Sun StorEdge PCI Dual Fibre Channel Network Adapter+, and the Sun StorEdge cPCI Dual Fibre Channel Network Adapter.

Storage Devices

Sun Cluster 3.0 supports campus clustering configurations using the Sun StorEdge A5x00 disk array or the Sun StorEdge T3/T3+ disk tray. The Sun StorEdge T3/T3+ can be configured either singly ("single-controller," as shown in FIGURE A-5) or in pairs ("partner-group," as shown in FIGURE A-1).

Long-wave gigabit interface converters (LWGBICs) should be used for the StorEdge A5x00 and Sun StorEdge T3/T3+ for distances greater than 500 meters and up to 10Km. (Use shortwave GBICs for distances less than 500 meters.) Consult Sun Professional Services for implementations with long-wave GBICs.

A campus cluster configuration must include two (or more) SANs for storage devices, in which the storage forming one submirror is in one room and mirrored to its submirror in another, physically separate room. Additionally, the submirrors of a mirror must be on different host bus adapters. For more on configuring SANs, refer to the *Sun StorEdge Network FC Switch-8 and Switch-16 Installation and Configuration Guide, Sun SAN 3.0*.

A quorum disk can be either a separate device or one of the dedicated storage devices (either Sun StorEdge T3/T3+ or A5x00).

Note – Because of potential limitations involving switch connectivity, it is not currently possible to use Sun StorEdge T3s in the third, quorum room.

Cluster Interconnect

The following components make up the campus cluster interconnect hardware configuration:

- SunFastEthernet Adapter. The SunFastEthernet Adapter provides 10/100 Mbps Ethernet functionality with an RJ-45 connector.
- Media converters. Use RJ-45 media converters to convert from copper to optical fiber connectors.
- Two 9/125-micrometer single-mode fiber pairs.

FIGURE A-3 shows the setup for the cluster interconnect:

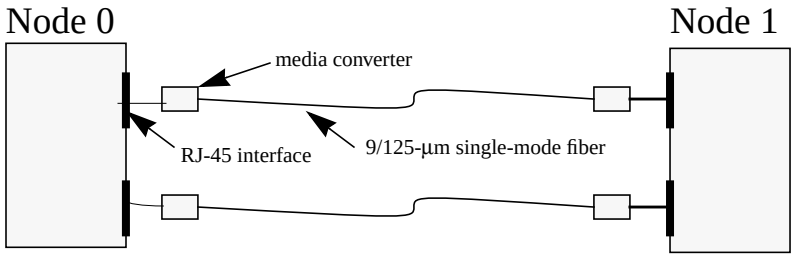

FIGURE A-3 100BASE-FX Setup

The interconnect should be capable of transmissions equal to the storage fiber connection distance. For connections up to 2km, multimode fibers can be used. If so, different transceivers might be required in place of media converters. Consult your sales representative.

Installing and Configuring Interconnect, Storage, and Fibre Channel Hardware

For the most part, using interconnect, storage, and fibre channel hardware does not differ markedly from non-campus cluster configurations.

- The steps for installing Ethernet-based campus cluster interconnect hardware are very similar to those for non-campus clusters. Refer to the *Sun Cluster 3.0 12/01 Hardware Guide* for those steps.

  When installing the media converters, consult the documentation that came with them, including requirements for fiber connections.

- The steps for installing Sun StorEdge A5x00 and Sun StorEdge T3/T3+ arrays are very similar to those for non-campus clusters. Refer to the *Sun Cluster 3.0 12/01 Hardware Guide* for those steps.

  However, when installing Sun StorEdge A5x00 arrays at distances greater than 500m, install the Sun Long Wave GBICs as indicated in the *Sun StorEdge LW GBIC Service Manual*. This manual also includes single-mode fiber specifications.

- Campus clusters using Sun StorEdge T3/T3+ arrays require Sun Fibre Channel switches to mediate between multimode and single-mode fibers. The steps for configuring the settings on the Sun Fibre Channel switches are very similar to those for non-campus clusters.

  Cascaded-switch SAN setups have requirements that are distinct from those of non-cascades setups, especially with regard to mirroring and zoning. Consult the *Sun StorEdge Network FC Switch-8 and Switch-16 Installation and Configuration Guide, Sun SAN 3.0*, as well as your service representative, for more information.

Additional Campus Cluster Configuration Examples

"Campus Cluster Configuration Examples" on page 134 showed two possible configurations for campus clustering: a two-room configuration using Sun StorEdge T3 partner groups, and a three-room configuration using Sun StorEdge A5x00 arrays. While detailing all of the configurations possible in campus clustering is far beyond the scope of this document, the following illustrations depict some other variations on the setups previously shown.

The following are two-room examples:

- Two-room campus cluster with Sun StorEdge T3/T3+ partner-groups and redundant switching (eight switches total) (FIGURE A-4)
- Two-room campus cluster with Sun StorEdge T3/T3+ arrays, single-controller configuration (FIGURE A-5)
- Two-room cluster using Sun StorEdge A5x00 disk arrays (FIGURE A-6)

The following are three-room examples:

- Three-room campus cluster with Sun StorEdge T3/T3+ partner-group arrays (FIGURE A-7)
- Three-room campus cluster with Sun StorEdge T3/T3+ single-controller arrays (FIGURE A-8)
- Three-room cluster using Sun StorEdge A5x00 disk arrays (FIGURE A-9)

Two-Room Examples

FIGURE A-1 depicted a two-room campus cluster using Sun StorEdge T3 partner groups and four Fibre Channel switches. FIGURE A-4 shows the same setup with four additional switches for greater redundancy and potentially better I/O throughput.

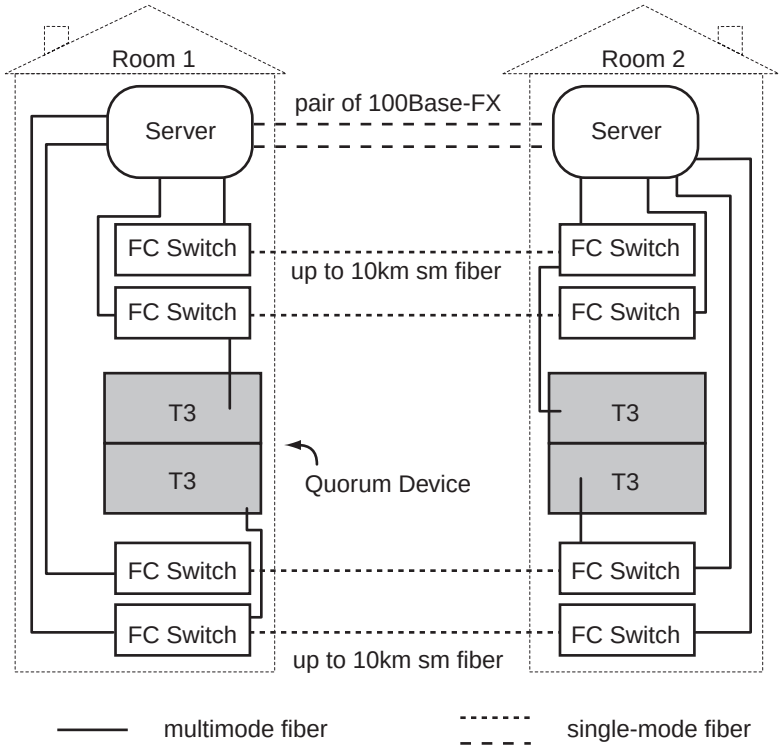

FIGURE A-4 Two-Room Campus Cluster (T3 Partner-Groups, 8 Switches)

FIGURE A-5 is similar to FIGURE A-1, except that it uses Sun StorEdge T3/T3+ arrays in single-controller configurations, rather than partner-groups.

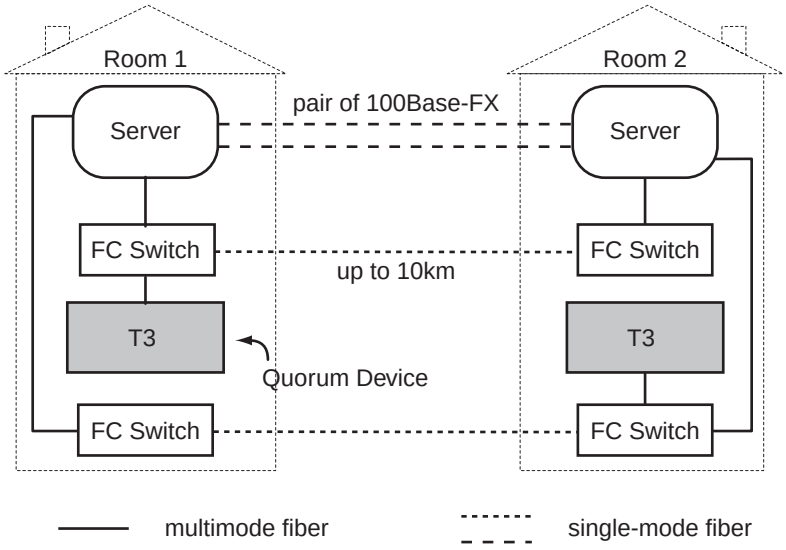

FIGURE A-5 Two-Room Campus Cluster (Sun StorEdge T3s, Single-Controller)

FIGURE A-6 depicts a two-room campus cluster using Sun StorEdge A5x00s. Note the absence of switches.

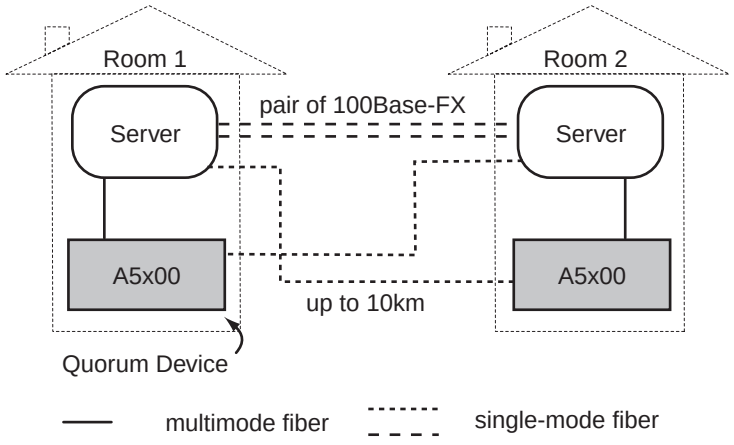

FIGURE A-6 Two-Room Configuration (Sun StorEdge A5x00s)

Three-Room Examples

The following examples all show three-room campus cluster configurations.

As mentioned in "Storage Devices" on page 138, because of potential limitations with switch connectivity, Sun StorEdge T3/T3+ arrays cannot currently be used for the third, quorum room. Therefore, FIGURE A-7 and FIGURE A-8 show Sun StorEdge A5x00 disk arrays in the quorum room.

FIGURE A-7 is the same as FIGURE A-1, except that the quorum disk is separate and in a third room.

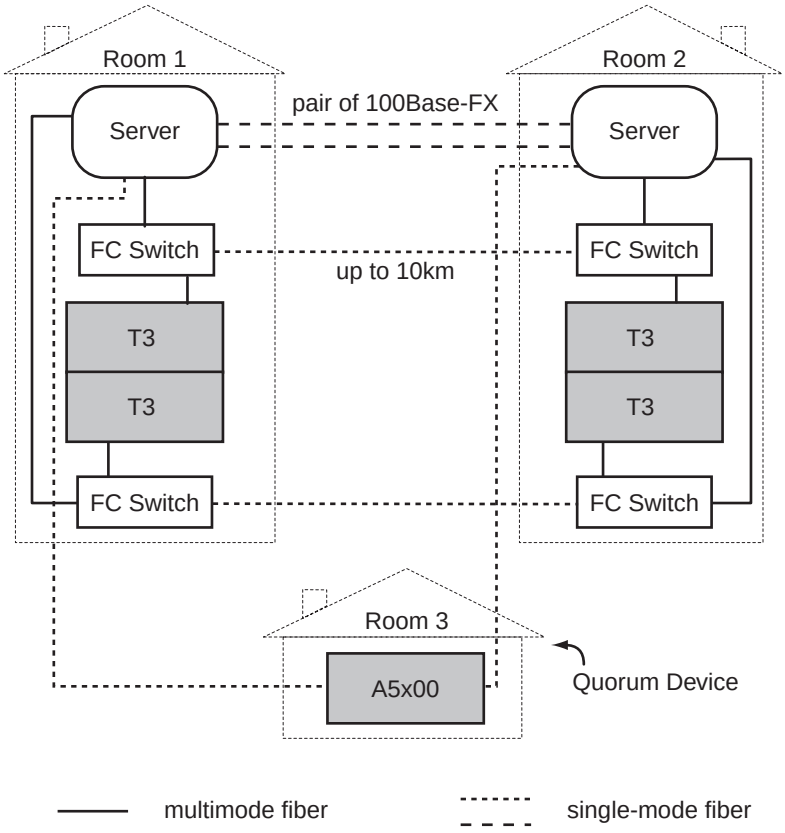

FIGURE A-7 Three-Room Campus Cluster (Sun StorEdge T3 Partner Groups)

Like FIGURE A-5, FIGURE A-8 uses Sun StorEdge T3/T3+ arrays in single-controller formation. However, in FIGURE A-8 the quorum disk is separate, in a third room.

Because the configurations in FIGURE A-7 and FIGURE A-8 use heterogeneous storage setups (Sun StorEdge T3/T3+ and Sun StorEdge A5x00 arrays), the host bus adapter types will be mixed. The Sun StorEdge A5x00 connects to the server using a SOC+-based SBus host adapter, so the server must be SBus-based, meaning that the connection to the T3/T3+ must also be SBus-based. Therefore, the T3 connection must be via a Sun StorEdge SBus Dual Fibre Channel Network Adapter.

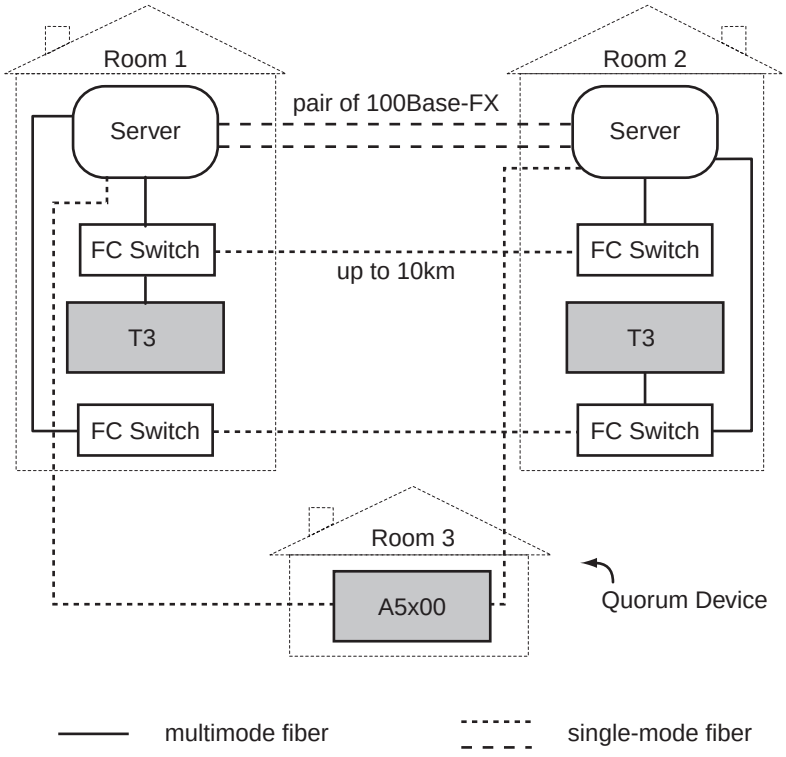

FIGURE A-8 Three-Room Campus Cluster (Sun StorEdge T3 Single-Controller)

FIGURE A-9, like FIGURE A-6, depicts a campus cluster using Sun StorEdge A5x00 arrays; however, in FIGURE A-9, the quorum disk is now separate and in its own room.

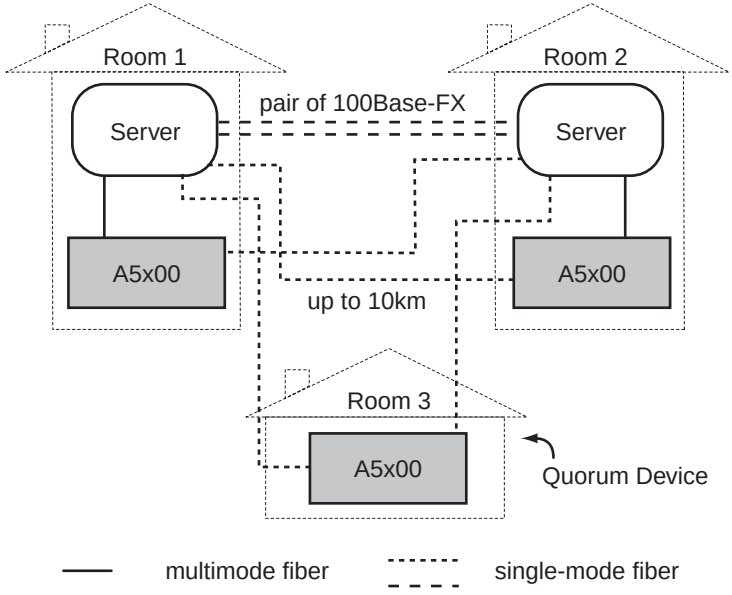

FIGURE A-9 Three-Room Campus Cluster (Sun StorEdge A5x00s)

APPENDIX **B**

Installing and Configuring Sun Cluster HA for SAP

This chapter provides instructions on how to plan, set up, and configure Sun Cluster HA for SAP on your Sun Cluster nodes.

This chapter includes the following procedures.

- "How to Upgrade a Resource Type or Convert a Failover Application Resource to a Scalable Application Resource" on page 158
- "How to Install SAP and the Database" on page 160
- "How to Install SAP for Scalable Application Server" on page 161
- "How to Verify SAP Installation for Scalable Application Server" on page 163
- "How to Enable Failover SAP Instances to Run in the Cluster" on page 163
- "How to Verify SAP and the Database Installation with Central Instance" on page 165
- "How to Verify SAP and the Database Installation for Failover Application Server" on page 166
- "How to Register and Configure Sun Cluster HA for SAP Central Instance" on page 169
- "How to Register and Configure Sun Cluster HA for SAP for Failover Application Server" on page 170
- "How to Register and Configure Sun Cluster HA for SAP for Scalable Application Server" on page 171
- "How to Verify the Installation and Configuration of Sun Cluster HA for SAP, Central Instance, and DBMS" on page 173
- "How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Failover Application Server" on page 174
- "How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Scalable Application Server" on page 175
- "How to Set Up a Lock File for Central Instance" on page 181
- "How to Set Up a Lock File for Scalable Application Server" on page 182

Sun Cluster HA for SAP Overview

Sun Cluster HA for SAP provides fault monitoring and automatic failover for the SAP application to eliminate single points of failure in an SAP system. The following table lists the data services that best protect SAP components in a Sun Cluster configuration. You can configure Sun Cluster HA for SAP as a failover application or a scalable application.

For conceptual information on failover and scalable services, see the *Sun Cluster 3.0 12/01 Concepts*.

TABLE B-1 Protection of SAP Components

SAP Component	Protected by
SAP database	Sun Cluster HA for Oracle, if the database is Oracle
SAP central instance	Sun Cluster HA for SAP, the resource type is `SUNW.sap_ci` or `SUNW.sap_ci_v2`
SAP application server	Sun Cluster HA for SAP, the resource type is `SUNW.sap_as` or `SUNW.sap_as_v2`
NFS file system	Sun Cluster HA for NFS

Use the `scinstall`(1M) command to install Sun Cluster HA for SAP. Sun Cluster HA for SAP requires a functioning cluster with the initial cluster framework already installed. See the *Sun Cluster 3.0 12/01 Software Installation Guide* for details on initial installation of clusters and data service software. Register Sun Cluster HA for SAP after you successfully install the basic components of the Sun Cluster and SAP software.

Installing and Configuring Sun Cluster HA for SAP

The following table lists the sections that describe the installation and configuration tasks.

TABLE B-2 Task Map: Installing and Configuring Sun Cluster HA for SAP (Sheet 1 of 2)

Task	For Instructions, Go To
Plan the SAP installation	"Sun Cluster HA for SAP Overview" on page 150 "Configuration Guidelines for Sun Cluster HA for SAP" on page 154 "Sample Configurations" on page 155 "Pre-Installation Requirements" on page 157 "Pre-Installation Considerations" on page 157
Upgrade Sun Cluster HA for SAP	"How to Upgrade a Resource Type or Convert a Failover Application Resource to a Scalable Application Resource" on page 158
Install and configure SAP and the database with a failover application server	"How to Install SAP and the Database" on page 160 "How to Enable Failover SAP Instances to Run in the Cluster" on page 163 "How to Verify SAP and the Database Installation with Central Instance" on page 165 "How to Verify SAP and the Database Installation for Failover Application Server" on page 166
or	
Install and configure SAP and the database with a scalable application server	"How to Install SAP and the Database" on page 160 "How to Install SAP for Scalable Application Server" on page 161 "How to Verify SAP Installation for Scalable Application Server" on page 163

TABLE B-2 Task Map: Installing and Configuring Sun Cluster HA for SAP (Sheet 2 of 2)

Task	For Instructions, Go To
Configure the Sun Cluster HA for DBMS	"Configuring Sun Cluster HA for DBMS" on page 168
Configure Sun Cluster HA for SAP with a failover application server	"How to Register and Configure Sun Cluster HA for SAP Central Instance" on page 169 "How to Register and Configure Sun Cluster HA for SAP for Failover Application Server" on page 170
or	
Configure Sun Cluster HA for SAP with a scalable application server	"How to Register and Configure Sun Cluster HA for SAP Central Instance" on page 169 "How to Register and Configure Sun Cluster HA for SAP for Scalable Application Server" on page 171
Verify Sun Cluster HA for SAP installation and configuration	"How to Verify the Installation and Configuration of Sun Cluster HA for SAP, Central Instance, and DBMS" on page 173 "How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Failover Application Server" on page 174 "How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Scalable Application Server" on page 175
Configure SAP extension properties	"Configuring Sun Cluster HA for SAP Extension Properties" on page 176
Understand Sun Cluster HA for SAP fault monitor	"Sun Cluster HA for SAP Fault Monitor" on page 183

Planning the Installation and Configuration

Read the following information to plan your Sun Cluster HA for SAP installation.

- Sun Cluster HA for SAP Packages and Support
- Configuration Guidelines for Sun Cluster HA for SAP
- Sample Configurations
- Pre-Installation Considerations

Sun Cluster HA for SAP Packages and Support

The following tables lists the packages that Sun Cluster HA for SAP supports.

TABLE B-3 Sun Cluster HA for SAP packages from Sun Cluster 3.0 7/01

Resource Type	Description
`SUNW.sap_ci`	Added support for failover central instance.
`SUNW.sap_as`	Added support for failover application servers.

TABLE B-4 Sun Cluster HA for SAP package from Sun Cluster 3.0 12/01

Resource Type	Description
`SUNW.sap_ci`	Same as Sun Cluster 3.0 7/01. See TABLE B-3.
`SUNW.sap_as`	Same as Sun Cluster 3.0 7/01. See TABLE B-3.
`SUNW.sap_ci_v2`	Added the Property `Network_resources_used` resource property to the Resource Type Registration (RTR) file. Retained support for failover central instance.
`SUNW.sap_as_v2`	Added the Property `Network_resources_used` resource property to RTR file. Added support for scalable application servers. Retained support for failover application servers

Configuration Guidelines for Sun Cluster HA for SAP

When you design a Sun Cluster HA for SAP configuration, consider the following guidelines.

Failover and Scalable Applications

- **Use an SAP software version that is qualified with Sun Cluster 3.0**.
- **Use an SAP software version with automatic enqueue reconnect mechanism capability –** Sun Cluster HA for SAP relies on this capability. SAP 4.0 software with patch information and later releases should have automatic enqueue reconnect mechanism capability.
- **Retrieve the latest patch for the `sapstart` executable** – This patch enables Sun Cluster HA for SAP users to configure a lock file. For details on the benefits of this patch in your cluster environment, see "Setting Up a Lock File" on page 180.
- **Read all of the related SAP online service-system notes for the SAP software release and database that you are installing on your Sun Cluster configuration –** Identify any known installation problems and fixes.
- **Consult SAP software documentation for memory and swap recommendations –** SAP software uses a large amount of memory and swap space.
- **Generously estimate the total possible load on nodes that might host the central instance, the database instance, and the application server, if you have an internal application server –** This guideline is especially important if you configure the cluster to ensure that the central instance, database instance, and application server will all exist on one node if failover occurs.
- **Install application servers on either the same cluster that hosts the central instance or on a separate cluster –** If you install and configure any application server outside of the cluster environment, Sun Cluster HA for SAP does not perform fault monitoring and does not automatically restart or fail over those application servers. You must manually start and shut down application servers that you install and configure outside of the cluster environment.
- **Limit node names as outlined in the SAP installation guide –** This limitation is an SAP software requirement.

Scalable Applications

- **Use the same instance number and the same SID when you create all application server instances on multiple cluster nodes** - This guideline ensures ease of maintenance and ease of administration because you will only need to use one set of commands to maintain all application servers on multiple nodes.
- **Install the application servers locally on the cluster node instead of on a cluster file system** - This guideline ensures that another application server does not overwrite the `log/data/work/sec` directory for the application server.
- **Ensure that the** *SAPSID*`adm` **home directory resides on a cluster file system** - This guideline enables you to maintain only one set of scripts for all application server instances that run on all nodes. However, if you have some application servers that need to be configured differently (for example, application servers with different profiles), install those application servers with different instance numbers, and then configure them in a separate resource group.
- **Place the application servers into multiple resource groups if you want to use RGOffload functionality to shut down one or more application servers when a higher priority resource is failing over** - This guideline provides flexibility and availability if you want to use RGOffload functionality (a separate resource type) to offload one or more application servers for the database. The functionality you gain from this guideline supersedes the ease of use you gain from placing the application servers into one large group. See "Freeing Node Resources by Offloading Non-critical Resource Groups" on page 332 for more information on using the `RGOffload` resource type.

Sample Configurations

See your Enterprise Services representative for the most current information about supported SAP versions. The following figures illustrate sample configurations for Sun Cluster HA for SAP.

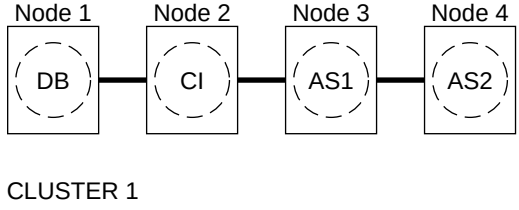

FIGURE B-1 Four-Node Cluster with Central Instance, Application Servers, and Database

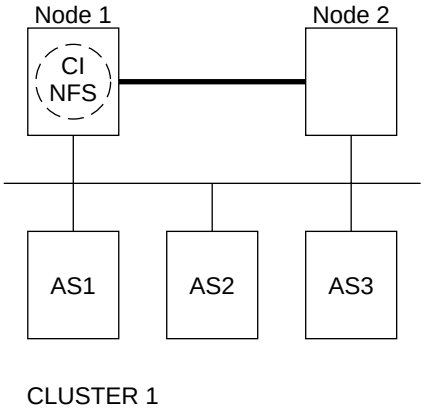

FIGURE B-2 Two-Node Cluster with Central Instance, NFS, and Non-HA External Application Servers

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Note – The configuration in FIGURE B-2 was a common configuration under previous Sun Cluster releases. To use the Sun Cluster 3.0 software to the fullest extent, configure SAP as shown in FIGURE B-1 or FIGURE B-3.

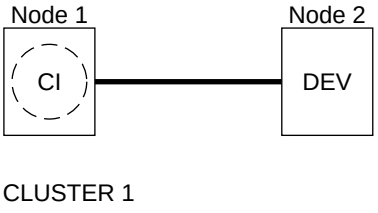


FIGURE B-3 Two-Node Cluster With Central Instance and Development Node

Pre-Installation Requirements

Before you install the SAP software, see "Installing and Configuring SAP and Database" on page 160, understand the following requirements.

- **After you create all of the file systems for the database and for SAP software, create the mount points, and put the mount points in the `/etc/vfstab` file on all of the cluster nodes –** See the SAP installation guides, *Installation of the SAP R/3 on UNIX* and *R/3 Installation on UNIX-OS Dependencies,* for details on how to set up the database and SAP file systems.
- **Create the required groups and users on all of the cluster nodes –** See the SAP installation guides, *Installation of the SAP R/3 on UNIX* and *R/3 Installation on UNIX-OS Dependencies,* for details on how to create SAP groups and users.
- **Configure Sun Cluster HA for NFS on the cluster that hosts the central instance if you plan to install some external SAP application servers –** See "Installing and Configuring Sun Cluster HA for NFS" in the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for details on how to configure Sun Cluster HA for NFS.
- **Set up the `/etc/nsswitch.conf` file so that the data service starts and stops correctly during switchovers or failovers –** On each node that can master the logical host that runs Sun Cluster HA for SAP, the `/etc/nsswitch.conf` file must have one of the following entries for `group`.

```
group:
group:  files
group:  files [NOTFOUND=return] nis
group:  files [NOTFOUND=return] nisplus
```

  Sun Cluster HA for SAP uses the `su` *user* command to start and stop the database node. The network information name service might become unavailable when a cluster node's public network fails. Add one of the preceding entries for `group` to ensure that the `su`(1M) command does not refer to the NIS/NIS+ name services if the name service becomes unavailable.

Pre-Installation Considerations

Before you install the SAP software, see "Installing and Configuring SAP and Database" on page 160, install SAP binaries and SAP users' home directories. Install SAP binaries and users' home directories on a cluster file system. Installation on a cluster file system, however, has some drawbacks with SAP software release upgrades. See "Determining the Location of the Application Binaries" on page 3 for information about drawbacks.

Upgrading Sun Cluster HA for SAP

As TABLE B-3 and TABLE B-4 illustrate, the Sun Cluster HA for SAP package from Sun Cluster 3.0 7/01 does not support a scalable application server and the `Network_resources_used` resource property. Therefore, you have the following upgrade options.

- Retain (do not upgrade) the existing `SUNW.sap_ci` and `SUNW.sap_as` resource types. Choose this option if any of the following statements apply to you.
  - You cannot schedule down time.
  - You do not want the `Network_resources_used` resource property.
  - You do not want to configure a scalable application server.
- Upgrade a resource type.

  See "How to Upgrade a Resource Type or Convert a Failover Application Resource to a Scalable Application Resource" on page 158 for the procedure on how to upgrade a resource type.
- Convert a failover application resource to a scalable application resource.

  See "How to Upgrade a Resource Type or Convert a Failover Application Resource to a Scalable Application Resource" on page 158 for the procedure on how to convert a failover application resource to a scalable application resource.

▼ How to Upgrade a Resource Type or Convert a Failover Application Resource to a Scalable Application Resource

To upgrade a resource type or to convert a failover application server resource to a scalable application server resource, perform the following steps. This procedure requires that you schedule down time.

1. **Disable the existing resource.**
2. **Delete the existing resource from the resource group.**
3. **Delete the existing resource type if no other resource uses it.**
4. **Register the new resource type.**

5. **Which task are you performing?**
   - If you are upgrading the resource type for the central instance, skip to Step 7.
   - If you are converting a failover application server resource to a scalable application server resource, proceed to Step 6.
6. **Create the new application server resource group `scalable_rg`.**
7. **Create the new resource in the resource group.**

Where to Go From Here

Go to "How to Register and Configure Sun Cluster HA for SAP for Scalable Application Server" on page 171.

Installing and Configuring SAP and Database

Use the procedures in this section to perform the following tasks.

- Install SAP and the database.
- Install SAP and the scalable application server.
- Enable SAP to run in the cluster.
- Verify SAP and the database installation with the central instance.
- Verify SAP and the database installation with the failover application server.

▼ How to Install SAP and the Database

To install SAP and the database, perform the following steps.

1. **Become superuser on one of the nodes in the cluster where you are installing the central instance.**
2. **Install SAP binaries on a cluster file system.**

Note – Before you install SAP software on a cluster file system, use the `scstat`(1M) command to verify that the Sun Cluster software is fully operational.

---

   a. **For all of the SAP-required kernel parameter changes, edit the `/etc/system` file on all of the cluster nodes that will run the SAP application.**

      After you edit the `/etc/system` file, reboot each node. See the SAP document *R/3 Installation on UNIX-OS Dependencies* for details on kernel parameter changes.

   b. **See the SAP document *Installation of the SAP R/3 on UNIX* for details on how to install the central instance, the database, and the application server instances.**

      See "How to Install SAP for Scalable Application Server" on page 161 for the procedure on how to install a scalable application server in a Sun Cluster environment.

Where to Go From Here

Go to "How to Enable Failover SAP Instances to Run in the Cluster" on page 163 or "How to Install SAP for Scalable Application Server" on page 161.

▼ How to Install SAP for Scalable Application Server

To install scalable application server instances, perform the following steps. This procedure assumes that you installed the central instance and the database.

Tip – The following file system layout ensures ease of use and prevents data from being overwritten.

- Cluster File Systems

  `/sapmnt/SID`

  `/usr/sap/SID` -> all subdirectories except the *app-instance* subdirectory

  `/usr/sap/SID/home` -> the SAPSID`adm` home directory

  `/usr/sap/trans`

- Local File Systems

  `/usr/sap/local/SID/`*app-instance*

1. **Create all SAP directories on cluster file systems.**
   - Ensure that the central instance and the database can fail over.
   - Set up the lock file on cluster file system for the central instance to prevent a multiple startup from a different node.

     For the procedure on how to set up a lock file on the central instance, see "How to Set Up a Lock File for Central Instance" on page 181.
   - Ensure that all application servers can use the SAP binaries on a cluster file system.
2. **Install the central instance and the database on a cluster file system.**

   See the SAP document *Installation of the SAP R/3 on UNIX* for details on how to install the central instance and the database.

3. **On all nodes that will host the scalable application server, create a local directory for the `data/log/sec/work` directories and the log files for starting and stopping the application server.**

Caution – You must perform this step. If you do not perform this step, you will inadvertently install a different application server instance on a cluster file system and the two application servers will overwrite each other.

Create a local directory for each new application server.

Example:

```
# mkdir -p /usr/sap/local/SC3/D03
```

4. **Set up a link to point to the local application server directory from a cluster file system, so the application server and the `startup/stop` log file will be installed on the local file system.**

   Example:

```
# ln -s /usr/sap/local/SC3/D03 /usr/sap/SC3/D03
```

5. **Install the application server.**

6. **Edit the `start/stop` script so that the `startup/stop` log files will be node specific under the home directories of users *sapsid*`adm` and `ora`*sapsid*.**

   Example:

```
# vi startsap_D03
```

   Before:

```
LOGFILE=$R3S_LOGDIR/‘basename $0.log‘
```

   After:

```
LOGFILE=$R3S_LOGDIR/‘basename $0‘_‘uname -n‘.log
```

7. **Copy the application server (with the same SAPSID and the same instance number) on all nodes that run the scalable application server.**

   The nodes that run the scalable application server are in the scalable application server resource group `nodelist`.

8. **Ensure that you can startup and stop the application server from each node, and verify that the log files are in the correct location.**

9. **Install the SAP logon group if you use a logon group.**

▼ How to Verify SAP Installation for Scalable Application Server

If you installed scalable application server instances in "How to Install SAP for Scalable Application Server" on page 161, you verified the installation of SAP for the scalable application server in Step 8 of "How to Install SAP for Scalable Application Server" on page 161.

▼ How to Enable Failover SAP Instances to Run in the Cluster

During SAP installation, the SAP software creates files and shell scripts on the server on which you installed the SAP instance. These files and scripts use physical server names. To run the SAP software with Sun Cluster software, replace references to a physical server with references to a network resource (logical hostname). Throughout these steps, the term *physicalserver* represents a physical server, and the term *logical-hostname* represents a network resource.

To enable failover SAP instances to run in the cluster, perform the following steps.

1. **Make backup copies of the files that you will modify in the following steps.**

2. **Log in to the node on which you installed the SAP software.**

3. **Shut down the SAP instances (central instance and application server instances) and the database.**

4. **Become user *sapsid*`adm`, and then perform the following tasks.**

   a. **In the SAPSID`adm` home directory, modify all of the file names that reference a physical server name.**

   b. **In the SAPSID`adm` home directory, modify all of the file contents—except log file contents—that reference a physical server name.**

c. **In the SAP profile directory, modify all of the file names that reference a physical server name.**

5. **As user** *sapsid*`adm`**, add entries for the parameter** `SAPLOCALHOST`**.**

   Add this entry to the *SAPSID_Service-StringSystem-Number_logical-hostname* profile file under the `/sapmnt/`*SAPSID*`/profile` directory.

   For Central Instance:

   ```
   SAPLOCALHOST=ci-logical-hostname
   ```

   This entry enables the external application server to locate the central instance by using the network resource (logical hostname or shared address).

   For Application Server:

   ```
   SAPLOCALHOST=as-logical-hostname
   ```

6. **Become user** `ora`*sapsid*, **and then perform the following tasks.**
   - In the `ora`SAPSID home directory, modify all of the file names that reference a physical server name.
   - In the `ora`SAPSID home directory, modify all of the file contents—except log file contents—that reference a physical server name.

7. **Ensure that the** `/usr/sap/tmp` **directory owned by user** *sapsid*`adm` **and group** `sapsys` **exists on all nodes that can master the failover SAP instance.**

Where to Go From Here

Go to "How to Verify SAP and the Database Installation with Central Instance" on page 165.

▼ How to Verify SAP and the Database Installation with Central Instance

To test starting and stopping the SAP central instance on all of the potential nodes on which the central instance can run, perform the following steps.

1. **Create the failover resource group to hold the network and central instance resources.**

```
# scrgadm -a -g sap-ci-resource-group [-h nodelist]
```

Note – Use the `-h` option to the `scrgadm`(1M) command to select the set of nodes on which the SAP central instance can run.

---

2. **Verify that you have added to your name service database all of the network resources that you use.**
3. **Add a network resource (logical hostname) to the failover resource group.**

```
# scrgadm -a -L -g sap-ci-resource-group -l ci-logical-hostname [-n netiflist]
```

4. **Enable the resource group.**

   Run the `scswitch`(1M) command to move the resource group into a managed state and bring the resource group online.

```
# scswitch -Z -g sap-ci-resource-group
```

5. **Log in to the cluster member that hosts the central instance resource group.**
6. **Ensure that the database is running.**
7. **Manually start the central instance.**
8. **Start the SAP GUI using the logical hostname, and verify that SAP initializes correctly.**

   The default dispatcher port is `3200`.

9. **Manually stop the central instance.**

10. **Switch this resource group to another cluster member that can host the central instance.**

```
# scswitch -z -h node -g sap-ci-resource-group
```

11. **Repeat Step 5 through Step 9 until you verify startup and shutdown of the central instance on each cluster node that can host the central instance.**

Where to Go From Here

Go to "How to Verify SAP and the Database Installation for Failover Application Server" on page 166.

▼ How to Verify SAP and the Database Installation for Failover Application Server

To test starting and stopping the failover application server, perform the following steps procedure on all of the potential nodes on which the failover application server can run.

1. **Create the failover resource group to hold the network and application server resources.**

```
# scrgadm -a -g sap-as-fo-resource-group
```

Note – Use the `-h` option to the `scrgadm` command to select the set of nodes on which the SAP application server can run.

```
# scrgadm -a -g sap-as-fo-resource-group [-h nodelist]
```

2. **Verify that you added to your name service database all of the network resources that you use.**

3. **Add a network resource (logical hostname) to the failover resource group.**

```
# scrgadm -a -L -g sap-as-fo-resource-group -l as-fo-logical-hostname [-n netiflist]
```

4. **Enable the resource group.**

   Run the `scswitch`(1M) command to move the resource group into a managed state and bring the resource group online.

   ```
   # scswitch -Z -g sap-as-of-resource-group
   ```

5. **Log in to the cluster member that hosts the application server resource group.**
6. **Manually start the application server.**
7. **Start the SAP GUI using the logical hostname, and verify that SAP initializes correctly.**
8. **Manually stop the application server.**
9. **Switch this resource group to another cluster member that can host the application server.**

   ```
   # scswitch -z -h node -g sap-as-fo-resource-group
   ```

10. **Repeat Step 5 through Step 7 until you verify startup and shutdown of the application server on each cluster node that can host the application server.**

Where to Go From Here

Go to "Configuring Sun Cluster HA for DBMS" on page 168 for information on how to configure DBMS, an SAP service, so that it is highly available.

Configuring Sun Cluster HA for DBMS

SAP supports various databases. See the appropriate chapter of this book for details on how to configure the resource type, resource group, and resource for your highly available database. For example, see "Installing and Configuring Sun Cluster HA for Oracle" on page 16 for more information if you plan to use Oracle with SAP.

Additionally, see the appropriate chapter of this book and the appropriate chapter of your database installation book for details on other resource types to configure with your database. This book includes details on how to configure other resource types for Oracle databases. For instance, set up the `SUNW.HAStorage` resource type if you use Oracle. See the procedure "How to Configure SUNW.HAStorage Resource Type" on page 35 for more information.

Where to Go From Here

Go to "Registering and Configuring Sun Cluster HA for SAP" on page 169.

Registering and Configuring Sun Cluster HA for SAP

Use the procedures in this section to perform the following tasks.

- Register and configure Sun Cluster HA for SAP central instance.
- Register and configure Sun Cluster HA for SAP with a failover application server.
- Register and configure Sun Cluster HA for SAP with a scalable application server.

▼ How to Register and Configure Sun Cluster HA for SAP Central Instance

To register and configure Sun Cluster HA for SAP central instance, perform the following steps.

1. **Become superuser on one of the nodes in the cluster that hosts the central instance.**

2. **Register the resource type for the central instance.**

```
# scrgadm -a -t SUNW.sap_ci | SUNW.sap_ci_v2
```

3. **Create SAP central instance resources in this failover resource group.**

```
# scrgadm -a -j sap-ci-resource -g sap-ci-resource-group \
-t SUNW.sap_ci | SUNW.sap_ci_v2 \
-x SAPSID=SAPSID \
-x Ci_startup_script=ci-startup-script \
-x Ci_shutdown_script=ci-shutdown-script
```

See "Configuring Sun Cluster HA for SAP Extension Properties" on page 176 for a list of extension properties.

4. **Enable the failover resource group that now includes the SAP central instance resource.**

```
# scswitch -Z -g sap-ci-resource-group
```

Where to Go From Here

Go to "How to Register and Configure Sun Cluster HA for SAP for Failover Application Server" on page 170 or "How to Register and Configure Sun Cluster HA for SAP for Scalable Application Server" on page 171.

▼ How to Register and Configure Sun Cluster HA for SAP for Failover Application Server

To register and configure Sun Cluster HA for SAP for a failover application server, perform the following steps.

1. **Become superuser on one of the nodes in the cluster that hosts the application server.**
2. **Register the resource type for the failover application server.**

```
# scrgadm -a -t SUNW.sap_as | SUNW.sap_as_v2
```

3. **Create SAP application server resources in this failover resource group.**

```
# scrgadm -a -j sap-as-resource -g sap-as-fo-resource-group \
-t SUNW.sap_as | SUNW.sap_as_v2 \
-x SAPSID=SAPSID \
-x As_instance_id=as-instance-id \
-x As_startup_script=as-startup-script \
-x As_shutdown_script=as-shutdown-script
```

See "Configuring Sun Cluster HA for SAP Extension Properties" on page 176 for a list of extension properties.

4. **Enable the failover resource group that now includes the SAP application server resource.**

```
# scswitch -Z -g sap-as-fo-resource-group
```

Where to Go From Here

Go to "How to Verify the Installation and Configuration of Sun Cluster HA for SAP, Central Instance, and DBMS" on page 173.

▼ How to Register and Configure Sun Cluster HA for SAP for Scalable Application Server

To register and configure Sun Cluster HA for SAP for a scalable application server, perform the following steps.

1. **Become superuser on one of the nodes in the cluster that hosts the application server.**

2. **Create a scalable resource group for the application server.**

```
# scrgadm -a -g sap-as-sa-appinstanceid-resource-group \
-y Maximum_primaries=value \
-y Desired_primaries=value
```

Note – You will not use the shared address to perform load balancing of the application server. The SAP Message Server will be used to perform load balancing of the application server.

Note – If you are using the `SUNW.RGOffload` resource type to offload an application server within this scalable application server resource group, then set `Desired_primaries=0`. See "Freeing Node Resources by Offloading Non-critical Resource Groups" on page 332 for more information about using the `SUNW.RGOffload` resource type.

---

3. **Register the resource type for the scalable application server.**

```
# scrgadm -a -t SUNW.sap_as_v2
```

4. **Create SAP application server resources in this scalable resource group.**

```
# scrgadm -a -j sap-as-resource -g sap-as-sa-appinstanceid-resource-group \
-t SUNW.sap_as_v2 \
-x SAPSID=SAPSID \
-x As_instance_id=as-instance-id \
-x As_startup_script=as-startup-script \
-x As_shutdown_script=as-shutdown-script
```

See "Configuring Sun Cluster HA for SAP Extension Properties" on page 176 for a list of extension properties.

5. **Enable the scalable resource group that now includes the SAP application server resource.**

   - If you *do not* use the `SUNW.RGOffload` resource type with this application server, use the following command.

```
# scswitch -Z -g sap-as-sa-appinstanceid-resource-group
```

   - If you use the `SUNW.RGOffload` resource type with this application server, use the following command.

```
# scswitch -z -h node1, node2 -g sap-as-sa-appinstanceid-resource-group
```

Note – If you use the `SUW.RGOffload` resource type with this application server, you must specify which node you want to bring the resource online by using the `-z` option instead of the `-j` option.

Where to Go From Here

Go to "How to Verify the Installation and Configuration of Sun Cluster HA for SAP, Central Instance, and DBMS" on page 173.

Verifying Sun Cluster HA for SAP Installation and Configuration

Use the procedures in this section to perform the following tasks.

- Verify the installation and configuration of Sun Cluster HA for SAP, the central instance, and DBMS.
- Verify the installation and configuration of Sun Cluster HA for SAP with a failover application server.
- Verify the installation and configuration of Sun Cluster HA for SAP with a scalable application server.

▼ How to Verify the Installation and Configuration of Sun Cluster HA for SAP, Central Instance, and DBMS

To verify both the Sun Cluster HA for SAP installation with the central instance and the DBMS installation and configuration, perform the following steps.

1. **Log in to the node that hosts the resource group that contains the SAP central instance resource.**
2. **Start the SAP GUI to check that Sun Cluster HA for SAP is functioning correctly.**
3. **As user *sapsid*`adm`, use the central instance `stopsap` script to shut down the SAP central instance.**

   The Sun Cluster software restarts the central instance.
4. **As user `root`, switch the SAP resource group to another cluster member.**

   ```
   # scswitch -z -h node2 -g sap-ci-resource-group
   ```
5. **Verify that the SAP central instance starts on this node.**
6. **Repeat Step 1 through Step 5 until you have tested all of the potential nodes on which the SAP central instance can run.**

Where to Go From Here

Go to "How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Failover Application Server" on page 174 or "How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Scalable Application Server" on page 175.

▼ How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Failover Application Server

To verify the Sun Cluster HA for SAP installation and configuration for a failover application server, perform the following steps.

1. **Log in to the node that currently hosts the resource group that contains the SAP application server resource.**
2. **As user *sapsid*`adm`, start the SAP GUI to check that the application server is functioning correctly.**
3. **Use the application server `stopsap` script to shut down the SAP application server on the node you identified in Step 1.**

   The Sun Cluster software restarts the application server.
4. **As user `root`, switch the resource group that contains the SAP application server resource to another cluster member.**

   ```
   # scswitch -z -h node2 -g sap-as-resource-group
   ```
5. **Verify that the SAP application server starts on the node you identified in Step 4.**
6. **Repeat Step 1 through Step 5 until you have tested all of the potential nodes on which the SAP application server can run.**

▼ How to Verify the Installation and Configuration of Sun Cluster HA for SAP for Scalable Application Server

To verify the Sun Cluster HA for SAP installation and configuration for a scalable application server, perform the following steps.

1. **Log on to one of the nodes that runs the application server.**
2. **Become user** *sapsid*`adm`**.**
3. **Start the SAP GUI to check that the application server is functioning correctly.**
4. **Use the application server `stopsap` script to shut down the SAP application server on the node you identified in Step 1.**

   The Sun Cluster software restarts the application server.
5. **Repeat Step 1 through Step 4 until you have tested all of the potential nodes on which the SAP application server can run.**

Configuring Sun Cluster HA for SAP Extension Properties

Use the Sun Cluster HA for SAP extension properties in this section to create the central instance resources and application server resources. Typically, you use the command line `scrgadm -x` *parameter=value* to configure the extension properties when you create the central instance or application resource. You can also use the procedures described in Chapter 13 to configure them later. See Appendix A for details on all of the Sun Cluster properties.

See the `r_properties`(5) and the `rg_properties`(5) man pages for details on all of the Sun Cluster extension properties.

TABLE B-5 describes SAP extension properties that you can set for the central instance. You can update some extension properties dynamically. You can update others, however, only when you create or disable the SAP resource. The Tunable entries indicate when you can update each property. TABLE B-6 describes the extension properties that you can set for the application servers.

TABLE B-5 Sun Cluster HA for SAP Extension Properties for the Central Instance (Sheet 1 of 3)

Property Category	Property Name	Description
SAP Configuration	`SAPSID`	SAP system name or *SAPSID*. **Default:** None **Tunable:** When disabled
	`Ci_instance_id`	Two-digit SAP system number. **Default:** `00` **Tunable:** When disabled
	`Ci_services_string`	String of central instance services. **Default:** `DVEBMGS` **Tunable:** When disabled
Starting SAP	`Ci_start_retry_interval`	The interval in seconds to wait between attempting to connect to the database before starting the central instance. **Default:** `30` **Tunable:** When disabled
	`Ci_startup_script`	Name of the SAP startup script for this instance in your *SID*`adm` home directory. **Default:** None **Tunable:** When disabled

TABLE B-5 Sun Cluster HA for SAP Extension Properties for the Central Instance (Sheet 2 of 3)

Property Category	Property Name	Description
Stopping SAP	`Stop_sap_pct`	Percentage of stop-timeout variables that are used to stop SAP processes. The SAP shutdown script is used to stop processes before calling Process Monitor Facility (PMF) to terminate and then kill the processes. **Default:** `95` **Tunable:** When disabled
	`Ci_shutdown_script`	Name of the SAP shutdown script for this instance in your *SID*`adm` home directory. **Default:** None **Tunable:** When disabled
Probe	`Message_server_name`	The name of the SAP Message Server. **Default:** `sapms` *SAPSID* **Tunable:** When disabled
	`Lgtst_ms_with_ logicalhostname`	How to check the SAP Message Server with the SAP `lgtst` utility. The `lgtst` utility requires a hostname (IP address) as the location for the SAP Message Server. This hostname can be either a Sun Cluster logical hostname or a localhost (loopback) name. If you set this resource property to `TRUE`, use a logical hostname. Otherwise, use a localhost name. **Default:** `TRUE` **Tunable:** Any time
	`Check_ms_retry`	Maximum number of times the SAP Message Server check fails before a total failure is reported and the Resource Group Manager (RGM) starts. **Default:** `2` **Tunable:** When disabled
	`Probe_timeout`	Time-out value in seconds for the probes. **Default:** `60` **Tunable:** Any time
	`Monitor_retry_count`	Number of PMF restarts that are allowed for the fault monitor. **Default:** `4` **Tunable:** Any time
	`Monitor_retry_ interval`	Time interval in minutes for fault monitor restarts. **Default:** `2` **Tunable:** Any time

TABLE B-5 Sun Cluster HA for SAP Extension Properties for the Central Instance (Sheet 3 of 3)

Property Category	Property Name	Description
Development System	`Shutdown_dev`	Whether the RGM should shut down the development system before starting up the central instance. **Default:** `FALSE` **Tunable:** When disabled
	`Dev_sapsid`	SAP System Name for the development system (if you set `Shutdown_dev` to `TRUE`, Sun Cluster HA for SAP requires this property). **Default:** None **Tunable:** When disabled
	`Dev_shutdown_script`	Script that is used to shut down the development system. If you set `Shutdown_dev` to `TRUE`, Sun Cluster HA for SAP requires this property. **Default:** None **Tunable:** When disabled
	`Dev_stop_pct`	Percentage of startup timeouts Sun Cluster HA for SAP uses to shut down the development system before starting the central instance. **Default:** `20` **Tunable:** When disabled

TABLE B-6 Sun Cluster HA for SAP Extension Properties for the Application Servers (Sheet 1 of 2)

Property Category	Property Name	Description
SAP Configuration	`SAPSID`	SAP system name or *SAPSID* for the application server. **Default:** None **Tunable:** When disabled
	`As_instance_id`	Two-digit SAP system number for the application server. **Default:** None **Tunable:** When disabled
	`As_services_string`	String of application server services. **Default:** `D` **Tunable:** When disabled

TABLE B-6 Sun Cluster HA for SAP Extension Properties for the Application Servers (Sheet 2 of 2)

Property Category	Property Name	Description
Starting SAP	`As_db_retry_interval`	The interval in seconds to wait between attempting to connect to the database and starting the application server. **Default:** `30` **Tunable:** When disabled
	`As_startup_script`	Name of the SAP startup script for the application server. **Default:** None **Tunable:** When disabled
Stopping SAP	`Stop_sap_pct`	Percentage of stop-timeout variables that are used to stop SAP processes. The SAP shutdown script is used to stop processes before calling Process Monitor Facility (PMF) to terminate and then kill the processes. **Default:** `95` **Tunable:** When disabled
	`As_shutdown_script`	Name of the SAP shutdown script for the application server. **Default:** None **Tunable:** When disabled
Probe	`Probe_timeout`	Time-out value in seconds for the probes. **Default:** `60` **Tunable:** Any time
	`Monitor_retry_count`	Number of PMF restarts that the probe allows for the fault monitor. **Default:** `4` **Tunable:** Any time
	`Monitor_retry_interval`	Time interval in minutes for fault monitor restarts. **Default:** `2` **Tunable:** Any time

Setting Up a Lock File

Use the procedure in this section to perform the following tasks.

- Set up a lock file for the central instance.
- Set up a lock file for a scalable application server.

Set up a lock file to prevent multiple startups of the SAP instance when the instance is already active on one node. Multiple startups of the same instance crash each other. Furthermore, the crash prevents SAP shutdown scripts from performing a clean shutdown of the instances, which might cause data corruption.

If you set up a lock file, when you start the SAP instance the SAP software locks the file `startup_lockfile`. If you start up the same instance outside of the Sun Cluster environment and then try to bring up SAP under the Sun Cluster environment, the Sun Cluster HA for SAP data service will attempt to start up the same instance. However, because of the file-locking mechanism, this attempt will fail. The data service will log appropriate error messages in `/var/adm/messages`.

The only difference between the lock file for the central instance or the failover application server and the lock file for a scalable application server is that the lock file for scalable application server resides on the local file system and the lock file for the central instance or the failover application server resides on a cluster file system.

▼ How to Set Up a Lock File for Central Instance

To set up a central instance lock file, perform the following steps.

1. **Install the latest patch for the `sapstart` executable, which enables Sun Cluster HA for SAP users to configure a lock file.**
2. **Set up the central instance lock file on a *cluster* file system.**
3. **Edit the profile `SC3_`*DVEBMGS00* to add the new SAP parameter, `sapstart/lockfile`, for the application server.**

```
sapstart/lockfile =/usr/sap/SC3/DVEBMGS00/work/startup_lockfile
```

`sapstart/lockfile`	New parameter name.
`/usr/sap/local/SC3/`*DVEBMGS00*`/work`	Work directory for the application server.
`startup_lockfile`	Lock file name that Sun Cluster HA for SAP uses.

SAP creates the lock file.

Note – You must locate the lock file path on a cluster file system. If you locate the lock file path locally on the nodes, startups of the same instance from multiple nodes cannot be prevented.

▼ How to Set Up a Lock File for Scalable Application Server

To set up a lock file for a scalable application server, perform the following steps.

1. **Install the latest patch for the `sapstart` executable, which enables Sun Cluster HA for SAP users to configure a lock file.**
2. **Set up the application server lock file on the *local* file system.**
3. **Edit the profile `SC3_`*instance-id* to add the new SAP parameter, `sapstart/lockfile`, for the application server.**

```
sapstart/lockfile =/usr/sap/local/SC3/Dinstance-id/work/startup_lockfile
```

`sapstart/lockfile`	New parameter name.
`/usr/sap/SC3/D`*instance-id*`/work`	Work directory for the central instance.
`startup_lockfile`	Lock file name that Sun Cluster HA for SAP uses.

SAP creates the lock file.

Note – The lock file will reside on the local file system. The lock file does not prevent multiple startups from *other* nodes, but the lock file does prevent multiple startups from the *same* node.

Sun Cluster HA for SAP Fault Monitor

The Sun Cluster HA for SAP fault monitor checks SAP process and database health. SAP process health impacts SAP resources' failure history. SAP resources' failure history in turn drives the fault monitor's actions, which include no action, restart, or failover.

In contrast to SAP process health, the health of the database SAP uses has no impact on SAP resources' failure history. Database health does, however, trigger the SAP fault monitor to log any `syslog` messages and to set the status accordingly for the SAP resource that uses the database.

Sun Cluster HA for SAP Fault Probes for Central Instance

For the central instance, the fault probe executes the following steps.

1. Retrieves the process IDs for the SAP Message Server and the dispatcher
2. Loops infinitely (sleeps for `Thorough_probe_interval`)
3. Checks the health of the SAP resources
    a. **Abnormal exit –** If the Process Monitor Facility (PMF) detects that the SAP process tree has failed, the fault monitor treats this problem as a complete failure. The fault monitor restarts or fails over the SAP resource to another node based on the resources' failure history.
    b. **Health check of the SAP resources through probe –** The probe uses the `ps`(1) command to check the SAP Message Server and main dispatcher processes. If any of the SAP Message Server or main dispatcher processes are missing from the system's active processes list, the fault monitor treats this problem as a complete failure.

       If you configure the parameter `Check_ms_retry` to have a value greater than zero, the probe checks the SAP Message Server connection. If you have set the extension property `Lgtst_ms_with_logicalhostname` to its default value `TRUE`, the probe completes the SAP Message Server connection test with the utility `lgtst`. The probe uses the logical hostname interface that is specified in the SAP resource group to call the SAP-supplied utility `lgtst`. If you set the extension property `Lgtst_ms_with_logicalhostname` to a value other than `TRUE`, the probe calls `lgtst` with the node's localhost name (loopback interface).

If the `lgtst` utility call fails, the SAP Message Server connection is not functioning. In this situation, the fault monitor considers the problem to be a partial failure and does not trigger an SAP restart or a failover immediately. The fault monitor counts two partial failures as a complete failure if the following conditions occur.

i. You configure the extension property `Check_ms_retry` to be `2`.

ii. The fault monitor accumulates two partial failures that happen within the retry interval that the resource property `Retry_interval` sets.

A complete failure triggers either a local restart or a failover, based on the resource's failure history.

c. **Database connection status through probe –** The probe calls the SAP-supplied utility `R3trans` to check the status of the database connection. Sun Cluster HA for SAP fault probes verify that SAP can connect to the database. Sun Cluster HA for SAP depends, however, on the highly available database fault probes to determine the health of the database. If the database connection status check fails, the fault monitor logs the message, `Database might be down`, to `syslog`. The fault monitor then sets the status of the SAP resource to `DEGRADED`. If the probe checks the status of the database again and the connection is reestablished, the fault monitor logs the message, `Database is up`, to `syslog` and sets the status of the SAP resource to `OK`.

4. Evaluates the failure history

   Based on the failure history, the fault monitor completes one of the following actions.

- no action
- local restart
- failover

Sun Cluster HA for SAP Fault Probes for Application Server

For the application server, the fault probe executes the following steps.

1. Retrieves the process ID for the main dispatcher
2. Loops infinitely (sleeps for `Thorough_probe_interval`)

3. Checks the health of the SAP resources

   a. **Abnormal exit –** If the Process Monitor Facility (PMF) detects that the SAP process tree has failed, the fault monitor treats this problem as a complete failure. The fault monitor restarts or fails over the SAP resource to another node, based on the resources' failure history.

   b. **Health check of the SAP resources through probe –** The probe uses the `ps`(1) command to check the SAP Message Server and main dispatcher processes. If the SAP main dispatcher process is missing from the system's active processes list, the fault monitor treats the problem as a complete failure.

   c. **Database connection status through probe –** The probe calls the SAP-supplied utility `R3trans` to check the status of the database connection. Sun Cluster HA for SAP fault probes verify that SAP can connect to the database. Sun Cluster HA for SAP depends, however, on the highly available database fault probes to determine the health of the database. If the database connection status check fails, the fault monitor logs the message, `Database might be down`, to `syslog` and sets the status of the SAP resource to `DEGRADED`. If the probe checks the status of the database again and the connection is reestablished, the fault monitor logs the message, `Database is up`, to `syslog`. The fault monitor then sets the status of the SAP resource to `OK`.

4. Evaluates the failure history

   Based on the failure history, the fault monitor completes one of the following actions.

- no action
- local restart
- failover

  If the application server resource is a failover resource, the fault monitor fails over the application server.

  If the application server resource is a scalable resource, after the number of local restarts are exhausted, RGM will bring up the application server on a different node if there is another node available in the cluster.

APPENDIX C

Installing and Maintaining a Sun StorEdge 9910 or StorEdge 9960 Array

This chapter contains the procedures for installing, configuring, and maintaining Sun StorEdge 9910 and Sun StorEdge 9960 arrays.

This chapter contains the following procedures:

- "How to Add a StorEdge 9910/9960 Array Logical Volume to a Cluster" on page 188
- "How to Remove a StorEdge 9910/9960 Array Logical Volume" on page 189
- "How to Add a StorEdge 9910/9960 Array" on page 192
- "How to Remove a StorEdge 9910/9960 Array" on page 196
- "How to Replace a Host-to-Array Fiber-Optic Cable" on page 199
- "How to Replace a Host Adapter" on page 199

For conceptual information on multihost disks, see the *Sun Cluster 3.0 12/01 Concepts* document.

Configuring a StorEdge 9910/9960 Array

This section contains the procedures for configuring a StorEdge 9910/9960 array in a running cluster. The following table lists these procedures.

TABLE C-1 Task Map: Configuring a StorEdge 9910/9960 Array

Task	For Instructions, Go To
Add a StorEdge 9910/9960 array logical volume	See "How to Add a StorEdge 9910/9960 Array Logical Volume to a Cluster" on page 188.
Remove a StorEdge 9910/9960 array logical volume	See "How to Remove a StorEdge 9910/9960 Array Logical Volume" on page 189.

▼ How to Add a StorEdge 9910/9960 Array Logical Volume to a Cluster

Use this procedure to add a logical volume to a cluster. This procedure assumes that your service provider has created your logical volumes and that all cluster nodes are booted and attached to the StorEdge 9910/9960 array.

1. **On all cluster nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm
```

2. **On one node connected to the partner-group, use the `format` command to verify that the new logical volume is visible to the system.**

```
# format
```

See the `format` command man page for more information about using the command.

3. **Are you running VERITAS Volume Manager?**
   - If not, go to Step 4.
   - If you are running VERITAS Volume Manager, update its list of devices on all cluster nodes attached to the logical volume that you created in Step 2.

   See your VERITAS Volume Manager documentation for information about using the `vxdctl enable` command to update new devices (volumes) in your VERITAS Volume Manager list of devices.

4. **If necessary, partition the logical volume.**

   Contact your service provider to partition the logical volume.

5. **From any node in the cluster, update the global device namespace.**

```
# scgdevs
```

   If a volume management daemon such as `vold` is running on your node, and you have a CD-ROM drive that is connected to the node, a `device busy` error might be returned even if no disk is in the drive. This error is expected behavior.

Where to Go From Here

To create a new resource or reconfigure a running resource to use the new StorEdge 9910/9960 Array logical volume, see the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.

▼ How to Remove a StorEdge 9910/9960 Array Logical Volume

Use this procedure to remove a logical volume. This procedure assumes all cluster nodes are booted and attached to the StorEdge 9910/9960 array that hosts the logical volume you are removing.

This procedure defines Node A as the node you begin working with, and Node B as the remaining node.

Caution – This procedure removes all data on the logical volume you are removing.

1. **If necessary, migrate all data and volumes off the logical volume that you are removing. Otherwise, proceed to Step 2.**

2. **Are you running VERITAS Volume Manager?**
   - If no, go to Step 3.
   - If yes, update the list of devices on all cluster nodes attached to the logical volume that you are removing.

   See your VERITAS Volume Manager documentation for information about using the `vxdisk rm` command to remove devices (volumes) in your VERITAS Volume Manager device list.

3. **Run the appropriate Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager commands to remove the reference to the logical unit number (LUN) from any diskset or disk group.**

   For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.

4. **Remove the logical volume.**

   Contact your service provider to remove the logical volume.

5. **Determine the resource groups and device groups that are running on Node A and Node B.**

   Record this information because you will use it in Step 12 of this procedure to return resource groups and device groups to these nodes.

```
# scstat
```

6. **Move all resource groups and device groups off Node A.**

```
# scswitch -S -h from-node
```

7. **Shut down and reboot Node A by using the `shutdown` command with the `-i6` option.**

   The `-i6` option with the shutdown command causes the node to shutdown and reboot.

```
# shutdown -y -g0 -i6
```

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

8. **On Node A, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# scdidadm -C
```

9. **Move all resource groups and device groups off Node B.**

```
# scswitch -S -h from-node
```

10. **Shut down and reboot Node B by using the `shutdown` command with the `-i6` option.**

    The `-i6` option with the shutdown command causes the node to reboot after it shuts down to the `ok` prompt.

```
# shutdown -y -g0 -i6
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

11. **On Node B, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# scdidadm -C
```

12. **Return the resource groups and device groups you identified in Step 5 to Node B.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

Where to Go From Here

To create a logical volume, see "How to Add a StorEdge 9910/9960 Array Logical Volume to a Cluster" on page 188.

Maintaining a StorEdge 9910/9960 Array

This section contains a limited set of procedures for maintaining a StorEdge 9910/9960 array. Contact your service provider to add, remove, or replace any StorEdge 9910/9960 components.

TABLE C-2 Task Map: Maintaining a StorEdge 9910/9960 Array

Task	For Instructions, Go To
Add a StorEdge 9910/9960 array.	*"How to Add a StorEdge 9910/9960 Array" on page 192*
Remove a StorEdge 9910/9960 array.	*"How to Remove a StorEdge 9910/9960 Array" on page 196*
Replace a host-to-array fiber-optic cable.	*"How to Replace a Host-to-Array Fiber-Optic Cable" on page 199*
Replace a host adapter.	"How to Replace a Host Adapter" on page 199

▼ How to Add a StorEdge 9910/9960 Array

Use this procedure to add a new StorEdge 9910/9960 array to a running cluster.

This procedure defines Node A as the node you begin working with, and Node B as the remaining node.

1. **Power on the StorEdge 9910/9960 array.**

Note – The StorEdge 9910/9960 array will require a few minutes to boot.

Contact your service provider to power on the StorEdge 9910/9960 array.

2. **Configure the new StorEdge 9910/9960 array.**

Contact your service provider to create the desired logical volumes.

3. **Determine the resource groups and device groups that are running on Node A and Node B.**

   Record this information because you will use it in Step 28 of this procedure to return resource groups and device groups to these nodes.

```
# scstat
```

4. **Move all resource groups and device groups off Node A.**

```
# scswitch -S -h from-node
```

5. **Do you need to install a host adapter in Node A?**
   - If no, skip to Step 11.
   - If yes, proceed to Step 6.
6. **Is the host adapter the first JNI host adapter on Node A?**
   - If no, skip to Step 11.
   - If yes, contact your service provider to install the support packages and configure the drivers.
7. **Stop the Sun Cluster software on Node A and shut down Node A.**

```
# shutdown -y -g0 -i0
```

   For the procedure on shutting down a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

8. **Power off Node A.**
9. **Install the host adapter in Node A.**

   For the procedure on installing a host adapter, see the documentation that shipped with your host adaper or updated information on the manufacturer's web site.

10. **If necessary, power on and boot Node A.**

```
{0} ok boot -x
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

11. **Attach the StorEdge 9910/9960 array to Node A.**

    Contact your service provider to install a fiber-optic cable between the StorEdge 9910/9960 array and your cluster node.

12. **Configure the fibre-channel adapter and the StorEdge 9910/9960 array.**

    Contact your service provider to configure the adapter and StorEdge 9910/9960 array.

13. **Shut down Node A.**

```
# shutdown -y -g0 -i0
```

14. **Perform a reconfiguration boot to create the new Solaris device files and links on Node A.**

```
{0} ok boot -r
```

15. **Label the new logical volume.**

    Contact your service provider to label the new logical volume.

16. **(Optional) On Node A, verify that the device IDs (DIDs) are assigned to the new StorEdge 9910/9960 array.**

```
# scdidadm -l
```

17. **Do you need to install a host adapter in Node B?**

    - If yes, proceed to Step 18.
    - If no, skip to Step 24.

18. **Is the host adapter the first JNI host adapter on Node B?**

    - If no, skip to Step 19.
    - If yes, contact your service provider to install the support packages and configure the drivers.

19. **Move all resource groups and device groups off Node B.**

```
# scswitch -S -h from-node
```

20. **Stop the Sun Cluster software on Node B, and shut down the node.**

```
# shutdown -y -g0 -i0
```

For the procedure on shutting down a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

21. **Power off Node B.**

For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

22. **Install the host adapter in Node B.**

For the procedure on installing a host adapter, see the documentation that shipped with your host adapter and node.

23. **If necessary, power on and boot Node B.**

```
{0} ok boot -x
```

For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

24. **Attach the StorEdge 9910/9960 array to Node B.**

Contact your service provider to install a fiber-optic cable between the StorEdge 9910/9960 array and your cluster node.

25. **Shut down Node B.**

```
# shutdown -y -g0 -i0
```

26. **Perform a reconfiguration boot to create the new Solaris device files and links on Node B.**

```
{0} ok boot -r
```

27. **(Optional) On Node B, verify that the device IDs (DIDs) are assigned to the new StorEdge 9910/9960 array.**

```
# scdidadm -l
```

28. **Return the resource groups and device groups you identified in Step 3 to Node B.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

29. **Perform volume management administration to incorporate the new logical volumes into the cluster.**

For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.

▼ How to Remove a StorEdge 9910/9960 Array

Use this procedure to permanently remove a StorEdge 9910/9960 array and its submirrors from a running cluster. This procedure provides the flexibility to remove the host adapters from the nodes for the StorEdge 9910/9960 array you are removing.

This procedure defines Node A as the node you begin working with, and Node B as the remaining node.

Caution – During this procedure, you will lose access to the data that resides on the StorEdge 9910/9960 array you are removing.

1. **Back up all database tables, data services, and volumes that are associated with the StorEdge 9910/9960 array that you are removing.**
2. **Detach the submirrors from the StorEdge 9910/9960 array you are removing in order to stop all I/O activity to the array.**

   For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.
3. **Run the appropriate Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager commands to remove the references to the LUN(s) from any diskset or disk group.**

   For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.
4. **Determine the resource groups and device groups that are running on Node A.**

```
# scstat
```

5. **Move all resource groups and device groups off Node A.**

```
# scswitch -S -h from-node
```

6. **Stop the Sun Cluster software on Node A, and shut down Node A.**

```
# shutdown -y -g0 -i0
```

For the procedure on shutting down a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

7. **Disconnect the fiber-optic cable between Node A and the StorEdge 9910/9960 array.**

8. **Do you want to remove the host adapter from Node A?**
   - If no, skip to Step 11.
   - If yes, power off Node A.

9. **Remove the host adapter from Node A.**

For the procedure on removing host adapters, see the documentation that shipped with your host adapter or updated information on the manufacturer's web site.

10. **Without allowing the node to boot, power on Node A.**

For more information, see the documentation that shipped with your server.

11. **Boot Node A into cluster mode.**

```
{0} ok boot
```

12. **Determine the resource groups and device groups that are running on Node A.**

```
# scstat
```

13. **Move all resource groups and device groups off Node B.**

```
# scswitch -S -h from-node
```

14. **Stop the Sun Cluster software on Node B, and shut down Node B.**

```
# shutdown -y -g0 -i0
```

15. **Disconnect the fiber-optic cable between Node B and the StorEdge 9910/9960 array.**

16. **Do you want to remove the host adapter from Node B?**

    - If no, skip to Step 19.
    - If yes, power off Node B.

17. **Remove the host adapter from Node B.**

    For the procedure on removing host adapters, see the documentation that shipped with your server and host adapter.

18. **Without allowing the node to boot, power on Node B.**

    For more information, see the documentation that shipped with your server.

19. **Boot Node B into cluster mode.**

```
{0} ok boot
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

20. **On all cluster nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# scdidadm -C
```

21. **Return the resource groups and device groups you identified in Step 4 to Node B.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

▼ How to Replace a Host-to-Array Fiber-Optic Cable

Use this procedure to replace the host-to-array fiber-optic cables. Node A in this procedure refers to the node with the failed fiber-optic cable that you are replacing.

1. **On Node A, determine the resource groups and device groups that are running on this node.**

   Record this information because you will use it in Step 4 of this procedure to return resource groups and device groups to these nodes.

```
# scstat
```

2. **Move all resource groups and device groups off Node A.**

```
# scswitch -S -h from-node
```

3. **Replace the host-to-array fiber-optic cable.**

4. **Return the resource groups and device groups you identified in Step 1 to Node A.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

▼ How to Replace a Host Adapter

Use this procedure to replace a failed host adapter in a running cluster. Node A in this procedure refers to the node with the failed host adapter you are replacing. Node B is a backup node.

1. **Determine the resource groups and device groups that are running on Node A and Node B.**

   Record this information because you will use it in Step 8 of this procedure to return resource groups and device groups to these nodes.

```
# scstat
```

2. **Move all resource groups and device groups off Node A.**

```
# scswitch -S -h from-node
```

3. **Shut down Node A.**

```
# shutdown -y -g0 -i0
```

4. **Power off Node A.**

   For more information, see the documentation that shipped with your server.

5. **Replace the failed host adapter.**

   Contact your service provider to replace the failed host adapter.

6. **Power on Node A.**

   For more information, see the documentation that shipped with your server.

7. **Boot Node A into cluster mode.**

```
{0} ok boot
```

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

8. **Return the resource groups and device groups you identified in Step 1 to Node A.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

APPENDIX **D**

Installing and Maintaining Sun StorEdge A1000 or Netra st A1000 Arrays

This chapter describes the procedures for installing, configuring, and maintaining Sun StorEdge A1000 and Netra st A1000 arrays in a Sun Cluster environment.

Note – The procedures in this chapter apply to both the Sun StorEdge A1000 and the Netra st A1000 arrays. However, when the procedures refer you to the array documentation for instructions, be sure to refer to the correct document for the disk array you are using.

This chapter contains the following procedures:

- "How to Install a Pair of StorEdge/Netra st A1000 Arrays" on page 202
- "How to Create a LUN" on page 209
- "How to Delete a LUN" on page 211
- "How to Reset a StorEdge/Netra st A1000 LUN Configuration" on page 213
- "How to Correct Mismatched DID Numbers" on page 216
- "How to Add a Pair of StorEdge/Netra st A1000 Arrays to a Running Cluster" on page 220
- "How to Remove a StorEdge/Netra st A1000 Array From a Running Cluster" on page 227
- "How to Add a Disk Drive in a Running Cluster" on page 231
- "How to Replace a Failed Disk Drive in a Running Cluster" on page 232
- "How to Remove a Disk Drive From a Running Cluster" on page 233
- "How to Upgrade Disk Drive Firmware in a Running Cluster" on page 233
- "How to Replace a Failed Controller or Restore an Offline Controller" on page 230
- "How to Replace a Host Adapter in a Node (Connected to a StorEdge/Netra st A1000 array)" on page 234

Installing a StorEdge/Netra st A1000 Array

This section provides the procedure for an initial installation of a pair of StorEdge/Netra st A1000 arrays to a non-configured cluster. To add StorEdge/Netra st A1000 arrays to an operating cluster, use the procedure, "How to Add a Pair of StorEdge/Netra st A1000 Arrays to a Running Cluster" on page 220.

▼ How to Install a Pair of StorEdge/Netra st A1000 Arrays

Use this procedure to install and configure a pair of StorEdge/Netra st A1000 arrays, *before* installing the Solaris operating environment and Sun Cluster software on your cluster nodes.

1. **Install the host adapters in the nodes that connect to the arrays.**

   For the procedure on installing host adapters, see the documentation that shipped with your host adapters and nodes.

2. **Cable the arrays.**

   The StorEdge/Netra st A1000 arrays must be configured in pairs for the Sun Cluster environment. Figure 7-1 illustrates the StorEdge/Netra st A1000 cabled in a Sun Cluster environment.

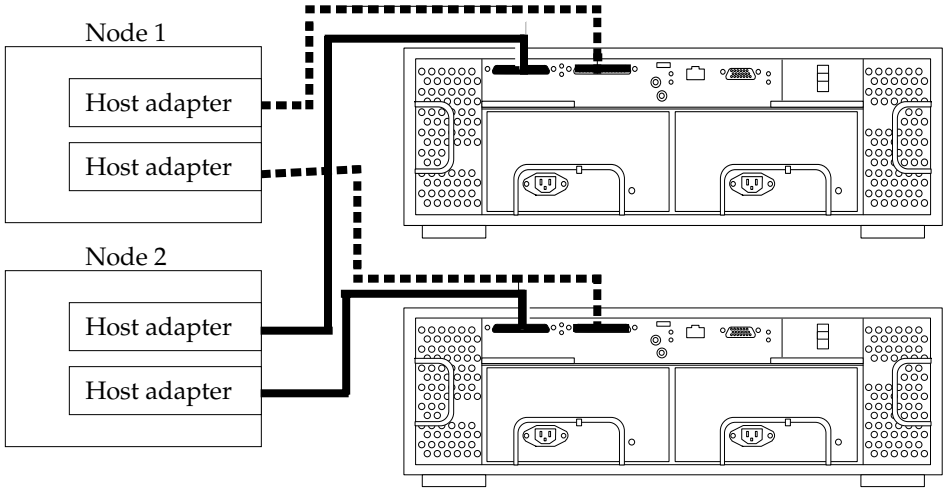


FIGURE D-1 StorEdge/Netra st A1000 Array Cabling

3. **Power on the arrays and then the cluster nodes.**

Note – When you power on the nodes, do not allow them to boot. If necessary, halt the nodes so that you can perform OpenBoot™ PROM (OBP) Monitor tasks at the `ok` prompt.

To power on a StorEdge/Netra st A1000 array, push the power switch to the momentary on position (right side) and then release it.

4. **Find the paths to the host adapters in the *first* node:**

```
{0} ok show-disks
...
b) /sbus@6,0/QLGC,isp@2,10000/sd
...
d) /sbus@2,0/QLGC,isp@2,10000/sd
...
```

Note – Use this information to change the SCSI addresses of the host adapters in the `nvramrc` script in Step 5, but do not include the `sd` directories in the device paths.

---

5. **Edit the `nvramrc` script to change the `scsi-initiator-id` for the host adapters on the *first* node.**

   The default SCSI address for host adapters is `7`. Reserve SCSI address `7` for one host adapter in the SCSI chain. This procedure refers to the node that has a host adapter with SCSI address `7` as the "second node."

   To avoid conflicts, you must change the `scsi-initiator-id` of the remaining host adapter in the SCSI chain to an available SCSI address. This procedure refers to the node that has a host adapter with an available SCSI address as the "first node."

   For a partial list of `nvramrc` editor and `nvedit` keystroke commands, see Appendix B of the *Sun Cluster 3.0 12/01 Hardware Guide*. For a full list of commands, see the *OpenBoot 3.x Command Reference Manual*.

   The following example sets the `scsi-initiator-id` of the host adapter on the first node to 6. The OpenBoot PROM Monitor prints the line numbers (`0:`, `1:`, and so on).

   Note – Insert exactly one space after the first quotation mark and before `scsi-initiator-id`.

```
{0} ok nvedit
0: probe-all
1: cd /sbus@6,0/QLGC,isp@2,10000
2: 6 " scsi-initiator-id" integer-property
3: device-end
4: cd /sbus@2,0/QLGC,isp@2,10000
5: 6 " scsi-initiator-id" integer-property
6: device-end
7: install-console
8: banner <Control C>
{0} ok
```

6. **Store the changes.**

   The changes you make through the `nvedit` command are recorded on a temporary copy of the `nvramrc` script. You can continue to edit this copy without risk. After you complete your edits, save the changes. If you are not sure about the changes, discard them.

   - To store the changes, type:

```
{0} ok nvstore
```

- To discard the changes, type:

```
{0} ok nvquit
```

7. **Verify the contents of the `nvramrc` script you created in Step 5, as shown in the following example.**

   If the contents of the `nvramrc` script are incorrect, use the `nvedit` command again to make corrections.

```
{0} ok printenv nvramrc
nvramrc =             probe-all
                      cd /sbus@6,0/QLGC,isp@2,10000
                      6 " scsi-initiator-id" integer-property
                      device-end
                      cd /sbus@2,0/QLGC,isp@2,10000
                      6 " scsi-initiator-id" integer-property
                      device-end
                      install-console
                      banner
```

8. **Set the parameter to instruct the OpenBoot PROM Monitor to use the `nvramrc` script:**

```
{0} ok setenv use-nvramrc? true
use-nvramrc? = true
```

9. **Verify that the `scsi-initiator-id` for each host adapter on the *second* node is set to 7.**

   Use the `show-disks` command to find the paths to the host adapters. Select each host adapter's device tree node, then display the node's properties to confirm that the `scsi-initiator-id` for each host adapter is set to 7.

```
{0} ok show-disks
...
b) /sbus@6,0/QLGC,isp@2,10000/sd
...
d) /sbus@2,0/QLGC,isp@2,10000/sd
...
{0} ok cd /sbus@6,0/QLGC,isp@2,10000
{0} ok .properties
scsi-initiator-id        00000007
```

10. **Install the Solaris operating environment, then apply any required Solaris patches.**

Note – For the current list of patches that are required for the Solaris operating environment, refer to SunSolve. SunSolve is available online to Sun service providers and to customers with SunSolve service contracts at the SunSolve site: `http://sunsolve.sun.com`.

---

11. **Install the RAID Manager software.**

    For the procedure on installing the RAID Manager software, see the *Sun StorEdge RAID Manager 6.22.1 Release Notes*.

Note – RAID Manager 6.22.1 is required for clustering the Sun StorEdge/Netra st A1000 array with Sun Cluster 3.0.

---

12. **Install any StorEdge/Netra st A1000 array or RAID Manager patches.**

Note – For the most current list of software, firmware, and patches that are required for the StorEdge/Netra st A1000 Array, refer to EarlyNotifier 20029, "A1000/A3x00/A1000FC Software/Firmware Configuration Matrix." This document is available online to Sun service providers and to customers with SunSolve service contracts at the SunSolve site, `http://sunsolve.sun.com`, under advanced search.

---

13. **Check the StorEdge/Netra st A1000 array NVSRAM file revision, and if necessary, install the most recent revision.**

    For the NVSRAM file revision number, boot level, and procedure on upgrading the NVSRAM file, see the *Sun StorEdge RAID Manager 6.22.1 Release Notes*.

14. **Set the `Rdac` parameters in the `/etc/osa/rmparams` file on both nodes.**

```
Rdac_RetryCount=1
Rdac_NoAltOffline=TRUE
```

15. **Set up the arrays with logical units (LUNs) and hot spares.**

    For the procedure on setting up the StorEdge/Netra st A1000 array with LUNs and hot spares, see the *Sun StorEdge RAID Manager User's Guide*.

Note – Use the `format` command to verify Solaris logical device names.

---

16. **Ensure that the new logical name for the LUN you created in Step 15 appears in the `/dev/rdsk` directory on both nodes by running the `hot_add` command on both nodes:**

```
# /etc/raid/bin/hot_add
```

Where to Go From Here

To continue with Sun Cluster software and data services installation tasks, see the *Sun Cluster 3.0 12/01 Software Installation Guide* and the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide*.

Configuring a Sun StorEdge/Netra st A1000 Array

This section describes the procedures for configuring a StorEdge/Netra st A1000 array *after* installing Sun Cluster software. TABLE D-1 lists these procedures.

Configuring a StorEdge/Netra st A1000 array *before* installing Sun Cluster software is the same as doing so in a non-cluster environment. For procedures on configuring StorEdge/Netra st A1000 arrays before installing Sun Cluster, see the *Sun StorEdge RAID Manager User's Guide*.

TABLE D-1 Task Map: Configuring StorEdge/Netra st A1000 Disk Drives

Task	For Instructions, Go To
Create a logical unit (LUN).	"How to Create a LUN" on page 209
Remove a LUN.	"How to Delete a LUN" on page 211
Reset the StorEdge/Netra st A1000 configuration.	"How to Reset a StorEdge/Netra st A1000 LUN Configuration" on page 213
Create a hot spare. Follow the same procedure that is used in a non-cluster environment.	*Sun StorEdge RAID Manager User's Guide* *Sun StorEdge RAID Manager Release Notes*
Delete a hot spare. Follow the same procedure that is used in a non-cluster environment.	*Sun StorEdge RAID Manager User's Guide* *Sun StorEdge RAID Manager Release Notes*
Increase the size of a drive group. Follow the same procedure that is used in a non-cluster environment.	*Sun StorEdge RAID Manager User's Guide* *Sun StorEdge RAID Manager Release Notes*

▼ How to Create a LUN

Use this procedure to create a logical unit (LUN) from unassigned disk drives or remaining capacity. See the *Sun StorEdge RAID Manager Release Notes* for the latest information about LUN administration.

This product supports the use of hardware RAID and host-based software RAID. For host-based software RAID, this product supports RAID levels 0+1 and 1+0.

Note – When you use host-based software RAID with hardware RAID, the hardware RAID levels you use affect the hardware maintenance procedures because they affect volume management administration.
If you use hardware RAID level 1, 3, or 5, you can perform most maintenance procedures in "Maintaining a StorEdge/Netra st A1000 Array" on page 218 without volume management disruptions.
If you use hardware RAID level 0, some maintenance procedures in "Maintaining a StorEdge/Netra st A1000 Array" on page 218 require additional volume management administration because the availability of the LUNs is impacted.

---

1. **With all cluster nodes booted and attached to the StorEdge/Netra st A1000 array, create the LUN on one node.**

   Shortly after the LUN formatting completes, a logical name for the new LUN appears in `/dev/rdsk` on all cluster nodes that are attached to the StorEdge/Netra st A1000 array.

   For the procedure on creating a LUN, see the *Sun StorEdge RAID Manager User's Guide*.

   If the following warning message is displayed, ignore it and continue with the next step:

   ```
   scsi: WARNING: /sbus@e,0/QLGC,isp@1,10000/sd@2,1 (sd153):
   corrupt label - wrong magic number
   ```

   Note – Use the `format`(1M) command to verify Solaris logical device names and label the LUN if necessary.

   ---

2. **Ensure that the new logical name for the LUN you created in Step 1 appears in the `/dev/rdsk` directory on both nodes by running the `hot_add` command on both nodes:**

   ```
   # /etc/raid/bin/hot_add
   ```

3. **On one node, update the global device namespace:**

```
# scgdevs
```

4. **Use the `scdidadm` command to verify that the DID numbers for the LUNs are the same on both nodes. In the sample output that follows, the DID numbers are different:**

```
# scdidadm -L
...
33       e07a:/dev/rdsk/c1t4d2           /dev/did/rdsk/d33
33       e07c:/dev/rdsk/c0t4d2           /dev/did/rdsk/d33
```

5. **Are the DID numbers you received from running the `scdidadm` command in Step 4 the same for both your nodes?**
   - If the DID numbers are the same, go to Step 6.
   - If the DID numbers are different, perform the procedure in "How to Correct Mismatched DID Numbers" on page 216 before you continue with Step 6 of this procedure.

6. **If you want a volume manager to manage the new LUN you created in Step 1, run the appropriate Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager commands to incorporate the new LUN into a diskset or disk group.**

   For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.

7. **If you want the new LUN to be a quorum device, add the quorum device.**

   For the procedure on adding a quorum device, see the *Sun Cluster 3.0 U2 System Administration Guide*

▼ How to Delete a LUN

Use this procedure to delete a LUN(s). See the *Sun StorEdge RAID Manager Release Notes* for the latest information about LUN administration.

Caution – This procedure removes all data on the LUN you delete.

Caution – Do not delete LUN 0.

1. **From one node that is connected to the StorEdge/Netra st A1000 array, use the `format` command to determine the paths to the LUN you are deleting (sample output follows).**

```
f28c# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
       0. c0t10d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
          /sbus@3,0/SUNW,fas@3,8800000/sd@a,0
       1. c1t5d0 <Symbios-StorEDGEA1000-0301 cyl 12160 alt 2 hd 64 sec 64>
          /pseudo/rdnexus@1/rdriver@5,0
       2. c2t2d0 <Symbios-StorEDGEA1000-0301 cyl 12160 alt 2 hd 64 sec 64>
          /pseudo/rdnexus@2/rdriver@2,0
```

2. **Determine if the LUN that you plan to remove is configured as a quorum device.**

```
# scstat -q
```

   - If the LUN is not a quorum device, go to Step 3.
   - If the LUN is configured as a quorum device, choose and configure another device to be the new quorum device. Then remove the old quorum device.

3. **Remove the LUN from disksets or disk groups.**

   Run the appropriate Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager commands to remove the LUN from any diskset or disk group. For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation. See the following paragraph for additional VERITAS Volume Manager commands that are required.

LUNs that were managed by VERITAS Volume Manager must be completely removed from VERITAS Volume Manager control before you can delete them. To remove the LUNs, after you delete the LUN from any disk group, use the following commands:

```
# vxdisk offline cNtXdY
# vxdisk rm cNtXdY
```

4. **From one node, delete the LUN.**

   For the procedure on deleting a LUN, see the *Sun StorEdge RAID Manager User's Guide*.

5. **From the same node, remove the paths to the LUN(s) you are deleting.**

```
# rm /dev/rdsk/cNtXdY*
# rm /dev/dsk/cNtXdY*
# rm /dev/osa/dev/dsk/cNtXdY*
# rm /dev/osa/dev/rdsk/cNtXdY*
```

6. **From the same node, remove all obsolete device IDs (DID)s.**

```
# scdidadm -C
```

7. **From the same node, switch resources and device groups off the node.**

```
# scswitch -Sh nodename
```

8. **Shut down the node.**

```
# shutdown -y -g0 -i0
```

9. **Boot the node and wait for it to rejoin the cluster:**

```
# boot -r
```

10. **Repeat Step 5 through Step 9 on the other node that is attached to the StorEdge/Netra st A1000 array.**

▼ How to Reset a StorEdge/Netra st A1000 LUN Configuration

Use this procedure to reset a StorEdge/Netra st A1000 LUN configuration.

Caution – Resetting LUN configuration results in a new DID number being assigned to LUN 0. This is because the software assigns a new worldwide number (WWN) to the new LUN.

1. **From one node that is connected to the StorEdge/Netra st A1000 array, use the `format` command to determine the paths to the LUN(s) you are resetting, as shown in the following example (sample output shown below).**

```
f28c# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
       0. c0t10d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
          /sbus@3,0/SUNW,fas@3,8800000/sd@a,0
       1. c1t5d0 <Symbios-StorEDGEA1000-0301 cyl 12160 alt 2 hd 64 sec 64>
          /pseudo/rdnexus@1/rdriver@5,0
       2. c2t2d0 <Symbios-StorEDGEA1000-0301 cyl 12160 alt 2 hd 64 sec 64>
          /pseudo/rdnexus@2/rdriver@2,0
```

2. **Determine if the LUN that you plan to reset is configured as a quorum device.**

```
# scstat -q
```

   - If the LUN is not a quorum device, go to Step 3.
   - If the LUN is configured as a quorum device, choose and configure another device to be the new quorum device. Then remove the old quorum device.

3. **Remove the LUN from disksets or disk groups.**

   Run the appropriate Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager commands to remove the LUN from any diskset or disk group. For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation. See the following paragraph for additional VERITAS Volume Manager commands that are required.

LUNs that were managed by VERITAS Volume Manager must be completely removed from VERITAS Volume Manager control before you can delete them. To remove the LUNs, after you delete the LUN from any disk group, use the following commands:

```
# vxdisk offline cNtXdY
# vxdisk rm cNtXdY
```

4. **On one node, reset the LUN configuration.**

   For the procedure for resetting StorEdge/Netra st A1000 LUN configuration, see the *Sun StorEdge RAID Manager User's Guide*.

Note – Use the `format` command to verify Solaris logical device names.

---

5. **By using the `format` command, label the new LUN 0.**

6. **Remove the paths to the old LUN(s) you reset:**

```
# rm /dev/rdsk/cNtXdY*
# rm /dev/dsk/cNtXdY*

# rm /dev/osa/dev/dsk/cNtXdY*
# rm /dev/osa/dev/rdsk/cNtXdY*
```

7. **Update device namespaces on both nodes:**

```
devfsadm -C
```

8. **Remove all obsolete DIDs on both nodes:**

```
# scdidadm -C
```

9. **Switch resources and device groups off the node:**

```
# scswitch -Sh nodename
```

10. **Shut down the node:**

```
# shutdown -y -g0 -i0
```

11. **Boot the node and wait for it to rejoin the cluster:**

```
# boot -r
```

If the following error message appears, ignore it and continue with the next step. The DID will be updated when the procedure is complete.

```
device id for '/dev/rdsk/c0t5d0' does not match physical disk's id.
```

12. **After the node has rebooted and joined the cluster, repeat Step 6 through Step 11 on the other node that is attached to the StorEdge/Netra st A1000 array.**

The DID number for the original LUN 0 is removed and a new DID is assigned to LUN 0.

▼ How to Correct Mismatched DID Numbers

Use this section to correct mismatched device ID (DID) numbers that might appear during the creation of A1000 LUNs. You correct the mismatch by deleting Solaris and Sun Cluster paths to the LUNs that have DID numbers that are different. After rebooting, the paths are corrected.

Note – Use this procedure only if you are directed to do so from "How to Create a LUN" on page 209.

---

1. **From one node that is connected to the StorEdge/Netra st A1000 array, use the `format` command to determine the paths to the LUN(s) that have different DID numbers:**

```
# format
```

2. **Remove the paths to the LUN(s) that have different DID numbers:**

```
# rm /dev/rdsk/cNtXdY*
# rm /dev/dsk/cNtXdY*

# rm /dev/osa/dev/dsk/cNtXdY*
# rm /dev/osa/dev/rdsk/cNtXdY*
```

3. **Use the `lad` command to determine the *alternate* paths to the LUN(s) that have different DID numbers.**

   The RAID Manager software creates two paths to the LUN in the `/dev/osa/dev/rdsk` directory. Substitute the `cNtXdY` number from the other array in the disk array to determine the alternate path.

   For example, with this configuration:

```
# lad
c0t5d0 1T93600714 LUNS: 0 1
c1t4d0 1T93500595 LUNS: 2
```

   The alternate paths would be as follows.

```
/dev/osa/dev/dsk/c1t4d1*
/dev/osa/dev/rdsk/c1t4d1*
```

4. **Remove the *alternate* paths to the LUN(s) that have different DID numbers:**

```
# rm /dev/osa/dev/dsk/cNtXdY*
# rm /dev/osa/dev/rdsk/cNtXdY*
```

5. **On both nodes, remove all obsolete DIDs:**

```
# scdidadm -C
```

6. **Switch resources and device groups off the node:**

```
# scswitch -Sh nodename
```

7. **Shut down the node:**

```
# shutdown -y -g0 -i0
```

8. **Boot the node and wait for it to rejoin the cluster:**

```
# boot -r
```

9. **Repeat Step 1 through Step 8 on the other node that is attached to the StorEdge/Netra st A1000 array.**

10. **Return to "How to Create a LUN" on page 209.**

Maintaining a StorEdge/Netra st A1000 Array

This section contains the procedures for maintaining a StorEdge/Netra st A1000 array in a Sun Cluster environment. Some maintenance tasks listed in TABLE D-2 are performed the same as in a non-cluster environment, so the task's procedures are referenced rather than contained in this section. TABLE D-2 lists the procedures for maintaining the StorEdge/Netra st A1000 array.

TABLE D-2 Tasks: Maintaining a StorEdge/Netra st A1000 Array

Task	For Instructions, Go To
A1000 array procedures:	
Add an array to a running cluster.	"How to Add a Pair of StorEdge/Netra st A1000 Arrays to a Running Cluster" on page 220
Remove an array from a running cluster.	"How to Remove a StorEdge/Netra st A1000 Array From a Running Cluster" on page 227
Replace a failed array. To replace a failed array, remove the failed array and add a new array to the configuration.	"How to Remove a StorEdge/Netra st A1000 Array From a Running Cluster" on page 227 "How to Add a Pair of StorEdge/Netra st A1000 Arrays to a Running Cluster" on page 220
Add a disk drive to a running cluster.	"How to Add a Disk Drive in a Running Cluster" on page 231
Replace a disk drive in a running cluster.	"How to Replace a Failed Disk Drive in a Running Cluster" on page 232
Remove a disk drive from a running cluster.	"How to Remove a Disk Drive From a Running Cluster" on page 233
Upgrade array firmware and NVSRAM file.	"How to Upgrade Disk Drive Firmware in a Running Cluster" on page 233
Replace a failed controller or restore an offline controller.	"How to Replace a Failed Controller or Restore an Offline Controller" on page 230

TABLE D-2 Tasks: Maintaining a StorEdge/Netra st A1000 Array *(Continued)*

Task	For Instructions, Go To
Replace a power cord to an array.	*Sun StorEdge A1000 and D1000 Installation, Operations, and Service Manual* Netra st A1000 and Netra st D1000 Installation and Maintenance Manual
Replace an array cooling canister. Follow the same procedure that is used in a non-cluster environment.	*Sun StorEdge A1000 and D1000 Installation, Operations, and Service Manual* Netra st A1000 and Netra st D1000 Installation and Maintenance Manual
Cable procedures:	
Replace a StorEdge A1000-to-host SCSI cable. Follow the same procedure that is used in a non-cluster environment.	*Sun StorEdge RAID Manager User's Guide* *Sun StorEdge RAID Manager 6.22.1 Release Notes*
Cabinet/power procedures:	
Replace the battery unit.	*Sun StorEdge RAID Manager 6.22.1 Release Notes* *Sun StorEdge A1000 and D1000 Installation, Operations, and Service Manual* Netra st A1000 and Netra st D1000 Installation and Maintenance Manual
Replace a power supply.	*Sun StorEdge A1000 and D1000 Installation, Operations, and Service Manual* Netra st A1000 and Netra st D1000 Installation and Maintenance Manual
Node/host adapter procedures:	
Replace a host adapter in a node.	"How to Replace a Host Adapter in a Node (Connected to a StorEdge/Netra st A1000 array)" on page 234

▼ How to Add a Pair of StorEdge/Netra st A1000 Arrays to a Running Cluster

Use this procedure to add a pair of StorEdge/Netra st A1000 arrays to a running cluster.

1. **Install the RAID Manager software on cluster nodes.**

   For the procedure on installing RAID Manager software, see the *Sun StorEdge RAID Manager Installation and Support Guide*.

   Note – RAID Manager 6.22 or a compatible version is required for clustering with Sun Cluster 3.0.

   ---

2. **Install any StorEdge/Netra st A1000 array patches on cluster nodes.**

   Note – For the most current list of software, firmware, and patches that are required for the StorEdge/Netra st A1000 array, refer to EarlyNotifier 20029, "A1000/A3x00/A1000FC Software/Firmware Configuration Matrix." This document is available online to Sun service providers and to customers with SunSolve service contracts at the SunSolve site: `http://sunsolve.sun.com`.

   ---

3. **Set the `Rdac` parameters in the `/etc/osa/rmparams` file on both nodes.**

   ```
   Rdac_RetryCount=1
   Rdac_NoAltOffline=TRUE
   ```

4. **Power on the StorEdge/Netra st A1000 array.**

   To power on the StorEdge/Netra st A1000 array, push the power switch to the momentary on position (right side) and then release it.

5. **Shut down the first node.**

   ```
   # scswitch -S -h nodename
   # shutdown -y -g0 -i0
   ```

6. **If you are installing new host adapters, power off the first node.**

   For the full procedure on shutting down and powering off a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

7. **Install the host adapters in the first node.**

   For the procedure on installing host adapters, see the documentation that shipped with your host adapters and nodes.

8. **Cable the StorEdge/Netra st A1000 array to the first node.**

   If you are adding a StorEdge/Netra st A1000 array, connect the differential SCSI cable between the node and the array. Verify that the *entire* SCSI bus length to each enclosure is less than 25 m. This measurement includes the cables to both nodes, as well as the bus length internal to each enclosure, node, and host adapter.

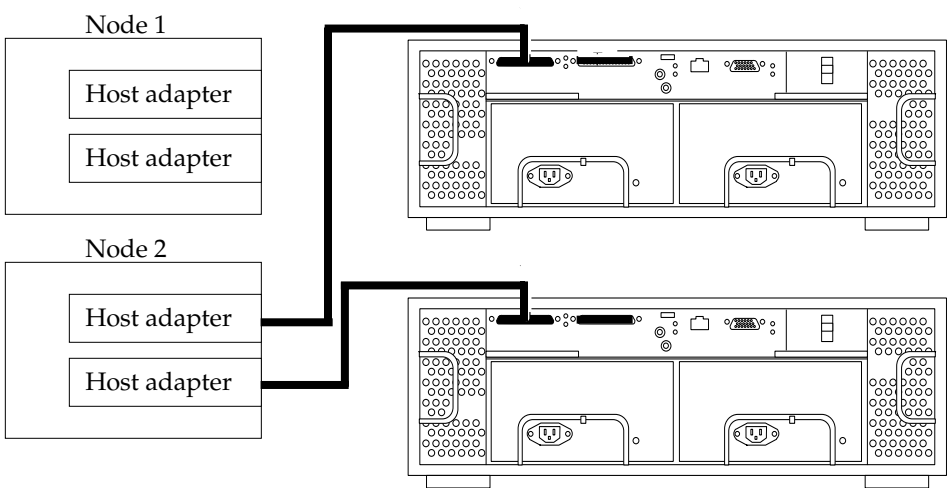


FIGURE D-2 StorEdge/Netra st A1000 Array Cabling

9. **Did you power off the first node to install a host adapter?**

   - If not, go to Step 10.
   - If you did power off the first node, power it and the StorEdge/Netra st A1000 array on, *but do not allow the node to boot*. If necessary, halt the array to continue with OpenBoot PROM (OBP) Monitor tasks.

10. **Find the paths to the SCSI host adapters.**

```
{0} ok show-disks
...
b) /sbus@6,0/QLGC,isp@2,10000/sd
...
d) /sbus@2,0/QLGC,isp@2,10000/sd
...
```

Identify and record the two controllers that are to be connected to the disk arrays, and record these paths. Use this information to change the SCSI addresses of these controllers in the `nvramrc` script in Step 11. Do not include the `sd` directories in the device paths.

11. **Edit the `nvramrc` script to change the `scsi-initiator-id` for the host adapters on the *first* node.**

The default SCSI address for host adapters is `7`. Reserve SCSI address `7` for one host adapter in the SCSI chain. This procedure refers to the host adapter that has SCSI address `7` as the host adapter on the "second node."

To avoid conflicts, change the `scsi-initiator-id` of the remaining host adapter in the SCSI chain to an available SCSI address. This procedure refers to the host adapter that has an available SCSI address as the host adapter on the "first node."

For a partial list of `nvramrc` editor and `nvedit` keystroke commands, see Appendix B of the *Sun Cluster 3.0 12/01 Hardware Guide*. For a full list of commands, see the *OpenBoot 3.x Command Reference Manual*.

The following example sets the `scsi-initiator-id` to `6`. The OpenBoot PROM Monitor prints the line numbers (`0:`, `1:`, and so on).

Note – Insert exactly one space after the quotation mark and before `scsi-initiator-id`.

```
{0} ok nvedit
0: probe-all
1: cd /sbus@6,0/QLGC,isp@2,10000
2: 6 " scsi-initiator-id" integer-property
3: device-end
4: cd /sbus@2,0/QLGC,isp@2,10000
5: 6 " scsi-initiator-id" integer-property
6: device-end
7: install-console
8: banner <Control C>
{0} ok
```

12. **Store the changes.**

    The changes you make through the `nvedit` command are recorded on a temporary copy of the `nvramrc` script. You can continue to edit this copy without risk. After you have completed your edits, save the changes. If you are not sure about the changes, discard them.

    - To store the changes, type:

```
{0} ok nvstore
{0} ok
```

    - To discard the changes, type:

```
{0} ok nvquit
{0} ok
```

13. **Verify the contents of the `nvramrc` script you created in Step 11, as shown in the following example.**

    If the contents of the `nvramrc` script are incorrect, use the `nvedit` command to make corrections.

```
{0} ok printenv nvramrc
nvramrc =             probe-all
                      cd /sbus@6,0/QLGC,isp@2,10000
                      6 " scsi-initiator-id" integer-property
                      device-end
                      cd /sbus@2,0/QLGC,isp@2,10000
                      6 " scsi-initiator-id" integer-property
                      device-end
                      install-console
                      banner
{0} ok
```

14. **Instruct the OpenBoot PROM Monitor to use the `nvramrc` script:**

```
{0} ok setenv use-nvramrc? true
use-nvramrc? = true
{0} ok
```

15. **Boot the first node.**

```
{0} ok boot -r
```

For more information on booting nodes, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

16. **Check the StorEdge/Netra st A1000 array NVSRAM file and firmware revisions, and if necessary, install the most recent revision.**

To verify that you have the current revision, see the *Sun StorEdge RAID Manager Release Notes*. For the procedure on upgrading the NVSRAM file and firmware, see the *Sun StorEdge RAID Manager User's Guide*.

17. **Shut down the second node.**

```
# scswitch -S -h nodename
# shutdown -y -g0 -i0
```

18. **If you are installing new host adapters, power off the second node.**

For the full procedure on shutting down and powering off a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

19. **Install the host adapters in the second node.**

For the procedure on installing host adapters, see the documentation that shipped with your nodes.

20. **Cable the StorEdge/Netra st A1000 array to your node.**

Connect the differential SCSI cable between the node and the array. Make sure that the *entire* SCSI bus length to each enclosure is less than 25 m. This measurement includes the cables to both nodes, as well as the bus length internal to each enclosure, node, and host adapter.

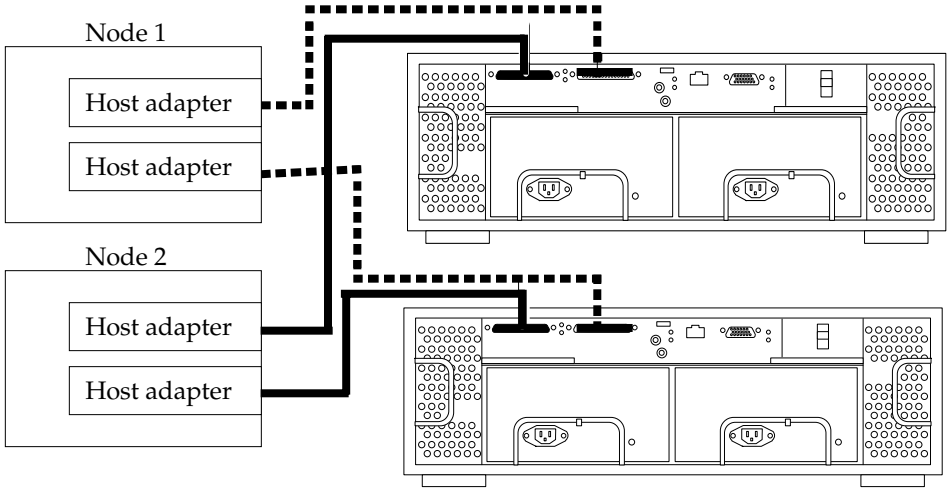


FIGURE D-3 StorEdge/Netra st A1000 Array Cabling

21. Did you power off the second node to install a host adapter?

- If not, go to Step 23.
- If you did power off the second node, power it and the StorEdge/Netra st A1000 array on, *but do not allow the node to boot*. If necessary, halt the array to continue with OpenBoot PROM (OBP) Monitor tasks.

22. Verify that the second node recognizes the new host adapters and disk drives.

If the node does not recognize the new hardware, check all hardware connections and repeat installation steps you performed in Step 19.

```
{0} ok show-disks
...
b) /sbus@6,0/QLGC,isp@2,10000/sd
...
d) /sbus@2,0/QLGC,isp@2,10000/sd
...
{0} ok
```

23. **Verify that the `scsi-initiator-id` for the host adapters on the second node is set to 7.**

    Use the `show-disks` command to find the paths to the host adapters that are connected to these enclosures. Select each host adapter's device tree node, and display the node's properties to confirm that the `scsi-initiator-id` for each host adapter is set to 7.

```
{0} ok cd /sbus@6,0/QLGC,isp@2,10000
{0} ok .properties
scsi-initiator-id        00000007
...
```

24. **Boot the second node.**

```
{0} ok boot -r
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

25. **On one node, verify that the DIDs have been assigned to the StorEdge/Netra st A1000 LUNs for all nodes that are attached to the StorEdge/Netra st A1000 array:**

```
# scdidadm -L
```

Where to Go From Here

To create a LUN from disk drives that are unassigned, see "How to Create a LUN" on page 209.

To upgrade StorEdge/Netra st A1000 array firmware, see "How to Upgrade Disk Drive Firmware in a Running Cluster" on page 233.

▼ How to Remove a StorEdge/Netra st A1000 Array From a Running Cluster

Use this procedure to remove a StorEdge/Netra st A1000 array from a running cluster.

Caution – This procedure removes all data that is on the StorEdge/Netra st A1000 array you remove.

1. **Migrate any Oracle Parallel Server/Real Application Clusters (OPS) tables, data services, or volumes off the array.**

2. **Determine if the array contains a LUN that is configured as a quorum device.**

```
# scstat -q
```

   - If the array does not contain a quorum device, go to Step 3.
   - If the array contains a LUN that is configured as a quorum device, choose and configure another device on a different array to be the new quorum device. Then remove the old quorum device.

3. **Halt all activity to the array.**

   See the *RAID Manager User's Guide* and your operating array documentation for instructions.

4. **Remove the LUN from disksets or disk groups.**

   If a volume manager does manage the LUN, run the appropriate Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager commands to remove the LUN from any diskset or disk group. For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation. See the following paragraph for additional VERITAS Volume Manager commands that are required.

   LUNs that were managed by VERITAS Volume Manager must be completely removed from VERITAS Volume Manager control before you can delete them. To remove the LUNs, after you delete the LUN from any disk group, use the following commands:

```
# vxdisk offline cNtXdY
# vxdisk rm cNtXdY
```

5. **From one node, delete the LUN.**

   For the procedure on deleting a LUN, see the *Sun StorEdge RAID Manager User's Guide*.

6. **Disconnect all cables from the array and remove the hardware from your cluster.**

7. **Remove the paths to the LUN(s) you are deleting:**

```
# rm /dev/rdsk/cNtXdY*
# rm /dev/dsk/cNtXdY*

# rm /dev/osa/dev/dsk/cNtXdY*
# rm /dev/osa/dev/rdsk/cNtXdY*
```

8. **On all cluster nodes, remove references to the StorEdge/Netra st A1000 array.**

```
# scdidadm -C
```

9. **Remove any unused host adapter from nodes that were attached to the StorEdge/Netra st A1000 array.**

   a. **Shut down and power off the first node from which you are removing a host adapter:**

```
# scswitch -S -h nodename
# shutdown -y -g0 -i0
```

   For the procedure on shutting down and powering off a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

   b. **Remove the host adapter from the first node.**

   See the documentation that came with your node hardware for removal instructions.

   c. **Boot the node and wait for it to rejoin the cluster.**

```
ok boot -r
```

   d. **Repeat Step a through Step c for the second node that was attached to the StorEdge/Netra st A1000 array.**

10. **Return resource groups to their primary nodes.**

```
# scswitch -Z
```

11. **Are you removing the *last* StorEdge/Netra st A1000 array from your cluster?**
    - If not, you are finished with this procedure.
    - If you are removing the last StorEdge/Netra st A1000 array from your cluster, go to Step 12.

12. **Remove RAID Manager patches, then remove RAID Manager software packages.**

Caution – If you improperly remove RAID Manager packages, the next reboot of the node will fail. Before you remove RAID Manager software packages, see the *Sun StorEdge RAID Manager 6.22.1 Release Notes* for uninstallation issues.

For the procedure on removing software packages, see the documentation that shipped with your StorEdge/Netra st A1000 array.

▼ How to Replace a Failed Controller or Restore an Offline Controller

Use this procedure to replace a StorEdge/Netra st A1000 controller, or to restore an offline controller.

For conceptual information on SCSI reservations and failure fencing, see the *Sun Cluster 3.0 12/01 Concepts*.

1. **Determine if the array contains a LUN that is configured as a quorum device.**

```
# scstat -q
```

   - If the array does not contain a quorum device, go to Step 2.
   - If the array contains a LUN that is configured as a quorum device, choose and configure another LUN on a different array to be the new quorum device. Then remove the old quorum device.

2. **Restart the RAID Manager daemon:**

```
# /etc/init.d/amdemon stop
# /etc/init.d/amdemon start
```

3. **Do you have a failed controller?**

   - If your array is offline, but does not have a failed controller, go to Step 4.
   - If you have a failed controller, replace the failed controller with a new controller, *but do not bring the controller online*.

     For the procedure on replacing StorEdge/Netra st A1000 controllers, see the *Sun StorEdge A3500/A3500FC Controller Module Guide* and the *Sun StorEdge RAID Manager Installation and Support Guide* for additional considerations.

4. **On one node, use the RAID Manager GUI's Recovery application to restore the controller online.**

Note – You must use the RAID Manager GUI's Recovery application to bring the controller online.

For information on the Recovery application, see the *Sun StorEdge RAID Manager User's Guide*. If you have problems with bringing the controller online, see the *Sun StorEdge RAID Manager Installation and Support Guide*.

5. **On one node that is connected to the StorEdge/Netra st A1000 array, verify that the controller has the correct SCSI reservation state.**

   Run the `scdidadm`(1M) repair option (`-R`) on LUN 0 of the controller you want to bring online:

```
# scdidadm -R /dev/dsk/cNtXdY
```

▼ How to Add a Disk Drive in a Running Cluster

Use this procedure to add a disk drive to a StorEdge/Netra st A1000 array that is in a running cluster.

1. **Verify that the new disk drive is formatted and not being transferred from another array.**

   For information about moving drives between StorEdge/Netra st array subsystems, see the *Sun StorEdge RAID Manager 6.22.1 Release Notes*.

2. **Install the new disk drive to the disk array.**

   For the procedure on installing a disk drive, see the *Sun StorEdge A1000 and D1000 Installation, Operations, and Service Manual or the Netra st A1000 and Netra st D1000 Installation and Maintenance Manual*.

3. **Allow the disk drive to spin up (approximately 30 seconds).**

4. **Run Health Check to ensure that the new disk drive is not defective.**

   For instructions on running Recovery Guru and Health Check, see the *Sun StorEdge RAID Manager User's Guide*.

5. **Fail the new drive, then revive the drive to update DacStore on the drive.**

   For instructions on failing drives and manual recovery procedures, see the *Sun StorEdge RAID Manager User's Guide*.

6. **Repeat Step 2 through Step 5 for each disk drive you are adding.**

Where to Go From Here

To create LUNs for the new drives, see "How to Create a LUN" on page 209 for more information.

▼ How to Replace a Failed Disk Drive in a Running Cluster

Use this procedure to replace a failed disk drive in a running cluster.

1. **Does replacing the disk drive affect any LUN's availability?**
   - If not, go to Step 2.
   - If the replacement does affect LUN availability, remove the LUN(s) from volume management control. For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.

2. **Replace the disk drive in the disk array.**

   For the procedure on replacing a disk drive, see the *Sun StorEdge D1000 Storage Guide*.

3. **Run Health Check to ensure that the new disk drive is not defective.**

   For instructions on running Recovery Guru and Health Check, see the *Sun StorEdge RAID Manager User's Guide*.

4. **Does the failed drive belong to a drive group?**
   - If the drive does *not* belong to a device group, go to Step 5.
   - If the drive is part of a device group, reconstruction is started automatically. If reconstruction does not start automatically for any reason, then select Reconstruct from the Manual Recovery application. Do not select Revive. When reconstruction is complete, go to Step 6.

5. **Fail the new drive, then revive the drive to update DacStore on the drive.**

   For instructions on failing drives and manual recovery procedures, see the *Sun StorEdge RAID Manager User's Guide*.

6. **If you removed LUNs from volume management control in Step 1, return the LUN(s) to volume management control.**

   For more information, see your Solstice DiskSuite/Solaris Volume Manager or VERITAS Volume Manager documentation.

▼ How to Remove a Disk Drive From a Running Cluster

Use this procedure to remove a disk drive from a running cluster.

1. **Determine if the LUN that is associated with the disk drive you plan to remove is configured as a quorum device.**

```
# scstat -q
```

   - If the LUN is not a quorum device, go to Step 2.
   - If the LUN is configured as a quorum device, choose and configure another device to be the new quorum device. Then remove the old quorum device.

2. **Remove the LUN that is associated with the disk drive you are removing.**

   For the procedure on removing a LUN, see "How to Delete a LUN" on page 211.

3. **Remove the disk drive from the disk array.**

   For the procedure on removing a disk drive, see the *Sun StorEdge D1000 Storage Guide*.

Caution – After you remove the disk drive, install a dummy drive to maintain proper cooling.

▼ How to Upgrade Disk Drive Firmware in a Running Cluster

Note – Only qualified service personnel should perform disk drive firmware updates. If you need to upgrade drive firmware, contact your local Sun solution center or Sun service provider.

▼ How to Replace a Host Adapter in a Node (Connected to a StorEdge/Netra st A1000 array)

This section describes the procedure for replacing a failed host adapter in a running node that is attached to a StorEdge/Netra st A1000 array.

In the following procedure, Node 1's host adapter on SCSI bus A needs replacement but Node 2 remains in service.

Note – Several steps in this procedure require that you halt I/O activity. To halt I/O activity, take the array offline by using the RAID Manager GUI's manual recovery procedure in the *Sun StorEdge RAID Manager User's Guide*.

---

1. **Without powering off the node, shut down Node 1.**

```
# scswitch -S -h nodename
# shutdown -y -g0 -i0
```

   For the procedure on shutting down a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

2. **From Node 2, halt I/O activity to SCSI bus A.**

   See the *RAID Manager User's Guide* for instructions.

3. **From the array end of the SCSI cable, disconnect the SCSI bus A cable that connects the array to Node 1, then replace this cable with a differential SCSI terminator.**

4. **Restart I/O activity on SCSI bus A.**

   See the *RAID Manager User's Guide* for instructions.

5. **Does servicing the failed host adapter affect SCSI bus B?**

   - If SCSI bus B is not affected, go to Step 9.
   - If SCSI bus B is affected, continue with Step 6.

6. **From Node 2, halt I/O activity to the array on SCSI bus B.**

   See the *RAID Manager User's Guide* for instructions.

7. **From the array end of the SCSI cable, disconnect the SCSI bus B cable that connects the array to Node 1 and replace this cable with a differential SCSI terminator.**

8. **Restart I/O activity on SCSI bus B.**

   See the *RAID Manager User's Guide* for instructions.

9. **Power off Node 1.**

10. **Replace Node 1's host adapter.**

    See the documentation that came with your node hardware for instructions.

11. **Power on Node 1, *but do not allow it to boot*. If necessary, halt the array.**

12. **From Node 2, halt I/O activity to the array on SCSI bus A.**

    See the *RAID Manager User's Guide* for instructions.

13. **Remove the differential SCSI terminator from SCSI bus A, then reinstall the SCSI cable to connect the array to Node 1.**

14. **Restart I/O activity on SCSI bus A.**

    See the *RAID Manager User's Guide* for instructions.

15. **Did you install a differential SCSI terminator to SCSI bus B in Step 7?**

    - If not, skip to Step 18.
    - If you did install a SCSI terminator to SCSI bus B, halt I/O activity on SCSI bus B, then continue with Step 16.

16. **Remove the differential SCSI terminator from SCSI bus B, then reinstall the SCSI cable to connect the array to Node 1.**

17. **Restart I/O activity on SCSI bus B.**

    See the *RAID Manager User's Guide* for instructions.

18. **Bring the array back online.**

    See the *RAID Manager User's Guide* for instructions.

19. **Rebalance all logical units (LUNs).**

    See the *RAID Manager User's Guide* for instructions.

20. **Boot Node 1 into cluster mode.**

```
{0} ok boot
```

APPENDIX **E**

Installing and Maintaining a Sun StorEdge 3900 or 6900 Series System

This chapter contains the procedures for installing, configuring, and maintaining Sun StorEdge 3900 Series and Sun StorEdge 6900 Series systems.

This chapter contains the following procedures:

- "How to Install StorEdge 3900 and 6900 Series Systems" on page 238
- "How to Configure LUNs on the Arrays in Your StorEdge 3900 or 6900 Series System" on page 242
- "How to Add StorEdge 3900 or 6900 Series Systems to a Running Cluster" on page 247
- "How to Remove StorEdge 3900 or 6900 Series Systems From a Running Cluster" on page 256
- "How to Replace a Node-to-Switch Component in a Running Cluster" on page 259
- "How to Replace a Virtualization Engine in a Running Cluster (StorEdge 6900 Series Only)" on page 258
- "How to Remove StorEdge T3/T3+ Arrays From a Running Cluster" on page 260
- "How to Upgrade StorEdge T3+ Array Firmware" on page 263
- "How to Replace a Failed Disk Drive in a Running Cluster" on page 266
- "How to Replace a Node's Host Adapter in a Running Cluster" on page 267

The StorEdge 3900 and 6900 Series configuration utilities can be run from a menu-driven interface or a command line interface (this chapter describes the menu-driven interface). For detailed information about Sun StorEdge 3900 and 6900 Series architecture, features, and configuration utilities, see the *Sun StorEdge 3900 and 6900 Series Reference Manual* and the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*.

Installing StorEdge 3900 or 6900 Series Systems

Note – This section contains the procedure for an *initial installation* of StorEdge 3900 or 6900 Series systems in a new Sun Cluster that is not running. If you are adding systems to an existing cluster, use the procedure in "How to Add StorEdge 3900 or 6900 Series Systems to a Running Cluster" on page 247.

▼ How to Install StorEdge 3900 and 6900 Series Systems

Perform the steps in this procedure in conjunction with the procedures in the *Sun Cluster 3.0 12/01 Software Installation Guide* and your server hardware manual.

1. **Install host adapters in the nodes that will be connected to the system.**

   For the procedure on installing host adapters, see the documentation that shipped with your host adapters and nodes.

2. **Unpack, place, and level the system cabinet.**

   For instructions, see the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*.

3. **Install cables in the following order.**

   a. **Install the system power cord.**

   b. **Install the system grounding strap.**

   c. **Install the cables from the FC switches to the cluster nodes (see** FIGURE E-1 **for an example).**

   d. **Install the Ethernet cable to the local area network (LAN).**

   For instructions on cabling, see the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*.

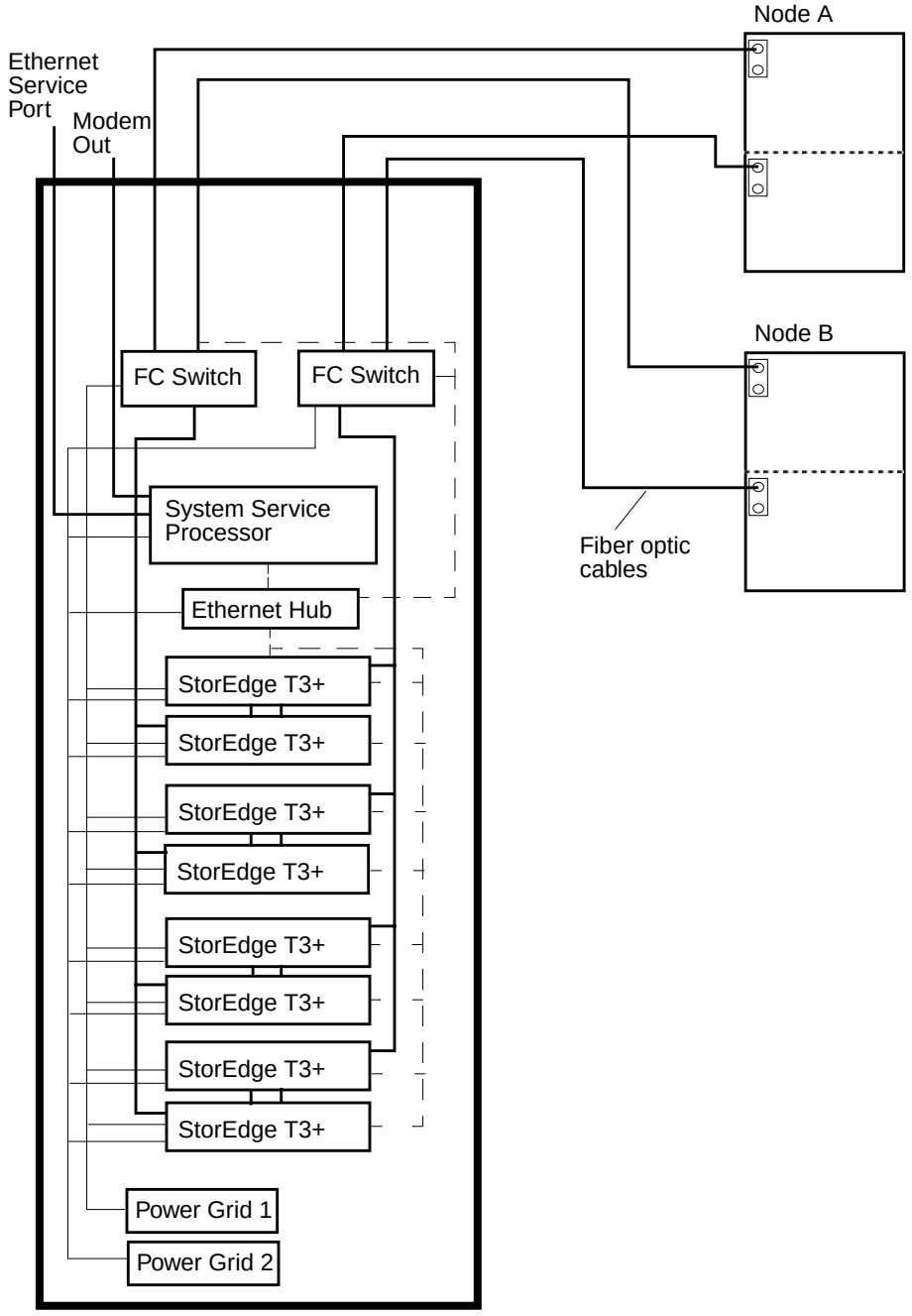


FIGURE E-1 Sample Cabling to Cluster Nodes (Sun StorEdge 3910 Shown)

4. **Power on the StorEdge 3900 or 6900 Series system and the cluster nodes.**

   For instructions on powering on the system, see the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*. For instructions on powering on a node, see the documentation that came with your node hardware.

5. **Set the host name, IP address, date, and timezone for the system's storage service processor.**

   For detailed instructions, see the initial field installation instructions in the *Sun StorEdge 3900 and 6900 Series Reference Manual*.

6. **For StorEdge 3900 Series systems only: Remove the preconfigured, default hard zoning from the system's FC switches.**

   Note – For StorEdge 3900 Series only: To configure the StorEdge 3900 Series system for use with Sun Cluster host-based mirroring, the default hard zones *must* be removed from the system's FC switches. See the *SANbox-8/16 Switch Management User's Manual* for instructions on using the installed SANsurfer interface for removing the preconfigured hard zones from all Sun StorEdge Network FC Switch-8 and Switch-16 switches.

   ---

7. **Install the Solaris operating environment to the cluster nodes and apply the required Solaris patches for Sun Cluster software and StorEdge T3+ array support.**

   For the procedure on installing the Solaris operating environment, see the *Sun Cluster 3.0 12/01 Software Installation Guide*.

   See the *Sun Cluster 3.0 5/02 Release Notes* for information about accessing Sun's EarlyNotifier web pages, which list information about any required patches or firmware levels that are available for download. For the procedure on applying any host adapter firmware patch, see the firmware patch `README` file.

8. **Install any required patches or software for Sun StorEdge Traffic Manager software support to the cluster nodes from the Sun Download Center Web site, `http://www.sun.com/storage/san/`.**

   For instructions on installing the software, see the information on the web site.

9. **Activate the Sun StorEdge Traffic Manager software functionality in the software you installed to the cluster nodes in Step 8.**

   To activate the Sun StorEdge Traffic Manager software functionality, manually edit the `/kernel/drv/scsi_vhci.conf` file that is installed on the node to change the `mpxio-disable` parameter to `no`:

   ```
   mpxio-disable="no"
   ```

10. **Shut down the entire cluster.**

```
# scshutdown -y -g0
```

For the full procedure on shutting down a cluster, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

11. **Perform a reconfiguration boot on all nodes to create the new Solaris device files and links.**

```
{0} ok boot -r
```

12. **On all nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# devfsadm
```

13. **On all nodes, update the paths to the DID instances.**

```
# scdidadm -C
# scdidadm -r
```

14. **For StorEdge 6900 Series systems only: On any cluster node, use the `cfgadm` command as shown below to view the virtualization engine (VE) controller status and to enable the VE controllers.**

```
# cfgadm -al
# cfgadm -c configure <c::controller id>
```

See the `cfgadm(1M)` man page for more information about the command and its options.

15. **On all nodes, use the `luxadm probe` command to confirm that all arrays you installed are now visible.**

```
# luxadm probe
```

Where to Go From Here

To continue with Sun Cluster software installation tasks, see the *Sun Cluster 3.0 12/01 Software Installation Guide*.

Configuring StorEdge 3900 or 6900 Series Systems in a Running Cluster

You can customize the configuration of the logical unit numbers (LUNs) on the StorEdge T3+ arrays in your StorEdge 3900 or 6900 Series system, using the system's menu-driven or command-line interface. The *Sun StorEdge 3900 and 6900 Series Reference Manual* describes the factory default settings for the StorEdge T3+ arrays in the StorEdge 3900 and 6900 Series systems.

For StorEdge 6900 Series systems only, you can also customize the configuration of the virtual LUNs (VLUNs) on the virtualization engines in the system, using the system's menu-driven or command-line interface. The *Sun StorEdge 3900 and 6900 Series Reference Manual* describes the factory default settings for the virtualization engines in the StorEdge 6900 Series systems.

How to Configure LUNs on the Arrays in Your StorEdge 3900 or 6900 Series System

A summary of the steps used to configure the LUNs, or logical volumes, on the StorEdge T3+ arrays in your StorEdge 3900 or 6900 system is listed below.

- If you are using the menu-driven interface, perform the following steps.

1. On the storage service processor (SSP), start the Configuration Utilities using the `runsecfg` command.
2. Select `T3+ Configuration Utility` from the main menu.
3. Enter your StorEdge T3+ array password when you are prompted.
4. Step through the submenus to configure the StorEdge T3+ arrays. See the *Sun StorEdge 3900 and 6900 Series Reference Manual* for more information about the submenus.

- If you are using the command-line interface, perform the following steps.

1. On the SSP, enter your StorEdge T3+ array password (if prompted to do so).
2. Use the SSP StorEdge T3+ array commands to configure the arrays in your system. See the *Sun StorEdge 3900 and 6900 Series Reference Manual* and the man pages for these commands for more information.

How to Configure VLUNs on the Virtualization Engines in Your StorEdge 6900 Series System

The Sun StorEdge 6900 Series systems' virtualization engines allow you to divide StorEdge T3+ array LUNs into small virtual LUNs (VLUNs) for more customized storage usage, such as in a storage area network (SAN).

A summary of the steps used to configure the VLUNs on the virtualization engines in your StorEdge 6900 system is listed below.

- If you are using the menu-driven interface, perform the following steps.

1. On the SSP, start the Configuration Utilities using the `runsecfg` command.
2. Select `VE Configuration Utility` from the main menu.
3. Step through the submenus to configure the virtualization engines. See the *Sun StorEdge 3900 and 6900 Series Reference Manual* for more information about the submenus.
4. After you configure the VLUNs, from any cluster node use the `scgdevs` command to update the global device IDs.

```
# scgdevs
```

5. On one node connected to the partner-group, use the `format` command to label the new VLUNs.

```
# format
```

   See the `format` command man page for more information about using the command.

- If you are using the command-line interface, perform the following steps.

1. Use the SSP virtualization engine commands to configure the virtualization engines in your system. See the *Sun StorEdge 3900 and 6900 Series Reference Manual* and the man pages for these commands for more information.
2. After you configure the VLUNs, from any cluster node use the `scgdevs` command to update the global device IDs.

```
# scgdevs
```

3. On one node connected to the partner-group, use the `format` command to label the new VLUNs.

```
# format
```

See the `format` command man page for more information about using the command.

Maintaining StorEdge 3900 and 6900 Series Systems

This section contains the procedures for maintaining StorEdge 3900 and 6900 Series systems. TABLE E-1 lists these procedures. This section does not include procedures for adding or removing disk drives because the StorEdge T3+ arrays in your StorEdge 3900 or 6900 Series system operate only when fully configured with disk drives.

Caution – If you remove any field replaceable unit (FRU) from the StorEdge T3+ arrays for an extended period of time, thermal complications might result. To prevent these complications, the StorEdge T3+ array is designed so that an orderly shutdown occurs when you remove a component for longer than 30 minutes. Therefore, a replacement part must be immediately available before you start an FRU replacement procedure. You must replace an FRU within 30 minutes or the StorEdge T3+ array, and all attached StorEdge T3+ arrays, will shut down and power off.

TABLE E-1 Task Map: Maintaining a StorEdge 3900 or 6900 Series System (Sheet 1 of 3)

Task	For Instructions, Go To...
Add a StorEdge 3900 or 6900 Series system.	"How to Add StorEdge 3900 or 6900 Series Systems to a Running Cluster" on page 247
Remove a StorEdge 3900 or 6900 Series system.	"How to Remove StorEdge 3900 or 6900 Series Systems From a Running Cluster" on page 256
Replace a virtualization engine (StorEdge 6900 Series only).	"How to Replace a Virtualization Engine in a Running Cluster (StorEdge 6900 Series Only)" on page 258
Replace a node-to-switch fiber optic cable.	*"How to Replace a Node-to-Switch Component in a Running Cluster" on page 259*
Replace a gigabit interface converter (GBIC) on a node's host adapter.	"How to Replace a Node-to-Switch Component in a Running Cluster" on page 259
Replace a GBIC on an FC switch, connecting to a node.	*"How to Replace a Node-to-Switch Component in a Running Cluster" on page 259*

TABLE E-1 Task Map: Maintaining a StorEdge 3900 or 6900 Series System (Sheet 2 of 3)

Task	For Instructions, Go To...
Remove a T3+ array partner group from the system.	"How to Remove StorEdge T3/T3+ Arrays From a Running Cluster" on page 260
Upgrade StorEdge T3+ array firmware.	"How to Upgrade StorEdge T3+ Array Firmware" on page 263
Replace a disk drive in an array.	"How to Replace a Failed Disk Drive in a Running Cluster" on page 266
Replace a host adapter in a node.	"How to Replace a Node's Host Adapter in a Running Cluster" on page 267
Replace a StorEdge network FC switch-8 or switch-16. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge 3900 and 6900 Series Reference Manual*
Replace an array-to-switch fiber optic cable. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge 3900 and 6900 Series Reference Manual*
Replace a GBIC on an FC switch, connecting to an array. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge 3900 and 6900 Series Reference Manual*
Replace a StorEdge 3900 or 6900 Series storage service processor. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge 3900 and 6900 Series Reference Manual*
Replace a StorEdge 3900 or 6900 Series Ethernet hub. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge 3900 and 6900 Series Reference Manual*
Replace a StorEdge T3+ Power and Cooling Unit (PCU). Follow the same procedure used in a non-cluster environment.	*Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*

TABLE E-1 Task Map: Maintaining a StorEdge 3900 or 6900 Series System (Sheet 3 of 3)

Task	For Instructions, Go To...
Replace a StorEdge T3+ unit interconnect card (UIC). Follow the same procedure used in a non-cluster environment.	*Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*
Replace a StorEdge T3+ array power cable. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*
Replace a StorEdge T3+ Ethernet cable. Follow the same procedure used in a non-cluster environment.	*Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*

▼ How to Add StorEdge 3900 or 6900 Series Systems to a Running Cluster

Note – Use this procedure to add new StorEdge 3900 and 6900 Series systems to a running cluster. To install systems to a new Sun Cluster that is not running, use the procedure in "How to Install StorEdge 3900 and 6900 Series Systems" on page 238.

This procedure defines "Node A" as the node you begin working with, and "Node B" as the second attached node.

1. **Unpack, place, and level the system cabinet.**

   For instructions, see the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*.

2. **Install cables in the following order.**

   a. **Install the system power cord.**

   b. **Install the system grounding strap.**

   c. **Install the cables from the FC switches to the cluster nodes (see** FIGURE E-1 **for an example).**

   d. **Install the Ethernet cable to the LAN.**

   For instructions on cabling, see the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*.

3. **Power on the new system.**

Note – The StorEdge T3+ arrays in your system might take several minutes to boot.

For instructions, see the *Sun StorEdge 3900 and 6900 Series Cabinet Installation and Service Manual*.

4. **Set the host name, IP address, date, and timezone for the system's Storage Service Processor.**

   For detailed instructions, see the initial field installation instructions in the *Sun StorEdge 3900 and 6900 Series Reference Manual*.

5. **Remove the preconfigured, default hard zoning from the new system's FC switches.**

Note – For StorEdge 3900 Series only: To configure the StorEdge 3900 Series system for use with Sun Cluster host-based mirroring, the default hard zones *must* be removed from the system's FC switches. See the *SANbox-8/16 Switch Management User's Manual* for instructions on using the installed SANsurfer interface for removing the preconfigured hard zones from all Sun StorEdge Network FC Switch-8 and Switch-16 switches.

---

6. **Determine the resource groups and device groups running on all nodes.**

   Record this information because you will use it in Step 48 of this procedure to return resource groups and device groups to these nodes.

```
# scstat
```

7. **Move all resource groups and device groups off Node A.**

```
# scswitch -S -h nodename
```

8. **Do you need to install host adapters in Node A?**
   - If not, go to Step 14.
   - If you do need to install host adapters to Node A, continue with Step 9.

9. **Is the host adapter you are installing the first host adapter on Node A?**
   - If not, go to Step 11.
   - If it is the first host adapter, use the `pkginfo` command as shown below to determine whether the required support packages for the host adapter are already installed on this node. The following packages are required.

```
# pkginfo | egrep Wlux
system      SUNWluxd    Sun Enterprise Network Array sf Device Driver
system      SUNWluxdx   Sun Enterprise Network Array sf Device Driver (64-bit)
system      SUNWluxl    Sun Enterprise Network Array socal Device Driver
system      SUNWluxlx   Sun Enterprise Network Array socal Device Driver (64-bit)
system      SUNWluxop   Sun Enterprise Network Array firmware and utilities
system      SUNWluxox   Sun Enterprise Network Array libraries (64-bit)
```

10. **Are the required support packages already installed?**
    - If they are already installed, go to Step 11.
    - If not, install the required support packages that are missing.

    The support packages are located in the `Product` directory of the Solaris CD-ROM. Use the `pkgadd` command to add any missing packages.

```
# pkgadd -d path_to_Solaris/Product Pkg1 Pkg2 Pkg3 ... PkgN
```

11. **Shut down and power off Node A.**

```
# shutdown -y -g0 -i0
```

    For the procedure on shutting down and powering off a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

12. **Install the host adapters in Node A.**

    For the procedure on installing host adapters, see the documentation that shipped with your host adapters and nodes.

13. **Power on and boot Node A into non-cluster mode.**

```
{0} ok boot -x
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

14. **If necessary, upgrade the host adapter firmware on Node A.**

    See the *Sun Cluster 3.0 5/02 Release Notes* for information about accessing Sun's EarlyNotifier web pages, which list information about any required patches or firmware levels that are available for download. For the procedure on applying any host adapter firmware patch, see the firmware patch `README` file.

15. **If necessary, install GBICs in the FC switches.**

    For the procedure on installing a GBIC to an FC switch, see the *SANbox 8/16 Segmented Loop Switch User's Manual*.

16. **Connect fiber optic cables between Node A and the FC switches in your StorEdge 3900 or 6900 Series system (see FIGURE E-1 for an example).**

17. **If necessary, install the required Solaris patches for StorEdge T3+ array support on Node A.**

    See the *Sun Cluster 3.0 5/02 Release Notes* for information about accessing Sun's EarlyNotifier web pages, which list information about any required patches or firmware levels that are available for download. For the procedure on applying any host adapter firmware patch, see the firmware patch `README` file.

18. **Install any required patches or software for Sun StorEdge Traffic Manager software support to Node A from the Sun Download Center Web site, `http://www.sun.com/storage/san/`.**

    For instructions on installing the software, see the information on the web site.

19. **Activate the Sun StorEdge Traffic Manager software functionality in the software you installed in Step 18.**

    To activate the Sun StorEdge Traffic Manager software functionality, manually edit the `/kernel/drv/scsi_vhci.conf` file that is installed to change the `mpxio-disable` parameter to `no`:

    ```
    mpxio-disable="no"
    ```

20. **Shut down Node A.**

    ```
    # shutdown -y -g0 -i0
    ```

21. **Perform a reconfiguration boot on Node A to create the new Solaris device files and links.**

    ```
    {0} ok boot -r
    ```

22. **On all nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# devfsadm
```

23. **On all nodes, update the paths to the DID instances.**

```
# scdidadm -C
# scdidadm -r
```

24. **Are you adding a StorEdge 3900 Series or StorEdge 6900 Series system?**

- If you are adding a StorEdge 3900 Series system, go to Step 26.
- If you are adding StorEdge 6900 Series systems: On Node A, use the `cfgadm` command as shown below to view the virtualization engine (VE) controller status and to enable the VE controllers.

```
# cfgadm -al
# cfgadm -c configure <c::controller id>
```

See the `cfgadm(1M)` man page for more information about the command and its options.

25. **(Optional) Configure VLUNs on the VEs in the new StorEdge 6900 Series system.**

For instructions on configuring VLUNs in a cluster, see "How to Configure VLUNs on the Virtualization Engines in Your StorEdge 6900 Series System" on page 243.

26. **(Optional) On Node A, verify that the device IDs (DIDs) were assigned to the new array.**

```
# scdidadm -l
```

27. **Do you need to install host adapters in Node B?**

- If not, go to Step 34.
- If you do need to install host adapters to Node B, continue with Step 28.

28. **Is the host adapter you are installing the first host adapter on Node B?**
    - If not, go to Step 30.
    - If it is the first host adapter, determine whether the required support packages for the host adapter are already installed on this node. The following packages are required.

```
# pkginfo | egrep Wlux
system      SUNWluxd    Sun Enterprise Network Array sf Device Driver
system      SUNWluxdx   Sun Enterprise Network Array sf Device Driver (64-bit)
system      SUNWluxl    Sun Enterprise Network Array socal Device Driver
system      SUNWluxlx   Sun Enterprise Network Array socal Device Driver (64-bit)
system      SUNWluxop   Sun Enterprise Network Array firmware and utilities
system      SUNWluxox   Sun Enterprise Network Array libraries (64-bit)
```

29. **Are the required support packages already installed?**
    - If they are already installed, go to Step 30.
    - If not, install the missing support packages.

    The support packages are located in the `Product` directory of the Solaris CD-ROM. Use the `pkgadd` command to add any missing packages.

```
# pkgadd -d path_to_Solaris/Product Pkg1 Pkg2 Pkg3 ... PkgN
```

30. **Move all resource groups and device groups off Node B.**

```
# scswitch -S -h nodename
```

31. **Shut down and power off Node B.**

```
# shutdown -y -g0 -i0
```

    For the procedure on shutting down and powering off a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

32. **Install the host adapters in Node B.**

    For the procedure on installing host adapters, see the documentation that shipped with your host adapters and nodes.

33. **Power on and boot Node B.**

```
{0} ok boot -x
```

For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

34. **If necessary, upgrade the host adapter firmware on Node B.**

See the *Sun Cluster 3.0 5/02 Release Notes* for information about accessing Sun's EarlyNotifier web pages, which list information about any required patches or firmware levels that are available for download. For the procedure on applying any host adapter firmware patch, see the firmware patch `README` file.

35. **If necessary, install GBICs in the FC switches.**

For the procedure on installing a GBIC to an FC switch, see the *SANbox 8/16 Segmented Loop Switch User's Manual*.

36. **Connect fiber optic cables between the FC switches in your StorEdge 3900 or 6900 Series system and Node B (see FIGURE E-1 for an example.**

37. **If necessary, install the required Solaris patches for StorEdge T3+ array support on Node B.**

For a list of required Solaris patches for StorEdge T3+ array support, see the *Sun StorEdge T3 Disk Tray Release Notes*.

38. **Install any required patches or software for Sun StorEdge Traffic Manager software support to Node B from the Sun Download Center Web site, `http://www.sun.com/storage/san/`.**

For instructions on installing the software, see the information on the web site.

39. **Activate the Sun StorEdge Traffic Manager software functionality in the software you installed in Step 38.**

To activate the Sun StorEdge Traffic Manager software functionality, manually edit the `/kernel/drv/scsi_vhci.conf` file that is installed to change the `mpxio-disable` parameter to `no`:

```
mpxio-disable="no"
```

40. **Shut down Node B.**

```
# shutdown -y -g0 -i0
```

41. **Perform a reconfiguration boot to create the new Solaris device files and links on Node B.**

```
{0} ok boot -r
```

42. **On all nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# devfsadm
```

43. **On all nodes, update the paths to the DID instances.**

```
# scdidadm -C
# scdidadm -r
```

44. **Are you adding a StorEdge 3900 Series or StorEdge 6900 Series system?**
    - If you are adding a StorEdge 3900 Series system, go to Step 46.
    - If you are adding StorEdge 6900 Series systems: On Node A, use the `cfgadm` command as shown below to view the virtualization engine (VE) controller status and to enable the VE controllers.

```
# cfgadm -al
# cfgadm -c configure <c::controller id>
```

    See the `cfgadm(1M)` man page for more information about the command and its options.

45. **(Optional) Configure VLUNs on the VEs in the new StorEdge 6900 Series system.**

    For instructions on configuring VLUNs in a cluster, see "How to Configure VLUNs on the Virtualization Engines in Your StorEdge 6900 Series System" on page 243.

46. **(Optional) On Node B, verify that the DIDs are assigned to the new arrays:**

```
# scdidadm -l
```

47. **On one node attached to the new arrays, reset the SCSI reservation state:**

```
# scdidadm -R n
```

Where *n* is the DID instance of a array LUN you are adding to the cluster.

Note – Repeat this command on the same node for each array LUN you are adding to the cluster.

---

48. **Return the resource groups and device groups you identified in Step 6 to all nodes.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

49. **Perform volume management administration to incorporate the new logical volumes into the cluster.**

For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

▼ How to Remove StorEdge 3900 or 6900 Series Systems From a Running Cluster

Use this procedure to permanently remove a StorEdge 3900 or 6900 Series system and its associated submirrors from a running cluster.

This procedure defines "Node A" as the cluster node you begin working with, and "Node B" as the other node.

Caution – During this procedure, you lose access to the data that resides on each StorEdge T3+ array partner-group in the StorEdge 3900 or 6900 Series system you are removing.

1. **If necessary, back up all database tables, data services, and volumes associated with each StorEdge T3+ partner-group in the StorEdge 3900 or 6900 Series system you are removing.**

2. **If necessary, run the appropriate Solstice DiskSuite or VERITAS Volume Manager commands to detach the submirrors from each StorEdge T3+ partner-group in the StorEdge 3900 or 6900 Series system that you are removing to stop all I/O activity to the partner-groups.**

   For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

3. **Run the appropriate Solstice DiskSuite or VERITAS Volume Manager commands to remove references to each LUN or VLUN in the StorEdge 3900 or 6900 Series system that you are removing.**

   For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

4. **Determine the resource groups and device groups running on all nodes.**

   Record this information because you will use it in Step 17 of this procedure to return resource groups and device groups to these nodes.

   ```
   # scstat
   ```

5. **Move all resource groups and device groups off Node A.**

   ```
   # scswitch -S -h nodename
   ```

6. **Shut down Node A.**

```
# shutdown -y -g0 -i0
```

   For the procedure on shutting down a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

7. **Disconnect the cables that connected Node A to the FC switches in your StorEdge 3900 or 6900 Series system.**

8. **Without allowing the node to boot, power on Node A.**

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

9. **Boot Node A into cluster mode.**

```
{0} ok boot
```

10. **Move all resource groups and device groups off Node B.**

```
# scswitch -S -h nodename
```

11. **Shut down Node B.**

```
# shutdown -y -g0 -i0
```

12. **Disconnect the cables that connected Node B to the FC switches in your StorEdge 3900 or 6900 Series system.**

13. **Without allowing the node to boot, power on Node B.**

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

14. **Boot Node B into cluster mode.**

```
{0} ok boot
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

15. **On all nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# devfsadm
```

16. **On all nodes, update the paths to the DID instances.**

```
# scdidadm -C
# scdidadm -r
```

17. **Return the resource groups and device groups you identified in Step 4 to all nodes.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

▼ How to Replace a Virtualization Engine in a Running Cluster (StorEdge 6900 Series Only)

Use this procedure to replace a virtualization engine (VE) in a StorEdge 6900 Series system in a running cluster.

1. **Replace the VE hardware.**

   Follow the instructions in the *Sun StorEdge 3900 and 6900 Series Reference Manual*.

2. **On any cluster node, use the `cfgadm` command as shown below to view the virtualization engine (VE) controller status and to enable the VE controllers.**

```
# cfgadm -al
# cfgadm -c configure <c::controller id>
```

   See the `cfgadm(1M)` man page for more information about the command and its options.

▼ How to Replace a Node-to-Switch Component in a Running Cluster

Use this procedure to replace the following node-to-switch components in a running cluster:

- Node-to-switch fiber optic cable
- GBIC on an FC switch, connecting to a node

1. **On the node connected to the component you are replacing, determine the resource groups and device groups running on the node.**

   Record this information because you will use it in Step 4 of this procedure to return resource groups and device groups to these nodes.

   ```
   # scstat
   ```

2. **Move all resource groups and device groups to another node.**

   ```
   # scswitch -S -h nodename
   ```

3. **Replace the node-to-switch component.**

   - For the procedure on replacing a fiber optic cable between a node and an FC switch, see the *Sun StorEdge network FC switch-8 and switch-16 Installation and Configuration Guide*.
   - For the procedure on replacing a GBIC on an FC switch, see the *SANbox 8/16 Segmented Loop Switch User's Manual*.

4. **Return the resource groups and device groups you identified in Step 1 to the node that is connected to the component you replaced.**

   ```
   # scswitch -z -g resource-group -h nodename
   # scswitch -z -D device-group-name -h nodename
   ```

▼ How to Remove StorEdge T3/T3+ Arrays From a Running Cluster

Use this procedure to permanently remove StorEdge T3/T3+ array partner groups and their submirrors from a StorEdge 3900 or 6900 Series system in a running cluster.

This procedure defines "Node A" as the cluster node you begin working with, and "Node B" as the other node.

Caution – During this procedure, you lose access to the data that resides on each StorEdge T3+ array partner-group you are removing.

1. **If necessary, back up all database tables, data services, and volumes associated with each partner-group you are removing.**
2. **If necessary, run the appropriate Solstice DiskSuite or VERITAS Volume Manager commands to detach the submirrors from each array or partner-group that you are removing to stop all I/O activity to the array or partner-group.**

   For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.
3. **Run the appropriate Solstice DiskSuite or VERITAS Volume Manager commands to remove references to each LUN that belongs to the array or partner-group that you are removing.**

   For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.
4. **Determine the resource groups and device groups running on all nodes.**

   Record this information because you will use it in Step 22 of this procedure to return resource groups and device groups to these nodes.

   ```
   # scstat
   ```
5. **Move all resource groups and device groups off Node A.**

   ```
   # scswitch -S -h nodename
   ```

6. **Shut down Node A.**

```
# shutdown -y -g0 -i0
```

For the procedure on shutting down a node, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

7. **Disconnect from both arrays the fiber optic cables connecting to the FC switches, then the Ethernet cable(s).**

8. **Is any array you are removing the last array connected to an FC switch on Node A?**
   - If not, go to Step 12.
   - If it is the last array, disconnect the fiber optic cable between Node A and the FC switch that was connected to this array.

   For the procedure on removing a fiber optic cable, see the *Sun StorEdge T3 and T3+ Array Configuration Guide*.

9. **Do you want to remove the host adapters from Node A?**
   - If not, go to Step 12.
   - If yes, power off Node A.

10. **Remove the host adapters from Node A.**

    For the procedure on removing host adapters, see the documentation that shipped with your host adapter and nodes.

11. **Without allowing the node to boot, power on Node A.**

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

12. **Boot Node A into cluster mode.**

```
{0} ok boot
```

13. **Move all resource groups and device groups off Node B.**

```
# scswitch -S -h nodename
```

14. **Shut down Node B.**

```
# shutdown -y -g0 -i0
```

15. **Is any array you are removing the last array connected to an FC switch on Node B?**
    - If not, go to Step 19.
    - If it is the last array, disconnect the fiber optic cable connecting this FC switch to Node B.

    For the procedure on removing a fiber optic cable, see the *Sun StorEdge T3 and T3+ Array Configuration Guide*.

16. **Do you want to remove the host adapters from Node B?**
    - If not, go to Step 19.
    - If yes, power off Node B.

17. **Remove the host adapters from Node B.**

    For the procedure on removing host adapters, see the documentation that shipped with your nodes.

18. **Without allowing the node to boot, power on Node B.**

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

19. **Boot Node B into cluster mode.**

```
{0} ok boot
```

    For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

20. **On all nodes, update the `/devices` and `/dev` entries.**

```
# devfsadm -C
# devfsadm
```

21. **On all nodes, update the paths to the DID instances.**

```
# scdidadm -C
# scdidadm -r
```

22. **Return the resource groups and device groups you identified in Step 4 to all nodes.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

▼ How to Upgrade StorEdge T3+ Array Firmware

Use one of the following procedures to upgrade the firmware on the StorEdge T3+ arrays in your StorEdge 3900 or 6900 Series system, depending on whether your array partner-group has been configured to support submirrors of a cluster node's volumes. StorEdge T3+ array firmware includes controller firmware, unit interconnect card (UIC) firmware, EPROM firmware, and disk drive firmware.

- "Upgrading Firmware on Arrays That Support Submirrored Data" on page 263
- "Upgrading Firmware on Arrays That Do Not Support Submirrored Data" on page 265

Note – For all firmware, always read any README files that accompany the firmware for the latest information and special notes.

▼ Upgrading Firmware on Arrays That Support Submirrored Data

Caution – Perform this procedure on one array at a time. This procedure requires that you reset the arrays you are upgrading. If you reset more than one array at a time, your cluster will lose access to data.

---

1. **On the node that currently owns the disk group or disk set to which the submirror belongs, detach the submirrors of the array on which you are upgrading firmware. (This procedure refers to this node as Node A and remaining node as Node B.)**

   For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

2. **Disconnect both array-to-switch fiber optic cables from the two arrays of the partner-group.**

3. **Apply the controller, disk drive, and UIC firmware patches.**

   For the list of required StorEdge T3+ array patches, see the *Sun StorEdge T3 Disk Tray Release Notes*. For the procedure on applying firmware patches, see the firmware patch `README` file. For the procedure on verifying the firmware level, see the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

4. **Reset the arrays.**

   For the procedure on resetting an array, see the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

5. **Use the StorEdge T3+ `disable` command to disable the array controller that is attached to Node B so that all logical volumes come under the control of the remaining controller.**

```
t3:/:<#> disable uencidctr
```

See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for more information about the `disable` command.

6. **Reconnect both array-to-switch fiber optic cables to the two arrays of the partner-group.**

7. **On one node connected to the partner-group, use the `format` command to verify that the array controllers are rediscovered by the node.**

```
# format
```

8. **Use the StorEdge T3+ `enable` command to enable the array controller that you disabled in Step 5.**

```
t3:/:<#> enable uencidctr
```

9. **Reattach the submirrors that you detached in Step 1 to resynchronize them.**

For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

▼ Upgrading Firmware on Arrays That Do Not Support Submirrored Data

In a partner-pair configuration, it is possible to have non-mirrored data; however, this requires that you shut down the cluster when upgrading firmware, as described in this procedure.

1. **Shut down the entire cluster.**

```
# scshutdown -y -g0
```

For the full procedure on shutting down a cluster, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

2. **Apply the controller, disk drive, and UIC firmware patches.**

For the list of required StorEdge T3+ array patches, see the *Sun StorEdge T3 Disk Tray Release Notes*. For the procedure on applying firmware patches, see the firmware patch `README` file. For the procedure on verifying the firmware level, see the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

3. **Reset the arrays.**

For the procedure on resetting an array, see the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

4. **Boot all nodes back into the cluster.**

```
ok boot
```

For the full procedure on booting nodes into the cluster, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

5. **On one node connected to the partner-group, use the `format` command to verify that the array controllers are rediscovered by the node.**

```
# format
```

▼ How to Replace a Failed Disk Drive in a Running Cluster

Use this procedure to replace one failed disk drive in a StorEdge T3+ array that is in your StorEdge 3900 or 6900 Series system, in a running cluster.

Caution – If you remove any field replaceable unit (FRU) for an extended period of time, thermal complications might result. To prevent this complication, the StorEdge T3+ array is designed so that an orderly shutdown occurs when you remove a component for longer than 30 minutes. Therefore, a replacement part must be immediately available before starting an FRU replacement procedure. You must replace an FRU within 30 minutes or the StorEdge T3+ array, and all attached StorEdge T3+ arrays, will shut down and power off.

1. **Did the failed disk drive impact the array LUN's availability?**
   - If not, go to Step 2.
   - If it did impact LUN availability, remove the LUN from volume management control.

     For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.
2. **Replace the disk drive in the array.**

   For the procedure on replacing a disk drive, see the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.
3. **Did you remove a LUN from volume management control in Step 1?**
   - If not, you are finished with this procedure.
   - If you did remove a LUN from volume management control, return the LUN to volume management control now.

     For more information, see your Solstice DiskSuite or VERITAS Volume Manager documentation.

▼ How to Replace a Node's Host Adapter in a Running Cluster

Use this procedure to replace a failed host adapter in a running cluster. As defined in this procedure, "Node A" is the node with the failed host adapter you are replacing and "Node B" is the other node.

1. **Determine the resource groups and device groups running on all nodes.**

   Record this information because you will use it in Step 8 of this procedure to return resource groups and device groups to these nodes.

   ```
   # scstat
   ```

2. **Move all resource groups and device groups off Node A.**

   ```
   # scswitch -S -h nodename
   ```

3. **Shut down Node A.**

   ```
   # shutdown -y -g0 -i0
   ```

4. **Power off Node A.**

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

5. **Replace the failed host adapter.**

   For the procedure on removing and adding host adapters, see the documentation that shipped with your nodes.

6. **Power on Node A.**

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

7. **Boot Node A into cluster mode.**

   ```
   {0} ok boot
   ```

   For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

8. **Return the resource groups and device groups you identified in Step 1 to all nodes.**

```
# scswitch -z -g resource-group -h nodename
# scswitch -z -D device-group-name -h nodename
```

For more information, see the *Sun Cluster 3.0 12/01 System Administration Guide*.

APPENDIX **F**

Generic Data Service

This appendix provides information on the generic data service (GDS) and shows you how to create a service that uses the GDS using either the SunPlex Agent Builder or the standard Sun Cluster administration commands.

- "Generic Data Service Overview" on page 270
- "Using the SunPlex Agent Builder to Create a Service Using GDS" on page 276
- "Using the Standard Sun Cluster Administration Commands to Create a Service Using GDS" on page 281
- "Command Line Interface to the SunPlex Agent Builder" on page 284

Generic Data Service Overview

The generic data service (GDS) is a mechanism for making simple network-aware applications highly available or scalable by plugging them into the Sun Cluster Resource Group Management framework. This mechanism does not require the coding of an agent which is the typical approach for making an application highly available or scalable.

The GDS is a single, precompiled data service. In this approach, the precompiled data service and its components, the callback method (`rt_callbacks`(1HA)) implementations and the resource type registration file (`rt_reg`(4)), are not modifiable.

Precompiled Resource Type

The generic data service resource type, `SUNW.gds`, is included in the `SUNWscgds` package. The `scinstall`(1M) utility installs this package during cluster installation. The `SUNWscgds` package includes the following files:

```
# pkgchk -v SUNWscgds

/opt/SUNWscgds
/opt/SUNWscgds/bin
/opt/SUNWscgds/bin/gds_monitor_check
/opt/SUNWscgds/bin/gds_monitor_start
/opt/SUNWscgds/bin/gds_monitor_stop
/opt/SUNWscgds/bin/gds_probe
/opt/SUNWscgds/bin/gds_svc_start
/opt/SUNWscgds/bin/gds_svc_stop
/opt/SUNWscgds/bin/gds_update
/opt/SUNWscgds/bin/gds_validate
/opt/SUNWscgds/etc
/opt/SUNWscgds/etc/SUNW.gds
```

Why Use GDS

The GDS has the following advantages over using either the SunPlex Agent Builder generated source code model (see `scdscreate`(1HA)) or the standard Sun Cluster administration commands:

- The GDS is easy to use.
- The GDS and its methods are precompiled and are therefore not modifiable.
- The SunPlex Agent Builder can be used to generate driving scripts for your application and these scripts are packaged in a Solaris-installable package that can be reused across multiple clusters.

Methods of Creating a Service Using GDS

There are 2 methods of creating a service that uses the GDS:

- Using the SunPlex Agent Builder
- Using the standard Sun Cluster administration commands

GDS and the SunPlex Agent Builder

Use the SunPlex Agent Builder and select GDS as the type of generated source code. The user input is used to generate a set of driving scripts that configure resources for the given application.

GDS and the Standard Sun Cluster Administration Commands

This method utilizes the precompiled data service code in `SUNWscgds` but requires that the system administrator use the standard Sun Cluster administration commands (`scrgadm`(1M) and `scswitch`(1M)) to create and configure the resource.

How to Select Which Method to Use to Create a GDS-Based Service

As shown in the procedures "Standard Sun Cluster Administration Commands to Create a Highly Available Service Using GDS" on page 281 and "Standard Sun Cluster Administration Commands to Create a Scalable Service Using GDS" on page 282, a significant amount of typing is required to issue the appropriate `scrgadm` and `scswitch` commands.

Using the GDS with SunPlex Agent Builder simplifies the process because it generates driving scripts that issue the `scrgadm` and `scswitch` commands for you.

When Is GDS Not Appropriate

While using the GDS has many advantages, there are instances when it is not appropriate to use the GDS. The GDS is not appropriate:

- When more control is required than is available using the pre-compiled resource type such as when you need to add extension properties or change the defaults.
- When the source code needs to be modified to add special functions.
- When you want to use multiple process trees.
- When you want to use non-network-aware applications.

GDS Mandatory Inputs

The following properties must be provided:

- `Start_command` (extension property)
- `Port_list`

Start_command

The start command, specified on the `Start_command` property, launches the application. It must be a UNIX command complete with its arguments that can be passed directly to a shell to start the application.

Port_list

The `Port_list` identifies the list of ports that the application listens on. The `Port_list` property must be specified on the start script created by the SunPlex Agent Builder or on the `scrgadm` command if you are using the standard Sun Cluster administration commands.

GDS Optional Inputs

The optional inputs to the GDS include:

- `Network_resources_used`
- `Stop_command` (extension property)
- `Probe_command` (extension property)
- `Start_timeout`
- `Stop_timeout`
- `Probe_timeout`
- `Child_mon_level` (extension property only used with the standard administration commands)
- `Failover_enabled` (extension property)
- `Stop_signal` (extension property)

Network_resources_used

The default value for this property is Null. This property must be specified if the application needs to bind to one or more specific addresses. If this property is omitted or is specified as Null, the application is assumed to listen on all addresses.

Before creating the GDS resource, a `LogicalHostname` or `SharedAddress` resource must already have been configured. See the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for information on how to configure a `LogicalHostname` or `SharedAddress` resource.

To specify a value, specify one or more resource names; each resource name can contain one or more logical host names or one or more shared addresses. See `r_properties`(5) for details.

Stop_command

The stop command must stop the application and only return after the application has been completely stopped. It must be a complete UNIX command that can be passed directly to a shell to stop the application.

If the `Stop_command` is provided, the GDS stop method launches the stop command with 80% of the stop timeout. Regardless of the outcome of launching the stop command, the GDS stop method sends `SIGKILL` with 15% of the stop timeout. The remaining 5% of the time is reserved for housekeeping overhead.

If the stop command is omitted, the GDS tries to stop the application using the signal specified in `Stop_signal`.

Probe_command

The probe command periodically checks the health of the given application. It must be a UNIX command complete with its arguments that can be passed directly to a shell to probe the application. The probe command returns with an exit status of 0 if the application is OK.

The exit status of the probe command is used to determine the severity of the failure of the application. This exit status, called probe status, must be an integer between 0 (for success) and 100 (for complete failure). The probe status can also be a special value of 201 which results in immediate failover of the application unless `Failover_enabled` is set to false. The probe status is used within the GDS probing algorithm (see `scds_fm_action`(3HA)) to make the decision about restarting the application locally versus failing it over to another node; if the exit status is 201, the application is immediately failed over.

If the probe command is omitted, the GDS provides its own simple probe that connects to the application on the set of IP addresses derived from the `Newtork_resources_used` property or the output of `scds_get_netaddr_list`(3HA). If the connect succeeds, it disconnects immediately. If both connect and disconnect succeed, the application is deemed to be running healthily.

Note – The probe provided with the GDS is only intended to be a simple substitute for the fully functioning application-specific probe.

Start_timeout

This property specifies the start timeout for the start command (see "Start_command" on page 272 for additional information). The default for `Start_timeout` is 300 seconds.

Stop_timeout

This property specifies the stop timeout for the stop command (see "Stop_command" on page 273 for the additional information. The default for `Stop_timeout` is 300 seconds.

Probe_timeout

This property specifies the timeout value for the probe command (see "Probe_command" on page 274 for additional information. The default for `Probe_timeout` is 30 seconds.

Child_mon_level

This property provides control over which processes get monitored through PMF. It denotes the level up to which the forked children processes are monitored. This is similar to the `-C` argument to the `pmfadm`(1M) command.

Omitting this property, or setting it to the default value of `-1`, has the same effect as omitting the `-C` option on the `pmfadm` command; that is, all children (and their descendents) will be monitored. See the `pmfadm`(1M) man page for more details.

Note – This option can only be specified using the standard Sun Cluster administration commands. This option cannot be specified if you are using the SunPlex Agent Builder.

Failover_enabled

This boolean extension property controls the failover behavior of the resource. If this extension property is set to `true`, the application fails over when the number of restarts exceeds the `retry_count` within the `retry_interval` number of seconds.

If this extension property is set to `false`, the application does not restart or fail over to another node when the number of restarts exceed the `retry_count` within the `retry_interval` number of seconds.

This extension property can be used to prevent the application resource from initiating a failover of the resource group. The default is `true`.

Stop_signal

The GDS uses the value of this integer extension property to determine the signal used for stopping the application through PMF. See `signal`(3head) for a list of the integer values that can be specified. The default is 15 (SIGTERM).

Using the SunPlex Agent Builder to Create a Service Using GDS

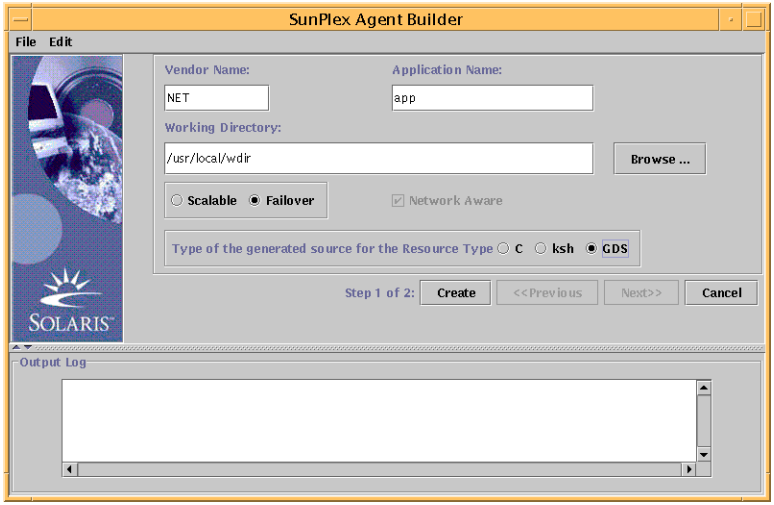
You can use the SunPlex Agent Builder to create the service that uses the GDS. See the *Sun Cluster 3.0 12/01 Data Services Installation and Configuration Guide* for information on the SunPlex Agent Builder as well as a definition of the fields.

▼ Creating a Service Using GDS in the Agent Builder

1. **Bring up the SunPlex Agent Builder.**

```
# /usr/cluster/bin/scdsbuilder
```

2. **The SunPlex Agent Builder panel appears.**



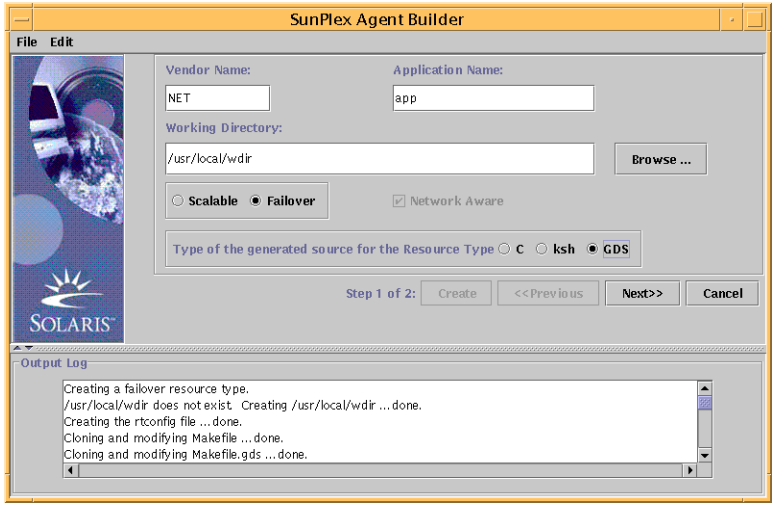
3. **Enter the Vendor Name.**

4. **Enter the Application Name.**

Note – The combination of Vendor and Application Name may not contain more than nine characters. It will be used as the name of the package for the driving scripts.

---

5. **Enter the Working Directory. You can use the Browse pulldown to select the directory rather than typing the path.**
6. **Select whether the data service is scalable or failover.**
7. **You do not need to select Network Aware since that is the default when creating the GDS.**
8. **Select GDS.**
9. **Click the Create button to create the driving scripts.**
10. **The SunPlex Agent Builder panel displays the results of the creation of the service. The Create button is grayed out and the Next button is now available.**



▼ Configuring the Driving Scripts

After creating the driving scripts, you need to use the SunPlex Agent Builder to configure the new service.

1. **Click the Next button and the configuration panel appears.**

2. **Either enter the location of the Start command or use the browse button to locate the Start command.**

3. **(Optional) Enter the Stop command or use the browse button to locate the Stop command.**

4. **(Optional) Enter the Probe command or use the browse button to locate the Probe command.**

5. **(Optional) Specify the timeout values for the Start, Stop, and Probe commands.**

6. **Click Configure to start the configuration of the driving scripts.**

   A package for driving scripts will be created and placed in:

   ```
   working-dir/<vendor_name><application>/pkg
   ```

   For example, `/export/wdir/NETapp/pkg`.

   Note – The package name consists of a concatenation of the Vendor Name and Application Name.

7. **Install the completed package on all nodes of the cluster.**

   ```
   # cd /export/wdir/NETapp/pkg
   # pkgadd -d . NETapp
   ```

8. **The following files will be installed during the pkgadd:**

   ```
   /opt/NETapp
   /opt/NETapp/README.app
   /opt/NETapp/man
   /opt/NETapp/man/man1m
   /opt/NETapp/man/man1m/removeapp.1m
   /opt/NETapp/man/man1m/startapp.1m
   /opt/NETapp/man/man1m/stopapp.1m
   /opt/NETapp/man/man1m/app_config.1m
   /opt/NETapp/util
   /opt/NETapp/util/removeapp
   /opt/NETapp/util/startapp
   /opt/NETapp/util/stopapp
   /opt/NETapp/util/app_config
   ```

Note – The man pages and script names will correspond to the Application Name you entered above preceded by the script name; for example, `startapp`.

To view the man pages, you need to specify the path to the man page. For example, to view the `startapp` man pages, use:

```
# man -M /opt/NETapp/man startapp
```

9. **On one node of the cluster, configure the resources and start the application.**

```
# /opt/NETapp/util/startapp -h <logichostname> -p <port and protocol list>
```

The arguments to the start script will vary according to the type of resource: failover or scalable. Check the customized man page or run the start script without any argument to get a usage statement.

```
# /opt/NETapp/util/startapp
 The resource name of LogicalHostname or SharedAddress must be
specified.
 For failover services:
 Usage: startapp -h <logical host name>
           -p <port and protocol list>
          [ -n <nafogroup/adapter list>]
 For scalable services:
 Usage: startapp
          -h <shared address name>
          -p <port and protocol list>
          [ -l <load balancing policy>]
          [-n <nafogroup/adapter list>]
           [-w <load balancing weights>]
```

Output from SunPlex Agent Builder

The SunPlex Agent Builder generates three driving scripts and a configuration file based on input you provide. The configuration file specifies the names of the resource group and resource type.

The driving scripts are:

- Start script: Used to configure the resources and start the application under RGM control.
- Stop script: Used to stop the application and take down resources and resource groups.
- Remove script: Used to remove the resources and resource groups created by the start script.

These driving scripts have the same interface and behavior as the utility scripts generated by the SunPlex Agent Builder for non-GDS-based agents. The scripts are packaged in a Solaris-installable package that can be reused across multiple clusters.

You can customize the configuration file to provide your own names for resource groups or other parameters that are normally given as inputs to the `scrgadm` command. If you do not customize the scripts, the SunPlex Agent Builder provides reasonable defaults for the `scrgadm` parameters.

Using the Standard Sun Cluster Administration Commands to Create a Service Using GDS

In this section we describe how the above mentioned parameters would actually be input to the GDS. The GDS will be used and administered using the existing Sun Cluster administration commands such as `scrgadm` and `scswitch`.

There is no need to enter the lower level administration commands shown in this section if the driving scripts provide adequate functionality. However, you can do so if you need to have finer control over the GDS-based resource. These are the commands actually executed by the driving scripts.

▼ Standard Sun Cluster Administration Commands to Create a Highly Available Service Using GDS

1. **Register the resource type `SUNW.gds`.**

```
# scrgadm -a -t SUNW.gds
```

2. **Create the resource group containing the LogicalHostname resource and the failover service itself.**

```
# scrgadm -a -g haapp_rg
```

3. **Create the resource for the LogicalHostname resource.**

```
# scrgadm -a -L -g haapp_rs -l hhead
```

4. **Create the resource for the failover service itself.**

```
# scrgadm -a -j haapp_rs -g haapp_rg -t SUNW.gds \
     -y Scalable=false -y Start_timeout=120 \
     -y Port_list=”2222/tcp” \
     -x Start_command="/export/ha/appctl/start" \
     -x Stop_command="/export/ha/appctl/stop" \
     -x Probe_command="/export/app/bin/probe" \
     -x Child_mon_level=0 -y Network_resources_used=hhead \
     -x Failover_enabled=true -x Stop_signal=9
```

5. **Bring the resource group** `haapp_rg` **online.**

```
# scswitch -Z -g haapp_rg
```

▼ Standard Sun Cluster Administration Commands to Create a Scalable Service Using GDS

1. **Register the resource type** `SUNW.gds`**.**

```
# scrgadm -a -t SUNW.gds
```

2. **Create the resource group for the SharedAddress resource.**

```
# scrgadm -a -g sa_rg
```

3. **Create the SharedAddress resource on** `sa_rg`**.**

```
# scrgadm -a -S -g sa_rg -l hhead
```

4. **Create the resource group for the scalable service.**

```
# scrgadm -a -g app_rg -y Maximum_primaries=2 \
-y Desired_primaries=2 -y RG_dependencies=sa_rg
```

5. **Create the resource group for the scalable service itself.**

```
# scrgadm -a -j app_rs -g app_rg -t SUNW.gds \
     -y Scalable=true -y Start_timeout=120 \
     -y Stop_timeout=120 -x Probe_timeout=120 \
     -y Portlist=”2222/tcp” \
     -x Start_command="/export/app/bin/start" \
     -x Stop_command="/export/app/bin/stop" \
     -x Probe_command="/export/app/bin/probe \
     -x Child_mon_level=0 -y Network_resource_used=hhead \
     -x Failover_enabled=true -x Stop_signal=9
```

6. **Bring the resource group containing the network resources online.**

```
# scswitch -Z -g sa_rg
```

7. **Bringing the resource group** `app_rg` **online.**

```
# scswitch -Z -g app_rg
```

Command Line Interface to the SunPlex Agent Builder

The SunPlex Agent Builder has a command line interface that has equivalent functionality to the GUI interface. This interface consists of the commands `scsdcreate`(1ha) and `scdsconfig`(1ha). The following section performs the same function as the GUI-based procedure "Bring up the SunPlex Agent Builder." on page 276 but uses the non-GUI interface.

▼ Creating A Service that Uses GDS Using the Command Line Equivalent Functionality of the SunPlex Agent Builder

1. **Create the service.**

   For a failover service, use:

```
# scdscreate -g -V NET -T app -d /export/wdir
```

   For a scalable service, use:

```
# scdscreate -g -s -V NET -T app -d /export/wdir
```

Note – The *–d* parameter is optional. If it is not specified, the working directory defaults to the current directory.

2. **Configure the service.**

```
# scdsconfig -s "/export/app/bin/start" \
-t "/export/app/bin/stop" \
-m "/export/app/bin/probe" -d /export/wdir
```

Note – Only the start command is required. All other parameters are optional.

3. **Install the completed package on all nodes of the cluster.**

```
# cd /export/wdir/NETapp/pkg
# pkgadd -d . NETapp
```

4. **The following files will be installed during the pkgadd:**

```
/opt/NETapp
/opt/NETapp/README.app
/opt/NETapp/man
/opt/NETapp/man/man1m
/opt/NETapp/man/man1m/removeapp.1m
/opt/NETapp/man/man1m/startapp.1m
/opt/NETapp/man/man1m/stopapp.1m
/opt/NETapp/man/man1m/app_config.1m
/opt/NETapp/util
/opt/NETapp/util/removeapp
/opt/NETapp/util/startapp
/opt/NETapp/util/stopapp
/opt/NETapp/util/app_config
```

Note – The man pages and script names will correspond to the Application Name you entered above preceded by the script name; for example, `startapp`.

To view the man pages, you need to specify the path to the man page. For example, to view the `startapp` man pages, use:

```
# man -M /opt/NETapp/man startapp
```

5. **On one node of the cluster, configure the resources and start the application.**

```
# /opt/NETapp/util/startapp -h <logichostname> -p <port and protocol list>
```

The arguments to the start script will vary according to the type of resource: failover or scalable. Check the customized man page or run the start script without any argument to get a usage statement.

```
# /opt/NETapp/util/startapp
 The resource name of LogicalHostname or SharedAddress must be
specified.
 For failover services:
 Usage: startapp -h <logical host name>
           -p <port and protocol list>
          [-n <nafogroup/adapter list>]
 For scalable services:
 Usage: startapp
          -h <shared address name>
          -p <port and protocol list>
          [-l <load balancing policy>]
          [-n <nafogroup/adapter list>]
           [-w <load balancing weights>]
```