Sun Cluster 3.1 10/03 Software Installation Guide

Sun Microsystems, Inc.
4150 Network Circle
Santa Clara, CA 95054
U.S.A.

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Contents

Preface

The *Sun Cluster 3.1 10/03 Software Installation Guide* contains guidelines for planning a Sun™ Cluster 3.1 configuration, and provides procedures for installing, configuring, and upgrading the Sun Cluster software.

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 book assume knowledge of the Solaris™ operating environment and expertise with the volume-manager software that is used with Sun Cluster software.

Using UNIX Commands

This document contains information about commands that are 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.

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

Typographic Conventions

The following table describes the typographic changes used in this book.

TABLE P–1 Typographic Conventions

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

Shell Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P–2 Shell Prompts

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

Related Documentation

Application	Title	Part Number
Concepts	*Sun Cluster 3.1 10/03 Concepts Guide*	817-0519
Software Installation	*Sun Cluster 3.1 10/03 Software Installation Guide*	817–0518
Administration	*Sun Cluster 3.1 10/03 System Administration Guide*	817-0516
API Development	*Sun Cluster 3.1 10/03 Data Services Developer's Guide*	817-0520
Error Messages	*Sun Cluster 3.1 10/03 Error Messages Guide*	817-0521
Hardware	*Sun Cluster 3.x Hardware Administration Manual*	817-0168
	Sun Cluster 3.x Hardware Administration Collection at `http://docs.sun.com/db/coll/1024.1/`	
Data Services	*Sun Cluster 3.1 Data Service Planning and Administration Guide*	817–3305
	Sun Cluster 3.1 Data Services 10/03 Collection at `http://docs.sun.com/db/coll/573.11/`	
Man Pages	*Sun Cluster 3.1 10/03 Reference Manual*	817–0522
Release Notes	*Sun Cluster 3.1 10/03 Release Notes*	817-0638
	Sun Cluster 3.x Release Notes Supplement	816–3381

Accessing Sun Documentation Online

The docs.sun.com[SM] Web site enables you to access Sun technical documentation online. You can browse the docs.sun.com archive or search for a specific book title or subject. The URL is `http://docs.sun.com`.

Ordering Sun Documentation

Sun Microsystems offers select product documentation in print. For a list of documents and how to order them, see "Buy printed documentation" at http://docs.sun.com.

Getting Help

If you have problems installing or using Sun Cluster, contact your service provider and supply 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

Planning the Sun Cluster Configuration

This chapter provides planning information and guidelines for installing a Sun Cluster configuration.

The following overview information is in this chapter:

Where to Find Sun Cluster Installation Tasks

The following table shows where to find instructions for various installation tasks for Sun Cluster software installation and the order in which you should perform the tasks.

TABLE 1–1 Sun Cluster Software Installation Task Information

Task	Instructions
Set up cluster hardware.	■ *Sun Cluster 3.x Hardware Administration Manual* ■ Documentation that shipped with your server and storage devices

TABLE 1–1 Sun Cluster Software Installation Task Information *(Continued)*

Task	Instructions
Plan cluster software installation.	■ Chapter 1 ■ "Installation and Configuration Worksheets" on page 150
Install a new cluster or add nodes to an existing cluster.	"Installing the Software" on page 36
Install and configure Solstice DiskSuite™/Solaris Volume Manager software.	■ "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 ■ Solstice DiskSuite/Solaris Volume Manager documentation
Install and configure VERITAS Volume Manager (VxVM) software.	■ "Installing and Configuring VxVM Software" on page 203 ■ VxVM documentation
Configure cluster framework software and optionally install and configure the Sun Cluster module to Sun Management Center.	"Configuring the Cluster" on page 102
Plan, install, and configure resource groups and data services.	*Sun Cluster 3.1 Data Service Planning and Administration Guide*
Develop custom data services.	*Sun Cluster 3.1 10/03 Data Services Developer's Guide*
Upgrade to Sun Cluster 3.1 10/03 software.	■ Chapter 3 ■ "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 or "Installing and Configuring VxVM Software" on page 203 ■ Volume manager documentation

Planning the Solaris Operating Environment

This section provides guidelines for planning Solaris software installation in a cluster configuration. For more information about Solaris software, see your Solaris installation documentation.

Guidelines for Selecting Your Solaris Installation Method

You can install Solaris software from a local CD-ROM or from a network installation server by using the JumpStart™ installation method. In addition, Sun Cluster software provides a custom method for installing both the Solaris operating environment and Sun Cluster software by using the JumpStart installation method. If you are installing several cluster nodes, consider a network installation.

See "How to Install Solaris and Sun Cluster Software (JumpStart)" on page 77 for details about the `scinstall` JumpStart installation method. See your Solaris installation documentation for details about standard Solaris installation methods.

Solaris Operating-Environment Feature Restrictions

The following Solaris operating-environment features are not supported in a Sun Cluster configuration:

- Solaris interface groups are not supported in a Sun Cluster configuration. The Solaris interface groups feature is disabled by default during Solaris software installation. Do not re-enable Solaris interface groups. See the `ifconfig`(1M) man page for more information about Solaris interface groups.
- Automatic power-saving shutdown is not supported in Sun Cluster configurations and should not be enabled. See the `pmconfig`(1M) and `power.conf`(4) man pages for more information.

Solaris Software Group Considerations

Sun Cluster 3.1 software requires at least the Solaris End User System Support software group. However, other components of your cluster configuration might have their own Solaris software requirements as well. Consider the following information when you decide which Solaris software group you are installing.

- Check your server documentation for any Solaris software requirements. For example, Sun Enterprise 10000 servers require the Entire Distribution + OEM software group.
- If you intend to use SCI-PCI adapters or the Remote Shared Memory Application Programming Interface (RSMAPI), ensure that you install the RSMAPI software packages (`SUNWrsm`, `SUNWrsmx`, `SUNWrsmo`, and `SUNWrsmox`). The RSMAPI software packages are included in only some Solaris software groups. For example, the Solaris Developer System Support software group includes the RSMAPI software packages but the End User System Support software group does not.

If the software group that you are installing does not include the RSMAPI software packages, install the RSMAPI software packages manually before you install Sun Cluster software. Use the `pkgadd`(1M) command to manually install the software packages. See the Solaris 8 Section (3RSM) man pages for information about using the RSMAPI.

- You might need to install other Solaris software packages that are not part of the End User System Support software group. The Apache HTTP server packages are one example. Third-party software, such as ORACLE®, might also require additional Solaris software packages. See your third-party documentation for any Solaris software requirements.

System Disk Partitions

Add this information to the appropriate "Local File System Layout Worksheet" on page 152.

When you install the Solaris operating environment, ensure that you create the required Sun Cluster partitions and that all partitions meet minimum space requirements.

- **swap –** The combined amount of swap space that is allocated for Solaris and Sun Cluster software must be no less than 750 Mbytes. For best results, add at least 512 Mbytes for Sun Cluster software to the amount that is required by the Solaris operating environment. In addition, allocate any additional swap amount that is required by applications that are to run on the cluster node.
- `/globaldevices` **–** Create a 512-Mbyte file system that is to be used by the `scinstall`(1M) utility for global devices.
- **Volume manager –** Create a 20-Mbyte partition on a slice at the end of the disk (slice 7) for volume manager use. If your cluster uses VERITAS Volume Manager (VxVM) and you intend to encapsulate the root disk, you need to have two unused slices available for use by VxVM.

To meet these requirements, you must customize the partitioning if you are performing interactive installation of the Solaris operating environment.

See the following guidelines for additional partition planning information:

- "Guidelines for the Root (/) File System" on page 15
- "Guidelines for the `/globaldevices` File System" on page 15
- "Volume Manager Requirements" on page 16

Guidelines for the Root (/) File System

As with any other system running the Solaris operating environment, you can configure the root (/), /var, /usr, and /opt directories as separate file systems. Or, you can include all the directories in the root (/) file system. The following describes the software contents of the root (/), /var, /usr, and /opt directories in a Sun Cluster configuration. Consider this information when you plan your partitioning scheme.

- root (/) – The Sun Cluster software itself occupies less than 40 Mbytes of space in the root (/) file system. Solstice DiskSuite/Solaris Volume Manager software requires less than 5 Mbytes, and VxVM software requires less than 15 Mbytes. To configure ample additional space and inode capacity, add at least 100 Mbytes to the amount of space you would normally allocate for your root (/) file system. This space is used for the creation of both block special devices and character special devices used by either Solstice DiskSuite/Solaris Volume Manager or VxVM software. You especially need to allocate this extra space if a large number of shared disks are in the cluster.
- /var – The Sun Cluster software occupies a negligible amount of space in the /var file system at installation time. However, you need to set aside ample space for log files. Also, more messages might be logged on a clustered node than would be found on a typical standalone server. Therefore, allow at least 100 Mbytes for the /var file system.
- /usr – Sun Cluster software occupies less than 25 Mbytes of space in the /usr file system. Solstice DiskSuite/Solaris Volume Manager and VxVM software each require less than 15 Mbytes.
- /opt – Sun Cluster framework software uses less than 2 Mbytes in the /opt file system. However, each Sun Cluster data service might use between 1 Mbyte and 5 Mbytes. Solstice DiskSuite/Solaris Volume Manager software does not use any space in the /opt file system. VxVM software can use over 40 Mbytes if all of its packages and tools are installed.

  In addition, most database and applications software is installed in the /opt file system. If you use Sun Management Center software to monitor the cluster, you need an additional 25 Mbytes of space on each node to support the Sun Management Center agent and Sun Cluster module packages.

Guidelines for the /globaldevices File System

Sun Cluster software requires you to set aside a special file system on one of the local disks for use in managing global devices. This file system is later mounted as a cluster file system. Name this file system /globaldevices, which is the default name that is recognized by the scinstall(1M) command.

The scinstall command later renames the file system /global/.devices/node@*nodeid*, where *nodeid* represents the number that is assigned to a node when it becomes a cluster member. The original /globaldevices mount point is removed.

The `/globaldevices` file system must have ample space and ample inode capacity for creating both block special devices and character special devices. This guideline is especially important if a large number of disks are in the cluster. A file system size of 512 Mbytes should suffice for most cluster configurations.

Volume Manager Requirements

If you use Solstice DiskSuite/Solaris Volume Manager software, you must set aside a slice on the root disk for use in creating the state database replica. Specifically, set aside a slice for this purpose on each local disk. But, if you only have one local disk on a node, you might need to create three state database replicas in the same slice for Solstice DiskSuite/Solaris Volume Manager software to function properly. See your Solstice DiskSuite/Solaris Volume Manager documentation for more information.

If you use VxVM and you intend to encapsulate the root disk, you need to have two unused slices that are available for use by VxVM. Additionally, you need to have some additional unassigned free space at either the beginning or the end of the disk. See your VxVM documentation for more information about root disk encapsulation.

Example—Sample File-System Allocations

Table 1–2 shows a partitioning scheme for a cluster node that has less than 750 Mbytes of physical memory. This scheme is to be installed with the Solaris operating environment End User System Support software group, Sun Cluster software, and the Sun Cluster HA for NFS data service. The last slice on the disk, slice 7, is allocated with a small amount of space for volume-manager use.

This layout allows for the use of either Solstice DiskSuite/Solaris Volume Manager software or VxVM. If you use Solstice DiskSuite/Solaris Volume Manager software, you use slice 7 for the state database replica. If you use VxVM, you later free slice 7 by assigning the slice a zero length. This layout provides the necessary two free slices, 4 and 7, as well as provides for unused space at the end of the disk.

TABLE 1–2 Example File-System Allocation

Slice	Contents	Allocation (in Mbytes)	Description
0	/	6.75GB	Remaining free space on the disk after allocating space to slices 1 through 7. Used for Solaris operating environment software, Sun Cluster software, data-services software, volume-manager software, Sun Management Center agent and Sun Cluster module agent packages, root file systems, and database and application software.

TABLE 1–2 Example File-System Allocation *(Continued)*

Slice	Contents	Allocation (in Mbytes)	Description
1	swap	1GB	512 Mbytes for Solaris operating environment software. 512 Mbytes for Sun Cluster software.
2	overlap	8.43GB	The entire disk.
3	`/globaldevices`	512MB	The Sun Cluster software later assigns this slice a different mount point and mounts the slice as a cluster file system.
4	unused	-	Available as a free slice for encapsulating the root disk under VxVM.
5	unused	-	-
6	unused	-	-
7	volume manager	20MB	Used by Solstice DiskSuite/Solaris Volume Manager software for the state database replica, or used by VxVM for installation after you free the slice.

Planning the Sun Cluster Environment

This section provides guidelines for planning and preparing the following components for Sun Cluster software installation:

- "Licensing" on page 17
- "Software Patches" on page 18
- "IP Addresses" on page 18
- "Sun Cluster Configurable Components" on page 19

For detailed information about Sun Cluster components, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Licensing

Ensure that you have available all necessary license certificates before you begin software installation. Sun Cluster software does not require a license certificate, but each node installed with Sun Cluster software must be covered under your Sun Cluster software license agreement.

For licensing requirements for volume-manager software and applications software, see the installation documentation for those products.

Software Patches

After installing each software product, you must also install any required patches.

- For information about current required patches, see "Patches and Required Firmware Levels" in *Sun Cluster 3.1 10/03 Release Notes* or consult your Sun service provider.
- For general guidelines and procedures for applying patches, see "Patching Sun Cluster Software and Firmware" in *Sun Cluster 3.1 10/03 System Administration Guide*.

IP Addresses

You must set up a number of IP addresses for various Sun Cluster components, depending on your cluster configuration. Each node in the cluster configuration must have at least one public network connection to the same set of public subnets.

The following table lists the components that need IP addresses assigned. Add these IP addresses to any naming services that are used. Also add these IP addresses to the local `/etc/inet/hosts` file on each cluster node after you install Solaris software.

- For more information about IP addresses, see *System Administration Guide, Volume 3* (Solaris 8) or *System Administration Guide: IP Services* (Solaris 9).
- For more information about test IP addresses to support IP Network Multipathing, see *IP Network Multipathing Administration Guide*.

TABLE 1–3 Sun Cluster Components That Use IP Addresses

Component	Number of IP Addresses Needed
Administrative console	1 per subnet
IP Network Multipathing groups	■ Single-adapter groups – 1 ■ Multiple-adapter groups – 1 primary IP address plus 1 test IP address for each adapter in the group
Cluster nodes	1 per node, per subnet
Domain console network interface (Sun Fire™ 15000)	1 per domain
Console-access device	1

TABLE 1–3 Sun Cluster Components That Use IP Addresses *(Continued)*

Component	Number of IP Addresses Needed
Logical addresses	1 per logical host resource, per subnet

Console-Access Devices

You must have console access to all cluster nodes. If you install Cluster Control Panel software on your administrative console, you must provide the hostname of the console-access device that is used to communicate with the cluster nodes.

- A terminal concentrator is used to communicate between the administrative console and the cluster node consoles.
- A Sun Enterprise 10000 server uses a System Service Processor (SSP) instead of a terminal concentrator.
- A Sun Fire™ server uses a system controller instead of a terminal concentrator.

For more information about console access, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Logical Addresses

Each data-service resource group that uses a logical address must have a hostname specified for each public network from which the logical address can be accessed.

- For more information, see the *Sun Cluster 3.1 Data Service Planning and Administration Guide*.
- For additional information about data services and resources, also see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Sun Cluster Configurable Components

This section provides guidelines for the following Sun Cluster components that you configure during installation:

- "Cluster Name" on page 20
- "Node Names" on page 20
- "Private Network" on page 20
- "Private Hostnames" on page 21
- "Cluster Interconnect" on page 21
- "Public Networks" on page 22
- "Disk Device Groups" on page 23
- "IP Network Multipathing Groups" on page 23
- "Quorum Devices" on page 24

Cluster Name

Add this planning information to the "Cluster and Node Names Worksheet" on page 154.

Specify a name for the cluster during Sun Cluster installation. The cluster name should be unique throughout the enterprise.

Node Names

Add this planning information to the "Cluster and Node Names Worksheet" on page 154. Information for most other worksheets is grouped by node name.

The node name is the name that you assign to a machine when you install the Solaris operating environment. During Sun Cluster installation, you specify the names of all nodes that you are installing as a cluster. In single-node cluster installations, the default node name is the same as the cluster name.

Private Network

Add this planning information to the "Cluster and Node Names Worksheet" on page 154.

Note – You do not need to configure a private network for a single-node cluster.

Sun Cluster software uses the private network for internal communication between nodes. A Sun Cluster configuration requires at least two connections to the cluster interconnect on the private network. You specify the private network address and netmask when you install Sun Cluster software on the first node of the cluster. You can either accept the default private network address (`172.16.0.0`) and netmask (`255.255.0.0`) or type different choices if the default network address is already in use elsewhere in the enterprise.

Note – After you have successfully installed the node as a cluster member, you cannot change the private network address and netmask.

If you specify a private network address other than the default, the address must meet the following requirements:

- Use zeroes for the last two octets of the address.
- Follow the guidelines in RFC 1597 for network address assignments.

You can contact the InterNIC to obtain copies of RFCs. See "Planning Your TCP/IP Network" in *System Administration Guide, Volume 3* (Solaris 8) or "Planning Your TCP/IP Network (Task)" in *System Administration Guide: IP Services* (Solaris 9) for instructions.

If you specify a netmask other than the default, the netmask must minimally mask all bits that are given in the private network address.

Private Hostnames

Add this planning information to the "Cluster and Node Names Worksheet" on page 154.

The private hostname is the name that is used for internode communication over the private-network interface. Private hostnames are automatically created during Sun Cluster installation. These private hostnames follow the naming convention `clusternode`*nodeid*`-priv`, where *nodeid* is the numeral of the internal node ID. During Sun Cluster installation, the node ID number is automatically assigned to each node when the node becomes a cluster member. After installation, you can rename private hostnames by using the `scsetup`(1M) utility.

Cluster Interconnect

Add this planning information to the "Cluster Interconnect Worksheet" on page 156.

Note – You do not need to configure a cluster interconnect for a single-node cluster. However, if you anticipate eventually adding nodes to a single-node cluster configuration, you might want to configure the cluster interconnect for future use.

The cluster interconnects provide the hardware pathways for private network communication between cluster nodes. Each interconnect consists of a cable that is connected in one of the following ways:

- Between two transport adapters
- Between a transport adapter and a transport junction
- Between two transport junctions

During Sun Cluster installation, you specify the following configuration information for two cluster interconnects:

- **Transport adapters –** For the transport adapters, such as ports on network interfaces, specify the transport adapter names and transport type. If your configuration is a two-node cluster, you also specify whether your interconnect is direct connected (adapter to adapter) or uses a transport junction. If your two-node cluster is direct connected, you can still specify a transport junction for the interconnect.

Tip – If you specify a transport junction, you can more easily add another node to the cluster in the future.

See the `scconf_trans_adap_*`(1M) family of man pages for information about a specific transport adapter.

- **Transport junctions –** If you use transport junctions, such as a network switch, specify a transport junction name for each interconnect. You can use the default name `switch`*N*, where *N* is a number that is automatically assigned during installation, or create another name.

  Also specify the junction port name or accept the default name. The default port name is the same as the internal node ID number of the node that hosts the adapter end of the cable. However, you cannot use the default port name for certain adapter types, such as SCI-PCI.

Note – Clusters with three or more nodes *must* use transport junctions. Direct connection between cluster nodes is supported only for two-node clusters.

You can configure additional private-network connections after installation by using the `scsetup`(1M) utility.

For more information about the cluster interconnect, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Public Networks

Add this planning information to the "Public Networks Worksheet" on page 158.

Public networks communicate outside the cluster. Consider the following points when you plan your public network configuration.

- Public networks and the private network (cluster interconnect) must use separate adapters.
- You must have at least one public network that is connected to all cluster nodes.
- You can have as many additional public network connections as your hardware configuration allows.
- The `local-mac-address?` variable must use the default value `true` for Ethernet adapters. Sun Cluster 3.1 software does not support a `local-mac-address?` value of `false` for Ethernet adapters. This requirement is a change from Sun Cluster 3.0, which did require a `local-mac-address?` value of `false`.

See "IP Network Multipathing Groups" on page 23 for guidelines on planning public-network-adapter backup groups. For more information about public network interfaces, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Disk Device Groups

Add this planning information to the "Disk Device Group Configurations Worksheet" on page 162.

You must configure all volume-manager disk groups as Sun Cluster disk device groups. This configuration enables a secondary node to host multihost disks if the primary node fails. Consider the following points when you plan disk device groups.

- **Failover –** You can configure multiported disks and properly configured volume-manager devices as failover devices. Proper configuration of a volume-manager device includes multiported disks and correct setup of the volume manager itself. This configuration ensures that multiple nodes can host the exported device. You cannot configure tape drives, CD-ROMs, or single-ported disks as failover devices.
- **Mirroring –** You must mirror the disks to protect the data from disk failure. See "Mirroring Guidelines" on page 31 for additional guidelines. See "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 or "Installing and Configuring VxVM Software" on page 203 and your volume-manager documentation for instructions on mirroring.

For more information about disk device groups, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

IP Network Multipathing Groups

Add this planning information to the "Public Networks Worksheet" on page 158.

Internet Protocol (IP) Network Multipathing groups, which replace Network Adapter Failover (NAFO) groups, provide public network adapter monitoring and failover, and are the foundation for a network-address resource. A multipathing group provides high availability when the multipathing group is configured with two or more adapters. If one adapter fails, all of the addresses on the failed adapter fail over to another adapter in the multipathing group. In this way, the multipathing-group adapters maintain public-network connectivity to the subnet to which the adapters in the multipathing group connect.

Consider the following points when you plan your multipathing groups.

- Each public network adapter must belong to a multipathing group.
- For multipathing groups that contain two or more adapters, you must configure a test IP address for each adapter in the group. If a multipathing group contains only one adapter, you do not need to configure a test IP address.

- Test IP addresses for all adapters in the same multipathing group must belong to a single IP subnet.
- Test IP addresses must not be used by normal applications because the test IP addresses are not highly available.
- In the `/etc/default/mpathd` file, do no change the value of `TRACK_INTERFACES_ONLY_WITH_GROUPS` from `yes` to `no`.
- The name of a multipathing group has no requirements or restrictions.

For more information about IP Network Multipathing, see "Deploying Network Multipathing" in *IP Network Multipathing Administration Guide* (Solaris 8) or"Administering Network Multipathing (Task)" in *System Administration Guide: IP Services* (Solaris 9).

Quorum Devices

Sun Cluster configurations use quorum devices to maintain data and resource integrity. If the cluster temporarily loses connection to a node, the quorum device prevents amnesia or split-brain problems when the cluster node attempts to rejoin the cluster. You assign quorum devices by using the `scsetup`(1M) utility.

Note – You do not need to configure quorum devices for a single-node cluster.

Consider the following points when you plan quorum devices.

- **Minimum –** A two-node cluster must have at least one shared disk assigned as a quorum device. For other topologies, quorum devices are optional.
- **Odd-number rule –** If more than one quorum device is configured in a two-node cluster, or in a pair of nodes directly connected to the quorum device, configure an odd number of quorum devices. This configuration ensures that the quorum devices have completely independent failure pathways.
- **Connection –** You must connect a quorum device to at least two nodes.

For more information about quorum devices, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Planning the Global Devices and Cluster File Systems

This section provides the following guidelines for planning global devices and for planning cluster file systems:

- "Guidelines for Highly Available Global Devices and Cluster File Systems" on page 25
- "Mount Information for Cluster File Systems" on page 25

For more information about global devices and about cluster files systems, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Guidelines for Highly Available Global Devices and Cluster File Systems

Sun Cluster software does not require any specific disk layout or file system size. Consider the following points when you plan your layout for global devices and for cluster file systems.

- **Mirroring** – You must mirror all global devices for the global device to be considered highly available. You do not need to use software mirroring if the storage device provides hardware RAID as well as redundant paths to disks.
- **Disks** – When you mirror, lay out file systems so that the file systems are mirrored across disk arrays.
- **Availability** – You must physically connect a global device to more than one node in the cluster for the global device to be considered highly available. A global device with multiple physical connections can tolerate a single-node failure. A global device with only one physical connection is supported, but the global device becomes inaccessible from other nodes if the node with the connection is down.

Mount Information for Cluster File Systems

Consider the following points when you plan mount points for cluster file systems.

- **Mount-point location** – Create mount points for cluster file systems in the `/global` directory, unless you are prohibited by other software products. By using the `/global` directory, you can more easily distinguish cluster file systems, which are globally available, from local file systems.
- The following VxFS features are not supported in a Sun Cluster 3.1 configuration.
  - Quick I/O

- Snapshots
- Storage checkpoints
- VxFS-specific mount options:
  - `convosync` (Convert O_SYNC)
  - `mincache`
  - `qlog`, `delaylog`, `tmplog`
- VERITAS CFS requires VERITAS cluster feature & VCS

Cache advisories can be used, but the effect is observed on the given node only.

All other VxFS features and options that are supported in a cluster configuration are supported by Sun Cluster 3.1 software. See VxFS documentation for details about VxFS options that are supported in a cluster configuration.

- **VxFS mount requirement –** Globally mount and unmount a VxFS file system from the primary node. The primary node is the node that masters the disk on which the VxFS file system resides. This method ensures that the mount or unmount operation succeeds. A VxFS file-system mount or unmount operation that is performed from a secondary node might fail.
- **Nesting mount points –** Normally, you should not nest the mount points for cluster file systems. For example, do not set up one file system that is mounted on `/global/a` and another file system that is mounted on `/global/a/b`. To ignore this rule can cause availability and node boot-order problems. These problems would occur if the parent mount point is not present when the system attempts to mount a child of that file system. The only exception to this rule is if the devices for the two file systems have the same physical node connectivity. An example is different slices on the same disk.

Planning Volume Management

Add this planning information to the "Disk Device Group Configurations Worksheet" on page 162 and the "Volume Manager Configurations Worksheet" on page 164. For Solstice DiskSuite/Solaris Volume Manager, also add this planning information to the "Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)" on page 166.

This section provides the following guidelines for planning volume management of your cluster configuration:

Sun Cluster software uses volume-manager software to group disks into disk device groups which can then be administered as one unit. Sun Cluster software supports Solstice DiskSuite/Solaris Volume Manager software and VERITAS Volume Manager (VxVM) software that you install or use in the following ways.

TABLE 1–4 Supported Use of Volume Managers with Sun Cluster Software

Volume-Manager Software	Requirements
Solstice DiskSuite/Solaris Volume Manager	You must install Solstice DiskSuite/Solaris Volume Manager software on all nodes of the cluster, regardless of whether you use VxVM on some nodes to manage disks.
VxVM with the cluster feature	You must install and license VxVM with the cluster feature on all nodes of the cluster.
VxVM without the cluster feature	You are only required to install and license VxVM on those nodes that are attached to storage devices which VxVM manages.
Both Solstice DiskSuite/Solaris Volume Manager and VxVM	If you install both volume managers on the same node, you must use Solstice DiskSuite/Solaris Volume Manager software to manage disks that are local to each node. Local disks include the root disk. Use VxVM to manage all shared disks.

See your volume-manager documentation and "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 or "Installing and Configuring VxVM Software" on page 203 for instructions on how to install and configure the volume-manager software. For more information about volume management in a cluster configuration, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Guidelines for Volume-Manager Software

Consider the following general guidelines when you configure your disks with volume-manager software:

- **Mirrored multihost disks –** You must mirror all multihost disks across disk expansion units. See "Guidelines for Mirroring Multihost Disks" on page 32 for guidelines on mirroring multihost disks. You do not need to use software mirroring if the storage device provides hardware RAID as well as redundant paths to disks.
- **Mirrored root –** Mirroring the root disk ensures high availability, but such mirroring is not required. See "Mirroring Guidelines" on page 31 for guidelines about deciding whether to mirror the root disk.
- **Unique naming –** You might have local Solstice DiskSuite metadevices, local Solaris Volume Manager volumes, or VxVM volumes that are used as devices on which the `/global/.devices/node@`*nodeid* file systems are mounted. If so, the name of each local metadevice or local volume must be unique throughout the

cluster.

- **Node lists –** To ensure high availability of a disk device group, make its node lists of potential masters and its failback policy identical to any associated resource group. Or, if a scalable resource group uses more nodes than its associated disk device group, make the scalable resource group's node list a superset of the disk device group's node list. See the resource group planning information in the *Sun Cluster 3.1 Data Service Planning and Administration Guide* for information about node lists.
- **Multiported disks –** You must connect, or port, all disks used to construct a device group within the cluster to all of the nodes that are configured in the node list for that device group. Solstice DiskSuite/Solaris Volume Manager software can automatically check for this connection at the time that disks are added to a diskset. However, configured VxVM disk groups do not have an association to any particular set of nodes.
- **Hot spare disks –** You can use hot spare disks to increase availability, but hot spare disks are not required.

See your volume-manager documentation for disk layout recommendations and any additional restrictions.

Guidelines for Solstice DiskSuite/Solaris Volume Manager Software

Consider the following points when you plan Solstice DiskSuite/Solaris Volume Manager configurations:

- **Local metadevice names or volume names –** The name of each local Solstice DiskSuite metadevice or Solaris Volume Manager volume must be unique throughout the cluster. Also, the name cannot be the same as any device-ID name.
- **Mediators –** Each diskset configured with exactly two disk strings and mastered by exactly two nodes must have Solstice DiskSuite/Solaris Volume Manager mediators configured for the diskset. A *disk string* consists of a disk enclosure, its physical disks, cables from the enclosure to the node(s), and the interface adapter cards. Observe the following rules to configure mediators:
  - You must configure each diskset with exactly two nodes that act as mediator hosts.
  - You must use the same two nodes for all disksets that require mediators. Those two nodes must master those disksets.
  - Mediators cannot be configured for disksets that do not meet the two-string and two-host requirements. See the `mediator(7D) man page for details.`
- `/kernel/drv/md.conf` **settings –** All Solstice DiskSuite metadevices or Solaris Volume Manager volumes used by each diskset are created in advance, at reconfiguration boot time. This reconfiguration is based on the configuration parameters that exist in the `/kernel/drv/md.conf` file.

Caution – All cluster nodes must have identical `/kernel/drv/md.conf` files, regardless of the number of disksets that are served by each node. Failure to follow this guideline can result in serious Solstice DiskSuite/Solaris Volume Manager errors and possible loss of data.

You must modify the `nmd` and `md_nsets` fields as follows to support a Sun Cluster configuration:

- `md_nsets` – The `md_nsets` field defines the total number of disksets that can be created for a system to meet the needs of the entire cluster. Set the value of `md_nsets` to the expected number of disksets in the cluster plus one additional diskset. Solstice DiskSuite/Solaris Volume Manager software uses the additional diskset to manage the private disks on the local host. The private disks are those metadevices or volumes that are not in the local diskset.

  The maximum number of disksets that are allowed per cluster is 32. This number allows for 31 disksets for general use plus one diskset for private disk management. The default value of `md_nsets` is 4.

- `nmd` – The `nmd` field defines the number of metadevices or volumes that are created for each diskset. Set the value of `nmd` to the predicted highest value of metadevice or volume name that is used by any one of the disksets in the cluster. For example, if a cluster uses 10 metadevices or volumes in its first 15 disksets, but 1000 metadevices or volumes in the 16th diskset, set the value of `nmd` to at least 1000. Also, the value of `nmd` must be large enough to ensure that enough numbers exist for each device–ID name. The number must also be large enough to ensure that each local metadevice name or local volume name can be unique throughout the cluster.

  The highest allowed value of a metadevice or volume name per diskset is 8192. The default value of `nmd` is 128.

Set these fields at installation time to allow for all predicted future expansion of the cluster. To increase the value of these fields after the cluster is in production is time consuming. The value change requires a reconfiguration reboot for each node. To raise these values later also increases the possibility of inadequate space allocation in the root (`/`) file system to create all of the requested devices.

At the same time, keep the value of the `nmd`field and the `md_nsets` field as low as possible. Memory structures exist for all possible devices as determined by `nmd`and `md_nsets`, even if you have not created those devices. For optimal performance, keep the value of `nmd` and `md_nsets` only slightly higher than the number of metadevices or volumes you plan to use.

See "System and Startup Files" in *Solstice DiskSuite 4.2.1 Reference Guide* or "System Files and Startup Files" in *Solaris Volume Manager Administration Guide* for more information about the `md.conf` file.

Guidelines for VERITAS Volume Manager Software

Consider the following points when you plan VERITAS Volume Manager (VxVM) configurations.

- **Enclosure-Based Naming –** Enclosure-Based Naming is a feature that was introduced in VxVM version 3.2. If you use Enclosure-Based Naming of devices, ensure that you use consistent device names on all cluster nodes that share the same storage. VxVM does not coordinate these names, so the administrator must ensure that VxVM assigns the same names to the same devices from different nodes. Failure to assign consistent names does not interfere with correct cluster behavior. However, inconsistent names greatly complicate cluster administration and greatly increase the possibility of configuration errors, potentially leading to loss of data.
- **Root-disk group –** You must create a default root-disk group (`rootdg`) on each node. The `rootdg` disk group can be created on the following disks:
  - The root disk, which must be encapsulated
  - One or more local nonroot disks, which you can encapsulate or initialize
  - A combination of root and local nonroot disks

  The `rootdg` disk group must be local to the node.
- **Encapsulation –** Disks to be encapsulated must have two disk-slice table entries free.
- **Number of volumes –** Estimate the maximum number of volumes any given disk device group can use at the time the disk device group is created.
  - If the number of volumes is less than 1000, you can use default minor numbering.
  - If the number of volumes is 1000 or greater, you must carefully plan the way in which minor numbers are assigned to disk device group volumes. No two disk device groups can have overlapping minor number assignments.
- **Dirty Region Logging –** Using Dirty Region Logging (DRL) decreases volume recovery time after a node failure. Using DRL might decrease I/O throughput.
- **Dynamic Multipathing (DMP) –** DMP is not supported on Sun Cluster configurations. If you use VxVM in a configuration with multiple paths per node, then you must use another multipathing solution, such as Sun StorEdge Traffic Manager or EMC PowerPath. However, having DMP enabled on systems with only a single path per node poses no problems.

File-System Logging

Logging is required for cluster file systems. Sun Cluster software supports the following choices of file-system logging:

- Solaris UFS logging – See the `mount_ufs`(1M) man page for more information.
- Solstice DiskSuite trans-metadevice logging or Solaris Volume Manager transactional-volume logging – See "Creating DiskSuite Objects" in *Solstice DiskSuite 4.2.1 User's Guide* or "Transactional Volumes (Overview)" in *Solaris Volume Manager Administration Guide* for more information.
- VERITAS File System (VxFS) logging – See the `mount_vxfs` man page provided with VxFS software for more information.

The following table lists the file-system logging supported by each volume manager.

TABLE 1–5 Supported File System Logging Matrix

Volume Manager	Supported File System Logging
Solstice DiskSuite/Solaris Volume Manager	Solaris UFS logging, Solstice DiskSuite trans-metadevice logging or Solaris Volume Manager transactional-volume logging, VxFS logging
VERITAS Volume Manager	Solaris UFS logging, VxFS logging

Consider the following points when you choose between Solaris UFS logging and Solstice DiskSuite trans-metadevice logging/Solaris Volume Manager transactional-volume logging:

- Solaris Volume Managertransactional-volume logging (formerly Solstice DiskSuite trans-metadevice logging) is scheduled to be removed from the Solaris operating environment in an upcoming Solaris release. Solaris UFS logging provides the same capabilities but superior performance, as well as lower system administration requirements and overhead.
- **Solaris UFS log size –** Solaris UFS logging always allocates the log by using free space on the UFS file system, and depending on the size of the file system.
  - On file systems less than 1 Gbyte, the log occupies 1 Mbyte.
  - On file systems 1 Gbyte or greater, the log occupies 1 Mbyte per Gbyte on the file system, to a maximum of 64 Mbytes.
- **Log metadevice/transactional volume –** A Solstice DiskSuite trans metadevice or Solaris Volume Manager transactional volume manages UFS logging. The logging device component of a trans metadevice or transactional volume is a metadevice or volume that you can mirror and stripe. You can create a maximum 1-Gbyte log size, although 64 Mbytes is sufficient for most file systems. The minimum log size is 1 Mbyte.

Mirroring Guidelines

This section provides the following guidelines for planning the mirroring of your cluster configuration:

- "Guidelines for Mirroring Multihost Disks" on page 32
- "Guidelines for Mirroring the Root Disk" on page 32

Guidelines for Mirroring Multihost Disks

To mirror all multihost disks in a Sun Cluster configuration enables the configuration to tolerate single-disk failures. Sun Cluster software requires that you mirror all multihost disks across disk expansion units. You do not need to use software mirroring if the storage device provides hardware RAID as well as redundant paths to disks.

Consider the following points when you mirror multihost disks.

- **Separate disk expansion units –** Each submirror of a given mirror or plex should reside in a different multihost disk-expansion unit.
- **Disk space –** Mirroring doubles the amount of necessary disk space.
- **Three-way mirroring –** Solstice DiskSuite/Solaris Volume Manager software and VERITAS Volume Manager (VxVM) support three-way mirroring. However, Sun Cluster software requires only two-way mirroring.
- **Number of metadevices or volumes –** Under Solstice DiskSuite/Solaris Volume Manager software, mirrors consist of other Solstice DiskSuite metadevices or Solaris Volume Manager volumes such as concatenations or stripes. Large configurations might contain a large number of metadevices or volumes.
- **Differing disk sizes –** If you mirror to a disk of a different size, your mirror capacity is limited to the size of the smallest submirror or plex.

For more information about multihost disks, see the *Sun Cluster 3.1 10/03 Concepts Guide*.

Guidelines for Mirroring the Root Disk

Add this planning information to the "Local File System Layout Worksheet" on page 152.

For maximum availability, mirror root (`/`), `/usr`, `/var`, `/opt`, and `swap` on the local disks. Under VxVM, you encapsulate the root disk and mirror the generated subdisks. However, Sun Cluster software does not require that you mirror the root disk.

Before you decide whether to mirror the root disk, consider the risks, complexity, cost, and service time for the various alternatives that concern the root disk. No single mirroring strategy works for all configurations. You might want to consider your local Sun service representative's preferred solution when you decide whether to mirror root.

See your volume-manager documentation and "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 or "Installing and Configuring VxVM Software" on page 203 for instructions on how to mirror the root disk.

Consider the following points when you decide whether to mirror the root disk.

- **Boot disk –** You can set up the mirror to be a bootable root disk. You can then boot from the mirror if the primary boot disk fails.
- **Complexity –** To mirror the root disk adds complexity to system administration. To mirror the root disk also complicates booting in single-user mode.
- **Backups –** Regardless of whether you mirror the root disk, you also should perform regular backups of root. Mirroring alone does not protect against administrative errors. Only a backup plan enables you to restore files that have been accidentally altered or deleted.
- **Quorum devices –** Do not use a disk that was configured as a quorum device to mirror a root disk.
- **Quorum –** Under Solstice DiskSuite/Solaris Volume Manager software, in failure scenarios in which state database quorum is lost, you cannot reboot the system until maintenance is performed. See your Solstice DiskSuite/Solaris Volume Manager documentation for information about the state database and state database replicas.
- **Separate controllers –** Highest availability includes mirroring the root disk on a separate controller.
- **Secondary root disk –** With a mirrored root disk, the primary root disk can fail but work can continue on the secondary (mirror) root disk. Later, the primary root disk might return to service, for example, after a power cycle or transient I/O errors. Subsequent boots are then performed by using the primary root disk that is specified in the OpenBoot™ PROM `boot-device` field. In this situation, no manual repair task occurs, but the drive starts working well enough to boot. With Solstice DiskSuite/Solaris Volume Manager, a resync does occur. A resync requires a manual step when the drive is returned to service.

  If changes were made to any files on the secondary (mirror) root disk, they would not be reflected on the primary root disk during boot time. This condition would cause a stale submirror. For example, changes to the `/etc/system` file would be lost. With Solstice DiskSuite/Solaris Volume Manager, some administrative commands might have changed the `/etc/system` file while the primary root disk was out of service.

  The boot program does not check whether the system is booting from a mirror or from an underlying physical device. The mirroring becomes active partway through the boot process, after the metadevices or volumes are loaded. Before this point, the system is therefore vulnerable to stale submirror problems.

CHAPTER 2

Installing and Configuring Sun Cluster Software

This chapter provides procedures for how to install and configure your cluster. You can also use these procedures to add a new node to an existing cluster.

The following procedures are in this chapter.

- "How to Load the Sun Cluster Module" on page 115

Installing the Software

The following Task Map lists the tasks that you perform to install the software on multinode or single-node clusters. Complete the procedures in the order that is indicated.

TABLE 2–1 Task Map: Installing the Software on a Multinode Cluster

Task	Instructions
1. Plan the layout of your cluster configuration and prepare to install software.	"How to Prepare for Cluster Software Installation" on page 37
2. (*Optional*) Install Cluster Control Panel (CCP) software on the administrative console.	"How to Install Cluster Control Panel Software on the Administrative Console" on page 39
3. Install the Solaris operating environment and Sun Cluster software. Choose one of the following methods:	
■ **Method 1** – (*New multinode clusters only*) Install Solaris software, optionally preinstall Sun Cluster software on all nodes by using the Web Start program, and then use the `scinstall` utility to establish the cluster.	1. "How to Install Solaris Software" on page 42 2. "How to Preinstall Sun Cluster Software Packages" on page 46 3. "How to Install Sun Cluster Software on All Nodes (Typical)" on page 48 or "How to Install Sun Cluster Software on All Nodes (Custom)" on page 53
■ **Method 2** – (*Added nodes only*) Install Solaris software, optionally preinstall Sun Cluster software on the added nodes by using the Web Start program, and then add the nodes to the cluster by using the `scinstall` utility.	1. "How to Install Solaris Software" on page 42 2. "How to Preinstall Sun Cluster Software Packages" on page 46 3. "How to Install Sun Cluster Software on Additional Cluster Nodes (`scinstall`)" on page 60
■ **Method 3** – (*New multinode clusters only*) Install Solaris software, then install SunPlex™ Manager and use it to install Sun Cluster software.	1. "How to Install Solaris Software" on page 42 2. "Using SunPlex Manager to Install Sun Cluster Software" on page 67
■ **Method 4** – (*New multinode clusters or added nodes*) Install Solaris software and Sun Cluster software in one operation by using the `scinstall` utility's custom JumpStart option.	"How to Install Solaris and Sun Cluster Software (JumpStart)" on page 77
■ **Method 5** – (*New single-node clusters*) Install Solaris software and then install Sun Cluster software by using the `scinstall -iFo` command.	1. "How to Install Solaris Software" on page 42 2. "How to Install Sun Cluster Software on a Single-Node Cluster" on page 90

TABLE 2–1 Task Map: Installing the Software on a Multinode Cluster *(Continued)*

Task	Instructions
4. Configure the name-service look-up order.	"How to Configure the Name-Service Switch" on page 93
5. Set up directory paths.	"How to Set Up the Root Environment" on page 94
6. Install data-service software packages.	"How to Install Data-Service Software Packages (Web Start)" on page 95 or "How to Install Data-Service Software Packages (`scinstall`)" on page 97
7. Perform postinstallation setup and assign quorum votes. (*Multinode clusters only*)	"How to Perform Postinstallation Setup" on page 99
8. Install and configure volume-manager software:	
■ Install and configure Solstice DiskSuite/Solaris Volume Manager software.	■ "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 ■ Solstice DiskSuite/Solaris Volume Manager documentation
■ Install and configure VERITAS Volume Manager software.	■ "Installing and Configuring VxVM Software" on page 203 ■ VERITAS Volume Manager documentation
9. Configure the cluster.	"Configuring the Cluster" on page 102

▼ How to Prepare for Cluster Software Installation

Before you begin to install software, make the following preparations.

1. **Read the following manuals for information that can help you plan your cluster configuration and prepare your installation strategy.**
   - *Sun Cluster 3.1 10/03 Release Notes* – Restrictions, bug workarounds, and other late-breaking information.
   - *Sun Cluster 3.x Release Notes Supplement* – Post-release documentation about additional restrictions, bug workarounds, new features, and other late-breaking information. This document is regularly updated and published online at the following Web site.

     http://docs.sun.com
   - *Sun Cluster 3.1 10/03 Concepts Guide* – Overview of the Sun Cluster product.
   - *Sun Cluster 3.1 10/03 Software Installation Guide* (this manual) – Planning guidelines and procedures for installing and configuring Solaris, Sun Cluster, and volume-manager software.
   - *Sun Cluster 3.1 Data Service Planning and Administration Guide* – Planning guidelines and procedures to install and configure data services.

- Documentation for all third-party software products.

2. **Have available all related documentation, including third-party documents.**

   The following is a partial list of product documentation that you might need for reference during cluster installation.

   - Solaris software
   - Solstice DiskSuite/Solaris Volume Manager software
   - VERITAS Volume Manager
   - Sun Management Center
   - Third-party applications such as ORACLE

3. **Plan your cluster configuration.**

Caution – Plan your cluster installation completely. Identify requirements for all data services and third-party products **before** you begin Solaris and Sun Cluster software installation. Failure to do so might result in installation errors that require that you completely reinstall the Solaris and Sun Cluster software.

For example, the Oracle Parallel Fail Safe/Real Application Clusters Guard option of Oracle Parallel Server/Real Application Clusters has special requirements for the hostnames that you use in the cluster. Another example with special requirements is Sun Cluster HA for SAP. You must accommodate these requirements before you install Sun Cluster software because you cannot change hostnames after you install Sun Cluster software.

   - Use the planning guidelines in Chapter 1 and in the *Sun Cluster 3.1 Data Service Planning and Administration Guide* to determine how to install and configure your cluster.
   - Fill out the cluster framework and data-services configuration worksheets. Use your completed worksheets for reference during the installation and configuration tasks.

4. **Get all necessary patches for your cluster configuration.**

   See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

   Copy the patches that are required for Sun Cluster into a single directory. The directory must be on a file system that is accessible by all nodes. The default patch directory is `/var/cluster/patches`.

Tip – After you install Solaris software on a node, you can view the `/etc/release` file to see the exact version of Solaris software that is installed.

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a. **(Optional) If you are not using SunPlex Manager, you can create a patch list file. If you specify a patch list file, SunPlex Manager only installs the patches that are listed in the patch list file.**

   For information about creating a patch-list file, refer to the `patchadd`(1M) man page.

b. **Record the path to the patch directory.**

5. **Do you intend to use Cluster Control Panel software to connect from an administrative console to your cluster nodes?**

   - If yes, go to "How to Install Cluster Control Panel Software on the Administrative Console" on page 39.
   - If no, go to one of the following procedures.
     - To install Sun Cluster software by using either the `scinstall`(1 M) utility (text-based method) or SunPlex Manager (GUI-based method), go to "How to Install Solaris Software" on page 42 to first install Solaris software.
     - To install Solaris and Sun Cluster software in the same operation (JumpStart based method), go to "How to Install Solaris and Sun Cluster Software (JumpStart)" on page 77.

▼ How to Install Cluster Control Panel Software on the Administrative Console

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Note – You are not required to use an administrative console. If you do not use an administrative console, perform administrative tasks from one designated node in the cluster.

This procedure describes how to install the Cluster Control Panel (CCP) software on the administrative console. The CCP provides a launchpad for the `cconsole`(1M), `ctelnet`(1M), and `crlogin`(1M) tools. Each of these tools provides a multiple-window connection to a set of nodes. These tools also provide a common window that sends input to all nodes at one time.

You can use any desktop machine that runs the Solaris 8 or Solaris 9 operating environment as an administrative console. In addition, you can also use the administrative console as a Sun Management Center console or server as well as a documentation server. See Sun Management Center documentation for information on how to install Sun Management Center software. See the *Sun Cluster 3.1 10/03 Release Notes* for information on how to install Sun Cluster documentation.

1. **Ensure that a supported version of the Solaris operating environment and any Solaris patches are installed on the administrative console.**

All platforms require at least the Solaris End User System Support software group.

2. **(Optional) If you intend to use the Web Start program with a GUI, ensure that the `DISPLAY` environment variable is set.**

3. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive of the administrative console.**

   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_1_u1` directory.

4. **Become superuser on the administrative console.**

5. **Change to the /cdrom/suncluster_3_1_u1 directory.**

   ```
   # cd /cdrom/suncluster_3_1_u1
   ```

6. **Start the Web Start program.**

   ```
   # ./installer
   ```

7. **Choose Custom installation.**

   The utility displays a list of software packages.

8. **Deselect the Sun Cluster Framework package.**

9. **Select the Sun Cluster cconsole package.**

10. **(Optional) Select the Sun Cluster Documentation package.**

    If you do not install the documentation on your administrative console, you can still view an HTML or PDF collection directly from the CD-ROM.

11. **Follow onscreen instructions to continue package installation.**

    After installation is finished, you can view any available installation log.

12. **Create an `/etc/clusters` file on the administrative console.**

    Add your cluster name and the physical node name of each cluster node to the file.

    ```
    # vi /etc/clusters
    clustername  node1  node2
    ```

    See the `/opt/SUNWcluster/bin/clusters`(4) man page for details.

13. **Create an `/etc/serialports` file.**

    Add an entry for each node in the cluster to the file. Specify the physical node name, the hostname of the console-access device, and the port number. Examples of a console-access device are a terminal concentrator (TC), a System Service Processor (SSP), and a Sun Fire system controller.

    - For a Sun Fire 15000 system controller, use `telnet`(1) port number 23 for the serial port number of each entry.

- For all other console-access devices, use the `telnet` serial port number, not the physical port number. To determine the telnet serial port number, add 5000 to the physical port number. For example, if a physical port number is 6, the telnet serial port number is 5006.
- For Sun Enterprise 10000 servers, also see the `/opt/SUNWcluster/bin/serialports`(4) man page for details and special considerations.

```
# vi /etc/serialports
node1  ca-dev-hostname  port
node2  ca-dev-hostname  port
```

node1, node2	Physical names of the cluster nodes
ca-dev-hostname	Hostname of the console-access device
port	Serial port number

14. (Optional) For convenience, add the `PATH` to the `/opt/SUNWcluster/bin` directory and the `/opt/SUNWcluster/man` directory to the `MANPATH` on the administrative console.

If you installed the `SUNWscman` package, also add the `/usr/cluster/man` directory to the `MANPATH`.

15. Start the CCP utility.

```
# /opt/SUNWcluster/bin/ccp &
```

Click the `cconsole`, `crlogin`, or `ctelnet` button in the CCP window to launch that tool. Alternately, you can start any of these tools directly. For example, to start `ctelnet`, type the following command:

```
# /opt/SUNWcluster/bin/ctelnet &
```

See the procedure "How to Remotely Log In to Sun Cluster" in "Beginning to Administer the Cluster" in *Sun Cluster 3.1 10/03 System Administration Guide* for information about how to use the CCP utility. Also see the `ccp`(1M) man page.

16. Is the Solaris operating environment already installed on each cluster node to meet Sun Cluster software requirements?

- If yes, go to "How to Preinstall Sun Cluster Software Packages" on page 46.
- If no, install, reconfigure, or reinstall the Solaris operating environment as needed to meet Sun Cluster software requirements, such as required partitioning. See "Planning the Solaris Operating Environment" on page 12 for information about Sun Cluster installation requirements for the Solaris operating environment.
  - To install only Solaris software, go to "How to Install Solaris Software" on page 42.

- To install both Solaris and Sun Cluster software by using the `scinstall` JumpStart option, go to "How to Install Solaris and Sun Cluster Software (JumpStart)" on page 77.

▼ How to Install Solaris 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.

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

If your nodes are already installed with the Solaris operating environment but do not meet Sun Cluster installation requirements, you might need to reinstall the Solaris software. If so, follow the steps that are described in this procedure to ensure successful installation of Sun Cluster software. See "Planning the Solaris Operating Environment" on page 12 for information about required partitioning and other Sun Cluster installation requirements.

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

   See the *Sun Cluster 3.1 Hardware Administration Collection* 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" on page 37 for requirements and guidelines.

3. **Have available your completed "Local File System Layout Worksheet" on page 152.**

4. **Do you use a naming service?**

   - If no, go to Step 5. You set up local hostname information in Step 11.
   - If yes, add address-to-name mappings for all public hostnames and logical addresses to any naming services that clients use for access to cluster services. See "IP Addresses" on page 18 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) software is installed and configured on your administrative console, you can use the `cconsole`(1M) utility to display the individual console screens. The `cconsole` utility also opens a master window from which you can send your input to all individual console windows at the same time. Use the following command to start `cconsole`:

  ```
  # /opt/SUNWcluster/bin/cconsole clustername &
  ```

- If you do not use the `cconsole` utility, connect to the consoles of each node individually.

6. **Install the Solaris operating environment as instructed in your 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 that is normally used to install Solaris software. These methods include the Solaris interactive installation program, Solaris JumpStart, and the Solaris Web Start program.

During Solaris software installation, perform the following steps:

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 to use SCI-PCI adapters for the interconnect transport, only the higher-level software groups include the required RSMAPI software packages. These packages are `SUNWrsm`, `SUNWrsmx`, `SUNWrsmo`, and `SUNWrsmox`. If you install the End User System Support software group, you must install the RSMAPI software packages manually from the Solaris CD-ROM at Step 8.
   - 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 Apache software packages manually from the Solaris CD-ROM at Step 9.

   See "Solaris Software Group Considerations" on page 13 for information about additional Solaris software requirements.

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

   - Create a file system of at least 512 Mbytes for use by the global-device subsystem. If you intend to use SunPlex Manager to install Sun Cluster software, you must create the file system with a mount-point name of `/globaldevices`. The `/globaldevices` mount-point name is the default that is used by `scinstall`.

Note – Sun Cluster software requires a global-devices file system for installation to succeed.

- Specify that slice 7 is at least 20 Mbytes in size. If you intend to use SunPlex Manager to install Solstice DiskSuite software (Solaris 8) or configure Solaris Volume Manager software (Solaris 9), also make this file system mounted on `/sds`.

  Otherwise, create any file-system partitions that are needed to support your volume-manager software as described in "System Disk Partitions" on page 14.

Note – If you intend to install Sun Cluster HA for NFS or Sun Cluster HA for Apache, you must also install Solstice DiskSuite software (Solaris 8) or configure Solaris Volume Manager software (Solaris 9).

---

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

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

   - If no, skip to Step 8.
   - If yes, perform the following steps:

   a. **Have you added the new node to the cluster's authorized-node list?**

      - If yes, proceed to Step b.
      - 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 "Task Map: Adding a Cluster Node to an Existing Cluster" in *Sun Cluster 3.1 10/03 System Administration Guide* for procedures.

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

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

   c. **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.

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

   - If no, proceed to Step 8.
   - If yes, ensure that the same `vxio` number is used on the VxVM-installed nodes. Also ensure 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. Change the `/etc/name_to_major` entry to use a different number.

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

   - If no, proceed to Step 9.
   - If yes and you installed the End User System Support software group, install the RSMAPI software packages from the Solaris CD-ROM. Otherwise, proceed to Step 9.

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

   - If yes and you installed a higher-level software group than the End User System Support software group, proceed to Step 9.

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

   - If no, or if you installed a higher-level software group than the End User System Support software group, proceed to Step 10.
   - If yes and you installed the End User System Support software group, install the Apache software packages from the Solaris CD-ROM.

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

   - If yes and you installed a higher-level software group than the End User System Support software group, proceed to Step 14.

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

10. **Install any hardware-related patches and download any needed firmware that is contained in the hardware patches.**

    See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

11. **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.

12. **Do you intend to use dynamic reconfiguration on Sun Enterprise 10000 servers?**

- If no, proceed to Step 14.
- 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 3.1 10/03 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.

13. Do you intend to use VERITAS File System (VxFS) software?

- If no, proceed to Step 14.
- 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. Install any Sun Cluster patches that are required to support VxFS.

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

c. In the `/etc/system` file on each node, set the value for the `rpcmod:svc_default_stksize` variable to `0x8000` and set the value of the `lwp_default_stksize` variable to `0x6000`.

```
set rpcmod:svc_default_stksize=0x8000
set lwp_default_stksize=0x6000
```

Sun Cluster software requires a minimum `rpcmod:svc_default_stksize` setting of `0x8000`. Because VxFS installation sets the value of the `rpcmod:svc_default_stksize` variable to `0x4000`, you must manually set the value to `0x8000` after VxFS installation is complete.

Also, you must set the `lwp_default_stksize` variable in the `/etc/system` file to override the VxFS default value of `0x4000`.

14. Preinstall Sun Cluster software packages.

Go to "How to Preinstall Sun Cluster Software Packages" on page 46.

▼ How to Preinstall Sun Cluster Software Packages

Perform the following procedure to use the Web Start program to install the Sun Cluster software packages on each node of the cluster. You can run the Web Start program with a command-line interface (CLI) or with a graphical-user interface (GUI). The content and sequence of instructions in both the CLI and the GUI are generally the same. See the `installer`(1M) man page for more information about the Web Start installation program.

Note – If you enable remote shell (`rsh`(1M)) or secure shell (`ssh`(1)) access for superuser to all cluster nodes, you do not have to perform these procedures. The `scinstall` utility automatically installs Sun Cluster framework software on all cluster nodes.

However, if you need to install any Sun Cluster software packages in addition to the framework software, install the packages from the Sun Cluster 3.1 10/03 CD-ROM. Do this task before you start the `scinstall` utility. You can install these additional Sun Cluster packages by using the `pkgadd`(1M) command or by using the Web Start program.

---

1. **Ensure that the Solaris operating environment is installed to support Sun Cluster software.**

   If Solaris software is already installed on the node, you must ensure that the Solaris installation meets the requirements for Sun Cluster software and any other software that you intend to install on the cluster. See "How to Install Solaris Software" on page 42 for more information about installing Solaris software to meet Sun Cluster software requirements.

2. **Become superuser on a cluster node to install.**

3. **(Optional) If you intend to use the Web Start program with a GUI, ensure that the `DISPLAY` environment variable is set.**

4. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive.**

   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_1_u1` directory.

5. **Change to the root directory of the CD-ROM, where the `installer`(1M) utility resides.**

6. **Start the Web Start program.**

   ```
   # ./installer
   ```

7. **Choose Typical or Custom installation.**

   - Choose Typical to preinstall the default set of Sun Cluster framework software packages.
   - Choose Custom to specify the Sun Cluster software packages to preinstall. The nondefault software packages include packages that support other languages, the RSMAPI, and SCI-PCI adapters.

8. **Follow instructions on the screen to install Sun Cluster software on the node.**

   After installation is finished, you can view any available installation log.

9. **Repeat Step 1 through Step 8 on each remaining cluster node to install.**

10. **Install Sun Cluster software on the cluster nodes.**

    - To install a new cluster with the default cluster configuration settings, go to "How to Install Sun Cluster Software on All Nodes (Typical)" on page 48. In this procedure, the `scinstall` utility supplies the following default settings.

Component	Default Value
Private network address	`172.16.0.0`
Cluster transport junctions	`switch1` and `switch2`
Global-devices file-system name	`/globaldevices`
Installation security (DES)	Limited
Solaris and Sun Cluster patch directory	`/var/cluster/patches`

Note – You cannot change the private network address after cluster installation.

    - To install a new cluster and to specify all cluster configuration settings, go to "How to Install Sun Cluster Software on All Nodes (Custom)" on page 53.
    - To add a new node to an existing cluster, go to "How to Install Sun Cluster Software on Additional Cluster Nodes (`scinstall`)" on page 60.

▼ How to Install Sun Cluster Software on All Nodes (Typical)

Perform this procedure to install Sun Cluster software on all nodes of the cluster with the default cluster-configuration settings. To specify all cluster configuration settings, instead follow procedures in "How to Install Sun Cluster Software on All Nodes (Custom)" on page 53.

The `scinstall` command checks for patches in the `/var/cluster/patches` directory or the `/var/patches` directory. If neither of the directories exist, then no patches are added. If both directories exist, then only the patches in the `/var/cluster/patches` directory are added.

A patch-list file may be included in the patch directory. The default patch-list file is `patchlist`. For information about creating a patch-list file, refer to the `patchadd`(1M) man page.

1. **Ensure that the Solaris operating environment is installed to support Sun Cluster software.**

   If Solaris software is already installed on the node, you must ensure that the Solaris installation meets the requirements for Sun Cluster software and any other software that you intend to install on the cluster. See "How to Install Solaris Software" on page 42 for more information about installing Solaris software to meet Sun Cluster software requirements.

2. **Did you preinstall Sun Cluster software?**

   - If yes, proceed to Step 3.
   - If no, enable remote shell (`rsh`(1M)) or secure shell (`ssh`(1)) access for superuser . Doing this task enables the `scinstall` utility to install Sun Cluster software packages.

3. **Have available the following completed configuration planning worksheets:**

   - "Cluster and Node Names Worksheet" on page 154
   - "Cluster Interconnect Worksheet" on page 156

   See "Planning the Sun Cluster Environment" on page 17 for planning guidelines.

4. **Become superuser on the cluster node from which you intend to install the cluster.**

5. **On one node of the cluster, start the `scinstall` utility.**

   - If you preinstalled Sun Cluster software, type the following command:

     ```
     # /usr/cluster/bin/scinstall
     ```

   - If you did not preinstall Sun Cluster software, insert the Sun Cluster 3.1 10/03 CD-ROM and type the following commands, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9):

     ```
     # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/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.

6. **From the Main Menu, type `1` (Install a cluster or cluster node).**

   ```
   *** Main Menu ***

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

        * 1) Install a cluster or cluster node
          2) Configure a cluster to be JumpStarted from this install server
          3) Add support for new data services to this cluster node
        * 4) Print release information for this cluster node
   ```

```
      * ?) Help with menu options
      * q) Quit

    Option:  1
```

7. **From the Install Menu, type `1` (Install all nodes of a new cluster).**

```
  *** Install Menu ***

    Please select from any one of the following options:

        1) Install all nodes of a new cluster
        2) Install just this machine as the first node of a new cluster
        3) Add this machine as a node in an existing cluster

        ?) Help with menu options
        q) Return to the Main Menu

    Option:  1
...
  *** Installing all Nodes of a New Cluster ***
...
    Do you want to continue (yes/no) [yes]?  y
```

8. **Type `1` to specify the Typical installation option.**

```
  >>> Type of Installation <<<
...
    Please select from one of the following options:

        1) Typical
        2) Custom

        ?) Help
        q) Return to the Main Menu

    Option [1]:  1
```

For the Typical installation of Sun Cluster software, `scinstall` automatically specifies the following configuration defaults.

Component	Default Value
Private network address	`172.16.0.0`
Cluster transport junctions	`switch1` and `switch2`
Global-devices file-system name	`/globaldevices`
Installation security (DES)	Limited
Solaris and Sun Cluster patch directory	`/var/cluster/patches`

Note – You cannot change the private network address after cluster installation.

---

9. **Specify the cluster name.**

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

10. **Specify the names of the other nodes to become part of this cluster.**

```
  >>> Cluster Nodes <<<
...
    Node name:  node2
    Node name (Ctrl-D to finish):  Control-D

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

11. **Specify the first cluster-interconnect transport adapter.**

```
  >>> Cluster Transport Adapters and Cables <<<

    Select the first cluster transport adapter for "node":

        1) adapter
        2) adapter
...
        N) Other

    Option:  N
```

The `scinstall` utility lists all Ethernet adapters on the node. To configure adapters that are not listed, such as SCI-PCI adapters, type the number for the Other menu option. Then specify the adapter information that is requested in the subsequent prompts.

Note – If your configuration uses SCI–PCI 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`) that is on the SCI 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 switch port name `0`.

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

---

12. **Specify the second cluster-interconnect transport adapter.**

```
  >>> Cluster Transport Adapters and Cables <<<

    Select the second cluster transport adapter for "node":

        1) adapter
        2) adapter
...
        N) Other

    Option:  N
...
```

You configure two adapters by using the `scinstall` command. You can configure additional adapters after Sun Cluster software is installed by using the `scsetup` utility.

13. Confirm that the `scinstall` utility should begin installation.

```
    Is it okay to begin the installation (yes/no) [yes]?  y
```

14. Specify whether installation should stop if the `sccheck` utility detects errors.

```
    Interrupt the installation for sccheck errors (yes/no) [no]?
```

If you choose to interrupt installation and the `sccheck` utility detects any problems, the utility displays information about the problems and prompts you for your next action. Log files are placed in the `/var/cluster/logs/install/sccheck/` directory.

If the `sccheck` utility quits with an error message because a version Sun Explorer software earlier than 3.5.1 is installed, remove the existing `SUNWexplo` package. Install the `SUNWexplo` package that is supplied on the Sun Cluster 3.1 10/03 CD-ROM. Then restart the `scinstall` utility.

The `scinstall` utility continues installation of all cluster nodes and reboots the cluster. Sun Cluster installation output is logged in a `/var/cluster/logs/install/scinstall.log.`*N* file.

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

Go to "How to Configure the Name-Service Switch" on page 93.

Example – Installing Sun Cluster Software on All Nodes (Typical)

The following example shows the `scinstall` progress messages that are logged as `scinstall` completes Typical installation tasks on a two-node cluster. The cluster node names are `phys-schost-1` and `phys-schost-2`. The specified adapter names are `qfe2` and `hme2`. The Sun Cluster software is already installed by the Web Start program.

```
Installation and Configuration

  Log file - /var/cluster/logs/install/scinstall.log.834
```

```
    Testing for "/globaldevices" on "phys-schost-1" ... done
    Testing for "/globaldevices" on "phys-schost-2" ... done

    Checking installation status ... done

    The Sun Cluster software is already installed on "phys-schost-1".
    The Sun Cluster software is already installed on "phys-schost-2".

    Starting discovery of the cluster transport configuration.

    Probing ..

    The following connections were discovered:

        phys-schost-1:qfe2  switch1  phys-schost-2:qfe2
        phys-schost-1:hme2  switch2  phys-schost-2:hme2

    Completed discovery of the cluster transport configuration.

    Started sccheck on "phys-schost-1".
    Started sccheck on "phys-schost-2".

    sccheck completed with no errors or warnings for "phys-schost-1".
    sccheck completed with no errors or warnings for "phys-schost-2".

    Configuring "phys-schost-2" ... done
    Rebooting "phys-schost-2" ... done

    Configuring "phys-schost-1" ... done
    Rebooting "phys-schost-1" ...

Log file - /var/cluster/logs/install/scinstall.log.834

Rebooting ...
```

▼ How to Install Sun Cluster Software on All Nodes (Custom)

Perform this procedure to install Sun Cluster software on all nodes of the cluster and to specify all cluster configuration settings. To install Sun Cluster software with the default cluster configuration settings, instead go to "How to Install Sun Cluster Software on All Nodes (Typical)" on page 48.

1. **Ensure that the Solaris operating environment is installed to support Sun Cluster software.**

   If Solaris software is already installed on the node, you must ensure that the Solaris installation meets the requirements for Sun Cluster software and any other software that you intend to install on the cluster. See "How to Install Solaris Software" on page 42 for more information about installing Solaris software to

meet Sun Cluster software requirements.

2. **Did you preinstall Sun Cluster software?**
   - If yes, proceed to Step 3.
   - If no, enable remote shell (`rsh`(1M)) or secure shell (`ssh`(1)) access for superuser . Doing this task enables the `scinstall` utility to install Sun Cluster software packages.

3. **Have available the following completed configuration planning worksheets:**
   - "Cluster and Node Names Worksheet" on page 154
   - "Cluster Interconnect Worksheet" on page 156

   See "Planning the Sun Cluster Environment" on page 17 for planning guidelines.

4. **Become superuser on the cluster node from which you intend to install the cluster.**

5. **On one node of the cluster, start the `scinstall` utility.**
   - If you preinstalled Sun Cluster software, type the following command:

     ```
     # /usr/cluster/bin/scinstall
     ```

   - If you did not preinstall Sun Cluster software, insert the Sun Cluster 3.1 10/03 CD-ROM and type the following commands, where *ver* is `8`(for Solaris 8) or `9` (for Solaris 9):

     ```
     # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/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.

6. **From the Main Menu, type `1` (Install a cluster or cluster node).**

   ```
   *** Main Menu ***

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

       * 1) Install a cluster or cluster node
         2) Configure a cluster to be JumpStarted from this install server
         3) Add support for new data services to this cluster node
       * 4) Print release information for this cluster node

       * ?) Help with menu options
       * q) Quit

     Option:  1
   ```

7. **From the Install Menu, type `1` (Install all nodes of a new cluster).**

```
  *** Install Menu ***

    Please select from any one of the following options:

        1) Install all nodes of a new cluster
        2) Install just this machine as the first node of a new cluster
        3) Add this machine as a node in an existing cluster

        ?) Help with menu options
        q) Return to the Main Menu

    Option:  1
...
  *** Installing all Nodes of a New Cluster ***
...
    Do you want to continue (yes/no) [yes]?  y
```

8. **Type 2 to specify the Custom installation option.**

```
  >>> Type of Installation <<<
...
    Please select from one of the following options:

        1) Typical
        2) Custom

        ?) Help
        q) Return to the Main Menu

    Option [1]:  2
```

9. **Specify the cluster name.**

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

10. **Specify the names of the other nodes to become part of this cluster.**

```
  >>> Cluster Nodes <<<
...
    Node name:  node2
    Node name (Ctrl-D to finish):  Control-D

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

11. **Specify whether to use Data Encryption Standard (DES) authentication.**

    DES authentication provides an additional level of security at installation time. DES authentication enables the sponsoring node to authenticate nodes that attempt to contact the sponsoring node 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]?
```

12. 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.

---

13. 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:
```

14. Does this cluster use transport junctions?

- If no, proceed to Step 15.
- 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]?
```

15. **Specify the first cluster-interconnect transport adapter for the node from which you are installing the cluster.**

```
>>> Cluster Transport Adapters and Cables <<<

    Select the first cluster transport adapter for "node":

        1) adapter
        2) adapter
...
        N) Other

    Option:  N
```

The `scinstall` utility lists all Ethernet adapters that are found on the node. To configure adapters that are not listed, such as SCI-PCI adapters, type the number for the Other menu option. Then specify the adapter information that is requested in the subsequent prompts.

Note – If your configuration uses SCI–PCI 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`) that is on the SCI 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 switch port name `0`.

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

---

16. **Specify the second cluster-interconnect transport adapter for the node from which you are installing the cluster.**

```
>>> Cluster Transport Adapters and Cables <<<

    Select the second cluster transport adapter for "node":

        1) adapter
        2) adapter
...
        N) Other

    Option:  N
```

You configure two adapters by using the `scinstall` command. You can configure additional adapters after Sun Cluster software is installed by using the `scsetup` utility.

17. **Specify whether to use autodiscovery to automatically choose the transport adapters for the other nodes of the cluster.**

```
    Is it okay to use autodiscovery for the other nodes (yes/no) [yes]?
```

- If you type **yes** to choose to use autodiscovery, proceed to Step 18. The `scinstall` utility chooses transport adapters, junctions, and ports to configure for the remaining nodes.
- If you type **no** to decline autodiscovery, answer the subsequent prompts. Specify the transport adapter names, junction names, and port names that you want to configure for each of the remaining nodes.

18. Confirm that the `scinstall` utility should install patches.

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

```
  >>> Software Patch Installation <<<
...
    Do you want scinstall to install patches for you (yes/no) [yes]?  y
    What is the name of the patch directory? /var/cluster/patches
    Do you want scinstall to use a patch list file (yes/no) [no]?  n
...
```

19. Specify the global-devices file-system name.

```
 >>> Global Devices File System <<<
...
    The default is to use /globaldevices.
...
    Is it okay to use this default (yes/no) [yes]?
```

20. Confirm that the `scinstall` utility should begin installation.

```
    Is it okay to begin the installation (yes/no) [yes]?  y
```

21. Specify whether installation should stop if the `sccheck` utility detects errors.

```
    Interrupt the installation for sccheck errors (yes/no) [no]?
```

If you choose to interrupt installation and the `sccheck` utility detects any problems, the utility displays information about the problems and prompts you for your next action. Log files are placed in the `/var/cluster/logs/install/sccheck/` directory.

If the `sccheck` utility quits with an error message because a version Sun Explorer software earlier than 3.5.1 is installed, remove the existing `SUNWexplo` package. Install the `SUNWexplo` package that is supplied on the Sun Cluster 3.1 10/03 CD-ROM. Then restart the `scinstall` utility.

The `scinstall` utility continues installation of all cluster nodes and reboots the cluster. Sun Cluster installation output is logged in the `/var/cluster/logs/install/scinstall.log.`*N* file.

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

Go to "How to Configure the Name-Service Switch" on page 93.

Example – Installing Sun Cluster Software on All Nodes (Custom)

The following example shows the `scinstall` progress messages that are logged as `scinstall` completes Custom installation tasks on a two-node cluster. The cluster node names are `phys-schost-1` and `phys-schost-2`. The specified adapter names are `qfe2` and `hme2`. The Sun Cluster software is already installed by the Web Start program.

```
  Installation and Configuration

    Log file - /var/cluster/logs/install/scinstall.log.834

    Testing for "/globaldevices" on "phys-schost-1" ... done
    Testing for "/globaldevices" on "phys-schost-2" ... done

    Checking installation status ... done

    The Sun Cluster software is already installed on "phys-schost-1".
    The Sun Cluster software is already installed on "phys-schost-2".

    Starting discovery of the cluster transport configuration.

    Probing ..

    The following connections were discovered:

        phys-schost-1:qfe2  switch1  phys-schost-2:qfe2
        phys-schost-1:hme2  switch2  phys-schost-2:hme2

    Completed discovery of the cluster transport configuration.

    Started sccheck on "phys-schost-1".
    Started sccheck on "phys-schost-2".

    sccheck completed with no errors or warnings for "phys-schost-1".
    sccheck completed with no errors or warnings for "phys-schost-2".

    Configuring "phys-schost-2" ... done
    Rebooting "phys-schost-2" ... done

    Configuring "phys-schost-1" ... done
    Rebooting "phys-schost-1" ...

Log file - /var/cluster/logs/install/scinstall.log.834

Rebooting ...
```

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

Perform this procedure to add new nodes to an existing cluster.

1. **Ensure that the Solaris operating environment is installed to support Sun Cluster software.**

   If Solaris software is already installed on the node, you must ensure that the Solaris installation meets the requirements for Sun Cluster software and any other software that you intend to install on the cluster. See "How to Install Solaris Software" on page 42 for more information about installing Solaris software to meet Sun Cluster software requirements.

2. **Prepare the cluster to accept a new node.**

   Follow instructions in the procedure "How to Add a Cluster Node to the Authorized Node List" in "Adding and Removing a Cluster Node" in *Sun Cluster 3.1 10/03 System Administration Guide*.

3. **Did you preinstall Sun Cluster software?**

   - If yes, proceed to Step 4.
   - If no, enable remote shell (`rsh`(1M)) or secure shell (`ssh`(1)) access for superuser . Doing this task enables the `scinstall` utility to install Sun Cluster software packages.

4. **Become superuser on the cluster node to install.**

5. **Start the `scinstall` utility.**

   - If you preinstalled Sun Cluster software, type the following command:

     ```
     # /usr/cluster/bin/scinstall
     ```

   - If you did not preinstall Sun Cluster software, insert the Sun Cluster 3.1 10/03 CD-ROM. Then type the following commands, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9):

     ```
     # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/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.

6. **From the Main Menu, type `1` (Install a cluster or cluster node).**

   ```
   *** Main Menu ***

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

```
    * 1) Install a cluster or cluster node
      2) Configure a cluster to be JumpStarted from this install server
      3) Add support for new data services to this cluster node
    * 4) Print release information for this cluster node

    * ?) Help with menu options
    * q) Quit

  Option:  1
```

7. **From the Install Menu, type 3 (Add this machine as a node in an existing cluster).**

```
  *** Install Menu ***

    Please select from any one of the following options:

        1) Install all nodes of a new cluster
        2) Install just this machine as the first node of a new cluster
        3) Add this machine as a node in an existing cluster

        ?) Help with menu options
        q) Return to the Main Menu

    Option:  3
...
  *** Adding a Node to an Existing Cluster ***
...
    Do you want to continue (yes/no) [yes]?  y
```

8. **If prompted whether to continue to install Sun Cluster software packages, type `yes`.**

```
 >>> Software Package Installation <<<

    Installation of the Sun Cluster framework software packages will
    take a few minutes to complete.

    Is it okay to continue (yes/no) [yes]?  y

** Installing SunCluster 3.0 **
        SUNWscr.....done
...
Hit ENTER to continue:
```

After all packages are installed, press Return to continue to the next screen.

9. **Confirm that the `scinstall` utility should install patches.**

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

```
  >>> Software Patch Installation <<<
...
    Do you want scinstall to install patches for you (yes/no) [yes]?  y
    What is the name of the patch directory? /var/cluster/patches
```

```
    Do you want scinstall to use a patch list file (yes/no) [no]?  n
...
```

10. **Specify the name of any existing cluster node to be considered the** ***sponsoring node*****.**

```
 >>> Sponsoring Node <<<
...
    What is the name of the sponsoring node?  node1
```

11. **Specify the cluster name.**

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

12. **Specify whether installation should stop if the `sccheck` utility detects errors.**

```
 >>> Check <<<
...
    Do you want to run sccheck (yes/no) [yes]?  y
```

If you choose to interrupt installation and the `sccheck` utility detects any problems, the utility displays information about the problems and prompts you for your next action. Log files are placed in the `/var/cluster/logs/install/sccheck/` directory.

If the `sccheck` utility quits with an error message because a version Sun Explorer software earlier than 3.5.1 is installed, remove the existing `SUNWexplo` package. Install the `SUNWexplo` package that is supplied on the Sun Cluster 3.1 10/03 CD-ROM. Then restart the `scinstall` utility.

When the node passes `sccheck` validation checks, proceed to the next step.

13. **Specify whether to use autodiscovery to configure the cluster transport.**

If your configuration does not use Ethernet adapters, answer **no** and skip to Step 15.

```
 >>> Autodiscovery of Cluster Transport <<<

    If you are using ethernet adapters as your cluster transport
    adapters, autodiscovery is the best method for configuring the
    cluster transport.

    Do you want to use autodiscovery (yes/no) [yes]?
...
    The following connections were discovered:

        node1:adapter1  switch1  node2:adapter1
        node1:adapter2  switch2  node2:adapter2

    Is it okay to add these connections to the configuration (yes/no) [yes]?
```

14. **Did you choose to use autodiscovery in Step 13?**

- If yes, skip to Step 22.

- If no, proceed to Step 15.

15. Specify whether this is a two-node cluster.

```
 >>> Point-to-Point Cables <<<
...
    Is this a two-node cluster (yes/no) [yes]?
```

16. Did you specify that this cluster is a two-node cluster?

- If yes, specify whether to use transport junctions.

```
    Does this two-node cluster use transport junctions (yes/no) [yes]?
```

- If no, press Return to continue. You must use transport junctions if a cluster contains three or more nodes.

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

Hit ENTER to continue:
```

17. Did you specify that the cluster is to use transport junctions?

- If no, proceed to Step 18.
- If yes, specify the transport junctions.

```
 >>> 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]?
```

18. Specify the first cluster-interconnect transport adapter.

Type **`help`** to list all transport adapters that are available to the node.

```
 >>> Cluster Transport Adapters and Cables <<<
...
    What is the name of the first cluster transport adapter (help)?  adapter
```

19. Specify what the first transport adapter connects to.

- If the transport adapter uses a transport junction, specify the name of the junction and its port.

```
   Name of the junction to which "adapter" is connected [switch1]?
...
    Use the default port name for the "adapter" connection (yes/no) [yes]?
```

- If the transport adapter does not use a transport junction, specify the name of the other transport adapter that the first transport adapter connects to.

```
    Name of adapter on "node1" to which "adapter" is connected?  adapter
```

20. Specify the second cluster-interconnect transport adapter.

Type **`help`** to list all transport adapters that are available to the node.

```
    What is the name of the second cluster transport adapter (help)? adapter
```

21. Specify what the second transport adapter connects to.

- If the transport adapter uses a transport junction, specify the name of the junction and its port.

```
    Name of the junction to which "adapter" is connected [switch2]?
    Use the default port name for the "adapter" connection (yes/no) [yes]?

Hit ENTER to continue:
```

- If the transport adapter does not use a transport junction, specify the name of the other transport adapter that the first transport adapter connects to.

```
    Name of adapter on "node1" to which "adapter" is connected?  adapter
```

22. Specify the global-devices file-system name.

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

    Is it okay to use this default (yes/no) [yes]?
```

23. Specify automatic reboot.

```
 >>> Automatic Reboot <<<
...
    Do you want scinstall to reboot for you (yes/no) [yes]? y
```

24. Accept or decline the generated `scinstall` command.

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

```
 >>> Confirmation <<<

    Your responses indicate the following options to scinstall:

      scinstall -i  \
...
    Are these the options you want to use (yes/no) [yes]?
    Do you want to continue with the install (yes/no) [yes]?
```

- If you accept the command and continue the installation, `scinstall` processing continues.

  Sun Cluster installation output is logged in a `/var/cluster/logs/install/scinstall.log.`*N* file.

Note – Unless you have installed your own `/etc/inet/ntp.conf` file, the `scinstall` command installs a default `ntp.conf` file for you. The default file is shipped with references to the maximum possible number of nodes. Therefore, 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 Configure Network Time Protocol (NTP)" on page 109 for information on how to suppress these messages under otherwise normal cluster conditions.

- If you decline the command, the `scinstall` utility asks if you want to deinstall the Sun Cluster software.

  ```
  Do you want to de-install the Sun Cluster software (yes/no) [no]?
  ```

  After `scinstall` returns you to the Main Menu, you can rerun menu option `2` and provide different answers. Your previous session answers display as the defaults.

25. Repeat this procedure on any additional node to install until all nodes are fully configured.

26. From an active cluster member, prevent any nodes from joining the cluster.

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

`-a`	Add
`-T`	Specifies authentication options
`node=.`	Specifies the node name of dot (.) to add to the authentication list, to prevent any other node from adding itself to the cluster

Alternately, you can use the `scsetup`(1M) utility. See "How to Add a Cluster Node to the Authorized Node List" in "Adding and Removing a Cluster Node" in *Sun Cluster 3.1 10/03 System Administration Guide* for procedures.

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

Go to "How to Configure the Name-Service Switch" on page 93.

Example – Installing Sun Cluster Software on an Additional Node

The following example shows the `scinstall` command executed and the messages that the utility logs as `scinstall` completes installation tasks on the node `phys-schost-3`. The sponsoring node is `phys-schost-1`.

```
>>> Confirmation <<<

   Your responses indicate the following options to scinstall:
```

```
      scinstall -ik \
           -C sc-cluster \
           -N phys-schost-1 \
           -A trtype=dlpi,name=hme1 -A trtype=dlpi,name=hme3 \
           -m endpoint=:hme1,endpoint=switch1 \
           -m endpoint=:hme3,endpoint=switch2

    Are these the options you want to use (yes/no) [yes]?

    Do you want to continue with the install (yes/no) [yes]?

Checking device to use for global devices file system ... done

Adding node "phys-schost-3" to the cluster configuration ... done
Adding adapter "hme1" to the cluster configuration ... done
Adding adapter "hme3" to the cluster configuration ... done
Adding cable to the cluster configuration ... done
Adding cable to the cluster configuration ... done

Copying the config from "phys-schost-1" ... done
Setting the node ID for "phys-schost-3" ... done (id=3)

Verifying the major number for the "did" driver with "phys-schost-1" ...done

Checking for global devices global file system ... done
Updating vfstab ... done

Verifying that NTP is configured ... done
Installing a default NTP configuration ... done
Please complete the NTP configuration after scinstall has finished.

Verifying that "cluster" is set for "hosts" in nsswitch.conf ... done
Adding the "cluster" switch to "hosts" in nsswitch.conf ... done

Verifying that "cluster" is set for "netmasks" in nsswitch.conf ... done
Adding the "cluster" switch to "netmasks" in nsswitch.conf ... done

Verifying that power management is NOT configured ... done
Unconfiguring power management ... done
/etc/power.conf has been renamed to /etc/power.conf.61501001054
Power management is incompatible with the HA goals of the cluster.
Please do not attempt to re-configure power management.

Ensure that the EEPROM parameter "local-mac-address?" is set to "true" ...done
Ensure network routing is disabled ... done
Network routing has been disabled on this node by creating /etc/notrouter.
Having a cluster node act as a router is not supported by Sun Cluster.
Please do not re-enable network routing.

Log file - /var/cluster/logs/install/scinstall.log.9853


Rebooting ...
```

Using SunPlex Manager to Install Sun Cluster Software

Note – To add a new node to an existing cluster, do not use SunPlex Manager. Instead, use the procedure "How to Install Sun Cluster Software on Additional Cluster Nodes (`scinstall`)" on page 60.

This section describes how to install SunPlex Manager. This section also describes how to use SunPlex Manager to install Sun Cluster software and to establish new cluster nodes. You can also use SunPlex Manager to install or configure one or more of the following additional software products:

- (On Solaris 8 only) Solstice DiskSuite software – After installing Solstice DiskSuite software, SunPlex Manager configures up to three metasets and associated metadevices. SunPlex Manager also creates and mounts cluster file systems for each metaset.
- (On Solaris 9 only) Solaris Volume Manager software – SunPlex Manager configures up to three Solaris Volume Manager volumes. SunPlex Manager also creates and mounts cluster file systems for each volume. Solaris Volume Manager software is already installed as part of Solaris software installation.
- Sun Cluster HA for NFS data service.
- Sun Cluster HA for Apache scalable data service.

The following table lists SunPlex Manager installation requirements for these additional software products.

TABLE 2–2 Requirements to Use SunPlex Manager to Install Software

Software Package	Installation Requirements
Solstice DiskSuite/Solaris Volume Manager	A partition that uses `/sds` as the mount–point name. The partition must be at least 20 Mbytes in size.
Sun Cluster HA for NFS data service	■ At least two shared disks, of the same size, that are connected to the same set of nodes. ■ Solstice DiskSuite software installed, or Solaris Volume Manager software configured, by SunPlex Manager. ■ A logical hostname for use by Sun Cluster HA for NFS. The logical hostname must have a valid IP address that is accessible by all cluster nodes. The IP address must be on the same subnet as the base hostnames of the cluster nodes. ■ A test IP address for each node of the cluster. SunPlex Manager uses these test IP addresses to create Internet Protocol (IP) Network Multipathing (IP Network Multipathing) groups for use by Sun Cluster HA for NFS.

TABLE 2–2 Requirements to Use SunPlex Manager to Install Software *(Continued)*

Software Package	Installation Requirements
Sun Cluster HA for Apache scalable data service	■ At least two shared disks of the same size that are connected to the same set of nodes. ■ Solstice DiskSuite software installed, or Solaris Volume Manager software configured, by SunPlex Manager. ■ A shared address for use by Sun Cluster HA for Apache. The shared address must have a valid IP address that is accessible by all cluster nodes. The IP address must be on the same subnet as the base hostnames of the cluster nodes. ■ A test IP address for each node of the cluster. SunPlex Manager uses these test IP addresses to create Internet Protocol (IP) Network Multipathing (IP Network Multipathing) groups for use by Sun Cluster HA for Apache.

The test IP addresses that you supply must meet the following requirements:

- Test IP addresses for all adapters in the same multipathing group must belong to a single IP subnet.
- Test IP addresses must not be used by normal applications because the test IP addresses are not highly available.

The following table lists each metaset name and cluster-file-system mount point that is created by SunPlex Manager. The number of metasets and mount points that SunPlex Manager creates depends on the number of shared disks that are connected to the node. For example, if a node has four shared disks connected, SunPlex Manager creates the `mirror-1` and `mirror-2` metasets. However, SunPlex Manager does not create the `mirror-3` metaset, because the node does not have enough shared disks to create a third metaset.

TABLE 2–3 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

Note – If the cluster does not meet the minimum shared-disk requirement, SunPlex Manager still installs the Solstice DiskSuite packages. However, without sufficient shared disks, SunPlex Manager cannot configure the metasets, metadevices, or volumes. SunPlex Manager then cannot configure the cluster file systems that are needed to create instances of the data service.

SunPlex Manager recognizes a limited character set to increase security. Characters that are not a part of the set are silently filtered out when HTML forms are submitted to the SunPlex Manager server. The following characters are accepted by SunPlex Manager:

```
()+,-./0-9:=@A-Z^_a-z{|}~
```

This filter can cause problems in the following two areas:

- **Password entry for Sun Open Net Environment (Sun ONE) services –** If the password contains unusual characters, these characters are stripped out, resulting in one of the following problems:
  - The resulting password has less than eight characters and therefore fails.
  - The application is configured with a different password than the user expects.
- **Localization –** Alternative character sets, for example, accented characters or Asian characters, do not work for input.

▼ How to Install SunPlex Manager Software

This procedure describes how to install SunPlex Manager software on your cluster.

Note – If you intend to install Sun Cluster software by using another method, you do not need to perform this procedure. The `scinstall` command automatically installs SunPlex Manager for you as part of the installation process.

Perform this procedure on each node of the cluster.

1. **Ensure that Solaris software and patches are installed on each node of the cluster.**

   You must install Solaris software as described in "How to Install Solaris Software" on page 42.

Note – If Solaris software is already installed on the node, you must ensure that the Solaris installation meets the requirements for Sun Cluster software. You must also ensure that the installation meets the requirements for any other software that you intend to install on the cluster.

---

2. **Become superuser on a cluster node.**

3. **Are Apache software packages installed on the node?**

   - If yes, proceed to Step 4.
   - If no, install Apache software packages.

   a. **Insert the Solaris 8 Software 2 of 2 CD-ROM into the CD-ROM drive of the node.**

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

   b. **Change to the `/cdrom/sol_8_sparc/Solaris_8/Product` directory.**

      ```
      # cd /cdrom/sol_8_sparc/Solaris_8/Product
      ```

      For Solaris 9, change to the `/cdrom/cdrom0/Solaris_9/Product` directory.

      ```
      # cd /cdrom/cdrom0/Solaris_9/Product
      ```

   c. **Install the Apache software packages in the following order.**

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

   d. **Install any Apache software patches.**

      See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

4. **Install the SunPlex Manager software packages.**

   a. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive of the node.**

      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_1_u1` directory.

   b. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Packages` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

      The following example uses the path to the Solaris 8 version of Sun Cluster software.

      ```
      # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_8/Packages
      ```

   c. **Install the SunPlex Manager software packages. Answer `yes` for all prompts.**

```
# pkgadd -d . SUNWscva SUNWscvr SUNWscvw
```

5. **Repeat Step 2 through Step 4 on each node of the cluster.**

6. **Is the `root` password the same on every node of the cluster?**

   - If yes, proceed to Step 7.
   - If no, set the `root` password to the same value on each node of the cluster. If necessary, also use the `chkey`(1) command to update the RPC key pair.

     ```
     # passwd
         Enter new password
     # chkey -p
     ```

     The `root` password must be the same on all nodes in the cluster to use the `root` password to access SunPlex Manager.

7. **Use SunPlex Manager to install Sun Cluster software.**

   Go to "How to Install Sun Cluster Software (SunPlex Manager)" on page 71.

▼ How to Install Sun Cluster Software (SunPlex Manager)

Note – To add a new node to an existing cluster, do not use SunPlex Manager. Instead, go to "How to Install Sun Cluster Software on Additional Cluster Nodes (`scinstall`)" on page 60.

Perform this procedure to use SunPlex Manager to install Sun Cluster software and patches on all nodes in the cluster in a single operation. In addition, you can use this procedure to install Solstice DiskSuite software and patches (Solaris 8) or to configure Solaris Volume Manager mirrored disksets (Solaris 9).

If you use SunPlex Manager to install Solstice DiskSuite software or to configure Solaris Volume Manager disksets, you can also install one or both of the following data services:

- Sun Cluster HA for NFS data service
- Scalable Sun Cluster HA for Apache data service

The installation process might take from 30 minutes to two or more hours. The actual length of time depends on the number of cluster nodes, your choice of data services to install, and the number of disks in your cluster configuration.

1. **Ensure that the cluster configuration meets the requirements to use SunPlex Manager to install software.**

   See "Using SunPlex Manager to Install Sun Cluster Software" on page 67 for installation requirements and restrictions.

2. **Do you intend to install Sun Cluster HA for NFS or Sun Cluster HA for Apache?**

- If no, proceed to Step 3.
- If yes, ensure that the cluster configuration meets all applicable requirements. See "Using SunPlex Manager to Install Sun Cluster Software" on page 67.

3. **Ensure that SunPlex Manager software is installed on each node of the cluster.**

   See the installation procedures in "How to Install SunPlex Manager Software" on page 69.

4. **Have available the following completed configuration planning worksheets:**

   - "Cluster and Node Names Worksheet" on page 154
   - "Cluster Interconnect Worksheet" on page 156
   - "Network Resources Worksheet" in *Sun Cluster 3.1 Data Service 5/03 Release Notes*

   See Chapter 1 and the *Sun Cluster 3.1 Data Service Planning and Administration Guide* for planning guidelines.

5. **Prepare file-system paths to a CD-ROM image of each software product that you intend to install.**

   a. **Provide each CD-ROM image in a location that is available to each node.**

      The CD-ROM images must be accessible to all nodes of the cluster from the same file-system path. These paths can be one or more of the following locations:

      - CD-ROM drives that are exported to the network from machines outside the cluster.
      - Exported file systems on machines outside the cluster.
      - CD-ROM images that are copied to local file systems on each node of the cluster. The local file system must use the same name on each node.

   b. **Record the path to each CD-ROM image.**

      You specify this information in Step 17.

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

   - If no, proceed to Step 7.
   - If yes, install additional packages from the Sun Cluster 3.1 10/03 CD-ROM that are required to support the RSMAPI or SCI-PCI adapters. SunPlex Manager does not automatically install these packages. The following table lists the Sun Cluster 3.1 10/03 packages and the order in which you must install the packages.

Feature	Additional Sun Cluster 3.1 10/03 Packages to Install
RSMAPI	`SUNWscrif`
SCI-PCI adapters	`SUNWsci` `SUNWscid` `SUNWscidx`

Use the following command to install these additional packages. Replace *ver* with `8` (for Solaris 8) or `9` (for Solaris 9).

```
# cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/Packages
# pkgadd -d . packages
```

7. **Are there any patches that are required to support Sun Cluster or Solstice DiskSuite software?**
   - If yes, proceed to Step 8.
   - If no, skip to Step 10.

8. **Do you intend to use SunPlex Manager to install patches?**
   - If yes, proceed to Step 9.
   - If no, manually install all patches that are required to support Sun Cluster or Solstice DiskSuite software *before* you use SunPlex Manager, then skip to Step 10.

9. **Copy patches that are required for Sun Cluster or Solstice DiskSuite software into a single directory. This directory must reside on a file system that is available to each node.**

   a. **Ensure that only one version of each patch is present in this patch directory.**

      If the patch directory contains multiple versions of the same patch, SunPlex Manager cannot determine the correct patch dependency order.

   b. **Ensure that the patches are uncompressed.**

   c. **Record the path to the patch directory.**

      You specify this information in Step 17.

10. **Start SunPlex Manager.**

    a. **From the administrative console or any other machine outside the cluster, launch a browser.**

    b. **Disable the browser's Web proxy.**

       SunPlex Manager installation functionality is incompatible with Web proxies.

    c. **Ensure that disk caching and memory caching is enabled.**

       The disk cache and memory cache size must be greater than 0.

    d. **From the browser, connect to port 3000 on a node of the cluster.**

`https://node:3000`

The Sun Cluster Installation screen is displayed in the browser window.

Note – If SunPlex Manager displays the administration interface instead of the Sun Cluster Installation screen, Sun Cluster software is already installed on that node. Check that the name of the node in the URL is the correct name of the cluster node to install.

---

e. **If the browser displays a New Site Certification window, follow the onscreen instructions to accept the certificate.**

f. **Log in as superuser.**

11. **In the Sun Cluster Installation screen, verify that the cluster meets the listed requirements for using SunPlex Manager.**

    - The Solaris End User Software Group or higher is installed.
    - Root-disk partitions include the following:
      - At least 750 Mbytes for `swap`
      - A 512-Mbyte slice with the mount point `/globaldevices`
      - A 20-Mbyte slice with the mount point `/sds` for volume manager use
    - File system paths to all needed CD-ROM images and patches are set up, as described in Step 5 through Step 9.

    If you meet all listed requirements, click Next to continue to the next screen.

12. **Type a name for the cluster and select the number of nodes in your cluster.**

    The default number of nodes that are displayed might be higher than the number of nodes you intend to install in your cluster. If so, select the correct number of nodes you intend to install. This situation might occur if other nodes that are ready to be installed by SunPlex Manager use the same public network as the nodes that you intend to install.

Tip – You can use the Back button to return to a previous screen and change your information. However, SunPlex Manager does not save the information that you supplied in the later screens. When you click Next, you must again type or select your configuration information in those screens.

---

13. **Type the name of each cluster node.**

    SunPlex Manager supplies as defaults the names of nodes that the GUI finds on the public network that are ready to be installed by SunPlex Manager. If you specify a larger number of nodes to install than exist on the network, SunPlex Manager

supplies additional default names. These additional names follow the naming convention `phys-`*`clustername-N`*.

Note – SunPlex Manager might list nodes other than the ones you intend to install in your cluster. This situation occurs under the following conditions:

- The other nodes use the same public network as the nodes that you are installing.
- The other nodes are installed with SunPlex Manager software but are not yet installed with Sun Cluster software.

If SunPlex Manager supplies the name of a node that you do not want in your cluster, type over the name with the correct node name.

---

14. **From the pull-down lists for each node, select the names of the two adapters that are used for the private interconnects.**

    Refer to your completed "Cluster Interconnect Worksheet" for the appropriate adapter names for each node.

15. **Choose whether to install Solstice DiskSuite software (Solaris 8) or to configure Solaris Volume Manager mirrored disksets (Solaris 9).**

    You must install Solstice DiskSuite software (Solaris 8) or configure Solaris Volume Manager mirrored disksets (Solaris 9) if you intend to install the Sun Cluster HA for NFS or Sun Cluster HA for Apache data service.

Caution – When SunPlex Manager installs Solstice DiskSuite software or configures Solaris Volume Manager disksets, any data on all shared disks is lost.

---

16. **In Step 15, did you choose to install Solstice DiskSuite software or configure Solaris Volume Manager disksets?**

    - If no, proceed to Step 17.
    - If yes, choose whether to install Sun Cluster HA for NFS, Sun Cluster HA for Apache, or both.
      - Refer to your completed "Network Resources" worksheet for the appropriate logical hostname or shared address.
      - For Sun Cluster HA for NFS, also specify the logical hostname that the data service is to use and a test IP address for each node.
      - For Sun Cluster HA for Apache, also specify the shared address that the data service is to use and a test IP address for each node.

17. **Type the path for each CD-ROM image that is needed to install the packages you specified, and optionally the path for the patch directory.**

Type each path in the appropriate path field for each software package, as shown in the following table. If you have already installed the required patches, leave the Patch Directory Path field blank.

Software Package to Install	Name of CD-ROM Image Path Field
Solstice DiskSuite	Solaris CD-ROM Path
Sun Cluster	Sun Cluster 3.1 10/03 CD-ROM Path
Sun Cluster HA for NFS, Sun Cluster HA for Apache	Sun Cluster 3.1 Agents CD-ROM Path
Sun Cluster patches, Solstice DiskSuite patches	Patch Directory Path

Each specified path for a CD-ROM image must be the directory that contains the `.cdtoc` file for the CD-ROM.

18. **Choose whether to validate the cluster configuration by using the `sccheck`(1M) utility.**
    - If the `sccheck` utility detects no problems, SunPlex Manager displays the Confirm Information screen. Proceed to Step 19.
    - If the `sccheck` utility detects problems, SunPlex Manager displays information about the problems found and prompts you for your next action. If you must quit SunPlex Manager to correct the problem, return to Step 10 to restart SunPlex Manager. Otherwise, proceed to Step 19.
    - If the `sccheck` utility quits with an error message that a version of Sun Explorer software earlier than 3.5.1 is installed, click Cancel to stop installation. Remove the existing `SUNWexplo` package and install the `SUNWexplo` package that is supplied on the Sun Cluster 3.1 10/03 CD-ROM. Then restart SunPlex Manager.

19. **Is the information that you supplied correct as displayed in the Confirm Information screen?**
    - If yes, proceed to Step 20.
    - If no, perform the following steps to correct the configuration information.

    a. **Click Back until you return to the screen with the information to change.**

    Note – When you click Back to back up to a previous screen, any information that you typed in the subsequent screens is lost.

    ---

    b. **Type the correct information and click Next.**

c. **Retype or reselect the information in each screen until you return to the Confirm Information screen.**

d. **Verify that the information in the Confirm Information screen is now correct.**

20. **Click Begin Installation to start the installation process.**

Note – Do *not* close the browser window nor change the URL during the installation process.

---

a. **If the browser displays a New Site Certification window, follow the onscreen instructions to accept the certificate.**

b. **If the browser prompts for login information, type the appropriate superuser ID and password for the node that you connect to.**

During installation, the screen displays brief messages about the status of the cluster installation process. When installation is complete, the browser displays the cluster monitoring and administration GUI.

SunPlex Manager installation output is logged in the `/var/cluster/spm/messages` file.

Sun Cluster installation output is logged in a `/var/cluster/logs/install/scinstall.log.`*N* file.

21. **Log back into SunPlex Manager to verify quorum assignments and to modify the assignments, if necessary.**

For clusters with three or more nodes, the use of shared quorum devices is optional. SunPlex Manager might or might not have assigned quorum votes to any quorum devices, depending on whether appropriate shared disks were available. You can use SunPlex Manager to designate quorum devices and to reassign quorum votes in the cluster.

22. **Set up the name-service look-up order.**

Go to "How to Configure the Name-Service Switch" on page 93.

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

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 establishes 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 that connections are verified before you install Solaris software.**

See the *Sun Cluster 3.1 Hardware Administration Collection* 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" on page 37 for requirements and guidelines.

3. **Have available the following information:**

   - The Ethernet address of each cluster node
   - The following completed configuration planning worksheets:
     - "Local File System Layout Worksheet" on page 152
     - "Cluster and Node Names Worksheet" on page 154
     - "Cluster Interconnect Worksheet" on page 156

   See "Planning the Solaris Operating Environment" on page 12 and "Planning the Sun Cluster Environment" on page 17 for planning guidelines.

4. **Do you use a naming service?**

   - If no, proceed to Step 5. You set up the necessary hostname information in Step 30.
   - If yes, add the following information to any naming services that clients use to access cluster services:
     - Address-to-name mappings for all public hostnames and logical addresses
     - The IP address and hostname of the JumpStart server See "IP Addresses" on page 18 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 no, proceed to Step 6.
   - If yes, run `scsetup`(1M) from another cluster node that is active and add the new node's name to the list of authorized cluster nodes. For more information, see "How to Add a Cluster Node to the Authorized Node List" in "Adding and Removing a Cluster Node" in *Sun Cluster 3.1 10/03 System Administration Guide*.

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

   See "Preparing Custom JumpStart Installations" in *Solaris 8 Advanced Installation Guide* or "Preparing Custom JumpStart Installations (Tasks)" in *Solaris 9 Installation Guide* for instructions on how to set up a JumpStart installation server. See also the `setup_install_server`(1M) and `add_install_client`(1M) man pages.

   When you set up the installation server, ensure that the following requirements are met.

   - The installation server is on the same subnet as the cluster nodes but is not itself a cluster node.

- The installation 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 installation 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 installation server to hold your copy of the Sun Cluster 3.1 10/03 CD-ROM. Skip this step if a directory already exists.**

   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 installation server.**

   a. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive on the JumpStart installation 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_1_u1` directory.

   b. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Tools` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

      The following example uses the path to the Solaris 8 version of Sun Cluster software.

      ```
      # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_8/Tools
      ```

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

      The `scinstall` command creates the new installation directory when the command copies the CD-ROM files. The installation directory name `/export/suncluster/sc31` is used here as an example.

      ```
      # ./scinstall -a /export/suncluster/sc31
      ```

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

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

   e. **Ensure that the Sun Cluster 3.1 10/03 CD-ROM image on the JumpStart installation server is NFS exported for reading by the JumpStart installation server.**

      See "Solaris NFS Environment" in *System Administration Guide, Volume 3* or "Managing Network File Systems (Overview)" in *System Administration Guide: Resource Management and Network Services* for more information about automatic file sharing. See also the `share`(1M) and `dfstab`(4) man pages.

9. **From the JumpStart installation server, start the `scinstall`(1 M) utility.**

   The path `/export/suncluster/sc31` is used here as an example of the installation directory that you created.

```
# cd /export/suncluster/sc31/SunCluster_3.1/Sol_ver/Tools
# ./scinstall
```

Note – In the CD-ROM path, replace *ver* with `8` (for Solaris 8) or `9` (for Solaris 9).

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.

10. **From the Main Menu, type `2` (Configure a cluster to be JumpStarted from this installation server).**

    This option is used to configure custom 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) Install a cluster or cluster node
      * 2) Configure a cluster to be JumpStarted from this install server
        3) Add support for new data services to this cluster node
      * 4) Print release information for this cluster node

      * ?) Help with menu options
      * q) Quit

    Option:  2

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

Note – If option `2` does not have an asterisk in front, the option is disabled. This condition indicates that JumpStart setup is not complete or the setup has an error. Exit the `scinstall` utility, repeat Step 6 through Step 8 to correct JumpStart setup, then restart the `scinstall` utility.

---

11. **Specify the JumpStart directory name.**

    The JumpStart directory name `/export/suncluster/sc31` is used here as an example.

```
 >>> Custom JumpStart Directory <<<
...
    What is your JumpStart directory name?  /export/suncluster/sc31
```

12. Specify the name of the cluster.

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

13. 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]?
```

14. Specify whether to use Data Encryption Standard (DES) authentication.

DES authentication provides an additional level of security at installation time. DES authentication enables the sponsoring node to authenticate nodes that attempt to contact the sponsoring node 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]?
```

15. 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.

---

16. 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:
```

17. Does this cluster use transport junctions?

- If no, proceed to Step 18.
- 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]?
```

18. 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
```

19. 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–PCI 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`) that is on the SCI 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 switch port name `0`.

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

---

20. 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
```

21. 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–PCI 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`) that is on the SCI 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 switch port name `0`.

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

---

22. Does this cluster use transport junctions?

- If yes, repeat Step 18 through Step 21 for each additional cluster node.
- If no, proceed to Step 23.

23. 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]?
```

24. Confirm that the `scinstall` utility should install patches.

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

Note – If you specify a patch directory for the `scinstall` command, then patches in Solaris patch directories, as specified in Step 29, are not installed.

```
  >>> Software Patch Installation <<<
...
    Do you want scinstall to install patches for you (yes/no) [yes]?  y
    What is the name of the patch directory? /export/suncluster/sc31/patches
    Do you want scinstall to use a patch list file (yes/no) [no]?  n
...
```

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

The `scinstall` command that is 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. You can then rerun menu option `3` and provide different answers. Your previous answers display as the defaults.

26. 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/3.1` directory.

```
install_type    initial_install
system_type     standalone
partitioning    explicit
filesys         rootdisk.s0 free /
filesys         rootdisk.s1 750  swap
filesys         rootdisk.s3 512  /globaldevices
filesys         rootdisk.s7 20
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" on page 13 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.

If the Solaris operating-environment install profile meets minimum Sun Cluster file-system allocation requirements, no restrictions are placed on other changes to the install profile. See "System Disk Partitions" on page 14 for partitioning guidelines and requirements to support Sun Cluster 3.1 software. For more information about JumpStart profiles, see "Preparing Custom JumpStart Installations" in *Solaris 8 Advanced Installation Guide* or "Preparing Custom JumpStart Installations (Tasks)" in *Solaris 9 Installation Guide*.

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

- If no, proceed to Step 28.
- 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 26.

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

  In addition, you must create or modify a postinstallation finish script at Step 32 to install the Sun Cluster packages to support the RSMAPI and SCI-PCI adapters. If you install a higher software group than End User System Support, the RSMAPI software packages are automatically installed with the Solaris software. You then do not need to add the packages to the `class` file.

28. Do you intend to use SunPlex Manager?

- If no, proceed to Step 29.
- 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 26.

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

  These Apache software packages are required for SunPlex Manager. However, if you install a higher software group than End User System Support, the Apache software packages are installed with the Solaris software. You then do not need to add the packages to the `class` file.

29. Set up Solaris patch directories.

Note – If you specify a patch directory for the `scinstall` command in Step 24, patches in Solaris patch directories are not installed.

---

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

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

a. On the JumpStart installation server, create files that are 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. The NFS server could be the JumpStart installation server or another machine.
- IP address and hostname of each node in the cluster.

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

- If no, proceed to Step 32 if you intend to add your own postinstallation finish script. Otherwise, skip to Step 33.

- If yes, follow instructions in Step 32 to set up a postinstallation finish script to install the following additional packages. Install the appropriate packages from the `/cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_`*ver*`/Packages` directory of the Sun Cluster 3.1 10/03 CD-ROM in the order that is given in the following table.

Note – In the CD-ROM path, replace *ver* with `8` (for Solaris 8) or `9` (for Solaris 9).

Feature	Additional Sun Cluster 3.1 10/03 Packages to Install
RSMAPI	`SUNWscrif`
SCI-PCI adapters	`SUNWsci` `SUNWscid` `SUNWscidx`

32. (Optional) Add your own postinstallation finish script.

Note – If you intend to use the Remote Shared Memory Application Programming Interface (RSMAPI) or use SCI-PCI adapters for the interconnect transport, you must modify the finish script to 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 "Preparing Custom JumpStart Installations" in *Solaris 8 Advanced Installation Guide* or "Preparing Custom JumpStart Installations (Tasks)" in *Solaris 9 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.

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

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

```
# /opt/SUNWcluster/bin/cconsole clustername &
```

- If you do not use the `cconsole` utility, connect to the consoles of each node individually.

34. **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 – Surround the dash (-) in the command with a space on each side.

Sun Cluster installation output is logged in a `/var/cluster/logs/install/scinstall.log.`*N* file.

Note – Unless you have installed your own `/etc/inet/ntp.conf` file, the `scinstall` command installs a default `ntp.conf` file for you. The default file is shipped with references to the maximum number of nodes. Therefore, 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 Configure Network Time Protocol (NTP)" on page 109 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.

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

- If no, proceed to Step 36.
- If yes, create mount points on the new node for all existing cluster file systems.

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

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

b. **On the node that 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 that is returned by the mount command is `/global/dg-schost-1`, run **`mkdir -p /global/dg-schost-1`** on the node that is being added to the cluster.

Note – The mount points become active after you reboot the cluster in Step 37.

---

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

- If no, proceed to Step 36.
- If yes, ensure that the same `vxio` number is used on the VxVM-installed nodes. Also ensure 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. Change the `/etc/name_to_major` entry to use a different number.

36. Do you intend to use dynamic reconfiguration on Sun Enterprise 10000 servers?

- If no, proceed to Step 37.
- 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 3.1 10/03 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.

37. 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 that you installed require a node reboot. Also reboot if any other changes that you made require a reboot to become active, then proceed to Step 38.
- If yes, perform a reconfiguration reboot of the cluster 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 installation mode is disabled, only the first-installed node, which established the cluster, has a quorum vote. In an established cluster that is still in installation mode, if the cluster is not shut down before the first-installed node is rebooted, the remaining cluster nodes cannot obtain quorum. The entire cluster then shuts down. Cluster nodes remain in installation mode until the first time you run the

scsetup(1M) command, during the procedure "How to Perform Postinstallation Setup" on page 99.

38. **Set up the name-service look-up order.**

    Go to "How to Configure the Name-Service Switch" on page 93.

How to Install Sun Cluster Software on a Single-Node Cluster

Perform this task to install Sun Cluster software and establish the cluster on a single node by using the scinstall command. See the scinstall(1M) man page for details.

Note – You cannot use SunPlex Manager or the interactive form of the scinstall utility to install Sun Cluster software on a single-node cluster.

The scinstall -iFo command establishes the following defaults during installation.

- Creates the required device IDs
- Uses the default /globaldevices file system, unless the global-devices file system is specified with the -G option
- Establishes a default cluster name, which is the same as the name of the node being installed, unless the *clustername* is specified with the -C option

Some steps that are required for multinode cluster installations are not necessary for single-node cluster installations. When you install a single-node cluster, you do not need to perform the following steps:

- You do not need to configure quorum.
- You do not need to configure interconnect adapters or junctions.

Tip – If you anticipate eventually adding a second node to your cluster, you can configure the transport interconnect during initial cluster installation. The transport interconnect is then available for later use. See the scinstall(1M) man page for details.

---

1. **Ensure that the Solaris operating environment is installed to support Sun Cluster software.**

   If Solaris software is already installed on the node, you must ensure that the Solaris installation meets the requirements for Sun Cluster software and any other software that you intend to install on the cluster. See "How to Install Solaris

Software" on page 42 for more information about installing Solaris software to meet Sun Cluster software requirements.

2. **Become superuser on the cluster node to install.**

3. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive of the node to install and configure.**

   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_1_u1` directory.

4. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Tools` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9)).**

   The following example uses the path to the Solaris 8 version of Sun Cluster software.

   ```
   # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_8/Tools
   ```

5. **Install the Sun Cluster software and necessary patches by using the `scinstall` command.**

   ```
   # ./scinstall -iFo -M patchdir=dirname
   ```

   `-i`
   Specifies the install form of the `scinstall` command. The `scinstall` command installs Sun Cluster software and initializes the node as a new cluster.

   `-F`
   Establishes the node as the first node in a new cluster. All `-F` options can be used when installing a single-node cluster.

   `-o`
   Specifies that only one node is being installed for a single-node cluster. The `-o` option is only legal when used with both the `-i` and the `-F` forms of the command. When the `-o` option is used, cluster installation mode is preset to the disabled state.

   `-M patchdir=`*dirname*`[,patchlistfile=`*filename*`]`
   Specifies the path to patch information so that the specified patches can be installed by using the `scinstall` command. If you do not specify a patch-list file, the `scinstall` command installs all the patches in the directory *dirname*, including tarred, jarred, and zipped patches.

   The `-M` option is not required with the `scinstall -iFo` command. The `-M` option is shown in this procedure because it is the most efficient method of installing patches during a single-node cluster installation. However, you can use any method that you prefer to install patches.

6. **Reboot the node.**

   The reboot after Sun Cluster software installation establishes the node as the cluster.

7. **Verify the installation by using the `scstat` command.**

   ```
   # scstat -n
   ```

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

8. **Set up the name-service look-up order.**

   Go to "How to Configure the Name-Service Switch" on page 93.

Tip – You can expand a single-node cluster into a multinode cluster by following the appropriate procedures provided in "Adding and Removing a Cluster Node" in *Sun Cluster 3.1 10/03 System Administration Guide*.

Example—Installing Sun Cluster Software on a Single-Node Cluster

The following example shows how to use the `scinstall` and `scstat` commands to install and verify a single-node cluster. The example includes installation of all patches. See the `scinstall`(1M) and `scstat`(1M) man pages for details.

```
# scinstall -iFo -M patchdir=/var/cluster/patches

Checking device to use for global devices file system ... done
** Installing SunCluster 3.1 framework **
...
Installing patches ... done

Initializing cluster name to "phys-schost-1" ... done
Initializing authentication options ... done

Setting the node ID for "phys-schost-1" ... done (id=1)

Checking for global devices global file system ... done
Updating vfstab ... done

Verifying that "cluster" is set for "hosts" in nsswitch.conf ... done
Adding the "cluster" switch to "hosts" in nsswitch.conf ... done

Verifying that "cluster" is set for "netmasks" in nsswitch.conf ... done
Adding the "cluster" switch to "netmasks" in nsswitch.conf ... done

Verifying that power management is NOT configured ... done

Ensure that the EEPROM parameter "local-mac-address?" is set to "true" ... done

Ensure network routing is disabled ... done

Please reboot this machine.

# reboot
```

```
# scstat -n

-- Cluster Nodes --

                    Node name           Status
                    ---------           ------
  Cluster node:     phys-schost-1       Online
```

▼ How to Configure the Name-Service Switch

Perform this task on each node in the cluster.

1. **Become superuser on the cluster node.**

2. **Edit the `/etc/nsswitch.conf` file.**

   a. **Verify that `cluster` is the first source look-up for the `hosts` and `netmasks` database entries.**

      This order is necessary for Sun Cluster software to function properly. The `scinstall`(1 M) command adds `cluster` to these entries during installation.

   b. **(Optional) To increase availability to data services if the naming service becomes unavailable, change the look-up order of the following entries.**

      - For the `hosts` and `netmasks` database entries, follow `cluster` with `files`.
      - For Sun Cluster HA for NFS, also insert `[SUCCESS=return]` after `cluster files` and before name services.

        ```
        hosts:      cluster files [SUCCESS=return] nis
        ```

        This look-up order ensures that, if the node resolves a name locally, the node does not contact the listed name service(s). Instead, the node returns success immediately.
      - For all other database entries, place `files` first in the look-up order.
      - If the `[NOTFOUND=return]` criterion becomes the last item of an entry after you modify the lookup order, the criterion is no longer necessary. You can either delete the `[NOTFOUND=return]` criterion from the entry or leave the criterion in the entry. A `[NOTFOUND=return]` criterion at the end of an entry is ignored.

   The following example shows partial contents of an `/etc/nsswitch.conf` file. The look-up order for the `hosts` and `netmasks` database entries is first `cluster`, then `files`. The look-up order for other entries begins with `files`. The `[NOTFOUND=return]` criterion is removed from the entries.

   ```
   # vi /etc/nsswitch.conf
   ...
   passwd:     files nis
   ```

```
group:      files nis
...
hosts:      cluster files nis
...
netmasks:   cluster files nis
...
```

See the `nsswitch.conf`(4) man page for more information about `nsswitch.conf` file entries.

3. **Set up your root user's environment.**

   Go to "How to Set Up the Root Environment" on page 94.

▼ How to Set Up the Root Environment

Perform these tasks on each node in the cluster.

Note – In a Sun Cluster configuration, user initialization files for the various shells must verify that they are run from an interactive shell before they attempt to output to the terminal. Otherwise, unexpected behavior or interference with data services might occur. See "Customizing a User's Work Environment" in *System Administration Guide, Volume 1* (Solaris 8) or "Customizing a User's Work Environment" in *System Administration Guide: Basic Administration* (Solaris 9) for more information.

---

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

2. **Modify `PATH` and `MANPATH` entries in the `.cshrc` or `.profile` file.**

   a. **Set the `PATH` to include `/usr/sbin` and `/usr/cluster/bin`. Also include the following volume-manager-specific paths that apply to your configuration:**

Software Product	PATH
VERITAS Volume Manager (VxVM)	`/etc/vx/bin`
VxVM 3.2 GUI	`/opt/VRTSvmsa/bin`
VxVM 3.5 GUI	`/opt/VRTSob/bin`
VERITAS File System (VxFS)	`/opt/VRTSvxfs/sbin`, `/usr/lib/fs/vxfs/bin`, and `/etc/fs/vxfs`

   b. **Set the `MANPATH` to include `/usr/cluster/man`. Also include the following volume-manager-specific paths that apply to your configuration:**

Software Product	MANPATH
Solstice DiskSuite/Solaris Volume Manager	/usr/share/man
VxVM	/opt/VRTS/man
VxVM GUI	/opt/VRTSvmsa/man
VxFS	/opt/VRTS/man

3. **(Optional) For ease of administration, set the same root password on each node, if you have not already done so.**

4. **Repeat Step 1 through Step 3 on each remaining cluster node.**

5. **Install data-service software packages.**

   - To use the `scinstall` utility, go to "How to Install Data-Service Software Packages (`scinstall`)" on page 97.
   - To use the Web Start program to install data services from the Sun Cluster 3.1 10/03 Data Services release, go to "How to Install Data-Service Software Packages (Web Start)" on page 95.

▼ How to Install Data-Service Software Packages (Web Start)

If you install data services from the Sun Cluster 3.1 10/03 Data Services release, you can use the Web Start program to install the packages. To install data services from a an earlier release, follow the procedures in "How to Install Data-Service Software Packages (`scinstall`)" on page 97.

You can run the Web Start program with a command-line interface (CLI) or with a graphical user interface (GUI). The content and sequence of instructions in the CLI and the GUI are similar. For more information about the Web Start program, see the `installer`(1M) man page.

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

2. **(Optional) If you intend to use the Web Start program with a GUI, ensure that the `DISPLAY` environment variable is set.**

3. **Load the Sun Cluster 3.1 Agents CD-ROM into the CD-ROM drive.**

   If the Volume Management daemon `vold`(1M) is running and is configured to manage CD-ROM devices, the daemon automatically mounts the CD-ROM on the `/cdrom/suncluster_3_1_u1` directory.

4. **Change to the directory where the CD-ROM is mounted.**

   # **cd** *cdrom-mount-point*

5. **Start the Web Start program.**

```
# ./installer
```

6. **When you are prompted, select the type of installation.**

   - To install all data services on the CD-ROM, select Typical.
   - To install only a subset of the data services on the CD-ROM, select Custom.

7. **When you are prompted, select the locale to install.**

   - To install only the C locale, select Typical.
   - To install other locales, select Custom.

8. **Follow instructions on the screen to install the data-service packages on the node.**

   After the installation is finished, the Web Start program provides an installation summary. This summary enables you to view logs that the program created during the installation. These logs are located in the `/var/sadm/install/logs` directory.

9. **Exit the Web Start program.**

10. **Unload the Sun Cluster 3.1 Agents CD-ROM from the CD-ROM drive.**

    a. **To ensure that the CD-ROM is not being used, change to a directory that does *not* reside on the CD-ROM.**

    b. **Eject the CD-ROM.**

    ```
    # eject cdrom
    ```

11. **Repeat Step 1 through Step 10 on each remaining cluster node.**

12. **Install any Sun Cluster data-service patches.**

    See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

    You do not have to reboot after you install Sun Cluster data-service patches unless a reboot is specified by the patch special instructions. If a patch instruction requires that you reboot, perform the following steps:

    a. **Shut down the cluster by using the `scshutdown`(1M) command.**

    b. **Reboot each node in the cluster.**

Note – Until cluster installation mode is disabled, only the first-installed node, which established the cluster, has a quorum vote. In an established cluster which is still in installation mode, if the cluster is not shut down before the first-installed node is rebooted, the remaining cluster nodes cannot obtain quorum. The entire cluster then shuts down. Cluster nodes remain in installation mode until the first time you run the `scsetup`(1M) command, during the procedure "How to Perform Postinstallation Setup" on page 99.

---

13. **Perform postinstallation setup and assign quorum votes.**

    Go to "How to Perform Postinstallation Setup" on page 99.

▼ How to Install Data-Service Software Packages (`scinstall`)

Perform this task on each cluster node to install data services. If you install data services from the Sun Cluster 3.1 10/03 Data Services release, you can also use the Web Start program to install the packages. See "How to Install Data-Service Software Packages (Web Start)" on page 95.

Note – You do not need to perform this procedure if you used SunPlex Manager to install Sun Cluster HA for NFS or Sun Cluster HA for Apache, or both, and if you do not intend to install any other data services. Instead, go to "How to Perform Postinstallation Setup" on page 99.

---

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

2. **Insert the Sun Cluster 3.1 Agents CD-ROM into the CD-ROM drive on the node.**

3. **Change to the directory where the CD-ROM is mounted.**

   ```
   # cd cdrom-mount-point
   ```

4. **Start the `scinstall`(1 M) utility.**

   ```
   # 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 the Main Menu.

5. **To add data services, type `3` (Add support for new data services to this cluster node).**

6. **Follow the prompts to select all data services to install.**

   You must install the same set of data-service packages on each node. This requirement applies even if a node is not expected to host resources for an installed data service.

7. **After the data services are installed, exit the `scinstall` utility.**

8. **Unload the Sun Cluster 3.1 Agents CD-ROM from the CD-ROM drive.**

   a. **To ensure that the CD-ROM is not being used, change to a directory that does *not* reside on the CD-ROM.**

   b. **Eject the CD-ROM.**

   ```
   # eject cdrom
   ```

9. **Repeat Step 1 through Step 8 on each cluster node where you are installing data services.**

10. **Install any Sun Cluster data-service patches.**

    See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

    You do not have to reboot after you install Sun Cluster data-service patches unless a reboot is specified by the patch special instructions. If a patch instruction requires that you reboot, perform the following steps:

    a. **Shut down the cluster by using the `scshutdown`(1M) command.**

    b. **Reboot each node in the cluster.**

Note – Until cluster installation mode is disabled, only the first-installed node, which established the cluster, has a quorum vote. In an established cluster which is still in installation mode, if the cluster is not shut down before the first-installed node is rebooted, the remaining cluster nodes cannot obtain quorum. The entire cluster then shuts down. Cluster nodes remain in installation mode until the first time you run the `scsetup`(1M) command, during the procedure "How to Perform Postinstallation Setup" on page 99.

---

11. **Perform postinstallation setup and assign quorum votes.**

    Go to "How to Perform Postinstallation Setup" on page 99.

▼ How to Perform Postinstallation Setup

Perform this procedure one time only, after the cluster is fully formed.

1. **From one node, verify that all nodes have joined the cluster.**

   Run the `scstat`(1M) command to display a list of the cluster nodes. You do not need to be logged in as superuser to run this command.

   ```
   % scstat -n
   ```

   Output resembles the following.

   ```
   -- Cluster Nodes --
                      Node name      Status
                      ---------      ------
     Cluster node:    phys-schost-1  Online
     Cluster node:    phys-schost-2  Online
   ```

2. **On each node, verify device connectivity to the cluster nodes.**

   Run the `scdidadm`(1M) command to display a list of all the devices that the system checks. You do not need to be logged in as superuser to run this command.

   ```
   % scdidadm -L
   ```

   The list on each node should be the same. Output resembles the following.

   ```
   1       phys-schost-1:/dev/rdsk/c0t0d0 /dev/did/rdsk/d1
   2       phys-schost-1:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
   2       phys-schost-2:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
   3       phys-schost-1:/dev/rdsk/c1t2d0 /dev/did/rdsk/d3
   3       phys-schost-2:/dev/rdsk/c1t2d0 /dev/did/rdsk/d3
   ...
   ```

3. **Determine the global device-ID name of each shared disk that you are configuring as a quorum device.**

   Use the `scdidadm` output from Step 2 to identify the device–ID name of each shared disk that you are configuring as a quorum device. For example, the output in Step 2 shows that global device `d2` is shared by `phys-schost-1` and `phys-schost-2`. You use this information in Step 8. See "Quorum Devices" on page 24 for further information about planning quorum devices.

4. **Are you adding a new node to an existing cluster?**

   - If no, proceed to Step 5.
   - If yes, you might need to update the quorum configuration to accommodate your cluster's new configuration. See the *Sun Cluster 3.1 10/03 Concepts Guide* for information about quorum. To change the quorum configuration, follow procedures in "Administering Quorum" in *Sun Cluster 3.1 10/03 System Administration Guide*.

     When the quorum configuration is satisfactory, skip to Step 12.

5. **Did you use SunPlex Manager to install Sun Cluster software?**

- If no, proceed to Step 6.
- If yes, skip to Step 12. During Sun Cluster installation, SunPlex Manager assigns quorum votes and removes the cluster from installation mode for you.

6. **Become superuser on one node of the cluster.**

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

```
# scsetup
```

The Initial Cluster Setup screen is displayed.

Note – If the Main Menu is displayed instead, initial cluster setup was already successfully performed. Skip to Step 12.

If the quorum setup process is interrupted or fails to be completed successfully, rerun `scsetup`.

8. **At the prompt `Do you want to add any quorum disks?`, configure at least one shared quorum device if your cluster is a two-node cluster.**

   If your cluster has three or more nodes, quorum device configuration is optional.

9. **At the prompt `Is it okay to reset "installmode"?`, answer `Yes`.**

   After the `scsetup` utility sets the quorum configurations and vote counts for the cluster, the message `Cluster initialization is complete` is displayed. The utility returns you to the Main Menu.

10. **Quit the `scsetup` utility.**

11. **From any node, verify the device and node quorum configurations.**

```
% scstat -q
```

12. **From any node, verify that cluster installation mode is disabled.**

    You do not need to be superuser to run this command.

```
% scconf -p | grep "install mode"
Cluster install mode:
                                disabled
```

13. **Do you intend to use VERITAS File System (VxFS) software?**

    - If no, proceed to Step 2.
    - 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, if VxFS software is not already installed.**

b. **In the `/etc/system` file on each node, set the value for the `rpcmod:svc_default_stksize` variable to `0x8000` and set the value of the `lwp_default_stksize` variable to `0x6000`.**

```
set rpcmod:svc_default_stksize=0x8000
set lwp_default_stksize=0x6000
```

Sun Cluster software requires a minimum `rpcmod:svc_default_stksize` setting of `0x8000`. Because VxFS installation changes the value of the `rpcmod:svc_default_stksize` variable to `0x4000`, you must manually change the value back to `0x8000` after VxFS installation is complete.

Also, you must set the `lwp_default_stksize` variable in the `/etc/system` file to override the VxFS default value of `0x4000`.

14. Install volume management software.

- To install Solstice DiskSuite software or configure Solaris Volume Manager software, go to "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170.
- To install VERITAS Volume Manager software, go to "Installing and Configuring VxVM Software" on page 203.

▼ How to Uninstall Sun Cluster Software to Correct Installation Problems

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 installation mode (see Step 12 of "How to Perform Postinstallation Setup" on page 99), do not perform this procedure. Instead, go to "How to Uninstall Sun Cluster Software From a Cluster Node" in "Adding and Removing a Cluster Node" in *Sun Cluster 3.1 10/03 System Administration Guide*.

---

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

   You can correct certain failed installations simply by repeating 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 that you are uninstalling.**

3. **From the active cluster member, add the node that you intend to uninstall to the cluster 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 "Adding and Removing a Cluster Node" in *Sun Cluster 3.1 10/03 System Administration Guide* for procedures.

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

5. **Reboot the node into noncluster mode.**

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

6. **Uninstall the node.**

   Run the `scinstall` command from a directory that does not contain any files that are delivered by the Sun Cluster packages.

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

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

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

   Refer to Table 2–1 for the list of all installation tasks and the order in which to perform the tasks.

Configuring the Cluster

The following table lists the tasks to perform to configure your cluster. Before you start to perform these tasks, ensure that you completed the following tasks.

- Cluster framework installation as described in "Installing the Software" on page 36
- Volume manager installation and configuration as described in "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 or "Installing and Configuring VxVM Software" on page 203

TABLE 2–4 Task Map: Configuring the Cluster

Task	Instructions
Create and mount cluster file systems.	"How to Add Cluster File Systems" on page 103

TABLE 2–4 Task Map: Configuring the Cluster *(Continued)*

Task	Instructions
Configure IP Network Multipathing groups.	"How to Configure Internet Protocol (IP) Network Multipathing Groups" on page 107
(Optional) Change a node's private hostname.	"How to Change Private Hostnames" on page 108
Create or modify the NTP configuration file.	"How to Configure Network Time Protocol (NTP)" on page 109
(Optional) Install the Sun Cluster module to Sun Management Center software.	"Installing the Sun Cluster Module for Sun Management Center" on page 112 Sun Management Center documentation
Install third-party applications and configure the applications, data services, and resource groups.	*Sun Cluster 3.1 Data Service Planning and Administration Guide* Third-party application documentation

▼ How to Add Cluster File Systems

Perform this procedure for each cluster file system that 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 erase data that you might not intend to delete.

If you used SunPlex Manager to install data services, SunPlex Manager might have already created one or more cluster file systems.

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

   For volume-manager installation procedures, see "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" on page 170 or "Installing and Configuring VxVM Software" on page 203.

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

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

3. **Create a file system.**

- For a VxFS file system, follow procedures that are 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.

Volume Manager	Sample Disk Device Name	Description
Solstice DiskSuite/Solaris Volume Manager	`/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`

4. **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 is not 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

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

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

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

   Note – Logging is required for all cluster file systems.

- **Solaris UFS logging –** Use the `global,logging` mount options. For use by Oracle Parallel Server/Real Application Clusters RDBMS data files, log files, and control files, also use the `forcedirectio` mount option. 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. If a `write()` succeeds, then this mount option ensures that sufficient space is on the disk.
- If you do not specify `syncdir`, the same behavior occurs 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.

You see `ENOSPC` on close only during a very short time after a failover. With `syncdir` (and POSIX behavior), the out-of-space condition would be discovered before the close.

- **Solstice DiskSuite trans metadevice or Solaris Volume Manager transactional volume –** Use the `global` mount option only. Do **not** use the `logging` mount option.

Note – Solaris Volume Managertransactional-volume logging (formerly Solstice DiskSuite trans-metadevice logging) is scheduled to be removed from the Solaris operating environment in an upcoming Solaris release. Solaris UFS logging provides the same capabilities but superior performance, as well as lower system administration requirements and overhead.

See your Solstice DiskSuite documentation for information about setting up trans metadevices, or see your Solaris Volume Manager documentation for information about setting up transactional volumes.

- **VxFS logging –** Use the `global, log` mount options. See the VxFS `mount_vxfs` man page and "Administering Cluster File Systems Overview" in *Sun Cluster 3.1 10/03 System Administration Guide* 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`.

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

```
# sccheck
```

If no errors occur, nothing is returned.

7. **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.

---

8. **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.

Note – 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.

---

9. **Configure IP Network Multipathing groups.**

Go to "How to Configure Internet Protocol (IP) Network Multipathing Groups" on page 107.

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 Configure Internet Protocol (IP) Network Multipathing Groups

Perform this task on each node of the cluster. If you used SunPlex Manager to install Sun Cluster HA for Apache or Sun Cluster HA for NFS, SunPlex Manager configured IP Network Multipathing groups for the public network adapters those data services use. You must configure IP Network Multipathing groups for the remaining public network adapters.

Note – All public network adapters *must* belong to an IP Network Multipathing group.

---

1. **Have available your completed "Public Networks Worksheet" on page 158.**
2. **Configure IP Network Multipathing groups.**

   Perform procedures for IPv4 addresses in "Deploying Network Multipathing" in *IP Network Multipathing Administration Guide* (Solaris 8) or"Administering Network Multipathing (Task)" in *System Administration Guide: IP Services* (Solaris 9).

   Follow these additional guidelines to configure IP Network Multipathing groups in a Sun Cluster configuration:

   - Each public network adapter must belong to a multipathing group.

- For multipathing groups that contain two or more adapters, you must configure a test IP address for each adapter in the group. If a multipathing group contains only one adapter, you do not need to configure a test IP address.
- Test IP addresses for all adapters in the same multipathing group must belong to a single IP subnet.
- Test IP addresses must not be used by normal applications because the test IP addresses are not highly available.
- In the `/etc/default/mpathd` file, do no change the value of `TRACK_INTERFACES_ONLY_WITH_GROUPS` from `yes` to `no`.
- The name of a multipathing group has no requirements or restrictions.

3. **Do you intend to change any private hostnames?**
   - If no, proceed to Step 4.
   - If yes, go to "How to Change Private Hostnames" on page 108.
4. **Did you install your own `/etc/inet/ntp.conf` file before you installed Sun Cluster software?**
   - If yes, proceed to Step 5.
   - If no, go to "How to Configure Network Time Protocol (NTP)" on page 109 to install or create the NTP configuration file.
5. **Do you intend to use Sun Management Center to monitor the cluster?**
   - If yes, go to "Installing the Sun Cluster Module for Sun Management Center" on page 112.
   - If no, install third-party applications, register resource types, set up resource groups, and configure data services. Follow procedures in the *Sun Cluster 3.1 Data Service Planning and Administration Guide* and in the documentation that is supplied with your application software.

▼ How to Change Private Hostnames

Perform this task if you do not want to use the default private hostnames, `clusternode`*nodeid*`-priv`, that are assigned during Sun Cluster software installation.

Note – Do *not* perform this procedure after applications and data services have been configured and have been started. Otherwise, an application or data service might continue to use the old private hostname after the hostname is renamed, which would cause hostname conflicts. If any applications or data services are running, stop them before you perform this procedure.

---

1. **Become superuser on a node in the cluster.**
2. **Start the `scsetup`(1M) utility.**

   ```
   # scsetup
   ```

3. **To work with private hostnames, type `5` (Private hostnames).**
4. **To change a private hostname, type `1` (Change a private hostname).**
5. **Follow the prompts to change the private hostname.**

   Repeat for each private hostname to change.

6. **Verify the new private hostnames.**

   ```
   # scconf -pv | grep "private hostname"
   (phys-schost-1) Node private hostname:      phys-schost-1-priv
   (phys-schost-3) Node private hostname:      phys-schost-3-priv
   (phys-schost-2) Node private hostname:      phys-schost-2-priv
   ```

7. **Did you install your own `/etc/inet/ntp.conf` file before you installed Sun Cluster software?**
   - If yes, proceed to Step 8.
   - If no, go to "How to Configure Network Time Protocol (NTP)" on page 109 to install or create the NTP configuration file.
8. **Do you intend to use Sun Management Center to monitor the cluster?**
   - If yes, go to "Installing the Sun Cluster Module for Sun Management Center" on page 112.
   - If no, install third-party applications, register resource types, set up resource groups, and configure data services. See the documentation that is supplied with the application software and the *Sun Cluster 3.1 Data Service Planning and Administration Guide*.

▼ How to Configure Network Time Protocol (NTP)

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, as well as 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 if this basic requirement for synchronization is met.

See the *Sun Cluster 3.1 10/03 Concepts Guide* 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, proceed 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 no, proceed to Step 4.
   - 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.

     ---
4. **On one node of the cluster, edit the private hostnames in the `/etc/inet/ntp.conf.cluster` file.**

   Sun Cluster software creates the `/etc/inet/ntp.conf.cluster` file as the NTP configuration file if an `/etc/inet/ntp.conf` file is not already present on the node.

   Note – Do not rename the `ntp.conf.cluster` file as `ntp.conf`.

   If the `/etc/inet/ntp.conf.cluster` file 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.**

   The `ntp.conf.cluster` file might contain nonexistent private hostnames. When a node is rebooted, the system generates error messages as the node attempts to contact those nonexistent private hostnames.

c. **If you changed any 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 configuration 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.**

   - If you use the `ntp.conf.cluster` file, 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 the `ntp.conf` file does not exist but the `ntp.conf.cluster` file does exist, the script starts the NTP daemon by using the `ntp.conf.cluster` file as the NTP configuration file.

   - If you use the `ntp.conf` file, run the following command:

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

8. **Do you intend to use Sun Management Center to monitor the cluster?**

   - If yes, go to "Installing the Sun Cluster Module for Sun Management Center" on page 112.
   - If no, install third-party applications, register resource types, set up resource groups, and configure data services. See the documentation that is supplied with the application software and the *Sun Cluster 3.1 Data Service Planning and Administration Guide*.

Installing the Sun Cluster Module for Sun Management Center

The following table lists the tasks to perform to install the Sun Cluster–module software for Sun Management Center.

TABLE 2–5 Task Map: Installing the Sun Cluster Module for Sun Management Center

Task	Instructions
Install Sun Management Center server, help-server, agent, and console packages.	Sun Management Center documentation "Installation Requirements for Sun Cluster Monitoring" on page 112
Install Sun Cluster–module packages.	"How to Install the Sun Cluster Module for Sun Management Center" on page 113
Start Sun Management Center server, console, and agent processes.	"How to Start Sun Management Center" on page 114
Add each cluster node as a Sun Management Center agent host object.	"How to Add a Cluster Node as a Sun Management Center Agent Host Object" on page 114
Load the Sun Cluster module to begin to monitor the cluster.	"How to Load the Sun Cluster Module" on page 115

Installation Requirements for Sun Cluster Monitoring

The Sun Cluster module for Sun Management Center is used to monitor a Sun Cluster configuration. Perform the following tasks before you install the Sun Cluster module packages.

- **Space requirements –** Ensure that 25 Mbytes of space is available on each cluster node for Sun Cluster–module packages.
- **Sun Management Center packages –** You must install the Sun Management Center server, help–server, and console packages on noncluster nodes, and you must install the Sun Management Center agent package on each cluster node.

  If you have an administrative console or other dedicated machine, you can realize improved performance. Just run the console process on the administrative console and the server process on a separate machine.

  Follow procedures in your Sun Management Center documentation to install the Sun Management Center packages.

- **Simple Network Management Protocol (SNMP) port –** When you install Sun Management Center on an agent machine (cluster node), choose whether to use the default of `161` for the agent (SNMP) communication port or another number. This port number enables the server to communicate with this agent. Record the port number that you choose for reference later when you configure the cluster nodes for monitoring.

▼ How to Install the Sun Cluster Module for Sun Management Center

Perform this procedure to install the Sun Cluster–module server and help–server packages.

Note – The Sun Cluster–module agent packages, `SUNWscsal` and `SUNWscsam`, were added to cluster nodes during Sun Cluster software installation.

---

1. **Ensure that all Sun Management Center core packages are installed on the appropriate machines.**

   This step includes installing Sun Management Center agent packages on each cluster node. See your Sun Management Center documentation for installation instructions.

2. **On the server machine, install the Sun Cluster–module server package `SUNWscssv`.**

   a. **Become superuser.**

   b. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive.**

   c. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Packages` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

   The following example uses the path to the Solaris 8 version of Sun Cluster software.

   ```
   # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_8/Packages
   ```

   d. **Install the Sun Cluster–module server package.**

   ```
   # pkgadd -d . SUNWscssv
   ```

   e. **Change to the CD-ROM root directory, then eject the CD-ROM.**

3. **On the help-server machine, install the Sun Cluster–module help–server package `SUNWscshl`.**

   Use the same procedure as in the previous step.

4. **Install any Sun Cluster–module patches.**

   See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

5. **Start Sun Management Center.**

   Go to "How to Start Sun Management Center" on page 114.

▼ How to Start Sun Management Center

Perform this procedure to start the Sun Management Center server, agent, and console processes.

1. **As superuser, on the Sun Management Center server machine, start the Sun Management Center server process.**

   ```
   # /opt/SUNWsymon/sbin/es-start -S
   ```

2. **As superuser, on each Sun Management Center agent machine (cluster node), start the Sun Management Center agent process.**

   ```
   # /opt/SUNWsymon/sbin/es-start -a
   ```

3. **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
   ```

4. **On the Sun Management Center console machine (administrative console), start the Sun Management Center console.**

   You do not need to be superuser to start the console process.

   ```
   % /opt/SUNWsymon/sbin/es-start -c
   ```

5. **Type your login name, password, and server hostname and click Login.**

6. **Add cluster nodes as monitored host objects.**

   Go to "How to Add a Cluster Node as a Sun Management Center Agent Host Object" on page 114.

▼ How to Add a Cluster Node as a Sun Management Center Agent Host Object

Perform this procedure to create a Sun Management Center agent host object for a cluster node.

Note – You need only one cluster node host object to use Sun Cluster–module monitoring and configuration functions for the entire cluster. However, if that cluster node becomes unavailable, connection to the cluster through that host object also becomes unavailable. Then you need another cluster-node host object to reconnect to the cluster.

---

1. **From the Sun Management Center main window, select a domain from the Sun Management Center Administrative Domains pull-down list.**

   This domain contains the Sun Management Center agent host object that you create. During Sun Management Center software installation, a Default Domain was automatically created for you. You can use this domain, select another existing domain, or create a new domain.

   See your Sun Management Center documentation for information about how to create Sun Management Center domains.

2. **Choose Edit⇒Create an Object from the pull-down menu.**

3. **Click the Node tab.**

4. **From the Monitor Via pull-down list, select Sun Management Center Agent - Host.**

5. **Fill in the name of the cluster node, for example, `phys-schost-1`, in the Node Label and Hostname text fields.**

   Leave the IP text field blank. The Description text field is optional.

6. **In the Port text field, type the port number that you chose when you installed the Sun Management Center agent machine.**

7. **Click OK.**

   A Sun Management Center agent host object is created in the domain.

8. **Load the Sun Cluster module.**

   Go to "How to Load the Sun Cluster Module" on page 115.

▼ How to Load the Sun Cluster Module

Perform this procedure to start cluster monitoring.

1. **In the Sun Management Center main window, right–click the icon of a cluster node.**

   The pull-down menu is displayed.

2. **Choose Load Module.**

The Load Module window lists each available Sun Management Center module and whether the module is currently loaded.

3. **Choose Sun Cluster: Not Loaded and click OK.**

   The Module Loader window shows the current parameter information for the selected module.

4. **Click OK.**

   After a few moments, the module is loaded. A Sun Cluster icon is then displayed in the Details window.

5. **In the Details window under the Operating System category, expand the Sun Cluster subtree in either of the following ways:**

   - In the tree hierarchy on the left side of the window, place the cursor over the Sun Cluster–module icon and single-click the left mouse button.
   - In the topology view on the right side of the window, place the cursor over the Sun Cluster –module icon and double-click the left mouse button.

6. **See the Sun Cluster–module online help for information about how to use Sun Cluster–module features.**

   - To view online help for a specific Sun Cluster–module item, place the cursor over the item. Then click the right mouse button and select Help from the pop-up menu.
   - To access the home page for the Sun Cluster–module online help, place the cursor over the Cluster Info icon. Then click the right mouse button and select Help from the pop-up menu.
   - To directly access the home page for the Sun Cluster–module online help, click the Sun Management Center Help button to launch the help browser. Then go to the following URL:

     file:/opt/SUNWsymon/lib/locale/C/help/main.top.html

Note – The Help button in the Sun Management Center browser accesses online help for Sun Management Center, not the topics specific to the Sun Cluster module.

See Sun Management Center online help and your Sun Management Center documentation for information about how to use Sun Management Center.

7. **Install third-party applications, register resource types, set up resource groups, and configure data services.**

   See the documentation that is supplied with the application software and the *Sun Cluster 3.1 Data Service Planning and Administration Guide*.

CHAPTER 3

Upgrading Sun Cluster Software

This chapter provides the following step-by-step procedures to upgrade a Sun Cluster 3.x configuration to Sun Cluster 3.1 10/03 software:

Overview of Upgrading a Sun Cluster Configuration

This section provides the following guidelines to upgrade a Sun Cluster configuration:

Upgrade Requirements and Restrictions

Observe the following requirements and restrictions when you upgrade to Sun Cluster 3.1 10/03 software:

- The cluster must run on or be upgraded to at least Solaris 8 2/02 software, including the most current required patches.
- The cluster hardware must be a supported configuration for Sun Cluster 3.1 10/03 software. Contact your Sun representative for information about current supported Sun Cluster configurations.
- You must upgrade all software to a version that is supported by Sun Cluster 3.1 10/03 software. For example, you must upgrade a data service that is supported on Sun Cluster 3.0 software but is not supported on Sun Cluster 3.1 10/03 software to the version of that data service that is supported on Sun Cluster 3.1 10/03 software. If the related application is not supported on Sun Cluster 3.1 10/03 software, you must also upgrade that application to a supported release.
- The `scinstall` upgrade utility only upgrades those data services that are provided with Sun Cluster 3.1 10/03 software. You must manually upgrade any custom or third-party data services.
- For upgrade from a Sun Cluster 3.0 release, have available the test IP addresses to use with your public network adapters when NAFO groups are converted to Internet Protocol (IP) Network Multipathing groups. The `scinstall` upgrade utility prompts you for a test IP address for each public network adapter in the cluster. A test IP address must be on the same subnet as the primary IP address for the adapter.

  See the *IP Network Multipathing Administration Guide* (Solaris 8) or *System Administration Guide: IP Services* (Solaris 9) for information about test IP addresses for IP Network Multipathing groups.
- Sun Cluster 3.1 10/03 software supports only nonrolling upgrade from Solaris 8 software to Solaris 9 software.
- Sun Cluster 3.1 10/03 software supports direct upgrade only from Sun Cluster 3.x software.
- Sun Cluster 3.1 10/03 software does not support any downgrade of Sun Cluster software.

Choosing a Sun Cluster Upgrade Method

Choose one of the following methods to upgrade your cluster to Sun Cluster 3.1 10/03 software:

- **Nonrolling upgrade –** In a *nonrolling upgrade*, you shut down the cluster before you upgrade the cluster nodes. You return the cluster to production after all nodes are fully upgraded. You **must** use the nonrolling-upgrade method if one or more of the following conditions apply:

- You are upgrading from Sun Cluster 3.0 software.
- You are upgrading from Solaris 8 software to Solaris 9 software.
- Any software products you are upgrading, such as applications or databases, require that the same version of the software is running on all cluster nodes.

- **Rolling upgrade –** In a *rolling upgrade*, you upgrade one node of the cluster at a time. The cluster remains in production with services running on the other nodes. You can use the rolling-upgrade method only if **all** of the following conditions apply:
  - You are upgrading from Sun Cluster 3.1 software.
  - You are upgrading Solaris software only to a Solaris Update release, if at all.
  - For any applications or databases you must upgrade, the current version of the software can coexist in a running cluster with the upgrade version of that software.

If your cluster configuration meets the requirements to perform a rolling upgrade, you can still choose to perform a nonrolling upgrade instead.

For overview information about planning your Sun Cluster 3.1 10/03 configuration, see Chapter 1.

Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)

Perform the following tasks to perform a nonrolling upgrade from Sun Cluster 3.x software to Sun Cluster 3.1 10/03 software. In a nonrolling upgrade, you shut down the entire cluster before you upgrade the cluster nodes. This procedure also enables you to upgrade the cluster from Solaris 8 software to Solaris 9 software.

Note – To perform a rolling upgrade to Sun Cluster 3.1 10/03 software, instead perform the procedures in "Upgrading to Sun Cluster 3.1 10/03 Software (Rolling)" on page 134.

TABLE 3–1 Task Map: Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)

Task	Instructions
1. Read the upgrade requirements and restrictions.	"Upgrade Requirements and Restrictions" on page 118

TABLE 3–1 Task Map: Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling) *(Continued)*

Task	Instructions
2. Take the cluster out of production, disable resources, and back up shared data and system disks.	"How to Prepare the Cluster for Upgrade (Nonrolling)" on page 120
3. Upgrade the Solaris software, if necessary, to a supported Solaris update release. Optionally, upgrade VERITAS Volume Manager (VxVM).	"How to Upgrade the Solaris Operating Environment (Nonrolling)" on page 123
4. Upgrade to Sun Cluster 3.1 10/03 framework and data-service software. If necessary, upgrade applications. If you upgraded VxVM, upgrade disk groups.	"How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 125
5. (*Optional*) Upgrade the Sun Cluster module to Sun Management Center, if needed.	"How to Upgrade Sun Cluster–Module Software for Sun Management Center (Nonrolling)" on page 132
6. Reregister resource types, enable resources, and bring resource groups online.	"How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 132

▼ How to Prepare the Cluster for Upgrade (Nonrolling)

Before you upgrade the software, perform the following steps to take the cluster out of production:

1. **Ensure that the configuration meets requirements for upgrade.**

   See "Upgrade Requirements and Restrictions" on page 118.

2. **Have available the CD-ROMs, documentation, and patches for all software products you are upgrading.**

   - Solaris 8 or Solaris 9 operating environment
   - Sun Cluster 3.1 10/03 framework
   - Sun Cluster 3.1 10/03 data services (agents)
   - Applications that are managed by Sun Cluster 3.1 10/03 data-service agents
   - VERITAS Volume Manager

   See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

3. **(Optional) Install Sun Cluster 3.1 10/03 documentation.**

   Install the documentation packages on your preferred location, such as an administrative console or a documentation server. See the `index.html` file at the top level of the Sun Cluster 3.1 10/03 CD-ROM to access installation instructions.

4. **Are you upgrading from Sun Cluster 3.0 software?**
   - If no, proceed to Step 5.
   - If yes, have available your list of test IP addresses, one for each public network adapter in the cluster.

     A test IP address is required for each public network adapter in the cluster, regardless of whether the adapter is the active adapter or the backup adapter in the group. The test IP addresses will be used to reconfigure the adapters to use IP Network Multipathing.

     Note – Each test IP address must be on the same subnet as the existing IP address that is used by the public network adapter.

     To list the public network adapters on a node, run the following command:

     ```
     % pnmstat
     ```

     See the *IP Network Multipathing Administration Guide* (Solaris 8) or *System Administration Guide: IP Services* (Solaris 9) for more information about test IP addresses for IP Network Multipathing.

5. **Notify users that cluster services will be unavailable during upgrade.**

6. **Ensure that the cluster is functioning normally.**
   - To view the current status of the cluster, run the following command from any node:

     ```
     % scstat
     ```

     See the `scstat`(1M) man page for more information.
   - Search the `/var/adm/messages` log on the same node for unresolved error messages or warning messages.
   - Check volume-manager status.

7. **Become superuser on a node of the cluster.**

8. **Switch each resource group offline.**

   ```
   # scswitch -F -g resource-group
   ```

-F	Switches a resource group offline
-g *resource-group*	Specifies the name of the resource group to take offline

9. **Disable all resources in the cluster.**

   The disabling of resources before upgrade prevents the cluster from bringing the resources online automatically if a node is mistakenly rebooted into cluster mode.

Note – If you are upgrading from a Sun Cluster 3.1 release, you can use the `scsetup`(1M) utility instead of the command line. From the Main Menu, choose Resource Groups, then choose Enable/Disable Resources.

---

a. **From any node, list all enabled resources in the cluster.**

```
# scrgadm -pv | grep "Res enabled"
```

b. **Identify those resources that depend on other resources.**

You must disable dependent resources first before you disable the resources that they depend on.

c. **Disable each enabled resource in the cluster.**

```
scswitch -n -j resource
```

-n	Disables
-j *resource*	Specifies the resource

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

10. **Move each resource group to the unmanaged state.**

```
# scswitch -u -g resource-group
```

-u	Moves the specified resource group to the unmanaged state
-g *resource-group*	Specifies the name of the resource group to move into the unmanaged state

11. **Verify that all resources on all nodes are disabled and that all resource groups are in the unmanaged state.**

```
# scstat -g
```

12. **Stop all databases that are running on each node of the cluster.**

13. **Ensure that all shared data is backed up.**

14. **From one node, shut down the cluster.**

```
# scshutdown
ok
```

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

15. **Boot each node into noncluster mode.**

```
ok boot -x
```

16. **Ensure that each system disk is backed up.**

17. **Determine whether to upgrade the Solaris operating environment.**

    - If Sun Cluster 3.1 10/03 software does not support the release of the Solaris environment that you currently run on your cluster, you must upgrade the Solaris software to a supported release. Go to "How to Upgrade the Solaris Operating Environment (Nonrolling)" on page 123.
    - If your cluster configuration already runs on a release of the Solaris environment that supports Sun Cluster 3.1 10/03 software, further Solaris software upgrade is optional.
        - To upgrade Sun Cluster software, go to "How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 125.
        - To upgrade Solaris software, go to "How to Upgrade the Solaris Operating Environment (Nonrolling)" on page 123.

    See "Supported Products" in *Sun Cluster 3.1 10/03 Release Notes* for more information.

▼ How to Upgrade the Solaris Operating Environment (Nonrolling)

Perform this procedure on each node in the cluster to upgrade the Solaris operating environment. If the cluster already runs on a version of the Solaris environment that supports Sun Cluster 3.1 10/03 software, this procedure is optional.

Note – The cluster must already run on, or be upgraded to, at least the minimum required level of the Solaris 8 or Solaris 9 environment to support Sun Cluster 3.1 10/03 software. See "Supported Products" in *Sun Cluster 3.1 10/03 Release Notes* for more information.

---

1. **Ensure that all steps in "How to Prepare the Cluster for Upgrade (Nonrolling)" on page 120 are completed.**

2. **Become superuser on the cluster node to upgrade.**

3. **Determine whether the following Apache links already exist, and if so, whether the file names contain an uppercase K or S:**

```
/etc/rc0.d/K16apache
/etc/rc1.d/K16apache
/etc/rc2.d/K16apache
/etc/rc3.d/S50apache
/etc/rcS.d/K16apache
```

    - If these links already exist and do contain an uppercase K or S in the file name, no further action is necessary for these links.

- If these links do not exist, or if these links exist but instead contain a lowercase k or s in the file name, you move aside these links in Step 8.

4. **Comment out all entries for globally mounted file systems in the `/etc/vfstab` file.**

   a. **Make a record of all entries that are already commented out for later reference.**

   b. **Temporarily comment out all entries for globally mounted file systems in the `/etc/vfstab` file.**

      Entries for globally mounted file systems contain the `global` mount option. Comment out these entries to prevent the Solaris upgrade from attempting to mount the global devices.

5. **Determine which procedure to follow to upgrade the Solaris operating environment.**

Volume Manager	Procedure to Use	Location of Instructions
Solstice DiskSuite/Solaris Volume Manager	Upgrading Solaris software	Solaris 8 or Solaris 9 installation documentation
VERITAS Volume Manager	Upgrading VxVM and Solaris software	VERITAS Volume Manager installation documentation

6. **Upgrade the Solaris software, following the procedure you selected in Step 5.**

Note – Ignore the instruction to reboot at the end of the Solaris software upgrade process. You must first perform Step 7 and Step 8, then reboot into noncluster mode in Step 9 to complete Solaris software upgrade.

If you are instructed to reboot a node at other times during the upgrade process, always add the `-x` option to the command. This option ensures that the node reboots into noncluster mode. For example, either of the following two commands boot a node into single-user noncluster mode:

```
# reboot -- -xs
ok boot -xs
```

---

7. **In the `/a/etc/vfstab` file, uncomment those entries for globally mounted file systems that you commented out in Step 4.**

8. **If the Apache links in Step 3 did not already exist or if they contained a lowercase k or s in the file names *before* you upgraded the Solaris software, move aside the restored Apache links.**

Use the following commands to rename the files with a lowercase k or s:

```
# mv /a/etc/rc0.d/K16apache /a/etc/rc0.d/k16apache
# mv /a/etc/rc1.d/K16apache /a/etc/rc1.d/k16apache
# mv /a/etc/rc2.d/K16apache /a/etc/rc2.d/k16apache
# mv /a/etc/rc3.d/S50apache /a/etc/rc3.d/s50apache
# mv /a/etc/rcS.d/K16apache /a/etc/rcS.d/k16apache
```

9. **Reboot the node into noncluster mode.**

   Include the double dashes (--) in the following command:

   ```
   # reboot -- -x
   ```

10. **Install any required Solaris software patches and hardware-related patches, and download any needed firmware that is contained in the hardware patches.**

    For Solstice DiskSuite software (Solaris 8), also install any Solstice DiskSuite software patches.

    Note – Do not reboot after you add patches. You reboot the node after you upgrade the Sun Cluster software.

    See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

11. **Upgrade to Sun Cluster 3.1 10/03 software.**

    Go to "How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 125.

    Note – To complete upgrade from Solaris 8 to Solaris 9 software, you must also upgrade to the Solaris 9 version of Sun Cluster 3.1 10/03 software, even if the cluster already runs on Sun Cluster 3.1 10/03 software.

▼ How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)

This procedure describes how to upgrade the cluster to Sun Cluster 3.1 10/03 software. You must also perform this procedure to complete cluster upgrade from Solaris 8 to Solaris 9 software.

Tip – You can perform this procedure on more than one node at the same time.

---

1. **Ensure that all steps in "How to Prepare the Cluster for Upgrade (Nonrolling)" on page 120 are completed.**

   If you upgraded from Solaris 8 to Solaris 9 software, also ensure that all steps in "How to Upgrade the Solaris Operating Environment (Nonrolling)" on page 123 are completed.

2. **Become superuser on a node of the cluster.**

3. **Ensure that you have installed all required Solaris software patches and hardware-related patches.**

   For Solstice DiskSuite software (Solaris 8), also ensure that you have installed all required Solstice DiskSuite software patches.

4. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive on the node.**

   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_1_u1` directory.

5. **Upgrade the node to Sun Cluster 3.1 10/03 software.**

   a. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Tools` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

   ```
   # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/Tools
   ```

   b. **Upgrade the cluster framework software.**

   - To upgrade from Sun Cluster 3.0 software, run the following command:

     ```
     # ./scinstall -u update -S interact -M patchdir=dirname
     ```

     `-S`
     Specifies the test IP addresses to use to convert NAFO groups to IP Network Multipathing groups

     `interact`
     Specifies that `scinstall` prompts the user for each test IP address needed

     `-M patchdir=`*dirname*`[,patchlistfile=`*filename*`]`
     Specifies the path to patch information so that the specified patches can be installed using the `scinstall` command. If you do not specify a patch-list file, the `scinstall` command installs all the patches in the directory *dirname*, including tarred, jarred, and zipped patches.

     The `-M` option is not required. You can use any method you prefer for installing patches.

   - To upgrade from Sun Cluster 3.1 software, run the following command:

     ```
     # ./scinstall -u update -M patchdir=dirname
     ```

`-M patchdir=`*dirname*`[,patchlistfile=`*filename*`]`
Specifies the path to patch information so that the specified patches can be installed using the `scinstall` command. If you do not specify a patch-list file, the `scinstall` command installs all the patches in the directory *dirname*, including tarred, jarred, and zipped patches.

The `-M` option is not required. You can use any method you prefer for installing patches.

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

Tip – If upgrade processing is interrupted, use the `scstat`(1M) command to ensure that the node is in noncluster mode (`Offline`), then restart the `scinstall` command.

```
# scstat -n
-- Cluster Nodes --
                    Node name      Status
                    ---------      ------
  Cluster node:     nodename       Offline
  Cluster node:     nodename       Offline
```

See the `scinstall`(1M) man page for more information. See the *IP Network Multipathing Administration Guide* (Solaris 8) or *System Administration Guide: IP Services* (Solaris 9) for information about test addresses for IP Network Multipathing.

Note – Sun Cluster 3.1 software requires at least version 3.5.1 of Sun Explorer software. Upgrade to Sun Cluster software includes installing Sun Explorer data collector software, to be used in conjunction with the `sccheck` utility. If another version of Sun Explorer software was already installed before Sun Cluster upgrade, it is replaced by the version that is provided with Sun Cluster software. Options such as user identity and data delivery are preserved, but `crontab` entries must be manually recreated.

During Sun Cluster upgrade, `scinstall` might make one or more of the following configuration changes:

- Convert NAFO groups to IP Network Multipathing groups but keep the original NAFO-group name.
- Rename the `ntp.conf` file to `ntp.conf.cluster`, if `ntp.conf.cluster` does not already exist on the node.
- Set the `local-mac-address?` variable to `true`, if the variable is not already set to that value.

c. **Change to the CD-ROM root directory and eject the CD-ROM.**

6. **Upgrade software applications that are installed on the cluster.**

   Ensure that application levels are compatible with the current version of Sun Cluster and Solaris software. See your application documentation for installation instructions. In addition, follow these guidelines to upgrade applications in a Sun Cluster 3.1 10/03 configuration:

   - If the applications are stored on shared disks, you must master the relevant disk groups and manually mount the relevant file systems before you upgrade the application.
   - If you are instructed to reboot a node during the upgrade process, always add the `-x` option to the command. This option ensures that the node reboots into noncluster mode. For example, either of the following two commands boot a node into single-user noncluster mode:

     ```
     # reboot -- -xs
     ok boot -xs
     ```

7. **(Optional) Upgrade Sun Cluster data services to the Sun Cluster 3.1 10/03 software versions.**

   Note – You must upgrade the Sun Cluster HA for Oracle 3.0 64–bit for Solaris 9 data service to the Sun Cluster 3.1 10/03 version. Otherwise, you can continue to use Sun Cluster 3.0 data services after upgrade to Sun Cluster 3.1 10/03 software.

   Only those data services that are provided on the Sun Cluster 3.1 Agents CD-ROM are automatically upgraded by `scinstall`(1M). You must manually upgrade any custom or third-party data services.

   a. **Insert the Sun Cluster 3.1 Agents CD-ROM into the CD-ROM drive on the node to upgrade.**

   b. **Upgrade the data-service software.**

      ```
      # scinstall -u update -s all -d /cdrom/cdrom0
      ```

`-u update`	Specifies upgrade
`-s all`	Updates all Sun Cluster data services that are installed on the node

Tip – If upgrade processing is interrupted, use the `scstat`(1M) command to ensure that the node is in noncluster mode (`Offline`), then restart the `scinstall` command.

```
# scstat -n
-- Cluster Nodes --
                   Node name      Status
                   ---------      ------
  Cluster node:    nodename       Offline
  Cluster node:    nodename       Offline
```

c. **Change to the CD-ROM root directory and eject the CD-ROM.**

d. **As needed, manually upgrade any custom data services that are not supplied on the Sun Cluster 3.1 Agents CD-ROM.**

e. **Install any Sun Cluster 3.1 10/03 data-service patches.**

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

8. **After all nodes are upgraded, reboot each node into the cluster.**

```
# reboot
```

9. **Verify that all upgraded software is at the same version on all upgraded nodes.**

a. **On each upgraded node, view the installed levels of Sun Cluster software.**

```
# scinstall -pv
```

b. **From one node, verify that all upgraded cluster nodes are running in cluster mode (`Online`).**

```
# scstat -n
```

See the `scstat`(1M) man page for more information about displaying cluster status.

10. **Did you upgrade from Solaris 8 to Solaris 9 software?**

- If no, skip to Step 14.
- If yes, proceed to Step 11.

11. **On each node, run the following command to verify the consistency of the storage configuration:**

```
# scdidadm -c
```

`-c` Perform a consistency check

Caution – Do not proceed to Step 12 until your configuration passes this consistency check. Failure to do so might result in errors in device identification and cause data corruption.

The following table lists the possible output from the `scdidadm -c` command and the action you must take, if any.

Example Message	Action to Take
`device id for 'phys-schost-1:/dev/rdsk/c1t3d0' does not match physical device's id, device may have been replaced`	Go to "Recovering From Storage Configuration Changes During Upgrade" on page 143 and perform the appropriate repair procedure.
`device id for 'phys-schost-1:/dev/rdsk/c0t0d0' needs to be updated, run scdidadm –R to update`	None. You update this device ID in Step 12.
No output message	None

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

12. On each node, migrate the Sun Cluster storage database to Solaris 9 device IDs.

```
# scdidadm -R all
```

`-R` Perform repair procedures

`all` Specify all devices

13. On each node, run the following command to verify that storage database migration to Solaris 9 device IDs is successful:

```
# scdidadm -c
```

- If the `scdidadm` command displays a message, return to Step 11 to make further corrections to the storage configuration or the storage database.
- If the `scdidadm` command displays no messages, the device-ID migration is successful. If device-ID migration is verified on all cluster nodes, proceed to Step 14.

14. Did you upgrade VxVM?

- If no, proceed to Step 15.
- If yes, upgrade all disk groups.

To upgrade a disk group to the highest version supported by the VxVM release you installed, run the following command from the primary node of the disk group:

```
# vxdg upgrade dgname
```

See your VxVM administration documentation for more information about upgrading disk groups.

15. Do you intend to use Sun Management Center to monitor the cluster?

- If yes, go to "How to Upgrade Sun Cluster–Module Software for Sun Management Center (Nonrolling)" on page 132.
- If no, go to "How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 132.

Example—Upgrade From Sun Cluster 3.0 to Sun Cluster 3.1 10/03 Software

The following example shows the process of a nonrolling upgrade of a two-node cluster from Sun Cluster 3.0 to Sun Cluster 3.1 10/03 software on the Solaris 8 operating environment. The cluster node names are `phys-schost-1` and `phys-schost-2`.

(On the first node, upgrade framework software from the Sun Cluster 3.1 10/03 CD-ROM)

```
phys-schost-1# cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_8/Tools
phys-schost-1# ./scinstall -u update -S interact
```

(On the first node, upgrade data services from the Sun Cluster 3.1 Agents CD-ROM)

```
phys-schost-1# ./scinstall -u update -s all -d /cdrom/cdrom0
```

(On the second node, upgrade framework software from the Sun Cluster 3.1 10/03 CD-ROM)

```
phys-schost-2# cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_8/Tools
phys-schost-2# ./scinstall -u update -S interact
```

(On the second node, upgrade data services from the Sun Cluster 3.1 Agents CD-ROM)

```
phys-schost-2# ./scinstall -u update -s all -d /cdrom/cdrom0
```

(Reboot each node into the cluster)

```
phys-schost-1# reboot
phys-schost-2# reboot
```

(Verify cluster membership)

```
# scstat
-- Cluster Nodes --
                   Node name      Status
                   ---------      ------
  Cluster node:    phys-schost-1  Online
  Cluster node:    phys-schost-2  Online
```

▼ How to Upgrade Sun Cluster–Module Software for Sun Management Center (Nonrolling)

Perform the following steps to upgrade to the Sun Cluster 3.1 10/03 module software packages for Sun Management Center on the Sun Management Center server machine and help-server machine.

1. **Ensure that all Sun Management Center core packages are installed on the appropriate machines, as described in your Sun Management Center installation documentation.**

   This step includes installing Sun Management Center agent packages on each cluster node.

2. **Become superuser on the Sun Management Center server machine.**

3. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive.**

4. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Packages` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

   ```
   # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/Packages
   ```

5. **Install the Sun Cluster–module server package `SUNWscssv`.**

   ```
   # pkgadd -d . SUNWscssv
   ```

6. **Change to the CD-ROM root directory and eject the CD-ROM.**

7. **Become superuser on the Sun Management Center help-server machine.**

8. **Repeat Step 3 through Step 6 to install the Sun Cluster–module help-server package `SUNWscshl`.**

9. **Finish the upgrade.**

   Go to "How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 132.

▼ How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)

Perform this procedure to reregister and reversion all resource types that received a new version from the upgrade, then to re-enable resources and bring resource groups back online.

Note – To upgrade future versions of resource types, see "Upgrading a Resource Type" in *Sun Cluster 3.1 Data Service 4/03 Planning and Administration Guide*.

---

1. **Ensure that all steps in "How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 125 are completed.**
2. **From any node, start the `scsetup`(1M) utility.**

   ```
   # scsetup
   ```

3. **To work with resource groups, type `2` (Resource groups).**
4. **To register resource types, type `4` (Resource type registration).**

   Type **`yes`** when prompted to continue.
5. **Type `1` (Register all resource types which are not yet registered).**

   The `scsetup` utility displays all resource types that are not registered.

   Type **`yes`** to continue to register these resource types.
6. **Type `8` (Change properties of a resource).**

   Type **`yes`** to continue.
7. **Type `3` (Manage resource versioning).**

   Type **`yes`** to continue.
8. **Type `1` (Show versioning status).**

   The `scsetup` utility displays which resources you can upgrade to new versions of the same resource type. The utility also displays the state that the resource should be in before the upgrade can begin.

   Type **`yes`** to continue.
9. **Type `4` (Re-version all eligible resources).**

   Type **`yes`** to continue when prompted.
10. **Return to the Resource Group Menu.**
11. **Type `6` (Enable/Disable a resource).**

    Type **`yes`** to continue when prompted.
12. **Select a resource to enable and follow the prompts.**
13. **Repeat Step 12 for each disabled resource.**
14. **When all resources are re-enabled, type `q` to return to the Resource Group Menu.**
15. **Type `5` (Online/Offline or Switchover a resource group).**

Type **yes** to continue when prompted.

16. Follow the prompts to bring each resource group online.

17. Exit the `scsetup` utility.

Type **q** to back out of each submenu, or press Ctrl-C.

The cluster upgrade is complete. You can now return the cluster to production.

Upgrading to Sun Cluster 3.1 10/03 Software (Rolling)

This section provides the following procedure to perform a rolling upgrade from Sun Cluster 3.1 software to Sun Cluster 3.1 10/03 software. In a rolling upgrade, you upgrade one cluster node at a time, while the other cluster nodes remain in production.

To upgrade from Sun Cluster 3.0 software, perform the procedures in "Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 119.

Note – Sun Cluster 3.1 10/03 software does not support rolling upgrade from Solaris 8 software to Solaris 9 software. You can upgrade Solaris software to an update release during Sun Cluster rolling upgrade. To upgrade a Sun Cluster configuration from Solaris 8 software to Solaris 9 software, perform the procedures in "Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 119.

TABLE 3–2 Task Map: Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)

Task	Instructions
1. Read the upgrade requirements and restrictions.	"Upgrade Requirements and Restrictions" on page 118
2. Take the cluster out of production, disable resources, and ensure that shared data and system disks are backed up.	"How to Prepare the Cluster for Upgrade (Rolling)" on page 135
3. Upgrade the Solaris software, if necessary, to a supported Solaris update release. Optionally, upgrade VERITAS Volume Manager (VxVM).	"How to Upgrade to a Solaris Maintenance Update Release (Rolling)" on page 136

TABLE 3–2 Task Map: Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling) *(Continued)*

Task	Instructions
4. Upgrade to Sun Cluster 3.1 10/03 framework and data-service software. If necessary, upgrade applications. If you upgraded VxVM, upgrade disk groups.	"How to Upgrade to Sun Cluster 3.1 10/03 Software (Rolling)" on page 137
5. Upgrade the Sun Cluster module to Sun Management Center, if needed. Reregister resource types, enable resources, and bring resource groups online.	"How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Rolling)" on page 141

▼ How to Prepare the Cluster for Upgrade (Rolling)

Perform this procedure on one node at a time. The upgraded node is taken out of the cluster, while the remaining nodes continue to function as active cluster members.

Note – Do not use any new features of the update release, install new data services, or issue any administrative configuration commands until all nodes of the cluster are successfully upgraded.

---

1. **Ensure that the configuration meets requirements for upgrade.**

   See "Upgrade Requirements and Restrictions" on page 118.

2. **Have available the CD-ROMs, documentation, and patches for all the software products you are upgrading before you begin to upgrade the cluster.**

   - Solaris 8 or Solaris 9 operating environment
   - Sun Cluster 3.1 10/03 framework
   - Sun Cluster 3.1 10/03 data services (agents)
   - Applications that are managed by Sun Cluster 3.1 10/03 data-service agents

   See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

3. **(Optional) Install Sun Cluster 3.1 10/03 documentation.**

   Install the documentation packages on your preferred location, such as an administrative console or a documentation server. See the `index.html` file at the top level of the Sun Cluster 3.1 10/03 CD-ROM to access installation instructions.

4. **From any node, view the current status of the cluster.**

   Save the output as a baseline for later comparison.

```
% scstat
% scrgadm -pv[v]
```

See the `scstat`(1M) and `scrgadm`(1M) man pages for more information.

5. **Become superuser on one node of the cluster to upgrade.**

6. **Move all resource groups and device groups that are running on the node to upgrade.**

```
# scswitch -S -h from-node
```

`-S`	Moves all resource groups and device groups
`-h` *from-node*	Specifies the name of the node from which to move resource groups and device groups

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

7. **Verify that the evacuation completed successfully.**

```
# scstat -g -D
```

`-g`	Show status for all resource groups
`-D`	Show status for all disk device groups

8. **Ensure that the system disk and data is backed up.**

9. **Shut down the node to upgrade and boot it into noncluster mode.**

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

The other nodes of the cluster continue to function as active cluster members.

10. **Do you intend to upgrade the Solaris software to a Maintenance Update release?**

Note – The cluster must already run on, or be upgraded to, at least the minimum required level of the Solaris operating environment to support Sun Cluster 3.1 10/03 software. See the *Sun Cluster 3.1 10/03 Release Notes* for information about supported releases of the Solaris operating environment.

- If yes, go to "How to Upgrade to a Solaris Maintenance Update Release (Rolling)" on page 136.
- If no, go to "How to Upgrade to Sun Cluster 3.1 10/03 Software (Rolling)" on page 137.

How to Upgrade to a Solaris Maintenance Update Release (Rolling)

Perform this procedure to upgrade the Solaris 8 or Solaris 9 operating environment to a supported Maintenance Update release.

Note – To upgrade a cluster from Solaris 8 to Solaris 9 software, with or without upgrading Sun Cluster software as well, you must perform a nonrolling upgrade. Go to "Upgrading to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 119.

---

1. **Ensure that all steps in "How to Prepare the Cluster for Upgrade (Rolling)" on page 135 are completed.**

2. **Temporarily comment out all entries for globally mounted file systems in the `/etc/vfstab` file.**

   Perform this step to prevent the Solaris upgrade from attempting to mount the global devices.

3. **Follow instructions in your installation procedures for the Solaris Maintenance Update version you are upgrading to.**

   Note – Do not reboot the node when prompted to reboot.

   ---

4. **Uncomment all entries in the `/a/etc/vfstab` file for globally mounted file systems that you commented out in Step 2.**

5. **Install any required Solaris software patches and hardware-related patches, and download any needed firmware that is contained in the hardware patches.**

   Note – Do not reboot the node until Step 6.

   ---

6. **Reboot the node into noncluster mode.**

   Include the double dashes (--) in the following command:

   ```
   # reboot -- -x
   ```

7. **Upgrade the Sun Cluster software.**

   Go to "How to Upgrade to Sun Cluster 3.1 10/03 Software (Rolling)" on page 137.

How to Upgrade to Sun Cluster 3.1 10/03 Software (Rolling)

Perform this procedure to upgrade a node to Sun Cluster 3.1 10/03 software while the remaining cluster nodes are in cluster mode.

Note – Do not use any new features provided in the Sun Cluster 3.1 10/03 software until all nodes of the cluster are upgraded.

---

1. **Ensure that all steps in "How to Prepare the Cluster for Upgrade (Rolling)" on page 135 are completed.**

   If you upgraded the Solaris operating environment to a Maintenance Update release, also ensure that all steps in "How to Upgrade to a Solaris Maintenance Update Release (Rolling)" on page 136 are completed.

2. **Upgrade to Sun Cluster 3.1 10/03 software.**

   a. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive on the node.**

      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_1_u1` directory.

   b. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Tools` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

      ```
      # cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/Tools
      ```

   c. **Install the Sun Cluster 3.1 10/03 software.**

      Note – Do not use the `/usr/cluster/bin/scinstall` command that is already installed on the node. You must use the `scinstall` command on the Sun Cluster 3.1 10/03 CD-ROM.

      ```
      # ./scinstall -u update -M patchdir=dirname
      ```

      `-M patchdir=`*dirname*`[,patchlistfile=`*filename*`]`
      Specifies the path to patch information so that the specified patches can be installed using the `scinstall` command. If you do not specify a patch-list file, the `scinstall` command installs all the patches in the directory *dirname*, including tarred, jarred, and zipped patches.

      The `-M` option is not required. You can use any method you prefer for installing patches.

Tip – If upgrade processing is interrupted, use the `scstat`(1M) command to ensure that the node is in noncluster mode (`Offline`), then restart the `scinstall` command.

```
# scstat -n
-- Cluster Nodes --
                   Node name      Status
                   ---------      ------
  Cluster node:    nodename       Offline
  Cluster node:    nodename       Offline
```

See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

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

Note – Sun Cluster 3.1 software requires at least version 3.5.1 of Sun Explorer software. Upgrade to Sun Cluster software includes installing Sun Explorer data collector software, to be used in conjunction with the `sccheck` utility. If another version of Sun Explorer software was already installed before Sun Cluster upgrade, it is replaced by the version that is provided with Sun Cluster software. Options such as user identity and data delivery are preserved, but `crontab` entries must be manually recreated.

---

d. **Change to the CD-ROM root directory and eject the CD-ROM.**

e. **Install any Sun Cluster 3.1 10/03 software patches.**

3. **Do you intend to upgrade any data services?**

   - If yes, proceed to Step 4.
   - If no, skip to Step 6.

4. **Upgrade applications as needed.**

Note – Do not upgrade an application if the newer version cannot coexist in the cluster with the older version.

Follow the instructions that are provided in your third-party documentation.

5. **(Optional) For each node on which data services are installed, upgrade to the Sun Cluster 3.1 10/03 data-service update software.**

Note – You must upgrade the Sun Cluster HA for Oracle 3.0 64–bit for Solaris 9 data service to the Sun Cluster 3.1 10/03 version. Otherwise, you can continue to use Sun Cluster 3.0 data services after upgrade to Sun Cluster 3.1 10/03 software.

---

a. **Insert the Sun Cluster 3.1 Agents CD-ROM into the CD-ROM drive on the node.**

b. **Install the Sun Cluster 3.1 10/03 data-service–update patches.**

   Use one of the following methods:

   - To upgrade one or more specified data services, type the following command.

     ```
     # scinstall -u update -s srvc[,srvc,...] -d cdrom-image
     ```

`-u update`	Upgrades a cluster node to a later Sun Cluster software release
`-s` *srvc*	Upgrades the specified data service
`-d` *cdrom-image*	Specifies an alternate directory location for the CD-ROM image

   - To upgrade all data services present on the node, type the following command.

     ```
     # scinstall -u update -s all -d cdrom-image
     ```

`-s all`	Upgrades all data services

     This command assumes that updates for all installed data services exist on the update release. If an update for a particular data service does not exist in the update release, that data service is not upgraded.

c. **Change to the CD-ROM root directory and eject the CD-ROM.**

d. **Install any Sun Cluster 3.1 10/03 data-service software patches.**

e. **Verify that each data-service update patch is installed successfully.**

   View the upgrade log file that is referenced at the end of the upgrade output messages.

6. **Reboot the node into the cluster.**

   ```
   # reboot
   ```

7. **Run the following command on the upgraded node to verify that Sun Cluster 3.1 10/03 software is installed successfully.**

   ```
   # scinstall -pv
   ```

8. **From any node, verify the status of the cluster configuration.**

```
% scstat
% scrgadm -pv[v]
```

Output should be the same as for Step 4 in "How to Prepare the Cluster for Upgrade (Rolling)" on page 135.

9. **Do you have another node to upgrade?**

- If yes, return to "How to Prepare the Cluster for Upgrade (Rolling)" on page 135 and repeat all upgrade procedures on the next node to upgrade.
- If no, go to "How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Rolling)" on page 141.

How to Finish Upgrading to Sun Cluster 3.1 10/03 Software (Rolling)

1. **Ensure that all upgrade procedures are completed for all cluster nodes that you are upgrading.**

2. **Are you using Sun Management Center to monitor your Sun Cluster configuration?**

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

a. **Ensure that all Sun Management Center core packages are installed on the appropriate machines, as described in your Sun Management Center installation documentation.**

This step includes installing Sun Management Center agent packages on each cluster node.

b. **Become superuser on the Sun Management Center server machine.**

c. **Insert the Sun Cluster 3.1 10/03 CD-ROM into the CD-ROM drive.**

d. **Change to the `/cdrom/suncluster_3_1/SunCluster_3.1/Sol_`*ver*`/Packages` directory, where *ver* is `8` (for Solaris 8) or `9` (for Solaris 9) .**

```
# cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Sol_ver/Packages
```

e. **Install the Sun Cluster–module server package `SUNWscssv`.**

```
# pkgadd -d . SUNWscssv
```

f. **Change to the CD-ROM root directory and eject the CD-ROM.**

g. **Become superuser on the Sun Management Center help-server machine.**

h. **Repeat Step e through Step g to install the Sun Cluster–module help-server package `SUNWscshl`.**

3. **Reregister and re-version all resource types that received a new version from the upgrade, then re-enable resources and bring resource groups back online.**

   a. **From any node, start the `scsetup`(1M) utility.**

   ```
   # scsetup
   ```

   b. **To work with resource groups, type `2` (Resource groups).**

   c. **To register resource types, type `4` (Resource type registration).**

   Type **`yes`** when prompted to continue.

   d. **Type `1` (Register all resource types which are not yet registered).**

   The `scsetup` utility displays all resource types that are not registered.

   Type **`yes`** to continue to register these resource types.

   e. **Type `8` (Change properties of a resource).**

   Type **`yes`** to continue.

   f. **Type `3` (Manage resource versioning).**

   Type **`yes`** to continue.

   g. **Type `1` (Show versioning status).**

   The `scsetup` utility displays which resources you can upgrade to new versions of the same resource type, and the state that the resource should be in before the upgrade can begin.

   Type **`yes`** to continue.

   h. **Type `4` (Re-version all eligible resources).**

   Type **`yes`** to continue when prompted.

   i. **Return to the Resource Group Menu.**

   j. **Type `6` (Enable/Disable a resource).**

   Type **`yes`** to continue when prompted.

   k. **Select a resource to enable and follow the prompts.**

   l. **Repeat Step k for each disabled resource.**

   m. **When all resources are re-enabled, type `q` to return to the Resource Group Menu.**

   n. **Type `5` (Online/Offline or Switchover a resource group).**

Type **yes** to continue when prompted.

o. **Follow the prompts to bring each resource group online.**

p. **Exit the scsetup utility.**

Type **q** to back out of each submenu, or press Ctrl-C.

4. **Restart any applications.**

Follow the instructions that are provided in your third-party documentation.

The cluster upgrade is complete.

Recovering From Storage Configuration Changes During Upgrade

This section provides the following repair procedures to follow if changes were inadvertently made to the storage configuration during upgrade:

- "How to Handle Storage Reconfiguration During an Upgrade" on page 143
- "How to Resolve Mistaken Storage Changes During an Upgrade" on page 144

▼ How to Handle Storage Reconfiguration During an Upgrade

Any changes to the storage topology, including running Sun Cluster commands, should be completed before you upgrade the cluster to Solaris 9 software. If, however, changes were made to the storage topology during the upgrade, perform the following procedure. This procedure ensures that the new storage configuration is correct and that existing storage that was not reconfigured is not mistakenly altered.

1. **Ensure that the storage topology is correct.**

Check whether the devices that were flagged as possibly being replaced map to devices that actually were replaced. If the devices were not replaced, check for and correct possible accidental configuration changes, such as incorrect cabling.

2. **Become superuser on a node that is attached to the unverified device.**

3. **Manually update the unverified device.**

```
# scdidadm -R device
```

`-R` *device* Performs repair procedures on the specified *device*

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

4. **Update the DID driver.**

```
# scdidadm -ui
# scdidadm -r
```

`-u` Loads the device ID configuration table into the kernel

`-i` Initializes the DID driver

`-r` Reconfigures the database

5. **Repeat Step 2 through Step 4 on all other nodes that are attached to the unverified device.**

6. **Return to the remaining upgrade tasks.**

   - For nonrolling upgrade, go to Step 11 in "How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 125.
   - For rolling upgrade, go to Step 4 in "How to Prepare the Cluster for Upgrade (Rolling)" on page 135.

▼ How to Resolve Mistaken Storage Changes During an Upgrade

If accidental changes are made to the storage cabling during the upgrade, perform the following procedure to change the storage configuration back to the correct state.

Note – This procedure assumes that no physical storage was actually changed. If physical or logical storage devices were changed or replaced, instead follow procedures in "How to Handle Storage Reconfiguration During an Upgrade" on page 143.

---

1. **Change the storage topology back to its original configuration.**

   Check the configuration of the devices that were flagged as possibly being replaced, including the cabling.

2. **As superuser, update the DID driver on each node of the cluster.**

```
# scdidadm -ui
# scdidadm -r
```

`-u` Loads the device–ID configuration table into the kernel

`-i` Initializes the DID driver

`-r` Reconfigures the database

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

3. **Did the `scdidadm` command return any error messages in Step 2?**
   - If no, proceed to Step 4.
   - If yes, return to Step 1 to make further modifications to correct the storage configuration, then repeat Step 2.
4. **Return to the remaining upgrade tasks.**
   - For nonrolling upgrade, go to Step 11 in "How to Upgrade to Sun Cluster 3.1 10/03 Software (Nonrolling)" on page 125.
   - For rolling upgrade, go to Step 4 in "How to Prepare the Cluster for Upgrade (Rolling)" on page 135.

Sun Management Center Software Upgrade

This section describes how to upgrade from Sun Management Center 2.1.1 to either Sun Management Center 3.0 software or Sun Management Center 3.5 software on a Sun Cluster 3.1 10/03 configuration.

▼ How to Upgrade Sun Management Center Software

1. **Have available the following items:**
   - **Sun Cluster 3.1 10/03 CD-ROM or the path to the CD-ROM image.** You use the CD-ROM to reinstall the Sun Cluster 3.1 10/03 version of the Sun Cluster–module packages after you upgrade Sun Management Center software.
   - **Sun Management Center documentation.**
   - **Sun Management Center patches and Sun Cluster–module patches, if any.**

     See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.
2. **Stop any Sun Management Center processes.**

   a. **If the Sun Management Center console is running, exit the console.**

In the console window, select File>Exit from the menu bar.

b. **On each Sun Management Center agent machine (cluster node), stop the Sun Management Center agent process.**

```
# /opt/SUNWsymon/sbin/es-stop -a
```

c. **On the Sun Management Center server machine, stop the Sun Management Center server process.**

```
# /opt/SUNWsymon/sbin/es-stop -S
```

3. **As superuser, remove Sun Cluster–module packages.**

Use the `pkgrm`(1M) command to remove all Sun Cluster–module packages from all locations listed in the following table.

Location	Package to Remove
Each cluster node	`SUNWscsam`, `SUNWscsal`
Sun Management Center console machine	`SUNWscscn`
Sun Management Center server machine	`SUNWscssv`
Sun Management Center help-server machine	`SUNWscshl`

If you do not remove the listed packages, the Sun Management Center software upgrade might fail because of package dependency problems. You reinstall these packages in Step 5, after you upgrade Sun Management Center software.

4. **Upgrade the Sun Management Center software.**

Follow the upgrade procedures in your Sun Management Center documentation.

5. **As superuser, reinstall Sun Cluster–module packages to the locations listed in the table below.**

```
# cd /cdrom/suncluster_3_1_u1/SunCluster_3.1/Packages/
# pkgadd module-package
```

Location	Package to Install
Each cluster node	`SUNWscsam`, `SUNWscsal`
Sun Management Center server machine	`SUNWscssv`
Sun Management Center console machine	`SUNWscshl`
Sun Management Center help-server machine	`SUNWscshl`

You install the help-server package `SUNWscshl` on both the console machine and the help-server machine.

6. **Apply any Sun Management Center patches and any Sun Cluster–module patches to each node of the cluster.**

7. **Restart Sun Management Center agent, server, and console processes.**

   Follow procedures in "How to Start Sun Management Center" on page 114.

8. **Load the Sun Cluster module.**

   Follow procedures in "How to Load the Sun Cluster Module" on page 115.

   If the Sun Cluster module was previously loaded, unload the module and then reload it to clear all cached alarm definitions on the server. To unload the module, select Module⇒Unload Module from the console's Details window.

APPENDIX **A**

Sun Cluster Installation and Configuration Worksheets

This appendix provides worksheets to plan various components of your cluster configuration and examples of completed worksheets for your reference. See "Installation and Configuration Worksheets" in *Sun Cluster 3.1 Data Service 5/03 Release Notes* for configuration worksheets for resources, resource types, and resource groups.

Installation and Configuration Worksheets

If necessary, make additional copies of a worksheet to accommodate all the components in your cluster configuration. Follow planning guidelines in Chapter 1 to complete these worksheets. Then refer to your completed worksheets during cluster installation and configuration.

Note – The data used in the worksheet examples is intended as a guide only. The examples do not represent a complete configuration of a functional cluster.

The following table lists the planning worksheets and examples provided in this appendix, as well as the titles of sections in Chapter 1 that contain related planning guidelines.

TABLE A–1 Cluster Installation Worksheets and Related Planning Guidelines

Worksheet	Example	Section Titles of Related Planning Guidelines
"Local File System Layout Worksheet" on page 152	"Example: Local File System Layout Worksheets, With and Without Mirrored Root" on page 153	"System Disk Partitions" on page 14 "Guidelines for Mirroring the Root Disk" on page 32
"Cluster and Node Names Worksheet" on page 154	"Example: Cluster and Node Names Worksheet" on page 155	"Cluster Name" on page 20 "Node Names" on page 20 "Private Network" on page 20 "Private Hostnames" on page 21
"Cluster Interconnect Worksheet" on page 156	"Example: Cluster Interconnect Worksheet" on page 157	"Cluster Interconnect" on page 21
"Public Networks Worksheet" on page 158	"Example: Public Networks Worksheet" on page 159	"Public Networks" on page 22 "IP Network Multipathing Groups" on page 23
"Local Devices Worksheets" on page 160	"Example: Local Devices Worksheets" on page 161	---
"Disk Device Group Configurations Worksheet" on page 162	"Example: Disk Device Group Configurations Worksheet" on page 163	"Disk Device Groups" on page 23 "Planning Volume Management" on page 26

TABLE A–1 Cluster Installation Worksheets and Related Planning Guidelines *(Continued)*

Worksheet	Example	Section Titles of Related Planning Guidelines
"Volume Manager Configurations Worksheet" on page 164	"Example: Volume Manager Configurations Worksheet" on page 165	"Planning Volume Management" on page 26 Your volume manager documentation
"Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)" on page 166	"Example: Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)" on page 167	"Planning Volume Management" on page 26 *Solstice DiskSuite 4.2.1 Installation and Product Notes* or *Solaris Volume Manager Administration Guide*

Local File System Layout Worksheet

Node name: _____

TABLE A–2 Local File Systems With Mirrored Root Worksheet

Volume Name	Component	Component	File System	Size
			/	
			swap	
			/globaldevices	

TABLE A–3 Local File Systems with Non-Mirrored Root Worksheet

Device Name	File System	Size
	/	
	swap	
	/globaldevices	

Example: Local File System Layout Worksheets, With and Without Mirrored Root

Node name: **phys-schost-1**

TABLE A–4 Example: Local File Systems With Mirrored Root Worksheet

Volume Name	Component	Component	File System	Size
d1	c0t0d0s0	c1t0d0s0	/	6.75 GB
d2	c0t0d0s1	c1t0d0s1	swap	750 MB
d3	c0t0d0s3	c1t0d0s3	/globaldevices	512 MB
d7	c0t0d0s7	c1t0d0s7	SDS replica	20 MB

TABLE A–5 Example: Local File Systems With Non-Mirrored Root Worksheet

Device Name	File System	Size
c0t0d0s0	/	6.75 GB
c0t0d0s1	swap	750 MB
c0t0d0s3	/globaldevices	512 MB
c0t0d0s7	SDS replica	20 MB

Cluster and Node Names Worksheet

TABLE A–6 Cluster and Node Names Worksheet

Component	Default	Actual
Cluster name		
Private network address	172.16.0.0	_____._____.0.0
Private network mask	255.255.0.0	255.255._____._____
First-Installed node name		
Private hostname	clusternode_____-priv	
Additional node name		
Private hostname	clusternode_____-priv	
Additional node name		
Private hostname	clusternode_____-priv	
Additional node name		
Private hostname	clusternode_____-priv	

Example: Cluster and Node Names Worksheet

TABLE A–7 Example: Cluster and Node Names Worksheet

Component	Default	Actual
Cluster name		`sc-cluster`
Private network address	172.16.0.0	`172.16.0.0`
Private network mask	255.255.0.0	`255.255.0.0`
First-Installed node name		`phys-schost-1`
Private hostname	clusternode`1`-priv	`phys-schost-1-priv`
Additional node name		`phys-schost-2`
Private hostname	clusternode`2`-priv	`phys-schost-2-priv`
Additional node name		
Private hostname	clusternode_____-priv	
Additional node name		
Private hostname	clusternode_____-priv	

Cluster Interconnect Worksheet

TABLE A–8 Cluster Interconnect Worksheet

Node Name	Adapter Name	Transport Type	Junction Name	Junction Type	Port Name

Example: Cluster Interconnect Worksheet

TABLE A–9 Example: Cluster Interconnect Worksheet

Node Name	Adapter Name	Transport Type	Junction Name	Junction Type	Port Name
phys-schost-1	hme0	dlpi	switch1	switch	1
phys-schost-1	hme1	dlpi	switch2	switch	1
phys-schost-2	hme0	dlpi	switch1	switch	2
phys-schost-2	hme1	dlpi	switch2	switch	2

Public Networks Worksheet

TABLE A–10 Public Networks Worksheet

Component	Name
Node name	
Primary hostname	
IP Network Multipathing group	
Adapter name	
Backup adapter(s) (optional)	
Network name	
Secondary hostname	
IP Network Multipathing group	
Adapter name	
Backup adapter(s) (optional)	
Network name	
Secondary hostname	
IP Network Multipathing group	
Adapter name	
Backup adapter(s) (optional)	
Network name	
Secondary hostname	
IP Network Multipathing group	
Adapter name	
Backup adapter(s) (optional)	
Network name	

Example: Public Networks Worksheet

TABLE A–11 Example: Public Networks Worksheet

Component	Name
Node name	`phys-schost-1`
Primary hostname	`phys-schost-1`
IP Network Multipathing group	`ipmp0`
Adapter name	`qfe0`
Backup adapter(s) (optional)	`qfe4`
Network name	`net-85`
Secondary hostname	`phys-schost-1-86`
IP Network Multipathing group	`ipmp1`
Adapter name	`qfe1`
Backup adapter(s) (optional)	`qfe5`
Network name	`net-86`
Secondary hostname	
IP Network Multipathing group	
Adapter name	
Backup adapter(s) (optional)	
Network name	
Secondary hostname	
IP Network Multipathing group	
Adapter name	
Backup adapter(s) (optional)	
Network name	

Local Devices Worksheets

Node name:_____

TABLE A–12 Local Disks Worksheet

Local Disk Name	Size

TABLE A–13 Other Local Devices Worksheet

Device Type	Name

Example: Local Devices Worksheets

Node name: **phys-schost-1**

TABLE A–14 Example: Local Disks Worksheet

Local Disk Name	Size
c0t0d0	2G
c0t1d0	2G
c1t0d0	2G
c1t1d0	2G

TABLE A–15 Example: Other Local Devices Worksheet

Device Type	Name
tape	/dev/rmt/0

Disk Device Group Configurations Worksheet

Volume manager (circle one):

Solstice DiskSuite | Solaris Volume Manager | VxVM

TABLE A–16 Disk Device Groups Worksheet

Disk Group/ Diskset Name	Node Names (indicate priority if ordered list)	Ordered priority? (circle one)	Failback? circle one)
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No

Example: Disk Device Group Configurations Worksheet

Volume manager (circle one):

`Solstice DiskSuite`

TABLE A–17 Example: Disk Device Groups Configurations Worksheet

Disk Group/ Diskset Name	Node Names (indicate priority if ordered list)	Ordered priority? (circle one)	Failback? circle one)
`dg-schost-1`	`1) phys-schost-1,` `2) phys-schost-2`	`Yes`	`Yes`
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No
		Yes | No	Yes | No

Volume Manager Configurations Worksheet

Volume manager (circle one):

Solstice DiskSuite | Solaris Volume Manager | VxVM

TABLE A–18 Volume Manager Configurations Worksheet

Name	Type	Component	Component

Example: Volume Manager Configurations Worksheet

Volume manager (circle one):

`Solstice DiskSuite`

TABLE A–19 Example: Volume Manager Configurations Worksheet

Name	Type	Component	Component
`dg-schost-1/d0`	`trans`	`dg-schost-1/d1`	`dg-schost-1/d4`
`dg-schost-1/d1`	`mirror`	`c0t0d0s4`	`c4t4d0s4`
`dg-schost-1/d4`	`mirror`	`c0t0d2s5`	`d4t4d2s5`

Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)

TABLE A–20 Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)

File System	Metatrans	Metamirrors		Submirrors		Hot Spare Pool	Physical Device	
		(Data)	(Log)	(Data)	(Log)		(Data)	(Log)

Example: Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)

TABLE A–21 Example: Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)

File System	Metatrans	Metamirrors		Submirrors		Hot Spare Pool	Physical Device	
		(Data)	(Log)	(Data)	(Log)		(Data)	(Log)
/A	d10	d11		d12, d13		hsp000	c1t0d0s0, c2t0d1s0	
			d14		d15	hsp006		c1t0d1s6, c2t1d1s6

APPENDIX **B**

Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software

Install and configure your local and multihost disks for Solstice DiskSuite/Solaris Volume Manager software by using the procedures in this appendix, along with the planning information in "Planning Volume Management" on page 26. See your Solstice DiskSuite/Solaris Volume Manager documentation for additional details.

The following procedures are in this appendix.

Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software

Before you begin, have available the following information.

- Mappings of your storage disk drives.
- The following completed configuration planning worksheets. See "Planning Volume Management" on page 26 for planning guidelines.
  - "Local File System Layout Worksheet" on page 152
  - "Disk Device Group Configurations Worksheet" on page 162
  - "Volume Manager Configurations Worksheet" on page 164
  - "Metadevices Worksheet (Solstice DiskSuite/Solaris Volume Manager)" on page 166

The following table lists the tasks that you perform to install and configure Solstice DiskSuite/Solaris Volume Manager software for Sun Cluster configurations. You can skip certain procedures in the following conditions:

- If you used SunPlex Manager to install Solstice DiskSuite software (Solaris 8), the procedures "How to Install Solstice DiskSuite Software" on page 173 through "How to Create State Database Replicas" on page 176 are already completed. Go to "Mirroring the Root Disk" on page 177 or "How to Create a Diskset" on page 192 to continue to configure Solstice DiskSuite software.
- If you installed Solaris 9 software, Solaris Volume Manager is already installed. You can start at "How to Set the Number of Metadevice or Volume Names and Disksets" on page 174.

TABLE B–1 Task Map: Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software

Task	Instructions
1. Plan the layout of your Solstice DiskSuite/Solaris Volume Manager configuration.	■ "Planning Volume Management" on page 26 ■ "Solstice DiskSuite/Solaris Volume Manager Configuration Example" on page 171
2. (*Solaris 8 only*) Install Solstice DiskSuite software.	"How to Install Solstice DiskSuite Software" on page 173

TABLE B–1 Task Map: Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software *(Continued)*

Task	Instructions
3. Calculate the number of metadevice names and disksets needed for your configuration, and modify the `/kernel/drv/md.conf` file.	"How to Set the Number of Metadevice or Volume Names and Disksets" on page 174
4. Create state database replicas on the local disks.	"How to Create State Database Replicas" on page 176
5. (*Optional*) Mirror file systems on the root disk.	"Mirroring the Root Disk" on page 177
6. Create disksets by using the `metaset` command.	"How to Create a Diskset" on page 192
7. Add disk drives to the disksets.	"How to Add Disk Drives to a Diskset" on page 194
8. (*Optional*) Repartition disk drives in a diskset to allocate space to slices 1 through 6.	"How to Repartition Disk Drives in a Diskset" on page 196
9. List DID pseudo-driver mappings and define metadevices or volumes in the `/etc/lvm/md.tab` files.	"How to Create an `md.tab` File" on page 196
10. Initialize the `md.tab` files.	"How to Activate Metadevices or Volumes" on page 198
11. (*Dual-string configurations only*) Configure mediator hosts, check the status of mediator data, and, if necessary, fix bad mediator data.	1. "Configuring Mediators" on page 200 2. "How to Add Mediator Hosts" on page 200 3. "How to Check the Status of Mediator Data" on page 201
12. Configure the cluster.	"Configuring the Cluster" on page 102

Solstice DiskSuite/Solaris Volume Manager Configuration Example

The following example helps to explain the process for determining the number of disk drives to place in each diskset. In this example, three storage devices are used. Existing applications are run over NFS (two file systems of 5 Gbytes each) and two ORACLE databases (one 5 Gbytes and one 10 Gbytes).

The following table shows the calculations that are used to determine the number of disk drives needed in the sample configuration. In a configuration with three storage devices, you would need 28 disk drives, which would be divided as evenly as possible among each of the three storage devices. Note that the 5-Gbyte file systems were given an additional 1 Gbyte of disk space because the number of disk drives needed was rounded up.

TABLE B–2 Determining the Number of Disk Drives Needed for a Configuration

Use	Data	Disk Storage Needed	Disk Drives Needed
`nfs1`	5 Gbytes	3x2.1 Gbyte disks * 2 (Mirror)	6
`nfs2`	5 Gbytes	3x2.1 Gbyte disks * 2 (Mirror)	6
`oracle1`	5 Gbytes	3x2.1 Gbyte disks * 2 (Mirror)	6
`oracle2`	10 Gbytes	5x2.1 Gbyte disks * 2 (Mirror)	10

The following table shows the allocation of disk drives among the two disksets and four data services.

TABLE B–3 Division of Disksets

Diskset	Data Services	Disk Drives	Storage Device 1	Storage Device 2	Storage Device 3
`dg-schost-1`	`nfs1`, `oracle1`	12	4	4	4
`dg-schost-2`	`nfs2`, `oracle2`	16	5	6	5

Initially, four disk drives on each storage device (a total of 12 disks) are assigned to `dg-schost-1`, and five or six disk drives on each (a total of 16 disks) are assigned to `dg-schost-2`.

No hot spare disks are assigned to either diskset. A minimum of one hot spare disk per storage device per diskset enables one drive to be hot spared, which restores full two-way mirroring.

▼ How to Install Solstice DiskSuite Software

Note – If you used SunPlex Manager to install Solstice DiskSuite software, do not perform this procedure. Instead, go to "Mirroring the Root Disk" on page 177.

If you installed Solaris 9 software, do not perform this procedure. Solaris Volume Manager software is installed with Solaris 9 software. Instead, go to "How to Set the Number of Metadevice or Volume Names and Disksets" on page 174.

Perform this task on each node in the cluster.

1. **Become superuser on the cluster node.**

2. **If you install from the CD-ROM, insert the Solaris 8 Software 2 of 2 CD-ROM into the CD-ROM drive on the node.**

   This step assumes that the Volume Management daemon `vold`(1M) is running and configured to manage CD-ROM devices.

3. **Install the Solstice DiskSuite software packages in the order that is shown in the following example.**

```
# cd /cdrom/sol_8_sparc_2/Solaris_8/EA/products/DiskSuite_4.2.1/sparc/Packages
# pkgadd -d . SUNWmdr SUNWmdu [SUNWmdx] optional-pkgs
```

Note – If you have Solstice DiskSuite software patches to install, do not reboot after you install the Solstice DiskSuite software.

The `SUNWmdr` and `SUNWmdu` packages are required for all Solstice DiskSuite installations. The `SUNWmdx` package is also required for the 64-bit Solstice DiskSuite installation.

See your Solstice DiskSuite installation documentation for information about optional software packages.

4. **If you installed from a CD-ROM, eject the CD-ROM.**

5. **Install any Solstice DiskSuite patches.**

   See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

6. **Repeat Step 1 through Step 5 on the other nodes of the cluster.**

7. **From one node of the cluster, manually populate the global-device namespace for Solstice DiskSuite.**

```
# scgdevs
```

Note – The `scgdevs` command might return a message similar to the following:

```
Could not open /dev/rdsk/c0t6d0s2 to verify device id, Device busy
```

If the listed device is a CD-ROM device, you can safely ignore the message.

---

8. **Set the number of metadevice names and disksets that are expected in the cluster.**

   Go to "How to Set the Number of Metadevice or Volume Names and Disksets" on page 174.

▼ How to Set the Number of Metadevice or Volume Names and Disksets

---

Note – If you used SunPlex Manager to install Solstice DiskSuite software, do not perform this procedure. Instead, go to "Mirroring the Root Disk" on page 177.

This procedure describes how to determine the number of Solstice DiskSuite metadevice or Solaris Volume Manager volume names and disksets that are needed for your configuration. This procedure also describes how to modify the `/kernel/drv/md.conf` file to specify these numbers.

Tip – The default number of metadevice or volume names per diskset is 128, but many configurations need more than the default. Increase this number before you implement a configuration, to save administration time later.

At the same time, keep the value of the `nmd`field and the `md_nsets` field as low as possible. Memory structures exist for all possible devices as determined by `nmd`and `md_nsets`, even if you have not created those devices. For optimal performance, keep the value of `nmd` and `md_nsets` only slightly higher than the number of metadevices or volumes you plan to use.

---

1. **Have available the "Disk Device Group Configurations Worksheet" on page 162.**

2. **Determine the total number of disksets you expect to need in the cluster, then add one more diskset for private disk management.**

   The cluster can have a maximum of 32 disksets, 31 disksets for general use plus one diskset for private disk management. The default number of disksets is 4. You supply this value for the `md_nsets` field in Step 4.

3. **Determine the largest metadevice or volume name you expect to need for any diskset in the cluster.**

   Each diskset can have a maximum of 8192 metadevice or volume names. You supply this value for the `nmd` field in Step 4.

   a. **Determine the quantity of metadevice or volume names you expect to need for each diskset.**

      If you use local metadevices or volumes, ensure that each local metadevice or volume name is unique throughout the cluster and does not use the same name as any device-ID name in the cluster.

      Tip – Choose a range of numbers to use exclusively for device-ID names and a range for each node to use exclusively for its local metadevice or volume names. For example, device-ID names might use the range from `d1` to `d100`. Local metadevices or volumes on node 1 might use names in the range from `d100` to `d199`. And local metadevices or volumes on node 2 might use `d200` to `d299`.

      ---

   b. **Determine the highest of the metadevice or volume names you expect to use in any diskset.**

      The quantity of metadevice or volume names to set is based on the metadevice or volume name *value* rather than on the *actual quantity*. For example, if your metadevice or volume names range from `d950` to `d1000`, Solstice DiskSuite/Solaris Volume Manager software requires that you set the value at 1000 names, not 50.

4. **On each node, become superuser and edit the `/kernel/drv/md.conf` file.**

   Caution – All cluster nodes (or cluster pairs in the cluster-pair topology) must have identical `/kernel/drv/md.conf` files, regardless of the number of disksets served by each node. Failure to follow this guideline can result in serious Solstice DiskSuite/Solaris Volume Manager errors and possible loss of data.

   ---

   a. **Set the `md_nsets` field to the value that was determined in Step 2.**

   b. **Set the `nmd` field to the value that was determined in Step 3.**

5. **On each node, perform a reconfiguration reboot.**

```
# touch /reconfigure
# shutdown -g0 -y -i6
```

   Changes to the `/kernel/drv/md.conf` file become operative after you perform a reconfiguration reboot.

6. **Create local state database replicas.**

   Go to "How to Create State Database Replicas" on page 176.

▼ How to Create State Database Replicas

Note – If you used SunPlex Manager to install Solstice DiskSuite software, do not perform this procedure. Instead, go to "Mirroring the Root Disk" on page 177.

Perform this procedure on each node in the cluster.

1. **Become superuser on the cluster node.**

2. **Create state database replicas on one or more local disks for each cluster node by using the `metadb` command.**

   ```
   # metadb -af slice-1 slice-2 slice-3
   ```

   Tip – To provide protection of state data, which is necessary to run Solstice DiskSuite/Solaris Volume Manager software, create at least three replicas for each node. Also, you can place replicas on more than one disk to provide protection if one of the disks fails.

   See the `metadb`(1M) man page and your Solstice DiskSuite/Solaris Volume Manager documentation for details.

3. **Verify the replicas.**

   ```
   # metadb
   ```

   The `metadb` command displays the list of replicas.

4. **Do you intend to mirror file systems on the root disk?**

   - If yes, go to "Mirroring the Root Disk" on page 177.
   - If no, go to "How to Create a Diskset" on page 192 to create Solstice DiskSuite/Solaris Volume Manager disksets.

Example—Creating State Database Replicas

The following example shows three Solstice DiskSuite state database replicas. Each replica is created on a different disk. For Solaris Volume Manager, the replica size would be larger.

```
# metadb -af c0t0d0s7 c0t1d0s7 c1t0d0s7
# metadb
```

```
flags            first blk      block count
    a       u       16            1034         /dev/dsk/c0t0d0s7
    a       u       16          1034         /dev/dsk/c0t1d0s7
    a       u       16          1034         /dev/dsk/c1t0d0s7
```

Mirroring the Root Disk

Mirroring the root disk prevents the cluster node itself from shutting down because of a system disk failure. Four types of file systems can reside on the root disk. Each file-system type is mirrored by using a different method.

Use the following procedures to mirror each type of file system.

- "How to Mirror the Root (/) File System" on page 177
- "How to Mirror the Global Namespace" on page 181
- "How to Mirror File Systems Other Than Root (/) That Cannot Be Unmounted" on page 184
- "How to Mirror File Systems That Can Be Unmounted" on page 188

Note – Some of the steps in these mirroring procedures can cause an error message similar to the following, which is harmless and can be ignored.

```
metainit: dg-schost-1: d1s0: not a metadevice
```

Caution – For local disk mirroring, do not use `/dev/global` as the path when you specify the disk name. If you specify this path for anything other than cluster file systems, the system cannot boot.

▼ How to Mirror the Root (/) File System

Use this procedure to mirror the root (/) file system.

1. **Become superuser on the node.**

2. **Use the `metainit`(1M) command to put the root slice in a single-slice (one-way) concatenation.**

   Specify the physical disk name of the root-disk slice (c*N*t*X*d*Y*s*Z*).

   # **`metainit -f`** *submirror1* **`1 1`** *root-disk-slice*

3. **Create a second concatenation.**

   # **`metainit`** *submirror2* **`1 1`** *submirror-disk-slice*

4. **Create a one-way mirror with one submirror.**

   # **metainit** *mirror* **-m** *submirror1*

   Note – The metadevice or volume name for the mirror *must* be unique throughout the cluster.

   ---

5. **Run the `metaroot`(1M) command.**

   This command edits the `/etc/vfstab` and `/etc/system` files so the system can be booted with the root (`/`) file system on a metadevice or volume.

   # **metaroot** *mirror*

6. **Run the `lockfs`(1M) command.**

   This command flushes all transactions out of the log and writes the transactions to the master file system on all mounted UFS file systems.

   # **lockfs -fa**

7. **Move any resource groups or device groups from the node.**

   # **scswitch -S -h** *from-node*

`-S`	Moves all resource groups and device groups
`-h` *from-node*	Specifies the name of the node from which to move resource or device groups

8. **Reboot the node.**

   This command remounts the newly mirrored root (`/`) file system.

   # **shutdown -g0 -y -i6**

9. **Use the `metattach`(1M) command to attach the second submirror to the mirror.**

   # **metattach** *mirror* *submirror2*

10. **Is the disk that is used to mirror the root disk physically connected to more than one node (multiported)?**

    - If no, proceed to Step 11.
    - If yes, perform the following steps to enable the `localonly` property of the raw-disk device group for the disk used to mirror the root disk. You must enable the `localonly` property to prevent unintentional fencing of a node from its boot device if the boot device is connected to multiple nodes.

    a. **If necessary, use the `scdidadm`(1M) `-L` command to display the full device-ID path name of the raw-disk device group.**

       In the following example, the raw-disk device-group name `dsk/d2` is part of the third column of output, which is the full device-ID path name.

```
# scdidadm -L
...
1         phys-schost-3:/dev/rdsk/c1t1d0     /dev/did/rdsk/d2
```

b. **View the node list of the raw-disk device group.**

Output looks similar to the following:

```
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
...
  (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
...
```

c. **Does the node list contain more than one node name?**

- If yes, proceed to Step d.
- If no, skip to Step e.

d. **Remove all nodes from the node list for the raw-disk device group except the node whose root disk you mirrored.**

Only the node whose root disk you mirrored should remain in the node list.

```
# scconf -r -D name=dsk/dN,nodelist=node
```

`-D name=dsk/dN`	Specifies the cluster-unique name of the raw-disk device group
`nodelist=node`	Specifies the name of the node or nodes to remove from the node list

e. **Use the `scconf`(1M) command to enable the `localonly` property.**

When the `localonly` property is enabled, the raw-disk device group is used exclusively by the node in its node list. This usage prevents unintentional fencing of the node from its boot device if the boot device is connected to multiple nodes.

```
# scconf -c -D name=rawdisk-groupname,localonly=true
```

`-D name=rawdisk-groupname`	Specifies the name of the raw-disk device group

For more information about the `localonly` property, see the `scconf_dg_rawdisk`(1M) man page.

11. **Record the alternate boot path for possible future use.**

If the primary boot device fails, you can then boot from this alternate boot device. See "Troubleshooting the System" in *Solstice DiskSuite 4.2.1 User's Guide* or "Mirroring root (/) Special Considerations" in *Solaris Volume Manager Administration Guide* for more information about alternate boot devices.

```
# ls -l /dev/rdsk/root-disk-slice
```

12. **Repeat Step 1 through Step 11 on each remaining node of the cluster.**

Ensure that each metadevice or volume name for a mirror is unique throughout the cluster.

13. **Do you intend to mirror the global namespace, `/global/.devices/node@`*nodeid*?**

    - If yes, go to "How to Mirror the Global Namespace" on page 181.
    - If no, proceed to Step 14.

14. **Do you intend to mirror file systems than cannot be unmounted?**

    - If yes, go to "How to Mirror File Systems Other Than Root (/) That Cannot Be Unmounted" on page 184.
    - If no, proceed to Step 15.

15. **Do you intend to mirror user-defined file systems?**

    - If yes, go to "How to Mirror File Systems That Can Be Unmounted" on page 188.
    - If no, go to "How to Create a Diskset" on page 192 to create a diskset.

Example—Mirroring the Root (/) File System

The following example shows the creation of mirror `d0` on the node `phys-schost-1`, which consists of submirror `d10` on partition `c0t0d0s0` and submirror `d20` on partition `c2t2d0s0`. Disk `c2t2d0` is a multiported disk, so the `localonly` property is enabled.

```
    (Create the mirror)
# metainit -f d10 1 1 c0t0d0s0
d11: Concat/Stripe is setup
# metainit d20 1 1 c2t2d0s0
d12: Concat/Stripe is setup
# metainit d0 -m d10
d10: Mirror is setup
# metaroot d0
# lockfs -fa

    (Move resource groups and device groups from phys-schost-1)
# scswitch -S -h phys-schost-1

    (Reboot the node)
# shutdown -g0 -y -i6

    (Attach the second submirror)
# metattach d0 d20
d0: Submirror d20 is attached

    (Display the device-group node list)
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
```

```
...
  (dsk/d2) Device group node list:       phys-schost-1, phys-schost-3
...
```

(Remove phys-schost-3 from the node list)

```
# scconf -r -D name=dsk/d2,nodelist=phys-schost-3
```

(Enable the localonly property)

```
# scconf -c -D name=dsk/d2,localonly=true
```

(Record the alternate boot path)

```
# ls -l /dev/rdsk/c2t2d0s0
lrwxrwxrwx  1 root     root          57 Apr 25 20:11 /dev/rdsk/c2t2d0s0
-> ../../devices/node@1/pci@1f,0/pci@1/scsi@3,1/disk@2,0:a,raw
```

▼ How to Mirror the Global Namespace

Use this procedure to mirror the global namespace, `/global/.devices/node@`*nodeid*.

1. **Become superuser on a node of the cluster.**

2. **Put the global namespace slice in a single-slice (one-way) concatenation.**

   Use the physical disk name of the disk slice (`c`*N*`t`*X*`d`*Y*`s`*Z*).

   # **metainit -f** *submirror1* **1 1** *diskslice*

3. **Create a second concatenation.**

   # **metainit** *submirror2* **1 1** *submirror-diskslice*

4. **Create a one-way mirror with one submirror.**

   # **metainit** *mirror* **-m** *submirror1*

   Note – The metadevice or volume name for the mirror *must* be unique throughout the cluster.

   ---

5. **Attach the second submirror to the mirror.**

   This attachment starts a synchronization of the submirrors.

   # **metattach** *mirror* *submirror2*

6. **Edit the `/etc/vfstab` file entry for the `/global/.devices/node@`*nodeid* file system.**

   Replace the names in the `device to mount` and `device to fsck` columns with the mirror name.

```
#
vi /etc/vfstab
#device        device        mount    FS     fsck    mount    mount
#to mount      to fsck       point    type   pass    at boot  options
#
/dev/md/dsk/mirror /dev/md/rdsk/mirror /global/.devices/node@nodeid ufs 2 no global
```

7. **Repeat Step 1 through Step 6 on each remaining node of the cluster.**

8. **Wait for the synchronization of the mirrors, started in Step 5, to complete.**

   Use the `metastat`(1M) command to view mirror status and to verify that mirror synchronization if complete.

   ```
   # metastat mirror
   ```

9. **Is the disk that is used to mirror the global namespace physically connected to more than one node (multiported)?**

   - If no, proceed to Step 10.
   - If yes, perform the following steps to enable the `localonly` property of the raw-disk device group for the disk used to mirror the global namespace. You must enable the `localonly` property to prevent unintentional fencing of a node from its boot device if the boot device is connected to multiple nodes.

   a. **If necessary, use the `scdidadm`(1M) command to display the full device-ID path name of the raw-disk device group.**

      In the following example, the raw-disk device-group name `dsk/d2` is part of the third column of output, which is the full device-ID path name.

      ```
      # scdidadm -L
      ...
      1         phys-schost-3:/dev/rdsk/c1t1d0     /dev/did/rdsk/d2
      ```

   b. **View the node list of the raw-disk device group.**

      Output looks similar to the following.

      ```
      # scconf -pvv | grep dsk/d2
      Device group name:                        dsk/d2
      ...
        (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
      ...
      ```

   c. **Does the node list contain more than one node name?**

      - If yes, proceed to Step d.
      - If no, skip to Step e.

   d. **Remove all nodes from the node list for the raw-disk device group, except the node whose disk is mirrored.**

      Only the node whose disk is mirrored should remain in the node list.

      ```
      # scconf -r -D name=dsk/dN,nodelist=node
      ```

`-D name=dsk/d`*N*	Specifies the cluster-unique name of the raw-disk device group
`nodelist=`*node*	Specifies the name of the node or nodes to remove from the node list

e. Use the `scconf`(1M) command to enable the `localonly` property.

When the `localonly` property is enabled, the raw-disk device group is used exclusively by the node in its node list. This usage prevents unintentional fencing of the node from its boot device if the boot device is connected to multiple nodes.

```
# scconf -c -D name=rawdisk-groupname,localonly=true
```

`-D name=`*rawdisk-groupname*	Specifies the name of the raw-disk device group

For more information about the `localonly` property, see the `scconf_dg_rawdisk`(1M) man page.

10. Do you intend to mirror file systems other than root (/) that cannot be unmounted?

- If yes, go to "How to Mirror File Systems Other Than Root (/) That Cannot Be Unmounted" on page 184.
- If no, proceed to Step 11.

11. Do you intend to mirror user-defined file systems?

- If yes, go to "How to Mirror File Systems That Can Be Unmounted" on page 188.
- If no, go to "How to Create a Diskset" on page 192 to create a diskset.

Example—Mirroring the Global Namespace

The following example shows creation of mirror `d101`, which consists of submirror `d111` on partition `c0t0d0s3` and submirror `d121` on partition `c2t2d0s3`. The `/etc/vfstab` file entry for `/global/.devices/node@1` is updated to use the mirror name `d101`. Disk `c2t2d0` is a multiported disk, so the `localonly` property is enabled.

```
(Create the mirror)
# metainit -f d111 1 1 c0t0d0s3
d111: Concat/Stripe is setup
# metainit d121 1 1 c2t2d0s3
d121: Concat/Stripe is setup
# metainit d101 -m d111
d101: Mirror is setup
# metattach d101 d121
d101: Submirror d121 is attached
```

(Edit the /etc/vfstab file)

```
# vi /etc/vfstab
#device        device        mount    FS     fsck    mount    mount
#to mount      to fsck       point    type   pass    at boot  options
#
/dev/md/dsk/d101 /dev/md/rdsk/d101 /global/.devices/node@1 ufs 2 no global
```

(View the sync status)

```
# metastat d101
d101: Mirror
      Submirror 0: d111
         State: Okay
      Submirror 1: d121
         State: Resyncing
      Resync in progress: 15 % done
...
```

(Identify the device-ID name of the mirrored disk's raw-disk device group)

```
# scdidadm -L
...
1         phys-schost-3:/dev/rdsk/c2t2d0     /dev/did/rdsk/d2
```

(Display the device-group node list)

```
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
...
  (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
...
```

(Remove phys-schost-3 from the node list)

```
# scconf -r -D name=dsk/d2,nodelist=phys-schost-3
```

(Enable the localonly property)

```
# scconf -c -D name=dsk/d2,localonly=true
```

▼ How to Mirror File Systems Other Than Root (/) That Cannot Be Unmounted

Use this procedure to mirror file systems other than root (/) that cannot be unmounted during normal system usage, such as `/usr`, `/opt`, or `swap`.

1. **Become superuser on a node of the cluster.**

2. **Put the slice on which an unmountable file system resides in a single-slice (one-way) concatenation.**

   Specify the physical disk name of the disk slice (c*N*t*X*d*Y*s*Z*).

   ```
   # metainit -f submirror1 1 1 diskslice
   ```

3. **Create a second concatenation.**

```
# metainit submirror2 1 1 submirror-diskslice
```

4. **Create a one-way mirror with one submirror.**

```
# metainit mirror -m submirror1
```

Note – The metadevice or volume name for this mirror does *not* need to be unique throughout the cluster.

---

5. **Repeat Step 1 through Step 4 for each remaining unmountable file system that you want to mirror.**

6. **On each node, edit the `/etc/vfstab` file entry for each unmountable file system you mirrored.**

   Replace the names in the `device to mount` and `device to fsck` columns with the mirror name.

```
# vi /etc/vfstab
#device        device        mount    FS     fsck    mount    mount
#to mount      to fsck       point    type   pass    at boot  options
#
/dev/md/dsk/mirror /dev/md/rdsk/mirror /filesystem ufs 2 no global
```

7. **Move any resource groups or device groups from the node.**

```
# scswitch -S -h from-node
```

`-S`	Moves all resource groups and device groups
`-h` *from-node*	Specifies the name of the node from which to move resource or device groups

8. **Reboot the node.**

```
# shutdown -g0 -y -i6
```

9. **Attach the second submirror to each mirror.**

   This attachment starts a synchronization of the submirrors.

```
# metattach mirror submirror2
```

10. **Wait for the synchronization of the mirrors, started in Step 9, to complete.**

    Use the `metastat`(1M) command to view mirror status and to verify that mirror synchronization is complete.

```
# metastat mirror
```

11. **Is the disk that is used to mirror the unmountable file system physically connected to more than one node (multiported)?**

    - If no, proceed to Step 12.

- If yes, perform the following steps to enable the `localonly` property of the raw-disk device group for the disk used to mirror the unmountable file system. You must enable the `localonly` property to prevent unintentional fencing of a node from its boot device if the boot device is connected to multiple nodes.

a. If necessary, use the `scdidadm -L` command to display the full device-ID path name of the raw-disk device group.

In the following example, the raw-disk device-group name `dsk/d2` is part of the third column of output, which is the full device-ID path name.

```
# scdidadm -L
...
1            phys-schost-3:/dev/rdsk/c1t1d0    /dev/did/rdsk/d2
```

b. View the node list of the raw-disk device group.

Output looks similar to the following.

```
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
...
  (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
...
```

c. Does the node list contain more than one node name?

- If yes, proceed to Step d.
- If no, skip to Step e.

d. Remove all nodes from the node list for the raw-disk device group except the node whose root disk is mirrored.

Only the node whose root disk is mirrored should remain in the node list.

```
# scconf -r -D name=dsk/dN,nodelist=node
```

`-D name=dsk/dN`	Specifies the cluster-unique name of the raw-disk device group
`nodelist=node`	Specifies the name of the node or nodes to remove from the node list

e. Use the `scconf`(1M) command to enable the `localonly` property.

When the `localonly` property is enabled, the raw-disk device group is used exclusively by the node in its node list. This usage prevents unintentional fencing of the node from its boot device if the boot device is connected to multiple nodes.

```
# scconf -c -D name=rawdisk-groupname,localonly=true
```

`-D name=rawdisk-groupname`	Specifies the name of the raw-disk device group

For more information about the `localonly` property, see the `scconf_dg_rawdisk`(1M) man page.

12. Do you intend to mirror user-defined file systems?

- If yes, go to "How to Mirror File Systems That Can Be Unmounted" on page 188.
- If no, go to "How to Create a Diskset" on page 192 to create a diskset.

Example—Mirroring File Systems That Cannot Be Unmounted

The following example shows the creation of mirror `d1` on the node `phys-schost-1` to mirror `/usr`, which resides on `c0t0d0s1`. Mirror `d1` consists of submirror `d11` on partition `c0t0d0s1` and submirror `d21` on partition `c2t2d0s1`. The `/etc/vfstab` file entry for `/usr` is updated to use the mirror name `d1`. Disk `c2t2d0` is a multiported disk, so the `localonly` property is enabled.

```
    (Create the mirror)
# metainit -f d11 1 1 c0t0d0s1
d11: Concat/Stripe is setup
# metainit d21 1 1 c2t2d0s1
d21: Concat/Stripe is setup
# metainit d1 -m d11
d1: Mirror is setup

    (Edit the /etc/vfstab file)
# vi /etc/vfstab
#device        device        mount    FS     fsck    mount    mount
#to mount      to fsck       point    type   pass    at boot  options
#
/dev/md/dsk/d1 /dev/md/rdsk/d1 /usr ufs  2       no global

    (Move resource groups and device groups from phys-schost-1)
# scswitch -S -h phys-schost-1

    (Reboot the node)
# shutdown -g0 -y -i6

    (Attach the second submirror)
# metattach d1 d21
d1: Submirror d21 is attached

    (View the sync status)
# metastat d1
d1: Mirror
      Submirror 0: d11
         State: Okay
      Submirror 1: d21
         State: Resyncing
      Resync in progress: 15 % done
...

    (Identify the device-ID name of the mirrored disk's raw-disk device group)
```

```
# scdidadm -L
...
1         phys-schost-3:/dev/rdsk/c2t2d0     /dev/did/rdsk/d2
```

(Display the device-group node list)

```
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
...
  (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
...
```

(Remove phys-schost-3 from the node list)

```
# scconf -r -D name=dsk/d2,nodelist=phys-schost-3
```

(Enable the localonly property)

```
# scconf -c -D name=dsk/d2,localonly=true
```

▼ How to Mirror File Systems That Can Be Unmounted

Use this procedure to mirror user-defined file systems that can be unmounted. In this procedure, the nodes do not need to be rebooted.

1. **Become superuser on a node of the cluster.**

2. **Unmount the file system to mirror.**

   Ensure that no processes are running on the file system.

   # **umount /***mount-point*

   See the umount(1M) man page and "Mounting and Unmounting File Systems" in *System Administration Guide: Basic Administration* for more information.

3. **Put in a single-slice (one-way) concatenation the slice that contains a user-defined file system that can be unmounted.**

   Specify the physical disk name of the disk slice (cNtXdYsZ).

   # **metainit -f** *submirror1* **1 1** *diskslice*

4. **Create a second concatenation.**

   # **metainit** *submirror2* **1 1** *submirror-diskslice*

5. **Create a one-way mirror with one submirror.**

   # **metainit** *mirror* **-m** *submirror1*

Note – The metadevice or volume name for this mirror does *not* need to be unique throughout the cluster.

---

6. **Repeat Step 1 through Step 5 for each mountable file system to be mirrored.**

7. **On each node, edit the `/etc/vfstab` file entry for each file system you mirrored.**

   Replace the names in the `device to mount` and `device to fsck` columns with the mirror name.

   ```
   # vi /etc/vfstab
   #device        device        mount    FS     fsck    mount    mount
   #to mount      to fsck       point    type   pass    at boot  options
   #
   /dev/md/dsk/mirror /dev/md/rdsk/mirror /filesystem ufs 2 no global
   ```

8. **Attach the second submirror to the mirror.**

   This attachment starts a synchronization of the submirrors.

   ```
   # metattach mirror submirror2
   ```

9. **Wait for the synchronization of the mirrors, started in Step 8, to be completed.**

   Use the `metastat`(1M) command to view mirror status.

   ```
   # metastat mirror
   ```

10. **Is the disk that is used to mirror the user-defined file system physically connected to more than one node (multiported)?**

    - If no, proceed to Step 12.
    - If yes, perform the following steps to enable the `localonly` property of the raw-disk device group for the disk used to mirror the user-defined file system. You must enable the `localonly` property to prevent unintentional fencing of a node from its boot device if the boot device is connected to multiple nodes.

    a. **If necessary, use the `scdidadm -L` command to display the full device-ID path name of the raw-disk device group.**

       In the following example, the raw-disk device-group name `dsk/d4` is part of the third column of output, which is the full device-ID path name.

       ```
       # scdidadm -L
       ...
       1         phys-schost-3:/dev/rdsk/c1t1d0     /dev/did/rdsk/d2
       ```

    b. **View the node list of the raw-disk device group.**

       Output looks similar to the following.

       ```
       # scconf -pvv | grep dsk/d2
       Device group name:                        dsk/d2
       ...
         (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
       ...
       ```

    c. **Does the node list contain more than one node name?**

- If yes, proceed to Step d.
- If no, skip to Step e.

d. Remove all nodes from the node list for the raw-disk device group except the node whose root disk you mirrored.

Only the node whose root disk you mirrored should remain in the node list.

```
# scconf -r -D name=dsk/dN,nodelist=node
```

`-D name=dsk/dN`	Specifies the cluster-unique name of the raw-disk device group
`nodelist=node`	Specifies the name of the node or nodes to remove from the node list

e. Use the `scconf`(1M) command to enable the `localonly` property.

When the `localonly` property is enabled, the raw-disk device group is used exclusively by the node in its node list. This usage prevents unintentional fencing of the node from its boot device if the boot device is connected to multiple nodes.

```
# scconf -c -D name=rawdisk-groupname,localonly=true
```

`-D name=rawdisk-groupname`	Specifies the name of the raw-disk device group

For more information about the `localonly` property, see the `scconf_dg_rawdisk`(1M) man page.

11. Mount the mirrored file system.

```
# mount /mount-point
```

See the `mount`(1M) man page and "Mounting and Unmounting File Systems" in *System Administration Guide: Basic Administration* for more information.

12. Create a diskset.

Go to "How to Create a Diskset" on page 192.

Example—Mirroring File Systems That Can Be Unmounted

The following example shows creation of mirror `d4` to mirror `/export`, which resides on `c0t0d0s4`. Mirror `d4` consists of submirror `d14` on partition `c0t0d0s4` and submirror `d24` on partition `c2t2d0s4`. The `/etc/vfstab` file entry for `/export` is updated to use the mirror name `d4`. Disk `c2t2d0` is a multiported disk, so the `localonly` property is enabled.

```
    (Unmount the file system)
# umount /export
```

(Create the mirror)

```
# metainit -f d14 1 1 c0t0d0s4
d14: Concat/Stripe is setup
# metainit d24 1 1 c2t2d0s4
d24: Concat/Stripe is setup
# metainit d4 -m d14
d4: Mirror is setup
```

(Edit the /etc/vfstab file)

```
# vi /etc/vfstab
#device        device        mount    FS     fsck    mount    mount
#to mount      to fsck       point    type   pass    at boot  options
#
/dev/md/dsk/d4 /dev/md/rdsk/d4 /export ufs 2 no    global
```

(Attach the second submirror)

```
# metattach d4 d24
d4: Submirror d24 is attached
```

(View the sync status)

```
# metastat d4
d4: Mirror
      Submirror 0: d14
         State: Okay
      Submirror 1: d24
         State: Resyncing
      Resync in progress: 15 % done
...
```

(Identify the device-ID name of the mirrored disk's raw-disk device group)

```
# scdidadm -L
...
1         phys-schost-3:/dev/rdsk/c2t2d0     /dev/did/rdsk/d2
```

(Display the device-group node list)

```
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
...
  (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
...
```

(Remove phys-schost-3 from the node list)

```
# scconf -r -D name=dsk/d2,nodelist=phys-schost-3
```

(Enable the localonly property)

```
# scconf -c -D name=dsk/d2,localonly=true
```

(Mount the file system)

```
# mount /export
```

▼ How to Create a Diskset

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" on page 67 for information about the metasets that were created by SunPlex Manager.

---

1. **Do you intend to create more than three disksets in the cluster?**
   - If no, skip to Step 6.
   - If yes, proceed to Step 2 to prepare the cluster for more than three disksets. You must perform that task whether you are installing disksets for the first time or whether you are adding more disksets to a fully configured cluster.
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 configured 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/Solaris Volume Manager 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 to update the global-devices namespace.**

5. **On each node, verify that the `scgdevs` command has completed processing 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 the diskset is 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 "Configuring Mediators" on page 200 for details on how to configure mediators.
   - If the diskset is configured with more than two disk strings, ensure that for any two disk strings S1 and S2, the sum of the number of disk drives on those strings exceeds the number of disk drives on the third string S3. Stated as a formula, the requirement is that count(S1) + count(S2) > count(S3).

7. **Ensure that the local state database replicas exist.**

   For instructions, see "How to Create State Database Replicas" on page 176.

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

9. **Create the diskset.**

   The following command creates the diskset and 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

---

Note – When you run the `metaset` command to configure a Solstice DiskSuite/Solaris Volume Manager device group on a cluster, the command designates one secondary node by default. You can change the desired number of secondary nodes in the device group by using the `scsetup`(1M) utility after the device group is created. Refer to "Administering Disk Device Groups" in *Sun Cluster 3.1 10/03 System Administration Guide* for more information about how to change the `numsecondaries` property.

---

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

    # **metaset -s** *setname*

11. **Add disk drives to the diskset.**

    Go to "Adding Disk Drives to a Diskset" on page 194.

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` specified 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
```

Adding Disk Drives to a Diskset

When you add a disk drive to a diskset, Solstice DiskSuite/Solaris Volume Manager repartitions the disk drive as follows so that the state database for the diskset can be placed on the disk drive.

- A small portion of each disk drive is reserved in slice 7 for use by Solstice DiskSuite/Solaris Volume Manager software. The remainder of the space on each disk drive is placed into slice 0.
- Disk drives are repartitioned when they are added to the diskset only if slice 7 is not configured correctly.
- Any existing data on the disk drives is lost by the repartitioning.
- If slice 7 starts at cylinder 0, and the disk drive partition is large enough to contain a state database replica, the disk drive is not repartitioned.

▼ How to Add Disk Drives to a Diskset

1. **Become superuser on the node.**

2. **Ensure that the diskset has been created.**

   For instructions, see "How to Create a Diskset" on page 192.

3. **List the DID mappings.**

   # **scdidadm -L**

   - Choose disk drives that are shared by the cluster nodes that will master or potentially master the diskset.
   - Use the full device-ID path names when you add disk drives to a diskset.

The first column of output is the DID instance number, the second column is the full physical path name, and the third column is the full device-ID path name (pseudo path). A shared disk drive has more than one entry for the same DID instance number.

In the following example, the entries for DID instance number `2` indicate a disk drive that is shared by `phys-schost-1` and `phys-schost-2`, and the full device-ID path name is `/dev/did/rdsk/d2`.

```
1       phys-schost-1:/dev/rdsk/c0t0d0 /dev/did/rdsk/d1
2       phys-schost-1:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
2       phys-schost-2:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
3       phys-schost-1:/dev/rdsk/c1t2d0 /dev/did/rdsk/d3
3       phys-schost-2:/dev/rdsk/c1t2d0 /dev/did/rdsk/d3
...
```

4. **Take ownership of the diskset.**

   # **metaset -s** *setname* **-t**

`-s` *setname*	Specifies the diskset name
`-t`	Takes ownership of the diskset

5. **Add the disk drives to the diskset.**

   Use the full device-ID path name.

   # **metaset -s** *setname* **-a** *drivename*

`-a`	Adds the disk drive to the diskset
drivename	Full device-ID path name of the shared disk drive

Note – Do *not* use the lower-level device name (`c`*N*`t`*X*`d`*Y*) when you add a disk drive to a diskset. Because the lower-level device name is a local name and not unique throughout the cluster, using this name might prevent the metaset from being able to switch over.

---

6. **Verify the status of the diskset and disk drives.**

   # **metaset -s** *setname*

7. **Do you intend to repartition disk drives for use in metadevices or volumes?**

   - If yes, go to "How to Repartition Disk Drives in a Diskset" on page 196.
   - If no, go to "How to Create an `md.tab` File" on page 196 to define metadevices or volumes by using an `md.tab` file.

Example—Adding Disk Drives to a Diskset

The `metaset` command adds the disk drives `/dev/did/rdsk/d1` and `/dev/did/rdsk/d2` to the diskset `dg-schost-1`.

```
# metaset -s dg-schost-1 -a /dev/did/rdsk/d1 /dev/did/rdsk/d2
```

▼ How to Repartition Disk Drives in a Diskset

The `metaset`(1M) command repartitions disk drives in a diskset so that a small portion of each disk drive is reserved in slice 7 for use by Solstice DiskSuite/Solaris Volume Manager software. The remainder of the space on each disk drive is placed into slice 0. To make more effective use of the disk drive, use this procedure to modify the disk layout. If you allocate space to slices 1 through 6, you can use these slices when you set up Solstice DiskSuite metadevices or Solaris Volume Manager volumes.

1. **Become superuser on the cluster node.**

2. **Use the `format` command to change the disk partitioning for each disk drive in the diskset.**

   When you repartition a disk drive, you must meet the following conditions to prevent the `metaset`(1M) command from repartitioning the disk drive.

   - Create slice 7 starting at cylinder 0, large enough to hold a state database replica (approximately 2 Mbytes).
   - Set the `Flag` field in slice 7 to `wu` (read-write, unmountable). Do not set it to read-only.
   - Do not allow slice 7 to overlap any other slice on the disk drive.

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

3. **Define metadevices or volumes by using an `md.tab` file.**

   Go to "How to Create an `md.tab` File" on page 196.

▼ How to Create an `md.tab` File

Create an `/etc/lvm/md.tab` file on each node in the cluster. Use the `md.tab` file to define Solstice DiskSuite metadevices or Solaris Volume Manager volumes for the disksets that you created.

Note – If you are using local metadevices or volumes, ensure that local metadevices or volumes names are distinct from the device-ID names used to form disksets. For example, if the device-ID name `/dev/did/dsk/d3` is used in a diskset, do not use the name `/dev/md/dsk/d3` for a local metadevice or volume. This requirement does not apply to shared metadevices or volumes, which use the naming convention `/dev/md/`*setname*`/{r}dsk/d#`.

Tip – To avoid possible confusion between local metadevices or volumes in a cluster environment, use a naming scheme that makes each local metadevice or volume name unique throughout the cluster. For example, for node 1 choose names from d100-d199. And for node 2 use d200-d299.

---

1. **Become superuser on the cluster node.**

2. **List the DID mappings for reference when you create your `md.tab` file.**

   Use the full device-ID path names in the `md.tab` file in place of the lower-level device names (c*N*t*X*d*Y*).

   ```
   # scdidadm -L
   ```

   In the following example, the first column of output is the DID instance number, the second column is the full physical path name, and the third column is the full device-ID path name (pseudo path).

   ```
   1       phys-schost-1:/dev/rdsk/c0t0d0 /dev/did/rdsk/d1
   2       phys-schost-1:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
   2       phys-schost-2:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
   3       phys-schost-1:/dev/rdsk/c1t2d0 /dev/did/rdsk/d3
   3       phys-schost-2:/dev/rdsk/c1t2d0 /dev/did/rdsk/d3
   ...
   ```

3. **Create an `/etc/lvm/md.tab` file and edit it by hand with your preferred text editor.**

   See your Solstice DiskSuite/Solaris Volume Manager documentation and the `md.tab`(4) man page for details on how to create an `md.tab` file.

   Note – If you have existing data on the disk drives that will be used for the submirrors, you must back up the data before metadevice or volume setup. Then restore the data onto the mirror.

   ---

4. **Activate the metadevices or volumes that are defined in the `md.tab` files.**

   Go to "How to Activate Metadevices or Volumes" on page 198.

Example—Sample `md.tab` File

The following sample `md.tab` file defines the diskset that is named `dg-schost-1`. The ordering of lines in the `md.tab` file is not important.

```
dg-schost-1/d0 -m dg-schost-1/d10 dg-schost-1/d20
    dg-schost-1/d10 1 1 /dev/did/rdsk/d1s0
    dg-schost-1/d20 1 1 /dev/did/rdsk/d2s0
```

The sample `md.tab` file is constructed as follows.

Note – The following example uses Solstice DiskSuite terminology. For Solaris Volume Manager, a trans metadevice is instead called a *transactional volume* and a metadevice is instead called a *volume*. Otherwise, the following process is valid for both volume managers.

---

1. The first line defines the device `d0` as a mirror of metadevices `d10` and `d20`. The `-m` signifies that this device is a mirror device.

   ```
   dg-schost-1/d0 -m dg-schost-1/d0 dg-schost-1/d20
   ```

2. The second line defines metadevice `d10`, the first submirror of `d0`, as a one-way stripe.

   ```
   dg-schost-1/d10 1 1 /dev/did/rdsk/d1s0
   ```

3. The third line defines metadevice `d20`, the second submirror of `d0`, as a one-way stripe.

   ```
   dg-schost-1/d20 1 1 /dev/did/rdsk/d2s0
   ```

▼ How to Activate Metadevices or Volumes

Perform this procedure to activate Solstice DiskSuite metadevices or Solaris Volume Manager volumes that are defined in`md.tab` files.

1. **Become superuser on the cluster node.**

2. **Ensure that `md.tab` files are located in the `/etc/lvm` directory.**

3. **Ensure that you have ownership of the diskset on the node where the command will be executed.**

4. **Take ownership of the diskset.**

   ```
   # metaset -s setname -t
   ```

`-s` *setname*	Specifies the diskset name
`-t`	Takes ownership of the diskset

5. **Activate the diskset's metadevices or volumes, which are defined in the `md.tab` file.**

   # **metainit -s** *setname* **-a**

   `-a` Activates all metadevices in the `md.tab` file

6. **For each master and log device, attach the second submirror (*submirror2*).**

   When the metadevices or volumes in the `md.tab` file are activated, only the first submirror (*submirror1*) of the master and log devices is attached, so *submirror2* must be attached by hand.

   # **metattach** *mirror submirror2*

7. **Repeat Step 3 through Step 6 for each diskset in the cluster.**

   If necessary, run the `metainit`(1M) command from another node that has connectivity to the disk drives. This step is required for cluster-pair topologies, where the disk drives are not accessible by all nodes.

8. **Check the status of the metadevices or volumes.**

   # **metastat -s** *setname*

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

9. **Does your cluster contain disksets that are configured with exactly two disk enclosures and two nodes?**

   - If yes, those disksets require mediators. Go to "Configuring Mediators" on page 200 to add mediator hosts.
   - If no, go to "How to Add Cluster File Systems" on page 103 to create a cluster file system.

Example—Activating Metadevices or Volumes in the `md.tab` File

In the following example, all metadevices that are defined in the `md.tab` file for diskset `dg-schost-1` are activated. Then the second submirrors of master device `dg-schost-1/d1` and log device `dg-schost-1/d4` are activated.

```
# metainit -s dg-schost-1 -a
# metattach dg-schost-1/d1 dg-schost-1/d3
# metattach dg-schost-1/d4 dg-schost-1/d6
```

Configuring Mediators

A mediator, or mediator host, is a cluster node that stores mediator data. Mediator data provides information on the location of other mediators and contains a commit count that is identical to the commit count stored in the database replicas. This commit count is used to confirm that the mediator data is in sync with the data in the database replicas.

Mediators are required for all Solstice DiskSuite/Solaris Volume Manager disksets that are configured with exactly two disk strings and two cluster nodes. A *disk string* consists of a disk enclosure, its physical disk drives, cables from the enclosure to the node(s), and the interface adapter cards. The use of mediators enables the Sun Cluster software to ensure that the most current data is presented in the instance of a single-string failure in a dual-string configuration. The following rules apply to dual-string configurations that use mediators.

- Disksets must be configured with exactly two mediator hosts. Those two mediator hosts must be the same two cluster nodes that are used for the diskset.
- A diskset cannot have more than two mediator hosts.
- Mediators cannot be configured for disksets that do not meet the two-string and two-host criteria.

These rules do not require that the entire cluster must have exactly two nodes. Rather, only those disksets that have two disk strings must be connected to exactly two nodes. An N+1 cluster and many other topologies are permitted under these rules.

This section contains the following procedures:

- "How to Add Mediator Hosts" on page 200
- "How to Check the Status of Mediator Data" on page 201
- "How to Fix Bad Mediator Data" on page 201

▼ How to Add Mediator Hosts

Perform this procedure if your configuration requires mediators.

1. **Become superuser on the node that currently masters the diskset to which you intend to add mediator hosts.**

2. **Run the `metaset`(1M) command to add each node with connectivity to the diskset as a mediator host for that diskset.**

   # **`metaset -s`** *setname* **`-a -m`** *mediator-host-list*

   `-s` *setname* Specifies the diskset name

`-a`	Adds to the diskset
`-m` *mediator-host-list*	Specifies the name of the node to add as a mediator host for the diskset

See the `mediator`(7D) man page for details about mediator-specific options to the `metaset` command.

3. **Check the status of mediator data.**

   Go to "How to Check the Status of Mediator Data" on page 201.

Example—Adding Mediator Hosts

The following example adds the nodes `phys-schost-1` and `phys-schost-2` as mediator hosts for the diskset `dg-schost-1`. Both commands are run from the node `phys-schost-1`.

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

▼ How to Check the Status of Mediator Data

1. **Add mediator hosts as described in "How to Add Mediator Hosts" on page 200.**

2. **Run the `medstat` command.**

   # **`medstat -s`** *setname*

`-s` *setname*	Specifies the diskset name

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

3. **Is `Bad` the value in the Status field?**

   - If yes, go to "How to Fix Bad Mediator Data" on page 201 to repair the affected mediator host.
   - If no, go to "How to Add Cluster File Systems" on page 103 to create a cluster file system.

▼ How to Fix Bad Mediator Data

Perform this procedure to repair bad mediator data.

1. **Identify the mediator host(s) with bad mediator data as described in the procedure "How to Check the Status of Mediator Data" on page 201.**

2. **Become superuser on the node that owns the affected diskset.**

3. **Remove the mediator host(s) with bad mediator data from all affected disksets.**

   # **metaset -s** *setname* **-d -m** *mediator-host-list*

`-s` *setname*	Specifies the diskset name
`-d`	Deletes from the diskset
`-m` *mediator-host-list*	Specifies the name of the node to remove as a mediator host for the diskset

4. **Restore the mediator host.**

   # **metaset -s** *setname* **-a -m** *mediator-host-list*

`-a`	Adds to the diskset
`-m` *mediator-host-list*	Specifies the name of the node to add as a mediator host for the diskset

   See the `mediator`(7D) man page for details about mediator-specific options to the `metaset` command.

5. **Create cluster file systems.**

   Go to "How to Add Cluster File Systems" on page 103.

APPENDIX C

Installing and Configuring VERITAS Volume Manager

Install and configure your local and multihost disks for VERITAS Volume Manager (VxVM) by using the procedures in this appendix, along with the planning information in "Planning Volume Management" on page 26. See your VxVM documentation for additional details.

The following procedures are in this appendix.

- "How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk" on page 205
- "How to Mirror the Encapsulated Root Disk" on page 208
- "How to Install VERITAS Volume Manager Software Only" on page 210
- "How to Create a `rootdg` Disk Group on a Nonroot Disk" on page 213
- "How to Create and Register a Disk Group" on page 214
- "How to Assign a New Minor Number to a Disk Device Group" on page 216
- "How to Verify the Disk Group Configuration" on page 217
- "How to Unencapsulate the Root Disk" on page 217

Installing and Configuring VxVM Software

Before you begin, have available the following information.

- Mappings of your storage disk drives.
- The following completed configuration planning worksheets. See "Planning Volume Management" on page 26 for planning guidelines.
  - "Local File System Layout Worksheet" on page 152
  - "Disk Device Group Configurations Worksheet" on page 162
  - "Volume Manager Configurations Worksheet" on page 164

The following table lists the tasks to perform to install and configure VxVM software for Sun Cluster configurations.

TABLE C–1 Task Map: Installing and Configuring VxVM Software

Task	Instructions
1. Plan the layout of your VxVM configuration.	"Planning Volume Management" on page 26
2. Determine how you will create the `rootdg` disk group on each node.	"Setting Up a `rootdg` Disk Group Overview" on page 204
3. Install VxVM software and create the `rootdg` disk group:	
■ **Method 1** – Install VxVM software and encapsulate the root disk by using the `scvxinstall` command, and optionally mirror the encapsulated root disk.	1. "How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk" on page 205 2. "How to Mirror the Encapsulated Root Disk" on page 208
■ **Method 2** – Install VxVM software and create `rootdg` on local, nonroot disks.	1. "How to Install VERITAS Volume Manager Software Only" on page 210 2. "How to Create a `rootdg` Disk Group on a Nonroot Disk" on page 213
4. Create disk groups and volumes.	"How to Create and Register a Disk Group" on page 214
5. If necessary, resolve any minor-number conflicts between disk device groups by assigning a new minor number.	"How to Assign a New Minor Number to a Disk Device Group" on page 216
6. Verify the disk groups and volumes.	"How to Verify the Disk Group Configuration" on page 217
7. Configure the cluster.	"Configuring the Cluster" on page 102

Setting Up a `rootdg` Disk Group Overview

Each cluster node requires the creation of a `rootdg` disk group after VxVM is installed. This disk group is used by VxVM to store configuration information, and has the following restrictions.

- Access to a node's `rootdg` disk group must be restricted to only that node.
- Remote nodes must never access data stored in another node's `rootdg`.
- Do not use the `scconf`(1M) command to register the `rootdg` disk group as a disk device group.
- Whenever possible, configure the `rootdg` for each node on a nonshared disk.

Sun Cluster software supports the following methods to configure the `rootdg` disk group.

- **Encapsulate the node's root disk –** This method enables the root disk to be mirrored, which provides a boot alternative if the root disk is corrupted or damaged. To encapsulate the root disk you need two free disk slices as well as free cylinders, preferably at the beginning or the end of the disk.
- **Use local nonroot disks –** This method provides an alternative to encapsulating the root disk. If a node's root disk is encapsulated, certain tasks you might later perform, such as upgrade the Solaris operating environment or perform disaster recovery procedures, could be more complicated than if the root disk is not encapsulated. To avoid this potential added complexity, you can instead initialize or encapsulate local nonroot disks for use as `rootdg`.

  A `rootdg` disk group that is created on local nonroot disks is local to that node, neither globally accessible nor highly available. As with the root disk, to encapsulate a nonroot disk you need two free disk slices as well as free cylinders at the beginning or the end of the disk.

See your VxVM installation documentation for more information.

Where to Go From Here

Install VxVM by using one of the following installation methods, depending on how you intend to create the `rootdg` disk group.

- If you intend to encapsulate the root disk, go to "How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk" on page 205.
- If you intend to create the `rootdg` disk group on local nonroot disks, go to "How to Install VERITAS Volume Manager Software Only" on page 210.

▼ How to Install VERITAS Volume Manager Software and Encapsulate the Root Disk

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, nonroot disks, go instead to "How to Install VERITAS Volume Manager Software Only" on page 210.

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 devices that 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 that you intend to install with VxVM.**

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

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

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

   ```
   # scvxinstall
   ```

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

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

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

6. **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?
     ```

7. **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.

     Having DMP enabled on systems with only a single path per node poses no problems. However, if you use VxVM in a configuration with multiple paths per node, then you must use another multipathing solution, such as Sun StorEdge Traffic Manager or EMC PowerPath.

   - Installs the required VxVM software, licensing, and man-page packages, but does not install the GUI packages
   - 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 – Two automatic reboots occur during installation. After all installation tasks are completed, `scvxinstall` automatically reboots the node the second time unless you press Ctrl-C when prompted. If you press Ctrl-C to abort the second reboot, you must reboot the node later to complete VxVM installation.

---

8. **If you intend to enable the VxVM cluster feature, supply the cluster feature license key.**

   See your VxVM documentation for information about how to add a license.

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

   See your VxVM documentation for information about installing the VxVM GUI.

10. **Eject the CD-ROM.**

11. **Install any VxVM patches.**

    See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

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

    ```
    # pkgrm VRTSvmman
    ```

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

    - If yes, repeat Step 2 through Step 12.
    - If no, proceed to Step 14.

14. **Do you *not* intend to install one or more nodes with VxVM?**

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

- If yes, proceed to Step 15.
- If no, skip to Step 16.

15. **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.

16. **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.**

17. **Do you intend to mirror the encapsulated root disk?**

- If yes, go to "How to Mirror the Encapsulated Root Disk" on page 208.
- If no, go to "How to Create and Register a Disk Group" on page 214.

Note – If you later need to unencapsulate the root disk, follow the procedures in "How to Unencapsulate the Root Disk" on page 217.

▼ How to Mirror the Encapsulated Root Disk

After you install VxVM and encapsulate the root disk, perform this procedure on each node on which you mirror the encapsulated root disk.

1. **Mirror the encapsulated root disk.**

Follow the procedures in your VxVM documentation. For maximum availability and simplified administration, use a local disk for the mirror. See "Guidelines for Mirroring the Root Disk" on page 32 for additional guidelines.

Caution – Do not use a quorum device to mirror a root disk. Using a quorum device to mirror a root disk might prevent the node from booting from the root-disk mirror under certain circumstances.

2. **Display the DID mappings.**

   ```
   # scdidadm -L
   ```

3. **From the DID mappings, locate the disk that is used to mirror the root disk.**

4. **Extract the raw-disk device-group name from the device-ID name of the root-disk mirror.**

   The name of the raw-disk device group follows the convention `dsk/d`*N*, where *N* is a number. In the following output, the portion of a `scdidadm` output line from which you extract the raw-disk device-group name is highlighted in bold.

   N *node*`:/dev/rdsk/c`*N*`t`*X*`d`*Y* `/dev/did/r`**`dsk/d`***N*

5. **View the node list of the raw-disk device group.**

   Output looks similar to the following.

   ```
   # scconf -pvv | grep dsk/dN
   Device group name:                        dsk/dN
   ...
    (dsk/dN) Device group node list:        phys-schost-1, phys-schost-3
   ...
   ```

6. **Does the node list contain more than one node name?**

   - If yes, proceed to Step 7.
   - If no, skip to Step 9.

7. **Remove from the node list for the raw-disk device group all nodes except the node whose root disk you mirrored.**

   Only the node whose root disk you mirrored should remain in the node list.

   ```
   # scconf -r -D name=dsk/dN,nodelist=node
   ```

-D name=dsk/d*N*	Specifies the cluster-unique name of the raw-disk device group
nodelist=*node*	Specifies the name of the node or nodes to remove from the node list

8. **Enable the `localonly` property of the raw-disk device group.**

   When the `localonly` property is enabled, the raw-disk device group is used exclusively by the node in its node list. This usage prevents unintentional fencing of the node from its boot device if the boot device is connected to multiple nodes.

   ```
   # scconf -c -D name=dsk/dN,localonly=true
   ```

For more information about the `localonly` property, see the `scconf_dg_rawdisk`(1M) man page.

9. **Repeat this procedure for each node in the cluster whose encapsulated root disk you intend to mirror.**

10. **Create disk groups.**

    Go to "How to Create and Register a Disk Group" on page 214.

Example—Mirroring the Encapsulated Root Disk

The following example shows a mirror created of the root disk for the node `phys-schost-1`. The mirror is created on the disk `c1t1d0`, whose raw-disk device-group name is `dsk/d2`. Disk `c1t1d0` is a multiported disk, so the node `phys-schost-3` is removed from the disk's node list and the `localonly` property is enabled.

```
    (Display the DID mappings)
# scdidadm -L
...
2        phys-schost-1:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
2        phys-schost-3:/dev/rdsk/c1t1d0 /dev/did/rdsk/d2
...

    (Display the node list of the mirror disk's raw-disk device group)
# scconf -pvv | grep dsk/d2
Device group name:                        dsk/d2
...
  (dsk/d2) Device group node list:        phys-schost-1, phys-schost-3
...

    (Remove phys-schost-3 from the node list)
# scconf -r -D name=dsk/d2,nodelist=phys-schost-3

    (Enable the localonly property)
# scconf -c -D name=dsk/d2,localonly=true
```

▼ How to Install VERITAS Volume Manager Software Only

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" on page 205 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 devices that VxVM will manage.

1. **Ensure that all nodes in the cluster are running in cluster mode.**
2. **Become superuser on a cluster node that you intend to install with VxVM.**
3. **Insert the VxVM CD-ROM into the CD-ROM drive on the node.**
4. **Start `scvxinstall` in noninteractive 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.

     Having DMP enabled on systems with only a single path per node poses no problems. However, if you use VxVM in a configuration with multiple paths per node, then you must use another multipathing solution, such as Sun StorEdge Traffic Manager or EMC PowerPath.

   - Installs the required VxVM software, licensing, and man-page packages, but does not install the GUI packages
   - Selects a cluster-wide `vxio` driver major number

   Note – You add VxVM licenses during the next procedure, "How to Create a `rootdg` Disk Group on a Nonroot Disk" on page 213.

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

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

See your VxVM documentation for information about installing the VxVM GUI.

6. **Eject the CD-ROM.**

7. **Install any VxVM patches.**

   See "Patches and Required Firmware Levels" in *Sun Cluster 3.1 Release Notes* for the location of patches and installation instructions.

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

   ```
   # pkgrm VRTSvmman
   ```

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

   - If yes, repeat Step 2 through Step 8.
   - If no, proceed to Step 10.

10. **Do you *not* intend to install one or more nodes with VxVM?**

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

   - If yes, proceed to Step 11.
   - If no, skip to Step 12.

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

    a. **On a node that is 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.

12. **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.**

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

Go to "How to Create a `rootdg` Disk Group on a Nonroot Disk" on page 213.

▼ How to Create a `rootdg` Disk Group on a Nonroot Disk

Use this procedure to create a `rootdg` disk group by encapsulating or initializing local disks other than the root disk.

1. **Have available the VERITAS Volume Manager (VxVM) license keys.**

2. **Become superuser on the node.**

3. **(Optional) If the disks are to be encapsulated, ensure that each disk has at least two slices with 0 cylinders.**

   If necessary, use the `format`(1M) command to assign 0 cylinders to each VxVM slice.

4. **Start the `vxinstall` utility.**

```
# vxinstall
```

When prompted, make the following choices or entries.

- Supply the VxVM license key.
- If you intend to enable the VxVM cluster feature, supply the cluster feature license key.
- Choose Custom Installation.
- Do not encapsulate the boot disk.
- Choose any disks to add to the `rootdg` disk group.
- Do not accept automatic reboot.

5. **Move any resource groups or device groups from the node.**

   ```
   # scswitch -S -h from-node
   ```

-S	Moves all resource groups and device groups
-h *from-node*	Specifies the name of the node from which to move resource or device groups

6. **Reboot the node.**

   ```
   # shutdown -g0 -y -i6
   ```

7. **Use the `vxdiskadm` command to add multiple disks to the `rootdg` disk group.**

   The `rootdg` disk group becomes tolerant of a disk failure when it contains multiple disks. See VxVM documentation for procedures.

8. **Create disk groups.**

   Go to "How to Create and Register a Disk Group" on page 214.

▼ How to Create and Register a Disk Group

Use this procedure to create your VxVM disk groups and volumes.

Note – After a disk group is registered with the cluster as a disk device group, you should never import or deport a VxVM disk group by using VxVM commands. The Sun Cluster software can handle all cases where disk groups need to be imported or deported. See "Administering Disk Device Groups" in *Sun Cluster 3.1 10/03 System Administration Guide* for procedures on how to manage Sun Cluster disk device groups.

Perform this procedure from a node that is physically connected to the disks that make the disk group you add.

1. **Have available the following information.**

   - Mappings of your storage disk drives. See the appropriate manual in the *Sun Cluster 3.1 Hardware Administration Collection* to perform an initial installation of your storage device.
   - The following completed configuration planning worksheets.
     - "Local File System Layout Worksheet" on page 152
     - "Disk Device Group Configurations Worksheet" on page 162
     - "Volume Manager Configurations Worksheet" on page 164

     See "Planning Volume Management" on page 26 for planning guidelines.

2. **Become superuser on the node that will have ownership of the disk group.**

3. **Create a VxVM disk group and volume.**

   If you are installing Oracle Parallel Server/Real Application Clusters, create shared VxVM disk groups by using the cluster feature of VxVM as described in the *VERITAS Volume Manager Administrator's Reference Guide*. Otherwise, create VxVM disk groups by using the standard procedures that are documented in the VxVM documentation.

   Note – You can use Dirty Region Logging (DRL) to decrease volume recovery time if a node failure occurs. However, DRL might decrease I/O throughput.

   ---

4. **Is the VxVM cluster feature enabled?**

   - If no, proceed to Step 5.
   - If yes, skip to Step 7. If the VxVM cluster feature is enabled, do *not* register a shared disk group as a Sun Cluster disk device group.

5. **Register the disk group as a Sun Cluster disk device group.**

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

      ```
      # scsetup
      ```

   b. **To work with disk device groups, type `4` (Device groups and volumes).**

   c. **To register a disk device group, type `1` (Register a VxVM disk group).**

      Follow the instructions and type the VxVM disk device group to be registered as a Sun Cluster disk device group.

   d. **If you encounter the following error message when you attempt to register the disk device group, reminor the disk device group.**

      ```
      scconf: Failed to add device group - in use
      ```

      To reminor the disk device group, use the procedure "How to Assign a New Minor Number to a Disk Device Group" on page 216. This procedure enables you to assign a new minor number that does not conflict with a minor number used by existing disk device groups.

   e. **When finished, type `q` (Quit) to leave the `scsetup` utility.**

6. **Verify that the disk device group is registered.**

   Look for the disk device information for the new disk that is displayed by the following command.

   ```
   # scstat -D
   ```

Note – If you change any configuration information for a VxVM disk group or volume, you must register the configuration changes by using the `scsetup` utility. Configuration changes you must register include adding or removing volumes and changing the group, owner, or permissions of existing volumes. See "Administering Disk Device Groups" in *Sun Cluster 3.1 10/03 System Administration Guide* for procedures to register configuration changes to a disk device group.

---

7. **Verify the configuration of your VxVM disk groups and volumes.**

   Go to "How to Verify the Disk Group Configuration" on page 217.

▼ How to Assign a New Minor Number to a Disk Device Group

If disk device group registration fails because of a minor-number conflict with another disk group, you must assign the new disk group a new, unused minor number. Perform this procedure to reminor a disk group.

1. **Become superuser on a node of the cluster.**

2. **Determine the minor numbers in use.**

   ```
   # ls -l /global/.devices/node@1/dev/vx/dsk/*
   ```

3. **Choose any other multiple of 1000 that is not in use to become the base minor number for the new disk group.**

4. **Assign the new base minor number to the disk group.**

   ```
   # vxdg reminor diskgroup base-minor-number
   ```

5. **Go to Step 5 of "How to Create and Register a Disk Group" on page 214 to register the disk group as a Sun Cluster disk device group.**

Example—How to Assign a New Minor Number to a Disk Device Group

This example uses the minor numbers 16000-16002 and 4000-4001. The `vxdg reminor` command reminors the new disk device group to use the base minor number 5000.

```
# ls -l /global/.devices/node@1/dev/vx/dsk/*
/global/.devices/node@1/dev/vx/dsk/dg1
brw-------   1 root     root      56,16000 Oct  7 11:32 dg1v1
```

```
brw-------   1 root     root      56,16001 Oct  7 11:32 dg1v2
brw-------   1 root     root      56,16002 Oct  7 11:32 dg1v3

/global/.devices/node@1/dev/vx/dsk/dg2
brw-------   1 root     root      56,4000 Oct  7 11:32 dg2v1
brw-------   1 root     root      56,4001 Oct  7 11:32 dg2v2
# vxdg reminor dg3 5000
```

▼ How to Verify the Disk Group Configuration

Perform this procedure on each node of the cluster.

1. **Verify that only the local disks are included in the root-disk group (`rootdg`), and disk groups are imported on the current primary node only.**

   ```
   # vxdisk list
   ```

2. **Verify that all volumes have been started.**

   ```
   # vxprint
   ```

3. **Verify that all disk groups have been registered as Sun Cluster disk device groups and are online.**

   ```
   # scstat -D
   ```

4. **Configure the cluster.**

   Go to "Configuring the Cluster" on page 102.

▼ How to Unencapsulate the Root Disk

Perform this procedure to unencapsulate the root disk.

1. **Ensure that only Solaris root file systems are present on the root disk.**

   The Solaris root file systems are root (`/`), swap, the global devices namespace, `/usr`, `/var`, `/opt`, and `/home`. If any other file systems reside on the root disk, back them up and remove them from the root disk.

2. **Become superuser on the node that you intend to unencapsulate.**

3. **Move all resource groups and device groups from the node.**

   ```
   # scswitch -S -h from-node
   ```

-S	Moves all resource groups and device groups
-h *from-node*	Specifies the name of the node from which to move resource or device groups

4. **Determine the node-ID number of the node.**

```
# clinfo -nN
```

5. **Unmount the global-devices file system for this node, where *N* is the node ID number that is returned in Step 4.**

```
# umount /global/.devices/node@N
```

6. **View the `/etc/vfstab` file and determine which VxVM volume corresponds to the global-devices file system.**

```
# vi /etc/vfstab
#device        device        mount    FS     fsck    mount    mount
#to mount      to fsck       point    type   pass    at boot  options
#
#NOTE: volume rootdiskxNvol (/global/.devices/node@N) encapsulated
#partition cNtXdYsZ
```

7. **Remove the VxVM volume that corresponds to the global-devices file system from the `rootdg` disk group.**

```
# vxedit -rf rm rootdiskxNvol
```

Caution – Do not store data other than device entries for global devices in the global-devices file system. All data in the global-devices file system is destroyed when you remove the VxVM volume. Only data that is related to global devices entries is restored after the root disk is unencapsulated.

---

8. **Unencapsulate the root disk.**

Note – Do **not** accept the shutdown request from the command.

```
# /etc/vx/bin/vxunroot
```

See your VxVM documentation for details.

9. **Use the `format`(1M) command to add a 512-Mbyte partition to the root disk to use for the global-devices file system.**

Tip – Use the same slice that was allocated to the global-devices file system before the root disk was encapsulated, as specified in the `/etc/vfstab` file.

---

10. **Set up a file system on the partition that you created in Step 9.**

```
# newfs /dev/rdsk/cNtXdYsZ
```

11. **Determine the DID name of the root disk.**

```
# scdidadm -l cNtXdY
1        phys-schost-1:/dev/rdsk/cNtXdY   /dev/did/rdsk/dN
```

12. **In the `/etc/vfstab` file, replace the path names in the global-devices file system entry with the DID path that you identified in Step 11.**

    The original entry would look similar to the following.

```
# vi /etc/vfstab
/dev/vx/dsk/rootdiskxNvol /dev/vx/rdsk/rootdiskxNvol /global/.devices/node@N ufs 2 no global
```

    The revised entry that uses the DID path would look similar to the following.

```
/dev/did/dsk/dNsX /dev/did/rdsk/dNsX /global/.devices/node@N ufs 2 no global
```

13. **Mount the global-devices file system.**

```
# mount /global/.devices/node@N
```

14. **From one node of the cluster, repopulate the global-devices file system with device nodes for any raw disk and Solstice DiskSuite/Solaris Volume Manager devices.**

```
# scgdevs
```

    VxVM devices are recreated during the next reboot.

15. **Reboot the node.**

```
# reboot
```

16. **Repeat this procedure on each node of the cluster to unencapsulate the root disk on those nodes.**

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