



Netra™ High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS

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Preface

The *Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS* explains how to install the Netra™ High Availability (HA) Suite 3.0 Foundation Services on the nodes of a cluster. Nodes of a cluster can be *master-eligible nodes*, *diskless nodes*, or *dataless nodes*.

You can install the Netra HA Suite software using the `nhinstall` tool or by manually installing the software. This book describes only the manual installation method. For information on the `nhinstall` tool, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide*.

Who Should Use This Book

This book is for system integrators and operators who install the Netra HA Suite software. To install the Netra HA Suite software, you should be familiar with the process of installing the Solaris Operating System.

Before You Read This Book

Read the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide* for an introduction to installation considerations, and the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview* for an overview of the product.

How This Book Is Organized

This book contains the following chapters and appendixes:

[Chapter 1](#) describes the preparation of the installation server environment.

[Chapter 2](#) explains how to install and configure the Solaris Operating System and Netra HA Suite software manually on the master-eligible nodes.

[Chapter 3](#) explains how to install and configure the Solaris Operating System and Netra HA Suite software manually for the diskless nodes.

[Chapter 4](#) explains how to install and configure the Solaris Operating System and Netra HA Suite software manually on the dataless nodes.

[Chapter 5](#) describes how to add a node to a cluster, whether that cluster was originally created using the `nhinstall` tool or created manually.

[Appendix A](#) provides the directory structure that is created on the master-eligible nodes during installation.

Using UNIX Commands

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

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

<http://docs.sun.com>

Shell Prompts

Shell	Prompt
C shell	<i>machine-name%</i>
C shell superuser	<i>machine-name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

Typographic Conventions

Typeface*	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
AaBbCc123	What you type, when contrasted with onscreen computer output	% su Password:
<i>AaBbCc123</i>	Book titles, new words or terms, and words to be emphasized. Replace command-line variables with real names or values.	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. To delete a file, type rm <i>filename</i> .

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

Related Documentation

The following table lists the documentation for this product. The online documentation is available at:

<http://docs.sun.com/app/docs/prod/netra.ha30>

Application	Title	Part Number
Late-breaking news	<i>Netra High Availability Suite 3.0 1/08 Release Notes</i>	819-5249-14
Introduction to concepts	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Overview</i>	819-5240-13
Basic setup, supported hardware, and configurations	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide</i>	819-5241-13
Automated installation methods	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide</i>	819-5242-13
Detailed installation methods	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS</i>	819-5237-13
Cluster administration	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide</i>	819-5235-13
Using the Cluster Membership Manager	<i>Netra High Availability Suite 3.0 1/08 Foundation Services CMM Programming Guide</i>	819-5236-13
Using the SAF CMM API	<i>Netra High Availability Suite 3.0 1/08 Foundation Services SA Forum Programming Guide</i>	819-5246-13
Using the Node Management Agent	<i>Netra High Availability Suite 3.0 1/08 Foundation Services NMA Programming Guide</i>	819-5239-13
Configuring outside the cluster using CGTP	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Standalone CGTP Guide</i>	819-5247-13
Man pages for Foundation Services features and APIs using the Solaris OS	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Solaris Reference Manual</i>	819-5244-13
Man pages for Foundation Services features and APIs using Linux	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Linux Reference Manual</i>	819-5245-12
Definitions and acronyms	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Glossary</i>	819-5238-13
Common problems	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Troubleshooting Guide</i>	819-5248-13

Documentation, Support, and Training

The Sun web site provides information about the following additional resources:

- Documentation (<http://www.sun.com/documentation>)
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- Training (<http://www.sun.com/training>)

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Netra™ High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS, part number 819-5237-13

Preparing to Install Manually

Use the manual installation process only when your clusters are running the Solaris OS on every node. If you want to install Netra HA Suite Foundation Services on a cluster running Linux distributionss on all or some of the nodes, you must use the `nhinstall` tool to install and configure your cluster.

For more information about the `nhinstall` tool, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide*.

This chapter contains the following topics:

- [“Overview of the Manual Installation Process” on page 1](#)
- [“Choosing a Cluster Network” on page 3](#)

Overview of the Manual Installation Process

The following table lists the tasks for installing the Netra High Availability Suite software with the `nhinstall` tool. Perform the tasks in the order shown.

Note – The page numbers in the following table refer to sections in Chapter 1 of the *Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide*.

TABLE 1-1 Tasks for Manually Installing the Software

Task	For Instructions
1. Install the cluster and installation server hardware.	Refer to the documentation provided with your hardware and to the <i>Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide</i>
2. Connect the cluster to the installation server.	Chapter 1 of the <i>Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide</i>
3. Install an OS on the installation server.	Chapter 1 of the <i>Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide</i>
4. Choose the OS distribution you want to install on the cluster.	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide</i>
5. Prepare the installation environment on the installation server.	Chapter 2 of the <i>Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide</i>
6. Manually install the software.	Chapter 2 in this manual
7. If you have diskless nodes, install the software for the diskless nodes on a shared partition of the disk of one master-eligible node.	Chapter 3 in this manual
OR	
If you have dataless nodes in your cluster, install the Solaris OS and the Netra HA Suite software on the local disk of these nodes	Chapter 4 in this manual

After you have installed and connected the cluster hardware and the installation server), you are ready to manually install the Foundation Services on the cluster.

Choosing a Cluster Network

In the following chapters, you install and configure the Solaris Operating System and the Foundation Services on nodes of the cluster. One of the Foundation Services you can install and configure is the Carrier Grade Transport Protocol (CGTP). The CGTP enables a redundant network for your cluster.

You can choose not to install the CGTP if you want to configure a single network link for your cluster. In this case, if the network link fails, there is no backup network, and you might lose information.

For a complete description of the CGTP, see Carrier Grade Transport Protocol in the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Installing the Software on the Master-Eligible Nodes

After you have set up the installation environment, you are ready to manually install the Solaris Operating System and the Foundation Services manually on the master-eligible nodes of the cluster. The master-eligible nodes take on the roles of *master node* and *vice-master node* in the cluster. For more information about the types of nodes, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

To manually install and configure Netra HA Suite software on the master-eligible nodes of your cluster, see the following sections:

- [“Defining Disk Partitions on the Master-Eligible Nodes” on page 6](#)
- [“Installing the Solaris Operating System on the Master-Eligible Nodes” on page 7](#)
- [“Setting Up the Master-Eligible Nodes” on page 9](#)
- [“Installing the Man Pages on the Master-Eligible Nodes” on page 13](#)
- [“Installing the Netra HA Suite on the Master-Eligible Nodes” on page 13](#)
- [“Configuring the Master-Eligible Node Addresses” on page 19](#)
- [“Configuring the Netra HA Suite on the Master-Eligible Nodes” on page 24](#)
- [“Configuring Solaris Volume Manager With Reliable NFS and Shared Disk” on page 27](#)
- [“Setting Up File Systems on the Master-Eligible Nodes” on page 35](#)
- [“Starting the Master-Eligible Nodes” on page 38](#)

Note – Do not use the `nhcmmstat` or `scmadm` tools to monitor the cluster during the installation procedure. Use these tools only after the installation and configuration procedures have been completed on all nodes.

Defining Disk Partitions on the Master-Eligible Nodes

The master-eligible nodes store current data for all nodes in the cluster, whether the cluster has diskless nodes or dataless nodes. One master-eligible node is to be the master node, while the other master-eligible node is to be the vice-master node. The vice-master node takes over the role of master in case the master node fails or is taken offline for maintenance. Therefore, the disks of both these nodes must have exactly the same partitions. Create the disk partitions of the master-eligible node according to the needs of your cluster. For example, the disks of the master-eligible nodes must be configured differently if diskless nodes are part of the cluster.

The following table lists the space requirements for example disk partitions of master-eligible nodes in a cluster with diskless nodes.

TABLE 2-1 Example Disk Partitions of Master-Eligible Nodes for IP Replication

Disk Partition	File System Name	Description	Example Size
0	/	The root file system, boot partition, and volume management software. This partition must be mounted with the <code>logging</code> option.	2 Gbytes minimum
1	/swap	Minimum size when physical memory is less than 1 Gbyte.	1 Gbyte
2	overlap	Entire disk.	Size of entire disk
3	/export	Exported file system reserved for diskless nodes. This partition must be mounted with the <code>logging</code> option. This partition is further partitioned if diskless nodes are added to the cluster.	1 Gbyte + 100 Mbytes per diskless node
4	/SUNWcgha/local	This partition is reserved for NFS status files, services, and configuration files. This partition must be mounted with the <code>logging</code> option.	2 Gbytes
5	Reserved for Reliable NFS internal use	Bitmap partition reserved for the <code>nhrfsd</code> daemon. This partition is associated with the <code>/export</code> file system.	See TABLE 2-3
6	Reserved for Reliable NFS internal use	Bitmap partition reserved for the <code>nhrfsd</code> daemon. This partition is associated with the <code>/SUNWcgha/local</code> file system.	See TABLE 2-3
7	/mypartition	For any additional applications.	The remaining space

TABLE 2-2 Example Disk Partitions of Master-Eligible Nodes for Shared Disk

Disk Partition	File System Name	Description	Example Size
0	/	Data partition for diskless Solaris images	2 Gbytes minimum
1	/swap	Data partition for middleware data and binaries	1 Gbyte
2	overlap	Entire disk.	Size of entire disk
7		SVM replica	20 MBytes

For replication, create a bitmap partition for each partition containing an exported, replicated file system on the master-eligible nodes. The bitmap partition must be at least the following size.

1 Kbyte + 4 Kbytes per Gbyte of data in the associated data partition

In this example, the bitmaps are created on partitions 5 and 6. The bitmap partition sizes can be as shown in the following table.

TABLE 2-3 Example Bitmap Partitions

File System Name	Bitmap Partition	File System (Mbytes)	Bitmap File (Kbytes)	Bitmap Size (Block)
/export	/dev/rdisk/c0t0d0s5	2000	9216	18
/SUNWcgha/local	/dev/rdisk/c0t0d0s6	1512	7072	14

For information, see the *Sun Storage Tek Availability Suite 3.1 Remote Mirror Software Installation Guide* in the Sun Storage Tek™ Availability Suite 3.1 documentation set.

Note – In a cluster without diskless nodes, the /export file system and the associated bitmap partition are not required.



Installing the Solaris Operating System on the Master-Eligible Nodes

To install the Solaris Operating System on each master-eligible node, use the Solaris JumpStart tool on the installation server. The Solaris JumpStart tool requires the Solaris distribution to be on the installation server. For information about creating a Solaris distribution, see *Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide*.

▼ To Install the Solaris Operating System on the Master-Eligible Nodes

1. Log in to the installation server as superuser.
2. Create the Solaris JumpStart environment on the installation server by using the appropriate document for the Solaris release:
 - *Solaris 9 or Solaris 10 Installation Guide*You can access these documents on <http://docs.sun.com>.
3. In the `/etc/hosts` file, add the names and IP addresses of the master-eligible nodes.
4. Share the *Solaris-distribution-dir* and *Jumpstart-dir* directories by adding these lines to the `/etc/dfs/dfstab` file:

```
share -F nfs -o ro,anon=0 Solaris-distribution-dirshare -F nfs -o ro,anon=0 Jumpstart-dir
```

- *Solaris-distribution* is the directory that contains the Solaris distribution.
 - *Jumpstart-dir* is the directory that contains the Solaris JumpStart files.
5. Share the directories that are defined in the `/etc/dfs/dfstab` file:

```
# shareall
```
 6. Change to the directory where the `add_install_client` command is located:

```
# cd Solaris-dir/Solaris_x/Tools
```

 - *Solaris-dir* is the directory that contains the Solaris installation software. This directory could be on a CD-ROM or in an NFS-shared directory.
 - *x* is 9 or 10 depending on the Solaris version installed.
 7. Run the `add_install_client` command for each master-eligible node.
For information, see the `add_install_client1M` man page.
 8. Connect to the console of each master-eligible node.

9. **Boot each master-eligible node with the appropriate command using a network boot.**

If you are unsure of the appropriate command, refer to the hardware documentation for your platform. The common command for SPARC systems is shown in the following example:

```
ok> boot net - install
```

If the installation server is connected to the second Ethernet interface, type:

```
ok> boot net2 - install
```

This command installs the Solaris Operating System on the master-eligible nodes. For information about performing this task on the AMD64 platform, refer to the hardware documentation.

Setting Up the Master-Eligible Nodes

To prepare the master-eligible nodes for the installation of the Netra HA Suite, you must configure the master-eligible nodes. You must also mount the installation server directory that contains the Netra HA Suite distribution.

▼ To Configure the Master-Eligible Nodes

1. **Log in to a master-eligible node as superuser.**

2. **Create `/etc/notrouter` file:**

```
# touch /etc/notrouter
```

3. **Modify the `/etc/default/login` file so that you can connect to a node from a remote system as superuser:**

```
# mv /etc/default/login /etc/default/login.orig
# chmod 644 /etc/default/login.orig
# sed '1,$s/^CONSOLE/#CONSOLE/' /etc/default/login.orig >
/etc/default/login
# chmod 444 /etc/default/login
```

4. Disable power management:

```
# touch /noautoshtutdown
```

5. Modify the `.rhosts` file according to the security policy for your cluster:

```
# touch /.rhosts
# cp /.rhosts /.rhosts.orig
# echo "+ root" > /.rhosts
# chmod 444 /.rhosts
```

6. Set the boot parameters:

```
# /usr/sbin/eeprom local-mac-address?=true
# /usr/sbin/eeprom auto-boot?=true
# /usr/sbin/eeprom diag-switch?=false
```

The preceding example is for SPARC-based hardware. For the commands required on the x64 platform, refer to the hardware documentation.

7. (Optional) If you are using the Network Time Protocol (NTP) to run an external clock, configure the master-eligible node as an NTP server.

This procedure is described in the Solaris documentation.

8. (Optional) If your master-eligible node has an IDE disk, edit the `/usr/kernel/drv/sdbc.conf` file.

Change the value of the `sdbc_max_fbas` parameter from 1024 to 256.

9. Create the `data/etc` and `data/var/dhcp` directories in the `/SUNWcgha/local/export/` file system on the master-eligible node:

```
# mkdir -p /SUNWcgha/local/export/data/etc
# mkdir -p /SUNWcgha/local/export/data/var/dhcp
```

- `/SUNWcgha/local/export/data/etc` directory is required for the Cluster Membership Manager (CMM).
- `/SUNWcgha/local/export/data/var/dhcp` directory is required for the Reliable Boot Service.

10. Repeat [Step 1](#) through [Step 9](#) on the second master-eligible node.

▼ To Mount an Installation Server Directory on the Master-Eligible Nodes

1. Log in to the installation server as superuser.
2. Check that the `mountd` and `nfsd` daemons are running on the installation server.

For example, use the `ps` command:

```
# ps -ef | grep mountd
root  184      1  0   Aug 03 ?          0:01 /usr/lib/autofs/automountd
root  290      1  0   Aug 03 ?          0:00 /usr/lib/nfs/mountd
root  2978    2974  0 17:40:34 pts/2    0:00 grep mountd
# ps -ef | grep nfsd
root  292      1  0   Aug 03 ?          0:00 /usr/lib/nfs/nfsd -a 16
root  2980    2974  0 17:40:50 pts/2    0:00 grep nfsd
#
```

If a process ID is not returned for the `mountd` and `nfsd` daemons, start the NFS daemons as follows:

On the Solaris 9 OS, use the following command

```
# /etc/init.d/nfs.server start
```

On the Solaris 10 OS, use the following command

```
# svcadm enable svc:/network/nfs/server
```

3. Share the directory containing the distributions for the Netra HA Suite and the Solaris Operating System by adding the following lines to the `/etc/dfs/dfstab` file:

```
share -F nfs -o ro,anon=0 software-distribution-dir
```

where *software-distribution-dir* is the directory that contains the Netra HA Suite packages and Solaris patches.

4. Share the directories that are defined in the `/etc/dfs/dfstab` file:

```
# shareall
```

5. Log in to the a master-eligible node as superuser.

6. Create the mount point directories Solaris and NetraHASuite on the master-eligible node:

```
# mkdir /NetraHASuite
# mkdir /Solaris
```

7. Mount the Netra HA Suite and Solaris distribution directories on the installation server:

```
# mount -F nfs \installation-server-IP-address:/software-distribution-
dir/Product/NetraHASuite_3.0/
FoundationServices/Solaris_x/sparc
# mount -F nfs installation-server-IP-address:/Solaris-distribution-dir/Solaris
```

- *installation-server-IP-address* is the IP address of the cluster network interface that is connected to the installation server.
- *software-distribution-dir* is the directory that contains the Netra HA Suite packages. (Note that in the preceding example, this line wraps, due to space constraints; however, when typing this path, it should contain no spaces or line breaks.)
- *x* is the Solaris OS version.
- *Solaris-distribution-dir* is the directory that contains the Solaris distribution.

8. Repeat [Step 5](#) through [Step 7](#) on the other master-eligible node.

▼ To Install Solaris Patches

After you have completed the Solaris installation, you must install the Solaris patches delivered in the Netra HA Suite distribution. See the Netra High Availability Suite 3.0 1/08 Foundation Services README for the list of patches.

Note – Some of these patches are required for CGTP. If you do not plan to install CGTP, do not install the CGTP patches. For more information about the impact of not installing CGTP, see [“Choosing a Cluster Network”](#) on page 3.

- 1. Log in to each master-eligible node as superuser.**
- 2. Install the necessary Solaris patches on each master-eligible node:**

```
# patchadd -M /NetraHASuite/Patches/ patch-number
```

Installing the Man Pages on the Master-Eligible Nodes

▼ To Install the Man Pages on the Master-Eligible Nodes

1. Log in to a master-eligible node as superuser.
2. Add the man page package:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-manpages
```

The man pages are installed in the `/opt/SUNWcgha/man` directory. To access the man pages, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Reference Manual*.

3. Repeat [Step 1](#) and [Step 2](#) on the other master-eligible node.

Installing the Netra HA Suite on the Master-Eligible Nodes

The following procedures explain how to install the Netra HA Suite on the master-eligible nodes:

- [“To Install the Cluster Membership Manager” on page 14](#)
- [“To Install the nhadm Tool” on page 14](#)
- [“To Install the Carrier Grade Transport Protocol” on page 14](#)
- [“To Install the Node State Manager” on page 15](#)
- [“To Install the Reliable NFS When Using IP-Based Replication” on page 15](#)
- [“To Install the Node Management Agent” on page 17](#)
- [“To Install the Process Monitor Daemon” on page 19](#)

▼ To Install the Cluster Membership Manager

- As superuser, install the following CMM packages on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-common-libs \
SUNWnhas-common SUNWnhas-cmm-libs SUNWnhas-cmm
```

Note – During the installation of the CMM packages, the `/etc/opt/SUNWcgha/not_configured` file is created automatically. This file enables you to reboot a cluster node during the installation process without starting the Netra HA Suite.

For instructions on configuring the CMM, see [“Configuring the Netra HA Suite on the Master-Eligible Nodes” on page 24](#).

For information about the CMM, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

▼ To Install the nhadm Tool

The nhadm tool is a cluster administration tool that can verify that the installation was completed correctly. You can run this tool when your cluster is up and running.

- As superuser, install the `nhas-admintools` package on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-admintools
```

▼ To Install the Carrier Grade Transport Protocol

CGTP enables a redundant network for your cluster.

Note – If you do not require CGTP, do not install the CGTP packages. For more information about the impact of not installing CGTP, see [“Choosing a Cluster Network” on page 3](#).

1. Before you install the CGTP packages, make sure that you have installed the Solaris patches for CGTP.

See [“To Install Solaris Patches” on page 12](#).

2. As superuser, install the following CGTP packages on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-cgtp SUNWnhas-cgtp-cluster
```

▼ To Install the Node State Manager

- As superuser, install the Node State Manager packages on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-nsm
```

Note – During the installation of the Node State Manager packages, the `/etc/opt/SUNWcgha/not_configured` file is created automatically. This file enables you to reboot a cluster node during the installation process without starting the Netra HA Suite.

For more information about the Node State Manager, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

▼ To Install the External Address Manager

1. Become superuser.
2. Type the following command:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-eam
```

For information on configuring the EAM, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

▼ To Install the Reliable NFS When Using IP-Based Replication

Install the Reliable NFS packages to enable the Reliable NFS service and data-replication features of Netra HA Suite. For a description of the Reliable NFS service, see “File Sharing and Data Replication” in *Netra High Availability Suite 3.0 1/08*

Foundation Services Overview. The Reliable NFS feature is enabled by the StorEdge Network Data Replicator (SNDR), which is provided with the Reliable NFS packages.

Note – SNDR is supplied for use only with the Netra HA Suite. Any use of this product other than on a Netra HA Suite cluster is not supported.

1. **As superuser, install the following Reliable NFS and SNDR packages on a master-eligible node in the following order:**

```
# pkgadd -d /NetraHASuite/Packages/ SUNWscmr SUNWscmu SUNWspsvr \
    SUNWspsvu SUNWrdcr SUNWrdcu SUNWnhas-rnfs-client \ SUNWnhas-
    rnfs-server
```

Note – During the installation of the SNDR package SUNWscmu, you might be asked to specify a database configuration location. You can choose to use the SNDR directory that is automatically created. This directory is of the format `/sndrxy` where `x.y` is the version of the SNDR release.

2. **Repeat [Step 1](#) on the second master-eligible node.**

3. **Install the SNDR patches on each master-eligible node.**

See the Netra High Availability Suite 3.0 1/08 Foundation Services README for a list of SNDR patches.

4. **Edit the `/usr/kernel/drv/rdc.conf` file on each master-eligible node to change the value of the `rdc_bitmap_mode` parameter.**

To have changes to the bitmaps written on the disk at each update, change the value of the `rdc_bitmap_mode` parameter to 1.

To have changes to the bitmaps stored in memory at each update, change the value of the `rdc_bitmap_mode` parameter to 2. In this case, changes are written on the disk when the node is shut down. However, if both master-eligible nodes fail, both disks must be synchronized.

For example: `rdc_bitmap_mode=2`.

▼ To Install the Reliable NFS When Using Shared Disk

Install the Reliable NFS packages to enable the Reliable NFS service and disk mirroring features of Netra HA Suite. For a description of the Reliable NFS service, see “File Sharing and Data Replication” in *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

1. As superuser, install the following Reliable NFS packages on a master-eligible node in the following order:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-rnfs-client \
# SUNWnhas-rnfs-server
```

2. Repeat [Step 1](#) on the second master-eligible node.

▼ To Install the Node Management Agent

Install the Node Management Agent (NMA) packages to gather statistics on Reliable NFS, CGTP, and CMM. For a description of the NMA, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

The NMA consists of four packages. One NMA package is installed on both master-eligible nodes. Three packages are NFS-mounted as shared middleware software on the *first master-eligible node*. The first master-eligible node is the node that is booted first after you complete installing and configuring all the services on the master-eligible nodes.

The NMA requires the Java™ DMK packages, `SUNWjsnmp` and `SUNWjdrt`, to run. For information about installing the entire Java DMK software, see the *Java Dynamic Management Kit 5.0 Installation Guide*.

The following table describes the packages that are required on each type of node.

Package	Description	Installed On
<code>SUNWjsnmp</code>	Java DMK 5.0 Simple Network Management Protocol (SNMP) manager API classes	Both master-eligible nodes
<code>SUNWjdrt</code>	Java DMK 5.0 dynamic management runtime classes	First master-eligible node
<code>SUNWnhas-nma-local</code>	NMA configuration and startup script	Both master-eligible nodes
<code>SUNWnhas-nma-shared</code>	NMA shared component	First master-eligible node

Follow this procedure to install and configure the NMA.

1. **As superuser, install the following NMA package and Java DMK package on both master-eligible nodes:**

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-nma-local SUNWjsnmp
```

Note – If you plan to use shared disks, do not advance to [Step 2](#) until the metadevice used for shared disks has been created. See [Step 2](#) in “To Set Up File Systems on the Master-Eligible Nodes” on page 35.

2. **On the first master-eligible node, install the following shared Java DMK package and NMA packages:**

```
# pkgadd -d /NetraHASuite/Packages/ \-M -R  
/SUNWcggha/local/export/services/ha_3.0 \ SUNWjdrdt SUNWnhas-nma-  
shared
```

The packages are installed with a predefined root path in the
/SUNWcggha/local/export/services/ha_3.0 directory.

Note – Ignore error messages related to packages that have not been installed. Always answer Y to continue the installation.

3. **To configure the NMA, see the *Netra High Availability Suite 3.0 1/08 Foundation Services NMA Programming Guide*.**

▼ To Install the Process Monitor Daemon

- **As superuser, install the Process Monitor Daemon (PMD) packages on each master-eligible node, as follows:**

On the Solaris 9 OS:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-pmd \ SUNWnhas-pmd-  
avs SUNWnhas-pmd-solaris
```

On the Solaris 10 OS:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-pmd \SUNWnhas-pmd-  
solaris
```

For a description of the PMD, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Configuring the Master-Eligible Node Addresses

Before assigning IP addresses to the network interfaces of the master-eligible nodes, see “Cluster Addressing and Networking” in the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

In the Netra HA Suite, three IP addresses must be configured for each master-eligible node:

- An IP address for the first physical interface, *NIC0*, corresponding to the first network interface. This interface could be *hme0*.
- An IP address for the second physical interface, *NIC1*, corresponding to the second network interface. This interface could be *hme1*.
- An IP address for the virtual physical interface, *cgtp0*

The virtual physical interface should not be configured on a physical interface. The configuration is done automatically when you configure Reliable NFS. For more information about the *cgtp0* interface, see the *cgtp7D* man page.

The IP addresses can be IPv4 addresses of any class with the following structure:

```
network_id.host_id
```

When you configure the IP addresses, make sure that the node ID, *nodeid*, is the decimal equivalent of *host_id*. You define the *nodeid* in the `cluster_nodes_table` file and the `nhfs.conf` file. For more information, see [“Configuring the Netra HA Suite on the Master-Eligible Nodes” on page 24](#).

The following procedures explain how to create and configure IP addresses for master-eligible nodes.

- [“To Create the IP Addresses for the Network Interfaces” on page 20](#)
- [“To Update the Network Files” on page 20](#)
- [“To Configure External IP Addresses” on page 21](#)

Examples in these procedures use IPv4 Class C addresses.

▼ To Create the IP Addresses for the Network Interfaces

1. Log in to each master-eligible node as superuser.
2. In the `/etc/hosts` file on each master-eligible node, add the three IP addresses, followed by the name of each interface:

10.250.1.10	netraMEN1-nic0
10.250.2.10	netraMEN1-nic1
10.250.3.10	netraMEN1-cgtp
10.250.1.20	netraMEN2-nic0
10.250.2.20	netraMEN2-nic1
10.250.3.20	netraMEN2-cgtp
10.250.1.1	master-nic0
10.250.2.1	master-nic1
10.250.3.1	master-cgtp

In the rest of this book, the node `netraMEN1` is the first master-eligible node. The first master-eligible node is the node that is booted first after you complete installing the Netra HA Suite. The node `netraMEN2` is the *second master-eligible node* that is booted after the first master-eligible node has completed booting.

▼ To Update the Network Files

In the `/etc` directory on each master-eligible node, you must create a `hostname` file for each of the three interfaces. In addition, update the `nodename` and `netmasks` files.

1. Create or update the file `/etc/hostname.NIC0` for the *NIC0* interface.

This file must contain the name of the master-eligible node on the first interface, for example, `netraMEN1-nic0`.

2. Create or update the file `/etc/hostname.NIC1` for the *NIC1* interface.

This file must contain the name of the master-eligible node on the second interface, for example, `netraMEN1-nic1`.

3. Create or update the file `/etc/hostname.cgtp0` for the *cgtp0* interface.

This file must contain the name of the master-eligible node on the *cgtp0* interface, for example, `netraMEN1-cgtp`.

4. Update the `/etc/nodename` file with the IP address of the master-eligible node.

- If you have installed CGTP, add the name set on the CGTP interface, for example, `netraMEN1-cgtp`.
- If you have not installed CGTP, add the name set on the *NIC0* interface, for example, `netraMEN1-nic0`.

5. Create a `/etc/netmasks` file with a netmask of `255.255.255.0` for all subnetworks in the cluster.

▼ To Configure External IP Addresses

To configure external IP addresses for a master-eligible node, the node must have an extra physical network interface or logical network interface. An extra physical network interface is an unused interface on an existing Ethernet card or a supplemental Ethernet card, for example, `hme2`. A logical network interface is an interface that is configured on an existing Ethernet card, for example, `hme1:101`.

- **Configure an external IP address for the extra network interface based on your public network policy.**

▼ To Configure an External Floating Address Using a Single Link

Note – The procedure described in this section requires the installation of the External Address Manager.

1. If required, add the hostname associated with the external floating address in `/etc/host` on each master-eligible node.

```
129.253.1.13    ext-float
```

2. Add, if required, the associated netmask for the subnetwork in `/etc/netmasks` on each master-eligible node.

```
129.253.1.0    255.255.255.0
```

3. Create or update the file `/etc/hostname.interface` for the interface supporting the external floating address on each master-eligible node.

If the file does not exist, create the following lines (the file must contain at least two lines for the arguments to be taken into account):

```
ext-float netmask + broadcast +  
down
```

If the file already exists, add the following line:

```
addif ext-float netmask + broadcast + down
```

4. Configure the external floating address parameter in the `nhfs.conf` file on each master-eligible node.

For more information, see the `nhfs.conf4` man page.

▼ To Configure an External Floating Address Using Redundant Links Managed by IPMP

Note – The procedure described in this section requires the installation of the External Address Manager.

To configure the external floating address, the node must have two network interfaces not already used for a CGTP network. Using a different VLAN can be considered if no network interfaces are available.

Each interface must be configured with a special IP address used for monitoring. The external floating address must be configured in one of them, and all of these IP addresses must be part of the same subnetwork.

1. **Add, if required, the hostname associated to test IP addresses and the external floating address in `/etc/host` on each master-eligible node.**

IP addresses for testing must be different on each node.

129.253.1.11	test-ipmp-1
129.253.1.12	test-ipmp-2
129.253.1.30	ipmp-float

2. **Add, if required, the associated netmask for the subnetwork in `/etc/netmasks` on each master-eligible node.**

129.253.1.0	255.255.255.0
-------------	---------------

3. **Create or update the file `/etc/hostname.interface` for the first interface on each master-eligible node.**

The file must contain the definition of the test IP address for this interface and the external floating address in this format:

test IP address #1 netmask + broadcast + -failover deprecated group name up addif floating address netmask + broadcast + failover down

For example:

```
test-ipmp-1 netmask + broadcast + -failover deprecated group ipmp-group up
addif ipmp-float netmask + broadcast + failover down
```

4. **Create or update the file `/etc/hostname.interface` for the second interface on each master-eligible node.**

The file must contain the definition of the test IP address for this interface in this format:

test IP address #1 netmask + broadcast + -failover deprecated group name up

For instance:

```
test-ipmp-2 netmask + broadcast + -failover deprecated group ipmp-group up
```

5. **Configure the external floating address parameters (floating address and IPMP group to be monitored) in the `nhfs.conf` file on each master-eligible node.**

For more information, see the `nhfs.conf4` man page.

Configuring the Netra HA Suite on the Master-Eligible Nodes

Configure the services that are installed on the master-eligible nodes by modifying the `nhfs.conf` and the `cluster_nodes_table` files on each master-eligible node in the cluster. Master-eligible nodes have read-write access to these files. Diskless nodes or dataless nodes in the cluster have read-only access to these files.

- `nhfs.conf`

This file contains configurable parameters for each node and for the Netra HA Suite. This file must be configured on each node in the cluster.

- `cluster_nodes_table`

This file contains information about nodes in the cluster, such as *nodeid* and *domainid*. This file is used to elect the master node in the cluster. Therefore, this file must contain the most recent information about the nodes in the cluster.

There is one line in the table for each peer node. When the cluster is running, the table is updated by the `nhcmmd` daemon on the master node. The file is copied to the vice-master node every time the file is updated. The `cluster_nodes_table` must be located on a local partition that is not exported. For information about the `nhcmmd` daemon, see the `nhcmmd1M` man page.

Configuring the `nhfs.conf` File

The following procedures describe how to configure the `nhfs.conf` file.

- [“To Configure the `nhfs.conf` File Properties” on page 24](#)
- [“To Create the Floating Address Triplet Assigned to the Master Role” on page 25](#)
- [“To Configure a Direct Link Between the Master-Eligible Nodes” on page 26](#)

For more information, including parameter descriptions, see the `nhfs.conf4` man page.

▼ To Configure the `nhfs.conf` File Properties

The `nhfs.conf` file enables you to configure the node after you have installed the Netra HA Suite on the node. This file provides parameters for configuring the node, CMM, Reliable NFS, the direct link between the master-eligible nodes, the Node State Manager, and daemon scheduling.

1. **As superuser, copy the template** `/etc/opt/SUNWcgha/nhfs.conf.template` **file:**

```
# cp /etc/opt/SUNWcgha/nhfs.conf.template \  
/etc/opt/SUNWcgha/nhfs.conf
```

2. **For each property that you want to change, uncomment the associated parameter (delete the comment mark at the beginning of the line).**
3. **Modify the value of each parameter that you want to change.**

For descriptions of each parameter, see the `nhfs.conf4` man page.

If you have not installed the CGTP patches and packages, do the following:

- Disable the `Node.NIC1` and `Node.NICCGTP` parameters.
- Configure the `Node.UseCGTP` and the `Node.NIC0` parameters:
 - `Node.UseCGTP=False`
 - `Node.NIC0=interface-name`
where *interface-name* is the name of the `NIC0` interface, for example, `hme0`, `qfe0`, or `eri0`.

▼ To Create the Floating Address Triplet Assigned to the Master Role

The *floating address triplet* is a triplet of three logical addresses active on the node holding the master role. When the cluster is started, the floating address triplet is activated on the master node. In the event of a switchover or a failover, these addresses are activated on the new master node. Simultaneously, the floating address triplet is deactivated automatically on the old master node, that is, the new vice-master node.

- **To create the floating address triplet, you must define the master ID in the `nhfs.conf` file.**

The floating address triplet is calculated from the master ID, the netmask, and the network interface addresses.

For more information about the floating address triplet of the master node, see “Cluster Addressing and Networking” in *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

▼ To Configure a Direct Link Between the Master-Eligible Nodes

You can configure a direct link between the master-eligible nodes to prevent a split brain cluster. A split brain cluster is a cluster that has two master nodes because the network between the master node and the vice-master node has failed.

1. **Connect the serial ports of the master-eligible nodes.**

For an illustration of the connection between the master-eligible nodes, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*.

2. **Configure the direct link parameters.**

For more information, see the `nhfs.conf4` man page.

Creating the `cluster_nodes_table` File

The `cluster_nodes_table` file contains the configuration data for each node in the cluster. Create this file on each master-eligible node. Once the cluster is running, this file is accessed by all nodes in the cluster. Therefore, the `cluster_nodes_table` on both master-eligible nodes must be exactly the same.

▼ To Create the `cluster_nodes_table` File

1. **Log in to a master-eligible node as superuser.**

2. **Copy the template file from**

```
/etc/opt/SUNWcgha/cluster_nodes_table.template to  
/etc/opt/SUNWcgha/cluster_nodes_table.
```

You can save the `cluster_nodes_table` file in a directory other than the `/etc/opt/SUNWcgha` directory. By default, the `cluster_nodes_table` file is located in the `/etc/opt/SUNWcgha` directory.

3. **Edit the `cluster_nodes_table` file to add a line for each node in the cluster.**

For more information, see the `cluster_nodes_table4` man page.

4. **Edit the `nhfs.conf` file to specify the directory that contains the `cluster_nodes_table` file:**

```
CMM.LocalConfig.Dir=/etc/opt/SUNWcgha
```

For more information, see the `nhfs.conf4` man page.

5. **Log in to the other master-eligible node as superuser.**

6. **Copy the `/etc/opt/SUNWcgha/cluster_nodes_table` file from the first master-eligible node to the same directory on the second master-eligible node.**

If you saved the `cluster_nodes_table` file in a directory other than `/etc/opt/SUNWcgha`, copy the file to that *other directory* on the second master-eligible node. The `cluster_nodes_table` file must be available in the same directory on both master-eligible nodes.

7. **Repeat [Step 4](#) on the second master-eligible node.**

Note – When there is a change in the attribute of a node, the `cluster_nodes_table` file is updated by the `nhcmmnd` daemon on each master-eligible node. If a switchover or failover occurs, the diskless nodes or dataless nodes in the cluster access the `cluster_nodes_table` file on the new master node. Only master-eligible nodes can write information to the `cluster_nodes_table` file.

Configuring Solaris Volume Manager With Reliable NFS and Shared Disk

▼ To Configure Solaris Volume Manager for Use with Reliable NFS and a Shared Disk

This procedure uses the following values for its code examples:

- `c0t0d0` is the system disk
- `c1t8d0` is the primary shared disk
- `c1t9d0` is the secondary shared disk used to mirror the primary one

Detailed information about Solaris VM and how to set up a shared disk can be found in the *Solaris Volume Manager Administration Guide*.

1. **On the first master-eligible node, change the node name with the name of the host associated to the CGTP interface:**

```
# uname -S netraMEN1-cgtp
```

2. Repeat [Step 1](#) for the second master-eligible node:

```
# uname -S netraMEN2-cgtp
```

3. On the first master-eligible node, restart the `rpcbind` daemon to make it use the new node name:

```
# pkill -x -u 0 rpcbind
# /usr/sbin/rpcbind -w
```

4. Repeat [Step 3](#) on the second master-eligible node.

5. Create the database replicas for the dedicated root disk slice on each master-eligible node:

```
# metadb -a -c 3 -f /dev/rdisk/c0t0d0s7
```

6. Repeat [Step 9](#) for the second master-eligible node:

```
# cat /etc/nodename
netraMEN2-cgtp
```

7. (Optional) If you plan to use CGTP, configure a temporary network interface on the first private network and make it match the name and IP address of the CGTP interface on the first master-eligible node:

```
# ifconfig hme0:111 plumb
# ifconfig hme0:111 10.250.3.10 netmask + broadcast + up
Setting netmask of hme0:111 to 255.255.255.0
```

8. (Optional) If you plan to use CGTP, repeat [Step 7](#) for the second master-eligible node:

```
# ifconfig hme0:111 plumb
# ifconfig hme0:111 10.250.3.11 netmask + broadcast + up
Setting netmask of hme0:111 to 255.255.255.0
```

9. On the first master-eligible node, verify that the `/etc/nodename` file matches the name of the CGTP interface (or the name of the private network interface, if CGTP is not used):

```
# cat /etc/nodename
netraMEN1-cgtp
```

Note – The rest of the procedure only applies to the first master-eligible node.

10. Create the Solaris VM diskset that manages the shared disks:

```
# metaset -s nhas_diskset -a -h netraMEN1-cgtp netraMEN2-cgtp
```

11. Remove any possible existing SCSI3-PGR keys from the shared disks.

In the following example, there was no key lying on the disks:

```
# /opt/SUNWcgha/sbin/nhscsitool /dev/rdisk/c1t8d0s2
Performing a SCSI bus reset ... done.
There are no keys on disk '/dev/rdisk/c1t8d0s2'.
# /opt/SUNWcgha/sbin/nhscsitool /dev/rdisk/c1t9d0s2
Performing a SCSI bus reset ... done.
There are no keys on disk '/dev/rdisk/c1t9d0s2'.
```

12. On x64 master-eligible nodes, repartition the shared disk as described in [“To Partition a Shared Disk for Diskless Support”](#) on page 32.
13. Add the names of the shared disks to the previously created diskset:

```
# metaset -s nhas_diskset -a /dev/rdisk/c1t8d0 /dev/rdisk/c1t9d0
```

Note – This step will reformat the shared disks, and all existing data on the shared disks will be lost.

14. Verify that the SVM configuration is set up correctly:

```
# metaset
Set name = nhas_diskset, Set number = 1
Host      Owner
  netraMEN1-cgtp  Yes
  netraMEN2-cgtp
Drive    Dbase
c1t8d0   Yes
c1t9d0   Yes
```

Note – If you do not plan to install diskless nodes, skip to [Step 17](#)

15. On SPARC master-eligible nodes, repartition the shared disk as described in “To Partition a Shared Disk for Diskless Support” on page 32.

16. Create the metadevices for partition mapping and mirroring.

Create the metadevices on the primary disk:

```
# metainit -s nhas_diskset d11 1 1 /dev/rdisk/c1t8d0s0
# metainit -s nhas_diskset d12 1 1 /dev/rdisk/c1t8d0s1
```

Create the metadevices on the secondary disk:

```
# metainit -s nhas_diskset d21 1 1 /dev/rdisk/c1t9d0s0
# metainit -s nhas_diskset d22 1 1 /dev/rdisk/c1t9d0s1
```

Create the mirror sets:

```
# metainit -s nhas_diskset d1 -m d11
# metattach -s nhas_diskset d1 d21
# metainit -s nhas_diskset d2 -m d12
# metattach -s nhas_diskset d2 d22
```

Note – This ends the section specific to the configuration for diskless installation. To complete diskless installation, jump to [Step 19](#).

17. Create your specific Solaris VM RAID configuration (refer to the *Solaris Volume Manager Administration Guide* for information on specific configurations).

In the following example, the two disks form a mirror called d0:

```
# metainit -s nhas_diskset d18 1 1 /dev/rdisk/c1t8d0s0
# metainit -s nhas_diskset d19 1 1 /dev/rdisk/c1t9d0s0
# metainit -s nhas_diskset d0 -m d18
# metattach -s nhas_diskset d0 d19
```

18. Create soft partitions to host the shared data.

These soft partitions are the file systems managed by Reliable NFS. In the following example, d1 and d2 are managed by Reliable NFS.

```
# metainit -s nhas_diskset d1 -p d0 2g
# metainit -s nhas_diskset d2 -p d0 2g
```

The devices managed by Reliable NFS are now accessible through
/dev/md/nhas_diskset/dsk/d1 and /dev/md/nhas_diskset/dsk/d2.

19. Create the file systems on the soft partitions:

```
# newfs /dev/md/nhas_diskset/rdisk/d1
# newfs /dev/md/nhas_diskset/rdisk/d2
```

20. Create the following directories on both master-eligible nodes:

```
# mkdir /SUNWcgha
# mkdir /SUNWcgha/local
```

21. Mount the file systems on the metadevice on the first node:

```
# mount /dev/md/nhas_diskset/dsk/d1 /export
# mount /dev/md/nhas_diskset/dsk/d2 /SUNWcgha/local
```

▼ To Partition a Shared Disk for Diskless Support

1. Retrieve disk geometry information using the `prtvtoc` command.

A known problem in the diskless management tool, `smosservice`, prevents the creation of the diskless environment on a metadvice. To avoid this problem, mount the `/export` directory on a physical partition during the diskless environment creation.

To support access to the `/export` via a metadvice without preventing its access on a physical partition, the disk must be re-partitioned in a particular way after it has been inserted into a diskset. This re-partitioning preserves data already stored by SVM, since there is no formatting of created partitions.

The following table gives an example of the `prtvtoc` command output after inserting a disk into a diskset.

```
# prtvtoc /dev/rdisk/clt8d0s0
* /dev/rdisk/clt8d0s0 partition map
*
* Dimensions:
*   512 bytes/sector
*   107 sectors/track
*   27 tracks/cylinder
*   2889 sectors/cylinder
*   24622 cylinders
*   24620 accessible cylinders
*
* Flags:
*   1: unmountable
*   10: read-only
*
*
* Partition  Tag  Flags      First      Sector      Last
* Partition  Tag  Flags      Sector      Count      Sector      Mount Directory
*   0         4    00        8667  71118513  71127179
*   7         4    01           0     8667     8666
```

2. Create the data file using the `fmthard` command.

The `fmthard` command (see its man page for more information) is used to create physical partitions. It requires you to input a data file describing the partitions to be created. There is one entry per partition, using the following format:

slice # tag flag starting sector size in sectors

starting sector and *size in sectors* values must be rounded to a cylinder boundary and must be computed as explained below.

- *starting sector* = *starting sector* of the previous slice + *size in sectors* of the previous slice
- *size in sectors* = the required partition size in bytes divided by *bytes per sector*, the result being rounded to *sectors per cylinder* (upper value)

Three particular slices must be created:

- Slice 7 containing the meta-database (also called metadb). This slice must be created the same size as that created by the Solaris VM to overlap the existing one (to preserve data).
- A slice to support /export (diskless environment)
- A slice to support /SUNWcgha/local (shared Netra HA Suite packages and files)

Other slices can be added depending on your application requirements. The following table gives an example for partitioning:

Slice Number	Usage	Size in MBytes
0	/export	4096
1	/SUNWcgha/local	2048
7	metadb	Not Applicable

The following slice constraints must be respected:

- Slice 7 (metadb) is the first slice of the disk starting at sector # 0, with the size *size of slice 7* with tag 4 (user partition) and flag 0x01: (unmountable)
- Slice 2: On SPARC, Slice 2 maps the whole disk: *size in bytes* = *accessible cylinders* * *sectors per cylinder* * *bytes per sector* with tag 5 (backup) and flag 0x01 (unmountable). On x64, Slice 2 maps the whole disk except slice 7 with tag 5 (backup) and flag 0x01 (unmountable). This particular partitioning may provoke the display of warning message while formatting the disk.
- Other slices use tag 0 (unassigned) and flag 0x00 (mountable in R/W)

An example of computing for slice 0 (located after slice 7):

- Starting sector = (0 + 8667) = 8667
- Size in bytes = (4096 * 1024²) = 4294967296
- Size in sectors = 4294967296 / 512 = 8388608

- Size in sector rounded to cylinder boundaries (2889) = 8389656

```
7 4 01    0    8667
0 0 00    8667 8389656
1 0 00 8398323 4194828
2 5 01    0 71127180
```

```
7 4 01    0    8667
0 0 00    8667 8389656
1 0 00 8398323 4194828
2 5 01    8667 71118513
```

These values would display the following content in the data file (datafile.txt):

On x64, the content of the file appears as follows:

Note that this example leaves some unallocated spaces on the disk that can be used for user-specific partitions.

3. Re-partition the disk.

Execute the following commands for the primary and for the secondary disk:

```
# fmthard -s datafile.txt /dev/rdisk/c1t8d0s2
# fmthard -s datafile.txt /dev/rdisk/c1t9d0s2
```

Setting Up File Systems on the Master-Eligible Nodes

▼ To Set Up File Systems on the Master-Eligible Nodes

1. Ensure that the following directories exist on the first master-eligible node:

```
# mkdir /SUNWcgha/local/export
# mkdir /SUNWcgha/local/export/data
# mkdir /SUNWcgha/local/export/services
# mkdir /SUNWcgha/local/export/services/NetraHASuite_version/opt
```

where *NetraHASuite_version* is the version of the Netra HA Suite you install, for example, *ha_3.0*.

These directories contain packages and data shared between the master-eligible nodes.

2. If you are using shared disks, install the shared Java DMK package and NMA packages onto the first master-eligible node as explained in [Step 2 of “To Install the Node Management Agent” on page 17](#).

3. Create the following mount points on each master-eligible node:

```
# mkdir /SUNWcgha/services
# mkdir /SUNWcgha/remote
# mkdir /SUNWcgha/swdb
```

These directories are used as mount points for the directories that contain shared data.

4. Add the following lines to the `/etc/vfstab` file on each master-eligible node:

- If you have configured the CGTP, use the floating IP address for the `cgtp0` interface that is assigned to the master role to define the mount points.

```
master-cgtp:/SUNWcgha/local/export/data - \
/SUNWcgha/remote nfs - no rw,hard,fg,intr,noac
master-cgtp:/SUNWcgha/local/export/services/ha_3.0/opt \
```

```
- /SUNWcgha/services nfs - no rw,hard,fg,intr,noac
master-cgtp:/SUNWcgha/local/export/services/ha_3.0 - \
/SUNWcgha/swdb nfs - no rw,hard,fg,intr,noac
```

where master-cgtp is the host name associated with the floating address of the cgtp0 interface of the master node. For more information, see [“To Create the Floating Address Triplet Assigned to the Master Role”](#) on page 25.

- If you have not configured the CGTP, use the floating IP address for the NIC0 interface that is assigned to the master role.

```
master-nic0:/SUNWcgha/local/export/data - \
/SUNWcgha/remote nfs - no rw,hard,fg,intr,noac
master-nic0:/SUNWcgha/local/export/services/ha_3.0/opt \
- /SUNWcgha/services nfs - no rw,hard,fg,intr,noac
master-nic0:/SUNWcgha/local/export/services/ha_3.0 - \
/SUNWcgha/swdb nfs - no rw,hard,fg,intr,noac
```

where master-nic0 is the host name associated with the floating address of the NIC0 interface of the master node. For more information, see [“To Create the Floating Address Triplet Assigned to the Master Role”](#) on page 25.

Note – The noac mount option suppresses data and attribute caching. Use the noac option only if the impact on performance is acceptable.

5. Check the following in the /etc/vfstab file:

- The mount at boot field is set to no for all RNFS-managed partitions.

Example for SNDR:

```
/dev/dsk/c0t0d0s1 /dev/rdsk/c0t0d0s1 /SUNWcgha/local ufs 2 no
logging
```

Example for Solaris VM:

```
/dev/md/nhas_diskset/dsk/d1 /dev/md/nhas_diskset/rdsk/d1
/SUNWcgha/local ufs 2 no logging
```

- The root file system (/) has the logging option.

```
/dev/dsk/c0t0d0s0 /dev/rdsk/c0t0d0s0 / ufs 1 logging
```

Note – Only partitions identified in the `nhfs.conf` file can be managed by RNFS. For more information about the `nhfs.conf` file, see [“Configuring the `nhfs.conf` File” on page 24](#).

6. (Only applicable to SNDR) Create the file systems on the replicated partitions:

```
# newfs /dev/rdisk/c0t0d0s3
# newfs /dev/rdisk/c0t0d0s4
```

▼ To Verify File Systems Managed by Reliable NFS

The Reliable NFS daemon, `nhcrfsd`, is installed on each master-eligible node. To determine which partitions are managed by this daemon, do the following:

- **Check the `RNFS.Slice` parameters of the `/etc/opt/SUNWcgha/nhfs.conf` file.**
 - For SNDR:

```
# grep -i RNFS.slice /etc/opt/SUNWcgha/nhfs.conf
RNFS.Slice.0=/dev/rdisk/c0t0d0s3 /dev/rdisk/c0t0d0s5 \
ip sync Mandatory
```

This means that slice `/dev/rdisk/c0t0d0s3` is being replicated and slice `/dev/rdisk/c0t0d0s5` is the corresponding bitmap partition.

- For Solaris VM:

```
# grep -i RNFS.slice /etc/opt/SUNWcgha/nhfs.conf
RNFS.Slice.0=/dev/md/nhas_diskset/rdisk/d1 Mandatory
```

This means that soft partition `d1` of diskset `nhas_diskset` is being managed by Reliable NFS.

Starting the Master-Eligible Nodes

▼ To Delete the not_configured File

The `/etc/opt/SUNWcgha/not_configured` file was installed automatically when you installed the CMM packages. This file enables you to reboot a cluster node during the installation process without starting the Netra HA Suite.

- **After you have installed the Netra HA Suite packages on each master-eligible node, delete the `not_configured` file on each master-eligible node.**

▼ To Boot the Master-Eligible Nodes

1. **Unmount the shared file system, `/NetraHASuite`, on each master-eligible node by using the `umount` command.**

See the `umount1M` man page and [“To Mount an Installation Server Directory on the Master-Eligible Nodes”](#) on page 11.

2. **Reboot the first master-eligible node, which becomes the master node:**

Note – For detailed information about rebooting a node on the operating system version in use at your site, refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide*.

3. **After the first master-eligible node has completed rebooting, reboot the second master-eligible node:**

Note – For detailed information about rebooting a node on the operating system version in use at your site, refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide*.

This node becomes the vice-master node. To check the role of each node in the cluster, see the `nhcmmrole1M` man page.

4. **Create the `INST_RELEASE` file to allow patching of shared packages:**

```
# /opt/SUNWcgha/sbin/nhadm confshare
```

▼ To Verify the Cluster Configuration

Use the `nhadm` tool to verify that the master-eligible nodes have been configured correctly.

1. **Log in to the master-eligible node as superuser.**
2. **Run the `nhadm` tool to validate the configuration:**

```
# nhadm check starting
```

If all checks pass the validation, the installation of the Netra HA Suite was successful. See the `nhadm1M` man page.

Installing the Software for Diskless Nodes

When you have installed and configured the master-eligible nodes of the cluster, you can add diskless nodes and dataless nodes to the cluster.

This chapter pertains to diskless nodes. To add dataless nodes to your cluster, see the following chapter.

Information about installing software for diskless nodes is provided in the following sections:

- [“Preparing to Install a Diskless Node” on page 41](#)
- [“Installing the Solaris Operating System for Diskless Nodes on the Master Node” on page 42](#)
- [“Installing the DHCP and the Reliable Boot Service” on page 48](#)
- [“Configuring the DHCP for a Diskless Node” on page 49](#)
- [“Configuring the DHCP Boot Policy for Diskless Nodes” on page 52](#)
- [“Installing the Netra HA Suite Software on a Diskless Node” on page 58](#)
- [“Configuring the Netra HA Suite for a Diskless Node” on page 60](#)
- [“Integrating a Diskless Node Into the Cluster” on page 65](#)
- [“Starting the Cluster” on page 68](#)

Preparing to Install a Diskless Node

Before installing and configuring the software for a diskless node, check that the node is connected to the cluster and that there is enough disk space on the master-eligible nodes.

▼ To Connect a Diskless Node to the Cluster

- To connect a diskless node to a cluster, connect the two network interfaces of the diskless node to the two switches of the cluster.

For details on how to connect the diskless node to other nodes in the cluster, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*.

▼ To Check Disk Space on the Master Node

- Check that an exported file system is configured for the diskless node on a shared partition of the master node.

The number of diskless nodes in a cluster depends on your hardware configuration and the disk space that is available in your shared file system. For each diskless node, there must be a mounted file system on the master node with a capacity of 100 Mbytes. The file system for diskless nodes is in the `/export` directory. For example disk partitions for a master-eligible node, see [“Defining Disk Partitions on the Master-Eligible Nodes” on page 6](#).

Note – Each diskless node must be configured with sufficient physical memory so that swapping is not required. Swapping to a file system across NFS has a serious impact on performance.

Installing the Solaris Operating System for Diskless Nodes on the Master Node

Install the Solaris Operating System for diskless nodes by using the `smosservice` command on the master node. You run this command only the first time you add a diskless node to a cluster to install the common Solaris services for all diskless nodes. The common Solaris services for the diskless node is installed in the directory `/export/exec` on the master node. You must also install some OS-specific packages, some on the root file system on each diskless node, some on the `/usr` directory common to all diskless nodes.

For every additional diskless node, you only need to create the root file system for the new node by using the `smdiskless` command. The root file system is installed in the `/export/root/diskless-node-name` directory for each diskless node.

To install the Solaris Operating System for the diskless nodes, see the following procedures.

- [“To Install the Common Solaris Services for Diskless Nodes on the Master Node” on page 43](#)
- [“To Install OS-Specific Packages” on page 44](#)
- [“To Create a Root File System for a Diskless Node on the Master Node” on page 45](#)
- [“To Install the Solaris-Specific Packages for Diskless Nodes \(SPARC only\)” on page 46](#)
- [“To Configure the Trivial File Transfer Protocol on the Master-Eligible Nodes” on page 47](#)
- [“To Install Solaris Patches” on page 47](#)

▼ To Install the Common Solaris Services for Diskless Nodes on the Master Node

1. **Ensure that the mount points to the software distributions have been configured.**

For more information, see [“To Mount an Installation Server Directory on the Master-Eligible Nodes” on page 11](#).

2. **Log in to the master node as superuser.**
3. **Start the Solaris Management Console.**

```
# smc
# ps -ef | grep smc
root    474    473    0    Jul 29 ?           0:00
/usr/sadm/lib/smc/bin/smcboot
root    473      1    0    Jul 29 ?           0:00
/usr/sadm/lib/smc/bin/smcboot
```

For more information, see the `smc1M` man page.

4. **Run the `smosservice` command, as follows:**

For SPARC diskless nodes:

```
# /usr/sadm/bin/smosservice add -p root-password -- \-x mediapath=
Solaris-distribution-dir \-x platform=Solaris-platform \-x cluster=Solaris-cluster
\-x locale=locale
```

- *root-password* is the superuser password. By default, this password is *sunrules*.
- *Solaris-distribution-dir* is the mounted directory on the master node that contains the Solaris distribution.
- *Solaris-platform* is the Solaris platform, for example, *sparc.sun4u.Solaris_9*.
- *Solaris-cluster* is the Solaris cluster to install, for example, *SUNWCuser*.
- *locale* is the locale to install. For U.S. English, the value is *en_US*.

```
# /usr/sadm/bin/smosservice add -p root-password -- \-x mediapath=
Solaris-distribution-dir \-x platform=Solaris-platform \-x cluster=Solaris-cluster
```

```
# /usr/sadm/bin/smosservice add -p sunrules -- \-x mediapath=
/Solaris9-Distribution \-x platform=sparc.sun4u.Solaris_9 \-x
cluster=SUNWCuser \-x locale=en_US
```

For x64 diskless nodes:

For example, to install the Solaris services for Solaris 9 SPARC diskless nodes, type:

The common Solaris services for all diskless nodes are installed in the */export/exec* directory on the master node.

For more information, see the *smosservice1M* man page.

▼ To Install OS-Specific Packages

Note – Ignore error messages related to packages that have not been installed. Always answer *Y* to continue the installation.

1. **Ensure that the mount points to the software distributions have been configured.**

For more information, see [“To Mount an Installation Server Directory on the Master-Eligible Nodes”](#) on page 11.

2. **Log in to the master node as superuser.**
3. **Install OS-specific packages as follows:**

- a. **For Solaris 9 SPARC diskless nodes, install the SPARC-specific packages:**

```
# pkgadd -R /export/Solaris_x/usr_sparc.all SUNWkvm.u SMEvplu.u
```

b. For Solaris 10 SPARC diskless nodes, install the SPARC-specific packages:

```
# pkgadd -R /export/Solaris_x/usr_sparc.all SUNWkvm.u SMEvplu.u SUNWcsl
```

c. For x64 diskless nodes, install the x64-specific packages:

```
# pkgadd -R /export/Solaris_x/usr_i386.all SUNWkvm.i SUNWcsl
```

▼ To Create a Root File System for a Diskless Node on the Master Node

After the common Solaris services for the diskless nodes are installed, use the `smdiskless` command on the master node to create a root file system for each diskless node in the cluster. You must create the root file system for each diskless node in the cluster.

- 1. Log in to the master node as superuser.**
- 2. Create an entry in `/etc/hosts` for *diskless-node-name* on the first node.**
- 3. Create the root file system for each diskless node, as follows:**

For SPARC diskless nodes:

```
# /usr/sadm/bin/smdiskless add -p root-password -- \-i IP-address-NIC0 \
-e Ethernet-address \-n diskless-node-name \-x os=Solaris-platform \-x locale=
locale
```

- *root-password* is the root password; by default this password is `sunrules`.
- *IP-address-NIC0* is the IP address of the diskless node on the *NIC0* interface, for example, `10.250.1.30`.
- *Ethernet-address* is the Ethernet address of the diskless node, for example, `08:00:20:01:02:03`.
- *diskless-node-name* is the name of the diskless node, for example, `netraDISKLESS1`.
- *Solaris-platform* is the Solaris platform, for example, `sparc.sun4u.Solaris_9` for the Solaris 9 OS.

- *locale* is the language. For U.S. English, the value is `en_US`.

```
# /usr/sadm/bin/smdiskless add -p root-password -- \-i IP-address-NIC0 \
-e Ethernet-address \-n diskless-node-name \-x os=Solaris-platform
```

```
# /usr/sadm/bin/smdiskless add -p sunrules -- -i 10.250.1.20 \-e
08:00:20:01:02:03 -n netraDISKLESS1 \ -x os=sparc.sun4u.Solaris_9
-x locale=en_US
```

For x64 diskless nodes:

For example, to add a new diskless node that is named `netraDISKLESS1` that runs Solaris 9 on a Sun4U™ machine, type:

4. For each x64 diskless node, process the boot entry as follows:

- a. **umount the boot directory if it is mounted as follows:**

```
# umount /tftpboot/<diskless-nodename>
```

- b. **Update the `/etc/vfstab` file on the master node by setting the mount at boot option for each `umount /tftpboot/<diskless-nodename>` entry to no.**
- c. **Update the `/etc/vfstab` file on the vice-master node by adding all `/tftpboot/<diskless-nodename>` entries that are present in the master file to the vice-master file.**

The root file system for the diskless node is created in the following directory:
`/export/root/netraDISKLESS1`.

For more information, see the `smdiskless1M` man page.

▼ To Install the Solaris-Specific Packages for Diskless Nodes (SPARC only)

1. **Ensure that the mount points to the software distributions have been configured.**

For more information, see [“To Mount an Installation Server Directory on the Master-Eligible Nodes”](#) on page 11.

2. **Log in to the master node as superuser.**
3. **Install the SPARC-specific packages for each diskless node:**

```
# pkgadd -R /export/root/<diskless-nodename> -d /mnt SMEvplr.u SUNwsiox.u
```

▼ To Configure the Trivial File Transfer Protocol on the Master-Eligible Nodes

The `smdiskless` command creates the directory `/tftpboot` on the master node. This directory contains the boot image for each diskless node. Create the same directory on the vice-master node. Then, after a switchover, the new master node can boot the diskless nodes.

1. **Log in to the master node as superuser.**
2. **Modify the `/etc/inetd.conf` file to configure the Trivial File Transfer Protocol (TFTP).**

Uncomment the `tftp` line, by deleting the comment mark at the beginning of the line, for example:

```
# tftp      dgram    udp6      wait      root
/usr/sbin/in.tftpd      in.tftpd  -s /tftpboot
```

For more information, see the `inetd.conf4` man page.

3. **Copy the `/tftpboot` directory to the vice-master node:**

```
# find /tftpboot | cpio -omB | rsh vice-master-cgtp0-address cpio -idumvB
```

4. **Log in to the vice-master node.**
5. **Repeat [Step 2](#) on the vice-master node.**

▼ To Install Solaris Patches

In the root directory for each diskless node on the master node, install the necessary Solaris patches. The Netra High Availability Suite 3.0 1/08 Foundation Services README contains the list of Solaris patches that you must install. The contents of this list depends on the version of the Solaris Operating System you installed.

Note – Some of these patches are required for CGTP. If you do not plan to install CGTP, do not install the CGTP patches. For more information about the impact of not installing CGTP, see [“Choosing a Cluster Network” on page 3](#).

1. **Log in to the master node as superuser.**

2. Check that the directory containing the Netra HA Suite software distribution on the installation server is mounted on the master node:

```
# mount
...
/NetraHASuite on 10.250.1.100:/software-distribution-dir \
remote/read/write/setuid/dev=3ec0004 on Tue Sep 24 17:06:09 2002
#
```

- 10.250.1.100 is the IP address of the installation server network interface that is connected to the cluster.
- *software-distribution-dir* is the directory that contains the Netra HA Suite product for the hardware architecture.

If the directory is not mounted, mount the directory as described in [“To Mount an Installation Server Directory on the Master-Eligible Nodes”](#) on page 11.

3. Install the Solaris services patches for the diskless nodes on the master node:

```
# patchadd -S Solaris_x /NetraHASuite/Patches/patch-number
```

where *x* is 9 or 10 depending on the Solaris version installed.

4. Apply the patches for each diskless node:

```
# patchadd -R /export/root/diskless-node-name \
/NetraHASuite/Patches/patch-number
```

Installing the DHCP and the Reliable Boot Service

The Reliable Boot Service ensures continuous availability of the DHCP server in a cluster. In the event of a failover of the master node, the vice-master node takes over from the master node. In the event of the failure of a diskless node, the Reliable Boot Service enables the diskless node to reboot automatically. This service also reassigns IP addresses to diskless nodes. For more information, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

The Reliable Boot Service is included in Netra HA Suite package `SUNWnhas-rbs`. These packages contain a DHCP public module. These packages also contain template files for the DHCP service configuration file, the network containers, and `dhcptab` containers.

▼ To Install the DHCP and the Reliable Boot Service

1. Log in to each master-eligible node as superuser.
2. Check that the Solaris DHCP packages are installed on the master-eligible nodes.

The DHCP is delivered in the SUNWdhcm, SUNWdhcsr, and SUNWdhcsu packages.

```
# pkginfo SUNWdhcm SUNWdhcsr SUNWdhcsu
```

If not already installed, install the Solaris DHCP packages on each master-eligible node:

```
# pkgadd -d Solaris-distribution-dir SUNWdhcm SUNWdhcsr SUNWdhcsu
```

3. Install the SUNWnhas-rbs Reliable Boot Service packages on each master-eligible node as follows:

For SPARC diskless nodes:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-rbs
```

For x64 diskless nodes:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhas-rbs SUNWnhas-rbs-nsmscripts
```

Note – To support x64 diskless nodes, the Node State Manager must be installed on both master-eligible nodes.

Configuring the DHCP for a Diskless Node

To configure the DHCP for a diskless node, create the DHCP configuration table and network table for the node using the `dhcpconfig`, `dhtadm`, and `pntadm` commands. For more information about these commands and files, see the `dhcpconfig1M`, `dhtadm1M`, and `pntadm1M` man pages.

▼ To Configure the DHCP for a Diskless Node

1. Log in to the master node as superuser.

2. Configure the DHCP server:

```
# dhcpconfig -D -r SUNWnhrbs -p /SUNWcggha/remote/var/dhcp -n
```

3. Modify the `/etc/inet/dhcpsvc.conf` file:

```
DAEMON_ENABLED=TRUE
RUN_MODE=server
RESOURCE=SUNWnhrbs
PATH=/SUNWcggha/remote/var/dhcp
CONVER=1
INTERFACES=hme0,hme1
OFFER_CACHE_TIMEOUT=30
```

- `DAEMON_ENABLED` enables the DHCP daemon when set to `TRUE`.
- `RUN_MODE` selects the daemon run mode.
- `RESOURCE` enables you to add the Reliable Boot Service module, `SUNWnhrbs`, to the DHCP.
- `PATH` enables you to specify the path to the DHCP configuration file. This path must be in a shared file system.
- `CONVER` is the integer that specifies the DHCP container version. Do not modify this parameter.
- `INTERFACES` enables you to specify the network interfaces on the node, for example, `hme0` and `hme1`.

If you are configuring a single network link for your cluster (that is, you do not plan to install the CGTP), specify only the first network interface, for example, `hme0`.

- `OFFER_CACHE_TIMEOUT` enables you to specify the number of seconds before `OFFER` cache timeouts occur, for example, 30.

For more information, see the `dhcpsvc.conf4` man page.

4. Create the DHCP configuration table:

```
# dhtadm -C
```


5. Modify the DHCP configuration table:

```
# dhtadm -A -s SbootFIL -d 'Vendor=vendor-string,7,ASCII,1,0'
# dhtadm -A -s SswapPTH -d 'Vendor=vendor-string,6,ASCII,1,0'
# dhtadm -A -s SswapIP4 -d 'Vendor=vendor-string,5,IP,1,0'
# dhtadm -A -s SrootPTH -d 'Vendor=vendor-string,4,ASCII,1,0'
# dhtadm -A -s SrootNM -d 'Vendor=vendor-string,3,ASCII,1,0'
# dhtadm -A -s SrootIP4 -d 'Vendor=vendor-string,2,IP,1,0'
# dhtadm -A -s SrootOpt -d 'Vendor=vendor-string,1,ASCII,1,0'
# dhtadm -A -s NhCgtpAddr -d 'Site,128,IP,1,1'
# dhtadm -A -s NhNic0Addr -d 'Site,129,IP,1,1'
# dhtadm -A -s NhNic1Addr -d 'Site,130,IP,1,1'
# dhtadm -A -m subnet1 -d \
':Broadcast=broadcast1:MTU=1500:Router=router1:Subnet=255.255.255.0:'
# dhtadm -A -m subnet2 -d \
':Broadcast=broadcast2:MTU=1500:Router=router2:Subnet=255.255.255.0:'
# dhtadm -A -m Common -d \
':BootSrvA=floating-master-address:\
SrootIP4=floating-master-address:\
SswapIP4=floating-master-address:\
BootSrvN=floating-master-address:SrootNM=floating-master-address:'
```

If you are using x64 diskless nodes, execute the following command:

```
# dhtadm -A -m "PXECClient:Arch:00000:UNDI:002001" -d \
':BootSrvA=floating-master-address:'
```

Note – If you are not planning to use CGTP (that is, you plan to configure a single network link for your cluster 0, do not configure the NhCgtpAddr macro.

- *vendor-string* is an ASCII string that identifies the client class names that are supported by the DHCP. Specify multiple client class names separated by spaces, for example:

```
'SUNW.UltraSPARC-IIi-cEngine SUNW.UltraSPARC-IIi-Netrtract \
SUNW.UltraSPARCengine_CP-60,7,ASCII,1,0'
```

- *subnet1* is the *NIC0* subnet, for example, 10.250.1.0.
- *subnet2* is the *NIC1* subnet, for example, 10.250.2.0.
- *broadcast1* is the broadcast address of the *NIC0* subnet, for example, 10.250.1.255.
- *broadcast2* is the broadcast address of the *NIC1* subnet, for example, 10.250.2.255.
- *router1* is the router address of the *NIC0* subnet, for example, 10.250.1.1.

- *router2* is the router address of the *NIC1* subnet, for example, 10.250.2.1.
 - *floating-master-address* is the floating IP address assigned to the CGTP interface of the current master node. For example, 10.250.3.1. For more information, see [“Configuring the Master-Eligible Node Addresses” on page 19](#).
- If you are not planning to use the CGTP (that is, you plan to configure a single network link for your cluster), use the IP address assigned to one of the NICs on the current master node, for example, 10.250.1.1.

For more information about the DHCP options, see the `dhtadm1M` man page.

6. Create the DHCP network table:

```
# pntadm -C subnet1# pntadm -C subnet2
```

Configuring the DHCP Boot Policy for Diskless Nodes

Configure a DHCP boot policy for the diskless nodes in the cluster by updating the DHCP configuration table and the DHCP network table. The boot policy is a way to assign IP addresses to a diskless node when the node is booted.

Diskless nodes can have a static or client ID boot policy. For more information about the DHCP boot policies, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

TABLE 3-1 Boot Policies for Diskless Nodes

Boot Policy	Description
DHCP static boot policy	IP address is statically assigned based on the Ethernet address of the diskless node. See “To Configure the DHCP Static Boot Policy” on page 53 .
DHCP client ID boot policy	IP address is generated from the node's client ID. See “To Configure the DHCP Client ID Boot Policy” on page 55 .

Note – If you are not planning to use the CGTP (that is, you plan to configure a single network link for your cluster), configure the DHCP only for the *NIC0* interface. In addition, do not configure the `NhCgtpAddr` macro for the *cgtp0* interface.

▼ To Configure the DHCP Static Boot Policy

1. Log in to the master node as superuser.
2. Update the DHCP configuration table for the *NIC0* interface of the diskless node:

```
# dhtadm -A -m macro-name -d \  
'NhCgtpAddr=local-cgtp-addr:NhNic0Addr=local-nic0-addr:NhNic1Addr=  
local-nic1-addr:Include=Common:BootFile=inetboot.sun4u.os:\  
SrootPTH=/export/root/diskless-node-name:\  
SswapPTH=/export/swap/diskless-node-name:Include=subnet:'
```

- *macro-name* is the *NIC0* IP address of the node.
- *local-cgtp-addr*, *local-nic0-addr*, and *local-nic1-addr* are respectively the IP addresses of the *cgtp0*, *nic0*, and *nic1* interfaces of the node.
- *os* is the operating system. Specify *Solaris_9* or *Solaris_10* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC0* subnet.

```
# dhtadm -A -m 10.250.1.30 -d \  
'NhCgtpAddr=10.250.3.30:NhNic0Addr=10.250.1.30:NhNic1Addr=  
10.250.2.30:Include=Common:BootFile=inetboot.sun4u.Solaris 9:\  
SrootPTH=/export/root/netraDISKLESS1:\  
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.1.0:'
```

For a diskless node, *netraDISKLESS1*, with the *NIC0* IP address 10.250.1.30 and Solaris 9, type:

3. Update the DHCP container for the *NIC0* interface of the diskless node.

```
# pntadm -A IP-address \-i Ethernet-address \-f PERMANENT+MANUAL -m macro-  
name subnet
```

- *IP-address* is the *NIC0* IP address of the node.
- *Ethernet-address* of the board of the node. The letters of the address must be in uppercase.
- *macro-name* is the *NIC1* IP address of the node.

- *subnet* is the *NIC0* subnet.

```
# pntadm -A 10.250.1.30 -i 01080020F9B360 -f PERMANENT+MANUAL \-m
10.250.1.30 10.250.1.0
```

For the diskless node with the *NIC0* IP address 10.250.1.30 and Ethernet address 01080020F9B360, type:

4. Update the DHCP configuration table for the *NIC1* interface of the diskless node:

```
# dhtadm -A -m macro-name -d \
':NhCgtpAddr=local-cgtp-addr:NhNic0Addr=local-nic0-addr:NhNic1Addr=
local-nic1-addr:Include=Common:BootFile=inetboot.sun4u.os:\
SrootPTH=/export/root/diskless-node-name:\
SswapPTH=/export/swap/diskless-node-name:Include=subnet:'
```

- *macro-name* is the *NIC1* IP address of the node.
- *local-cgtp-addr*, *local-nic0-addr*, and *local-nic1-addr* are respectively the IP addresses of the *cgtp0*, *nic0*, and *nic1* interfaces of the node.
- *os* is the operating system. Specify *Solaris_9* or *Solaris_10* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC1* subnet.

```
# dhtadm -A -m 10.250.2.30 -d \
':NhCgtpAddr=10.250.3.30:NhNic0Addr=10.250.1.30:NhNic1Addr=
10.250.2.30:Include=Common:BootFile=inetboot.sun4u.Solaris 9:\
SrootPTH=/export/root/netraDISKLESS1:\
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.2.0:'
```

For the diskless node, *netraDISKLESS1*, with the *NIC1* IP address 10.250.2.30 and Solaris 9, type:

5. Update the DHCP container for the *NIC1* interface of the diskless node:

```
# pntadm -A IP-address \-i Ethernet-address \-f PERMANENT+MANUAL -m macro-
name subnet
```

- *IP-address* is the *NIC1* IP address of the node.
- *Ethernet-address* of the board of the node.
- *macro-name* is the *NIC1* IP address of the node.

- *subnet* is the *NIC1* subnet.

```
# pntadm -A 10.250.2.30 -i 01080020F9B361 \-f PERMANENT+MANUAL -m  
10.250.2.30 10.250.2.0
```

For the diskless node with the *NIC1* IP address 10.250.2.30 and Ethernet address 01080020F9B361, type:

▼ To Configure the DHCP Client ID Boot Policy

This procedure can only be performed on nodes with CompactPCI technology. For information specific to the hardware you are using, see the corresponding hardware documentation.

1. Create or retrieve the client ID for the diskless node.

- a. Log in to the diskless node as superuser.
- b. Get the `ok` prompt.
- c. Check for the client ID of the diskless node:

```
ok> printenv dhcp-clientid
```

If a client ID is not configured, configure it:

```
ok> setenv dhcp-clientid client-id-name
```

where *client-id-name* is an ASCII string. In this procedure, `test` is used as an example client ID.

d. Convert the ASCII string to hexadecimal.

For example, if `test` is your client ID, the hexadecimal equivalent is
74 65 73 74.

2. Log in to the master node.

3. Declare the diskless node's client ID in the `/export/root/diskless-node-name/etc/default/dhcpagent` file.

For example, if the hexadecimal equivalent of your client ID is 74 65 73 74 on a Netra CT 810 machine, add the following line to the `dhcpagent` file:

```
CLIENT_ID=0x74657374
```

For information about the format of the `CLIENT_ID` on the hardware you are using, see the corresponding hardware documentation.

4. Update the DHCP configuration table for the `NIC0` interface of the diskless node:

```
# dhtadm -A -m macro-name -d \  
' :NhCgtpAddr=local-cgtp-addr:NhNic0Addr=local-nic0-addr:NhNic1Addr=  
local-nic1-addr:Include=Common:BootFile=inetboot.sun4u.os:\br/>SrootPTH=/export/root/diskless-node-name:\br/>SswapPTH=/export/swap/diskless-node-name:Include=subnet:'
```

- *macro-name* is the `NIC0` IP address of the node.
- *local-cgtp-addr*, *local-nic0-addr*, and *local-nic1-addr* are respectively the IP addresses of the `cgtp0`, `nic0`, and `nic1` interfaces of the node.
- *os* is the operating system. Specify `Solaris_9` or `Solaris_10` depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the `NIC0` subnet.

```
# dhtadm -A -m 10.250.1.30 -d \  
' :NhCgtpAddr=10.250.3.30:NhNic0Addr=10.250.1.30:NhNic1Addr=  
10.250.2.30:Include=Common:BootFile=inetboot.sun4u.Solaris 9:\br/>SrootPTH=/export/root/netraDISKLESS1:\br/>SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.1.0:'
```

For a diskless node, `netraDISKLESS1`, with the `NIC0` IP address `10.250.1.30` and Solaris 9, type:

5. Update the DHCP network table for the `NIC0` interface of the diskless node:

```
# pntadm -A IP-address -i diskless-node-clientID \-f PERMANENT+MANUAL -m  
macro-name subnet
```

- *IP-address* is the `NIC0` IP address of the node.

- *diskless-node-clientID* is the hexadecimal equivalent of the client ID.
- *macro-name* is the *NIC0* IP address of the node.
- *subnet* is the subnet of the *NIC0* interface.

```
# pntadm -A 10.250.1.30 -i 74657374 \-f PERMANENT+MANUAL -m
10.250.1.30 10.250.1.0
```

For a Netra CT 810 diskless node with the *NIC0* IP address 10.250.1.30 and client ID 74657374, type:

For information about the format of the *CLIENT_ID* on the hardware you are using, see the corresponding hardware documentation.

6. Update the DHCP configuration table for the *NIC1* interface of the diskless node:

```
# dhtadm -A -m macro-name -d \
':NhCgtpAddr=local-cgtp-addr:NhNic0Addr=local-nic0-addr:NhNic1Addr=
local-nic1-addr:Include=Common:BootFile=inetboot.sun4u.os:\
SrootPTH=/export/root/diskless-node-name:\
SswapPTH=/export/swap/diskless-node-name:Include=subnet:'
```

- *macro-name* is the *NIC1* IP address of the node.
- *local-cgtp-addr*, *local-nic0-addr*, and *local-nic1-addr* are respectively the IP addresses of the *cgtp0*, *nic0*, and *nic1* interfaces of the node.
- *os* is the operating system. Specify *Solaris_9* or *Solaris_10* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC1* subnet.

```
# dhtadm -A -m 10.250.2.30 -d \
':NhCgtpAddr=10.250.3.30:NhNic0Addr=10.250.1.30:NhNic1Addr=
10.250.2.30:Include=Common:BootFile=inetboot.sun4u.Solaris 9:\
SrootPTH=/export/root/netraDISKLESS1:\
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.2.0:'
```

For the diskless node, *netraDISKLESS1*, with the *NIC1* IP address 10.250.2.30 and Solaris 9, type:

7. Update the DHCP container for the *NIC1* interface of the diskless node.

```
# pntadm -A IP-address -i diskless-node-clientID \-f PERMANENT+MANUAL -m
macro-name subnet
```

- *IP-address* is the *NIC1* IP address of the node.
- *diskless-node-clientID* is the hexadecimal equivalent of the client ID.
- *macro-name* is the *NIC1* IP address of the node.
- *subnet* is the *NIC1* subnet.

```
# pntadm -A 10.250.2.30 -i 74657374 \-f PERMANENT+MANUAL -m
10.250.2.30 10.250.2.0
```

For the diskless node with *NIC1* IP address 10.250.2.30 and client ID 74657374, type:

For information about the format of the `CLIENT_ID` on the hardware you are using, see the corresponding hardware documentation.

Installing the Netra HA Suite Software on a Diskless Node

The packages that are installed in the partitions for diskless nodes are a subset of the Netra HA Suite packages already installed on the master-eligible nodes. The following Netra HA Suite packages must be installed for each diskless node.

TABLE 3-2 Netra HA Suite Packages for Diskless Nodes

Package Name	Package Description
SUNWnhas-admintools	Netra HA Suite administration tool
SUNWnhas-cgtp	Netra HA Suite Sun CGTP
SUNWnhas-cgtp-cluster	CGTP user-space components, configuration scripts, and files
SUNWnhas-cmm	Netra HA Suite Cluster Membership Monitor
SUNWnhas-cmm-libs	CMM developer package (.h and .so files)
SUNWnhas-common	Netra HA Suite common components
SUNWnhas-common-libs	Trace library
SUNWjsnmp	Java SNMP API
SUNWnhas-nma-local	Netra HA Suite Management Agent (initscripts and configuration files)
SUNWnhas-rnfs-client	Netra HA Suite Reliable Network File Server (client binaries)

TABLE 3-2 Netra HA Suite Packages for Diskless Nodes (*Continued*)

Package Name	Package Description
SUNWnhas-safclm-libs	Netra HA Suite Service Availability Forum's Cluster Membership Service API (libraries)
SUNWnhas-pmd	Netra HA Suite process monitor daemon
SUNWnhas-pmd-solaris	Daemon monitor root file system (Solaris 9 OS only)

▼ To Install the Netra HA Suite Packages

1. Log in to the master node as superuser.

2. Install the Netra HA Suite packages.

For example, to install the Netra HA Suite packages and the Java DMK package on the Solaris 9 OS, run the following command:

```
# pkgadd -R /export/root/diskless-node-name -d netraHASuite/Packages \  
SUNWnhas-admintools SUNWnhas-cgtp SUNWnhas-cgtp-cluster \  
SUNWnhas-common-libs SUNWnhas-common SUNnhas-cmm-libs \  
SUNWnhas-cmm SUNWnhas-rnfs-client SUNWnhas-pmd \  
SUNWnhas-pmd-solaris SUNWnhas-nma-local SUNWjdrtd
```

Note – Install SUNWnhas-pmd-solaris only on the Solaris 9 OS.

In the preceding command, you also install the Java DMK 5.0 runtime classes in the root directory of each diskless node.

CGTP enables a redundant network for your cluster.

Note – If you do not require CGTP, do not install the CGTP packages. For more information about the impact of not installing CGTP, see [“Choosing a Cluster Network” on page 3](#).

3. Install the Java DMK SNMP manager API classes package in the shared `/usr` directory for the diskless nodes as follows:

On SPARC diskless nodes:

```
# pkgadd -R /export/Solaris_x/usr_sparc_all/ \-d
/NetraHASuite/Packages SUNWjsnmp
```

On x64 diskless nodes:

```
# pkgadd -R /export/Solaris_x/usr_i386_all/ \-d
/NetraHASuite/Packages SUNWjsnmp
```

where *x* is 9 or 10 depending on the Solaris version installed.

Configuring the Netra HA Suite for a Diskless Node

To configure the Netra HA Suite for a diskless node, see the following procedures:

- [“To Update the Network Files for the Diskless Node” on page 60](#)
- [“To Configure External IP Addresses” on page 62](#)
- [“To Disable the Router Feature” on page 62](#)
- [“To Set Up File Systems for a Diskless Node” on page 62](#)
- [“To Create the `nhfs.conf` File for a Diskless Node” on page 64](#)

▼ To Update the Network Files for the Diskless Node

- 1. Log in to the master node as superuser.**

2. **Create the `/export/root/diskless-node-name/etc/hostname.NIC0` and `/export/root/diskless-node-name/etc/hostname.NIC1` files.**

where *diskless-node-name* is the hostname of the diskless node.

```
# touch /export/root/diskless-node-name/etc/hostname.NIC0
# touch /export/root/diskless-node-name/etc/hostname.NIC1
```

For example, if you are using a CP2160 board, create the files:

```
/export/root/diskless-node-name/etc/hostname.eri0
/export/root/diskless-node-name/etc/hostname.eri1
```

Note – All four files must remain empty.

3. **Create the `/export/root/diskless-node-name/etc/hosts` file.**
4. **Edit the `/export/root/diskless-node-name/etc/hosts` file to include the IP addresses and node names for all the network interfaces of all the nodes.**

The interfaces are the *NIC0*, *NIC1*, and *cgtip0* interfaces.

127.0.0.1	localhost
10.250.1.10	netraMEN1-nic0
10.250.2.10	netraMEN1-nic1
10.250.3.10	netraMEN1-cgtip
10.250.1.20	netraMEN2-nic0
10.250.2.20	netraMEN2-nic1
10.250.3.20	netraMEN2-cgtip
10.250.1.30	netraDISKLESS1-nic0
10.250.2.30	netraDISKLESS1-nic1
10.250.3.30	netraDISKLESS1-cgtip
10.250.1.1	master-nic0
10.250.2.1	master-nic1
10.250.3.1	master-cgtip

5. **Create the `/export/root/diskless-node-name/etc/nodename` file.**
6. **Edit the `/export/root/diskless-node-name/etc/nodename` file to include the node name that is associated with the IP address of one of the network interfaces.**

For example, add the node name associated with the IP address of the *cgtip0* interface, that is, *netraDISKLESS1-cgtip*.

7. **Create the `/export/root/diskless-node-name/etc/netmasks` file.**

8. **Edit the `/export/root/diskless-node-name/etc/netmasks` file to include a line for each subnet on the cluster:**

10.250.1.0	255.255.255.0
10.250.2.0	255.255.255.0
10.250.3.0	255.255.255.0

▼ To Configure External IP Addresses

To configure external IP addresses for a diskless node, the node must have an extra physical network interface or logical network interface. A physical network interface is an unused interface on an existing Ethernet card or a supplemental HME Ethernet card or QFE Ethernet card, for example, `hme2`. A logical network interface is an interface that is configured on an existing Ethernet card, for example, `hme1:101`.

- **Configure an external IP address for the extra network interface based on your public network policy.**

▼ To Disable the Router Feature

Because the cluster network is not routable, you must disable the diskless node as a router.

1. **Log in to the master node as superuser.**
2. **Create the `notrouter` file:**

```
# touch /export/root/diskless-node-name/etc/notrouter
```

For a description of the advantages of using a private cluster network, see the “Cluster Addressing and Networking” in *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

▼ To Set Up File Systems for a Diskless Node

To set up file systems for a diskless node, create the mount points `/SUNWcgha/remote`, `/SUNWcgha/services`, and `/SUNWcgha/swdb`. Add the NFS mount points for the directories that contain middleware data and services on the master node. Update the `/etc/vfstab` file in the root directory for the diskless node. Then, these file systems are exported from the master node through the NFS, and are automatically mounted for the diskless nodes at boot time.

The following table explains the file systems that are exported on the master node and the corresponding mount points for the diskless nodes. For information about how to export these file systems on the master node, see [“To Set Up File Systems on the Master-Eligible Nodes” on page 35](#).

Description	Exported Mount Point on the Master Node	Mount Point for Diskless Nodes
Root file systems	/export/root/diskless-node-name	/
Netra HA Suite data used locally	/SUNWcgha/local	Not exported
Netra HA Suite exported data	/SUNWcgha/local/export/data	/SUNWcgha/remote
Netra HA Suite exported data	/SUNWcgha/local/export/services/ha_3.0/opt	/SUNWcgha/services
Netra HA Suite exported data	/SUNWcgha/local/export/services/ha_3.0	/SUNWcgha/swdb

All file systems that you mount using NFS must be mounted with the options `fg`, `hard`, and `intr`. You can also set the `noac` mount option, which suppresses data and attribute caching. Use the `noac` option only if the impact on performance is acceptable.

1. Log in to the master node as superuser.

2. Edit the entries in the `/export/root/diskless-node-name/etc/vfstab` file.

- If you have configured the CGTP, replace the host name of the master node with the host name associated with the floating IP address for the `cgtp0` interface that is assigned to the master role, for example, `master-cgtp`.
For more information, see [“To Create the Floating Address Triplet Assigned to the Master Role” on page 25](#).
- If you have not configured the CGTP, replace the host name of the master node with the host name associated with the floating IP address for the `NIC0` interface that is assigned to the master role, for example, `master-nic0`.

3. Define the mount points `/SUNWcgha/remote`, `SUNWcgha/services`, and `/SUNWcgha/swdb`.

- If you have configured the CGTP, use the floating IP address for the `cgtp0` interface that is assigned to the master role to define the mount points:

```

master-cgtp:/SUNWcgha/local/export/data - \
/SUNWcgha/remote      nfs      -      yes      \
rw,hard,fg,intr
master-cgtp:/SUNWcgha/local/export/services/ha_3.0/opt \
- /SUNWcgha/services      nfs      -      yes      \

```

```
rw,hard,fg,intr
master-cgtp:/SUNWcgha/local/export/services/ha_3.0 - \
/SUNWcgha/swdb nfs - yes rw,hard,fg,intr
```

- If you have not configured the CGTP, use the floating IP address for the *NIC0* interface that is assigned to the master role.

```
master-nic0:/SUNWcgha/local/export/data - \
/SUNWcgha/remote nfs - yes \
rw,hard,fg,intr
master-nic0:/SUNWcgha/local/export/services/ha_3.0/opt \
- /SUNWcgha/services nfs - yes \
rw,hard,fg,intr
master-nic0:/SUNWcgha/local/export/servicesha_3.0 - \
/SUNWcgha/swdb nfs - yes rw,hard,fg,intr
```

Note – Do not use IP addresses in the `/etc/vfstab` file for the diskless nodes. Instead, use logical host names. Otherwise, the `pkgadd R` command fails and returns the following message: “WARNING: cannot install to or verify on master_ip>”

4. In the diskless node directory `/export/root/diskless-node-name`, create the mount points:

```
# mkdir -p SUNWcgha/remote
# mkdir -p SUNWcgha/services
# mkdir -p SUNWcgha/swdb
```

5. Repeat [Step 2](#) through [Step 4](#) for all diskless nodes.

▼ To Create the `nhfs.conf` File for a Diskless Node

Each node in the cluster has a cluster configuration file, `nhfs.conf`. Create this file for the new diskless node by performing the following procedure.

1. Log in to the master node as superuser.
2. Create the `nhfs.conf` file for the diskless node:

```
# cp /etc/opt/SUNWcgha/nhfs.conf.template \
/export/root/diskless-node-name/etc/opt/SUNWcgha/nhfs.conf
```

3. Configure the `/export/root/diskless-node-name/etc/opt/SUNWcgha/nhfs.conf` file.

An example file for a diskless node on a cluster with the domain ID 250, with network interfaces `eri0`, `eri1`, and `cgtp0` would be as follows:

```
Node.NodeId=30
Node.NIC0=eri0
Node.NIC1=eri1
Node.NICCGTP=cgtp0
Node.UseCGTP=True
Node.Type=Diskless
Node.DomainId=250
CMM.IsEligible=False
CMM.LocalConfig.Dir=/etc/opt/SUNWcgha
```

For more information, see the `nhfs.conf4` man page.

If you have not installed the CGTP patches and packages, do the following:

- Disable the `Node.NIC1` and `Node.NICCGTP` parameters.
To disable these parameters, add a comment mark (`#`) at the beginning of the line containing the parameter if this mark is not already present.
- Configure the `Node.UseCGTP` and the `Node.NIC0` parameters:
 - `Node.UseCGTP=False`
 - `Node.NIC0=interface-name`
where *interface-name* is the name of the *NIC0* interface, for example, `hme0`, `qfe0`, or `eri0`.

4. Repeat [Step 2](#) and [Step 3](#) for all diskless nodes.

Integrating a Diskless Node Into the Cluster

You must update the `/etc/hosts` file on each peer node in the cluster to include the IP addresses of the diskless node. You must also update the `nhfs.conf` file and the `cluster_nodes_table` file on the master-eligible nodes to include the diskless node. See the following procedures.

- [“To Update the `/etc/hosts` File on Each Peer Node” on page 66](#)
- [“To Add the Diskless Node to the `cluster_nodes_table` File” on page 66](#)
- [“To Update the Shared Directory Configuration” on page 67](#)

▼ To Update the `/etc/hosts` File on Each Peer Node

To declare the diskless node to all peer nodes in the cluster, perform the following procedure:

1. **Log in to the master node as superuser.**
2. **Edit the `/etc/hosts` file to add the following lines:**

<pre>IP-address-NIC0 nic0-diskless-node-nameIP-address-NIC1 nic1-diskless-node-nameIP-address-cgtp0 cgtp0-diskless-node-name</pre>
--

Now, the master node can “see” the three network interfaces of the new diskless node.

3. **Log in to the vice-master node as superuser.**
4. **Repeat [Step 2](#).**
Now, the vice-master node can “see” the three network interfaces of the new diskless node.
5. **Log in to a diskless or dataless node that is part of the cluster, if one already exists.**
6. **Repeat [Step 2](#).**
Now, the diskless node can “see” the three network interfaces of the new diskless node.
7. **Repeat [Step 5](#) and [Step 6](#) on all other diskless or dataless nodes that are already part of the cluster.**

▼ To Add the Diskless Node to the `cluster_nodes_table` File

Update the cluster node table file, `cluster_nodes_table`, and the cluster configuration file, `nhfs.conf`, with the addressing information for the new diskless node.

1. **Log in to the master node as superuser.**

2. Using the following format, edit the `/etc/opt/SUNWcgha/cluster_nodes_table` file to add an entry for the diskless node:

#NodeId	Domain_id	Name	Attributes	nodeid	domainid
		<i>diskless-node-name</i>	-		

The *nodeid* that you define in the `cluster_nodes_table` file must be the decimal representation of the host part of the node's IP address. For more information, see the `cluster_nodes_table4` man page.

3. Create the `cluster_nodes_table` file on the master node disk:

```
# /opt/SUNWcgha/sbin/nhcmstat -c reload
```

4. Repeat [Step 2](#) for each diskless node you are adding to the cluster.

▼ To Update the Shared Directory Configuration

Specify the shared directory configuration in the `nhfs.conf` file on the master node and the vice-master node. Ensure that there is no existing shared directory configuration already specified in the `/etc/dfs/dfstab` file.

1. Log in to the master node as superuser.
2. Edit the `/etc/opt/SUNWcgha/nhfs.conf` file to add the following:

```
Rnfs.Share.0=share -F nfs -o rw=nic0-diskless-node-name: \
nic1-diskless-node-name:cgt0-diskless-node-name, \
root=nic0-diskless-node-name:nic1-diskless-node-name: \cgt0-diskless-node-name
/export/swap/diskless-node-nameRnfs.Share.1=share -F nfs -o
rw=nic0-diskless-node-name: \nic1-diskless-node-name:cgt0-diskless-node-name, \
root=nic0-diskless-node-name:nic1-diskless-node-name: \cgt0-diskless-node-name
/export/root/diskless-node-name
```

3. Update the `RNFS.Share.0` parameter that is used to share the `/SUNWcgha/local/export` directory to include the *cgt0-diskless-node-name* of the diskless node.
4. Log in to the vice-master node.
5. Repeat [Step 2](#) and [Step 3](#) on the vice-master node.
6. On the master node, edit the `/etc/dfs/dfstab` file to remove all uncommented lines.

Starting the Cluster

To integrate the new diskless node into the cluster, delete the `not_configured` file and reboot the master-eligible nodes. When the Solaris Operating System and the Netra HA Suite have been booted onto the diskless nodes, verify the new configuration before the cluster is restarted.

▼ To Delete the `not_configured` File

The `/export/root/diskless-node-name/etc/opt/SUNWcgha/not_configured` file is automatically created during the installation of the CMM packages for the diskless node. This file enables you to reboot a cluster node during the installation and configuration process without starting the Netra HA Suite.

- **After you complete the installation and configuration procedures, but before starting the cluster, delete this file for the diskless node.**

▼ To Boot a Diskless Node

1. **Log in to the master node as superuser.**
2. **Reboot the master node.**

Note – For detailed information about rebooting a node on the operating system version in use at your site, refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide*.

3. **After the master node has completed booting, log in to the vice-master node as superuser.**
4. **Reboot the vice-master node:**

Note – For detailed information about rebooting a node on the operating system version in use at your site, refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide*.

5. After the vice-master node has completed booting, get the `ok` prompt on the diskless node:

```
# halt
# Control-C
telnet> send brk
Type 'go' to resume
ok>
```

6. For SPARC diskless nodes, set the OpenBoot PROM parameters that exist on your system to the values below:

```
ok> setenv local-mac-address? true
ok> setenv auto-boot-retry? true
ok> setenv diag-switch? false
ok> setenv boot-device net:dhcp,,,,,5 net2:dhcp,,,,,5
```

For x64 diskless nodes, refer to the hardware manual.

Note – If you are going to use *client_id* on a diskless node, configure it on the diskless node. For more information, refer to the configuration information provided with the hardware.

7. For SPARC diskless nodes, reboot the diskless node as follows:

```
ok> boot
```

For x64 diskless nodes, refer to the hardware manual.

▼ To Verify the Cluster Configuration

Use the `nhadm` tool to verify that the diskless nodes have been configured correctly and are integrated into the cluster.

1. Log in to the diskless node as superuser.
2. Run the `nhadm` tool to validate the configuration:

```
# nhadm check
```

If all checks pass the validation, the installation of the Netra HA Suite software was successful. For more information, see the `nhadm1M` man page.

Installing the Software on the Dataless Nodes

After you have installed and configured the master-eligible nodes, you can add diskless nodes and dataless nodes to the cluster.

To add a dataless node to the cluster, see the following sections:

- [“Preparing to Install a Dataless Node” on page 71](#)
- [“Installing the Solaris Operating System on a Dataless Node” on page 72](#)
- [“Installing the Netra HA Suite on a Dataless Node” on page 75](#)
- [“Configuring the Netra HA Suite on a Dataless Node” on page 76](#)
- [“Integrating a Dataless Node Into the Cluster” on page 82](#)
- [“Starting the Cluster” on page 83](#)

Preparing to Install a Dataless Node

Perform the following procedures before installing and configuring a dataless node:

▼ To Connect a Dataless Node to the Cluster

- **To connect a dataless node to a cluster, connect the two Ethernet interfaces of the dataless node to the two switches of the cluster. Connect *NIC0* to switch 1 and *NIC1* to switch 2.**

For more information, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*.

Note – The packages and patches that you install on the dataless node might differ depending on the type of hardware you use on the dataless node. For information about the specific patches and packages required for your hardware configuration, see the Netra High Availability Suite 3.0 1/08 Foundation Services README.

▼ To Define Disk Partitions on a Dataless Node

- **Create the disk partitions of the dataless node according to the requirements of your cluster.**

The following table provides the space requirements for example disk partitions of a dataless node in a cluster.

Disk Partition	File System Name	Description	Example Size
0	/	The root file system, boot partition, and volume management software. This partition must be mounted with the logging option.	2 Gbytes
1	/swap	Minimum size when physical memory is less than 1 Gbyte.	1 Gbyte
2	overlap	Entire disk.	Size of entire disk
3	/mypartition	For any additional applications.	The remaining space

Installing the Solaris Operating System on a Dataless Node

To install the Solaris Operating System on a dataless node, use the Solaris JumpStart tool. The Solaris JumpStart tool requires the Solaris distribution to be on the installation server. For information about creating a Solaris distribution, see *Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide*.

▼ To Install the Solaris Operating System on a Dataless Node

1. Log in to the installation server as superuser.
2. If not already created, create the Solaris JumpStart environment on the installation server by using the appropriate document for the Solaris release:
 - *Solaris 9 or Solaris 10 Installation Guide*

At the end of this process, you have a *Jumpstart-dir* directory that contains the Solaris JumpStart files that are needed to install the Solaris Operating System on the node.
3. In the */etc/hosts* file, add the name and IP addresses of the dataless node.
4. In the */etc/ethers* file, add the Ethernet address of the dataless node's network interface that is connected to the same switch as the installation server, for example, *NIC0*.
5. Share the *Solaris-distribution-dir* and *Jumpstart-dir* directories by adding these lines to the */etc/dfs/dfstab* file:

```
share -F nfs -o rw Solaris-distribution-dirshare -F nfs -o rw Jumpstart-dir
```

- *Solaris-distribution-dir* is the directory that contains the Solaris distribution.
 - *Jumpstart-dir* is the directory that contains the Solaris JumpStart files.
6. Change to the directory where the `add_install_client` command is located:

```
# cd Solaris-dir/Solaris_x/Tools
```

- *Solaris-dir* is the directory that contains the Solaris installation software. This directory could be on a CD-ROM or in an NFS-shared directory.
 - *x* is 9 or 10 depending on the version of the Solaris Operating System you install.
7. Run the `add_install_client` command for each dataless node:

```
# ./add_install_client -i IP-address \-e Ethernet-address \  
-s iserver:Solaris-distribution-dir \-c iserver:Jumpstart-dir \-p iserver:sysidcfg-dir \  
-n name-service host-name platform-group
```

- *IP-address* is the IP address of the dataless node.
- *Ethernet-address* is the Ethernet address of the dataless node.
- *iserver* is the IP address of the installation server for the cluster

- *Solaris-distribution-dir* is the directory that contains the Solaris distribution.
- *Jumpstart-dir* is the directory that contains the Solaris JumpStart files.
- *sysidcfg-dir* is the directory that contains the *sysidcfg* file. This directory is a subdirectory of the *Jumpstart-dir* directory.
- *name-service* is the naming service you would like to use, for example, NIS or NIS+.
- *host-name* is the name of the dataless node.
- *platform-group* is the hardware platform of the dataless node, for example, sun4u.

For more details, see the *add_install_client1M* man page.

8. Connect to the console of the dataless node.

9. At the *ok* prompt, boot the dataless node by using the *net* device alias:

```
ok> boot net - install
```

If the installation server is connected to the second Ethernet interface, type:

```
ok> boot net2 - install
```

This command installs the Solaris Operating System on the dataless node.

Note – For x64 diskless nodes, refer to the hardware manual for information about booting.

▼ To Install Solaris Patches

After you have completed the Solaris installation, install the necessary Solaris patches. The Netra High Availability Suite 3.0 1/08 Foundation Services README contains the list of Solaris patches that you must install, depending on the version of Solaris you installed.

Note – Some of these patches are required for CGTP. If you do not plan to install CGTP, do not install the CGTP patches. For more information about the impact of not installing CGTP, see [“Choosing a Cluster Network” on page 3](#).

1. Log in to the dataless node as superuser.

2. Mount the directory from the installation server that contains the Solaris patches.
See [“To Mount an Installation Server Directory on the Master-Eligible Nodes” on page 11.](#)
3. Install the patches on the dataless node:

```
# patchadd -M /NetraHASuite/Patches/ patch-name
```



Installing the Netra HA Suite on a Dataless Node

After the Solaris Operating System has been installed on the dataless node, install the Netra HA Suite on the dataless node.

The set of services to be installed on the dataless node is a subset of the Netra HA Suite installed on the master-eligible nodes. Install the packages that are listed as needed for dataless nodes in [TABLE 4-1.](#)

TABLE 4-1 Netra HA Suite Packages for Dataless Nodes

Package Name	Package Description
SUNWnhas-admintools	Netra HA Suite administration tool
SUNWnhas-cgtp	Netra HA Suite Sun CGTP
SUNWnhas-cgtp-cluster	CGTP user-space components, configuration scripts, and files
SUNWnhas-cmm	Netra HA Suite Cluster Membership Monitor
SUNWnhas-cmm-libs	CMM developer package (.h and .so files)
SUNWnhas-common	Netra HA Suite common components
SUNWnhas-common-libs	Trace library
SUNWjsnmp	Java SNMP API
SUNWnhas-nma-local	Netra HA Suite Management Agent (initscripts and configuration files)
SUNWnhas-rnfs-client	Netra HA Suite Reliable Network File Server (client binaries)
SUNWnhas-safclm-libs	Netra HA Suite Service Availability Forum's Cluster Membership Service API (libraries)
SUNWnhas-pmd	Netra HA Suite process monitor daemon
SUNWnhas-pmd-solaris	Daemon monitor root file system (Solaris 9 OS only)

▼ To Install the Netra HA Suite

1. **Mount the installation server directory on the dataless node as described in “To Mount an Installation Server Directory on the Master-Eligible Nodes” on page 11.**
2. **Install the packages by using the `pkgadd` command:**

```
# pkgadd -d /NetraHASuite/Packages/ package-name
```

where `/NetraHASuite/Packages` is the installation server directory that is mounted on the dataless node.

CGTP enables a redundant network for your cluster.

Note – If you do not require CGTP, do not install the CGTP packages. For more information about the impact of not installing CGTP, see “[Choosing a Cluster Network](#)” on page 3.

Configuring the Netra HA Suite on a Dataless Node

The following procedures explain how to configure the Netra HA Suite on a dataless node.

- “To Configure a Dataless Node” on page 77
- “To Configure an External IP Address” on page 78
- “To Update the Network Files on a Dataless Node” on page 78
- “To Create the `nhfs.conf` File for a Dataless Node” on page 79
- “To Set Up File Systems for a Dataless Node” on page 80

▼ To Configure a Dataless Node

1. Create a `/etc/notrouter` file:

```
# touch /etc/notrouter
```

Because the cluster network is not routable, the dataless nodes must be disabled as routers.

2. Modify the `/etc/default/login` file so you can connect to the node from a remote system as superuser:

```
# mv /etc/default/login /etc/default/login.orig
# chmod 644 /etc/default/login.orig
# sed '1,$s/^CONSOLE/#CONSOLE/' /etc/default/login.orig >
/etc/default/login
# chmod 444 /etc/default/login
```

3. Disable power management:

```
# touch /noautoshtutdown
```

4. Modify the `.rhosts` file according to the security policy for your cluster:

```
# cp /.rhosts /.rhosts.orig
# echo "+ root" > /.rhosts
# chmod 444 /.rhosts
```

5. Set the boot parameters:

```
# /usr/sbin/eeprom local-mac-address?=true
# /usr/sbin/eeprom auto-boot?=true
# /usr/sbin/eeprom diag-switch?=false
```

Note – On x64, refer to the hardware documentation for information about performing this task.

6. (Optional) If using the Network Time Protocol (NTP) to run an external clock, configure the dataless node as an NTP server.

This procedure is described in the Solaris documentation.

▼ To Configure an External IP Address

To configure external IP addresses for a dataless node, the node must have an extra physical network interface or logical network interface. A physical network interface is an unused interface on an existing Ethernet card or a supplemental HME or QFE Ethernet card, for example, `hme2`. A logical network interface is an interface configured on an existing Ethernet card, for example, `hme1:101`.

- **Configure an external IP address for the extra network interface based on your public network policy.**

▼ To Update the Network Files on a Dataless Node

1. Log in to the dataless node as superuser.

As for the master-eligible nodes, three IP addresses are configured for each dataless node:

- The IP address for the first network interface, *NIC0*
- The IP address for the second network interface, *NIC1*
- The IP address for the virtual network interface, *cgtp0*

The IP addresses can be IPv4 addresses of any class. However, the *nodeid* that you later define in the `cluster_nodes_table` file and the `nhfs.conf` file must be a decimal representation of the host part of the node's IP address. For information about the files, see [“To Create the `nhfs.conf` File for a Dataless Node” on page 79](#) and [“To Update the Cluster Node Table” on page 83](#).

2. Create or update the file `/etc/hostname.NIC0` for the *NIC0* interface.

This file must contain the cluster network name of the dataless node on the second interface, for example, `netraDATALESS1-nic0`.

3. Create or update the file `/etc/hostname.NIC1` for the *NIC1* interface.

This file must contain the cluster network name of the master-eligible node on the second interface, for example, `netraDATALESS1-nic1`.

4. Create or update the file `/etc/hostname.cgtp0` for the *cgtp0* interface.

This file must contain the cluster network name of the dataless node on the *cgtp0* interface, for example, `netraDATALESS1-cgtp`.

5. In the `/etc/hosts` file, add the IP address and node name for the *NIC0*, *NIC01*, and *cgtp0* network interfaces of all the nodes in the cluster:

```
127.0.0.1 localhost
10.250.1.10 netraMEN1
10.250.2.10 netraMEN1-nic1
```

```

10.250.3.10 netraMEN1-cgtp

10.250.1.20 netraMEN2
10.250.2.20 netraMEN2-nic1
10.250.3.20 netraMEN2-cgtp

10.250.1.30 netraDATALESS1-nic0 loghost
netraDATALESS1.localdomain
10.250.2.30 netraDATALESS1-nic1 netraDATALESS1-nic1.localdomain
10.250.3.30 netraDATALESS1-cgtp netraDATALESS1-cgtp.localdomain

10.250.1.1 master
10.250.2.1 master-nic1
10.250.3.1 master-cgtp

```

6. **Update the `/etc/nodename` file with the name corresponding to the address of one of the network interfaces, for example, `netraDATALESS1-cgtp`.**
7. **Create the `/etc/netmasks` file by adding one line for each subnet on the cluster:**

```

10.250.1.0      255.255.255.0
10.250.2.0      255.255.255.0
10.250.3.0      255.255.255.0

```

▼ To Create the `nhfs.conf` File for a Dataless Node

1. **Log in to the dataless node as superuser.**
2. **Create the `nhfs.conf` file for the dataless node:**

```

# cp /etc/opt/SUNWcgha/nhfs.conf.template
/etc/opt/SUNWcgha/nhfs.conf

```

3. Edit the `nhfs.conf` file to suit your cluster configuration.

An example file for a dataless node on a cluster with the domain ID 250, with network interfaces `eri0`, `eri1`, and `cgtp0` would be as follows:

```
Node.NodeId=40
Node.NIC0=eri0
Node.NIC1=eri1
Node.NICCGTP=cgtp0
Node.UseCGTP=True
Node.Type=Dataless
Node.DomainId=250
CMM.IsEligible=False
CMM.LocalConfig.Dir=/etc/opt/SUNWcgha
```

Choose a unique *nodeid* and unique node name for the dataless node. To view the *nodeid* of each node already in the cluster, see the `/etc/opt/SUNWcgha/cluster_nodes_table` file on the master node. For more information, see the `nhfs.conf4` man page.

If you have not installed the CGTP patches and packages, do the following:

- Disable the `Node.NIC1` and `Node.NICCGTP` parameters.
To disable these parameters, add a comment mark (#) at the beginning of the line containing the parameter if this mark is not already present.
- Configure the `Node.UseCGTP` and the `Node.NIC0` parameters:
 - `Node.UseCGTP=False`
 - `Node.NIC0=interface-name`
where *interface-name* is the name of the *NIC0* interface, for example, `hme0`, `qfe0`, or `eri0`.

▼ To Set Up File Systems for a Dataless Node

Update the `/etc/vfstab` file in the dataless node's root directory to add the NFS mount points for master node directories that contain middleware data and services.

1. **Log in to a dataless node as superuser.**
2. **Edit the entries in the `/etc/vfstab` file.**
 - If you have configured the CGTP, replace the host name of the master node with the host name associated with the floating IP address for the `cgtp0` interface that is assigned to the master role, for example, `master-cgtp`.

- If you have not configured the CGTP, replace the host name of the master node with the host name associated with the floating IP address for the *NIC0* interface that is assigned to the master role, for example, master-nic0.

For more information about floating addresses of the master nodes, see [“To Create the Floating Address Triplet Assigned to the Master Role” on page 25](#).

3. Define the mount points /SUNWcgha/remote, SUNWcgha/services, and /SUNWcgha/swdb:

- If you have configured the CGTP, use the floating IP address for the cgtp0 interface that is assigned to the master role to define the mount points:

```
master-cgtp:/SUNWcgha/local/export/data - \
/SUNWcgha/remote      nfs      -      yes      rw,hard,fg,intr

master-cgtp:/SUNWcgha/local/export/services/ha_3.0/opt - \
/SUNWcgha/services    nfs      -      yes      rw,hard,fg,intr

master-cgtp:/SUNWcgha/local/export/services/ha_3.0 - \
/SUNWcgha/swdb  nfs      -      yes      rw,hard,fg,intr
```

- If you have not configured the CGTP, use the floating IP address for the *NIC0* interface that is assigned to the master role:

```
master-nic0:/SUNWcgha/local/export/data - \
/SUNWcgha/remote      nfs      -      yes      rw,hard,fg,intr

master-nic0:/SUNWcgha/local/export/services/ha_3.0/opt - \
/SUNWcgha/services    nfs      -      yes      rw,hard,fg,intr

master-nic0:/SUNWcgha/local/export/services/ha_3.0 - \
/SUNWcgha/swdb  nfs      -      yes      rw,hard,fg,intr
```

All file systems that you mount by using NFS must be mounted with the options *fg*, *hard*, and *intr*. You can also set the *noac* mount option, which suppresses data and attribute caching. Use the *noac* option only if the impact on performance is acceptable.

Note – Do not use IP addresses in the */etc/vfstab* file for the dataless node. Instead, use logical host names. Otherwise, the *pkgadd -R* command fails and return the following message:

```
WARNING: cannot install to or verify on master_ip>
```

4. **Create the mount points** `/SUNWcggha/remote`, `/SUNWcggha/services`, and `/SUNWcggha/swdb`:

```
# mkdir -p SUNWcggha/remote
# mkdir -p SUNWcggha/services
# mkdir -p SUNWcggha/swdb
```

5. **Repeat Step 1 through Step 4 for all dataless nodes in the cluster.**

Integrating a Dataless Node Into the Cluster

The following procedures explain how to integrate a dataless node into the cluster:

- [“To Update the `/etc/hosts` Files on Each Peer Node” on page 82](#)
- [“To Update the Cluster Node Table” on page 83](#)

▼ To Update the `/etc/hosts` Files on Each Peer Node

1. **Log in to the master node as superuser.**
2. **Edit the `/etc/hosts` file to add the following lines:**

```
IP-address-NIC0 nic0-dataless-node-nameIP-address-NIC1
nic1-dataless-node-nameIP-address-cgtp0 cgtp0-dataless-node-name
```

This modification enables the master node to “see” the network interfaces of the dataless node.

3. **Log in to the vice-master node as superuser.**
4. **Repeat Step 2.**
This modification enables the vice-master node to “see” the three network interfaces of the dataless node.
5. **Log in to a dataless node that is part of the cluster, if a dataless node already exists.**

6. Repeat [Step 2](#).

This modification enables the dataless node to “see” the three network interfaces of the dataless node.

7. Repeat [Step 5](#) and [Step 6](#) on all other diskless and dataless nodes that are already part of the cluster.

▼ To Update the Cluster Node Table

1. Log in to the master node as superuser.

2. Edit the `cluster_nodes_table` file on the master node with the node information for a dataless node:

```
#NodeId Domain_id Name Attributes
nodeid domainid dataless-node-name -
```

The nodeid that you define in the `cluster_nodes_table` file must be the decimal representation of the host part of the node's IP address. For more information about the `cluster_nodes_table` file, see the `cluster_nodes_table4` man page.

3. Create the `cluster_nodes_table` file on the master node disk:

```
# /opt/SUNWcgha/sbin/nhcmmstat -c reload
```

4. Repeat [Step 2](#) for each dataless node you are adding to the cluster.

Starting the Cluster

To integrate the dataless node into the cluster, delete the `not_configured` file and reboot all the nodes. After the nodes have completed booting, verify the configuration before the cluster is restarted.

▼ To Delete the `not_configured` File

During the installation of the CMM packages, the `/etc/opt/SUNWcgha/not_configured` file is automatically created. This file enables you to reboot a cluster node during the installation and configuration process without starting the Netra HA Suite.

- After you have completed installing and configuring the software on the dataless node, delete this file before starting the cluster.

▼ To Start the Cluster

1. As superuser, reboot the master node.
2. After the master node has completed rebooting, reboot the vice-master node as superuser.
3. After the vice-master node has completed rebooting, boot the master-ineligible nodes as superuser.

Note – For detailed information about rebooting a node on the operating system version in use at your site, refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide*.

▼ To Verify the Cluster Configuration

Use the `nhadm` tool to verify that the dataless nodes have been configured correctly and are integrated into the cluster.

1. Log in to the dataless node as superuser.
2. Run the `nhadm` tool to validate the configuration:

```
# nhadm check starting
```

If all checks pass the validation, the installation of the Netra HA Suite was successful. For more information, see the `nhadm1M` man page.

Adding a Diskless or Dataless Node to a Cluster

This chapter describes how to add a diskless or dataless, non-master-eligible node to a cluster.

Process for Adding Nodes to a Cluster

This section describes how to add a diskless or dataless node to a cluster.

▼ To Add a Diskless or Dataless Node

1. Verify that the hardware of the new node is supported.

For information, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*.

2. Verify that after adding the node, your cluster configuration will be supported.

For information, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*.

3. Verify that the new node has a unique node ID and name.

For a list of IDs and names of the nodes in the cluster, see the `cluster_nodes_table` file on the master node.

4. Verify which packages and patches are to be installed.

For information about the patches and packages required for your hardware configuration, see *Netra High Availability Suite 3.01/08 Foundation Services README*.

5. Verify that the master node and vice-master node are running the Netra HA Suite.

The configuration information is written to the master node and replicated to the vice-master node.

a. Log in to the master node as superuser.

b. Verify that the Netra HA Suite are running:

```
# /opt/SUNWcgha/sbin/nhcmstat -c all
```

This command returns the status of all nodes in the cluster.

6. Add the node:

- To add a diskless node, use the procedure in [Chapter 3](#).
- To add a dataless node, use the procedure in [Chapter 4](#).

7. Update the network topology map to include the new node.

For information, see “Examining the Cluster Networking Configuration” in *Netra High Availability Suite 3.0 1/08 Foundation Services Cluster Administration Guide*.

Installation Directory Structure

The directories that contain the Netra HA Suite are created on the master-eligible nodes. Most of the Netra HA Suite software is installed in the `/opt/SUNWcgha` and `/etc/opt/SUNWcgha` directories. However, device drivers in the Netra HA Suite software are installed in standard Solaris directories, for example, the `/kernel/drv` directory.

The following table summarizes the installation directory structure.

TABLE A-1 Installation Directory Structure

Directory	Description
<code>/etc</code>	Files that have read and write permissions, and that are specific to a given node. The <code>/etc/opt/SUNWcgha</code> directory is used for configuration files. The <code>/etc/opt/SUNWcgha/init.d</code> directory is used for startup scripts.
<code>/export</code>	Optional. Subdirectories are created by the <code>nhinstall</code> tool during the configuration of diskless nodes. If you install manually, you create the subdirectories for the diskless nodes.
<code>/opt/SUNWcgha</code>	Read-only files. These files are not shared.
<code>/opt/SUNWcgha/lib/locale\$NLS_LANG/LC_MESSAGES</code>	Message catalog files.
<code>/SUNWcgha/data</code>	Shared DHCP configuration data.
<code>/SUNWcgha/local/export</code>	The mount point for exported data and executables.
<code>/SUNWcgha/remote/lib/locale/\$NLS_LANG/LC_MESSAGES</code>	Message catalogs shared across multiple diskless nodes, for example, from middleware applications.

TABLE A-1 Installation Directory Structure *(Continued)*

Directory	Description
/SUNWcgha/services	Packages shared by the master-eligible nodes.
/SUNWcgha/swdb	Shared package repository.
/var/opt/SUNWcgha	Standard log files.
/var/run/SUNWcgha	Temporary files that are deleted when the node reboots.
/var/tmp	Temporary files that are not deleted when the node reboots.

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