



Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide

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Preface

The *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide* explains how to install the Netra™ High Availability (HA) Suite Foundation Services 2.1 6/03 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™ High Availability (HA) Suite Foundation Services 2.1 6/03 using the `nhinstall` tool or by manually installing the software. This book describes installation using the `nhinstall` tool and manual installation.

The `nhinstall` tool enables you to install master-eligible nodes and diskless nodes. To install a cluster with dataless nodes, you must manually install the software on these nodes.

Who Should Use This Book

This book is for system integrators and operators that install the Foundation Services. To install the Foundation Services, you should be familiar with the process of installing the Solaris operating system.

Before You Read This Book

Read the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview* for an overview of the product.

How This Book Is Organized

Part I describes the methods that you can choose to install the software on your cluster. It also lists the software requirements for your cluster.

- **Chapter 1** describes how to plan a cluster installation.
- **Chapter 2** lists the software that you can install on your cluster.

Part II explains how to install the software on your cluster using the `nhinstall` tool.

- **Chapter 3** explains how to install and configure the `nhinstall` tool. It also describes the main tasks involved in installing the software using the `nhinstall` tool.
- **Chapter 4** explains how to use the `nhinstall` tool to install the Solaris operating system and the Foundation Services on the nodes of the cluster.

Part III explains how to install the software manually on your cluster.

- **Chapter 5** describes the main tasks that are involved in manually installing the software on the cluster. This chapter also describes the preparation tasks for manually installing the software on the cluster.
- **Chapter 6** explains how to install and configure the Solaris operating system and the Foundation Services manually on the master-eligible nodes.
- **Chapter 7** explains how to install and configure the Solaris operating system and the Foundation Services manually for the diskless nodes.
- **Chapter 8** explains how to install and configure the Solaris operating system and the Foundation Services manually on the dataless nodes.

Part IV explains how to add nodes to an existing cluster.

- **Chapter 9** describes how to add a node to a cluster that was originally created using the `nhinstall` tool.
- **Chapter 10** describes how to add a node to a cluster that was originally created manually.

Part V describes how to upgrade a Foundation Services 2.1 cluster to Foundation Services 2.1 6/03.

- **Chapter 11** explains how to prepare the installation server and the cluster nodes for an upgrade.
- **Chapter 12** explains how to upgrade master-eligible nodes.
- **Chapter 13** explains how to upgrade diskless nodes.
- **Chapter 14** explains how to upgrade dataless nodes.

Appendix A provides the directory structure that is created on the master-eligible nodes during installation.

[Appendix B](#) describes how to install the man pages, the PDF format, and the HTML format of the documentation on a local system.

Related Books

You will require some of the following books from the Foundation Services documentation set:

- *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Glossary*
- *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Quick Start Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Cluster Administration Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Troubleshooting Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 CMM Programming Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 NMA Programming Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Reference Manual*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Standalone CGTP Guide*
- *Netra High Availability Suite Foundation Services 2.1 6/03 Release Notes*
- *Netra High Availability Suite Foundation Services 2.1 6/03 README*

The following books are not part of the Foundation Services documentation set, but these books provide related information:

- *Solaris 8 Advanced Installation Guide*
- *Solstice DiskSuite 4.2.1 Installation and Product Notes*
- *Solaris 9 Installation Guide*
- *Solaris Volume Manager Administration Guide*
- *Sun StorEdge Availability Suite 3.1 Remote Mirror Software Installation Guide*
- *OpenBoot 4.x Command Reference Manual*
- *Java Dynamic Management Kit 5.0 Installation Guide*

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Typographic Conventions

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

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name% you have mail.</code>
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name% su</code> Password:
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	To delete a file, type <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. Do <i>not</i> save changes yet.

Shell Prompts in Command Examples

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

TABLE P-2 Shell Prompts

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

Planning to Install Your Cluster

After you have installed and configured your cluster hardware and the installation server, you are ready to install the Solaris operating system and Foundation Services software on the cluster.

Before installing the software on your cluster, choose a method of installation and the software for the nodes of your cluster, as described in these chapters:

- [Chapter 1](#) describes how to plan a cluster installation.
- [Chapter 2](#) lists the software that you can install on the cluster nodes.

Planning Your Installation

Plan the installation and configuration of your cluster thoroughly to avoid setbacks and delays. Before you start to install the software on your cluster, verify that you have the required installation hardware and cluster hardware.

- For information about planning your cluster and choosing the method of installation, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.
- For information about the supported hardware, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

The Foundation Services product provides two ways of installing software on the cluster:

- **Installation with the `nhinstall` tool.** The `nhinstall` tool enables you to install the Foundation Services on a cluster. This tool is flexible and provides various configuration options that you can adapt to your requirements. However, the `nhinstall` tool only supports the installation of master-eligible nodes and diskless nodes. For more information, see [Part II](#).
- **Manual installation.** You can manually install the software on a cluster that contains master-eligible nodes and diskless nodes or dataless nodes.

Manual installation provides greater flexibility when installing components of the Foundation Services. However, a manual installation can result in a cluster configuration that is not easily reproducible on other clusters. For more information, see [Part III](#).

Choosing Your Software

The Foundation Services run on a cluster installed with the Solaris operating system.

For information about the Solaris versions supported on particular hardware, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Release Notes*.

Install the Solaris operating system and other supplementary software to enhance the *reliability, availability, and serviceability* of your cluster.

You install the following software on the nodes of the cluster:

- Software included in the Solaris distribution
 - Java™ Software Development Kit (SDK) Standard Edition for all nodes
 - Volume management software for master-eligible nodes: Solstice DiskSuite™ or Solaris Volume Manager depending on the version of Solaris used.
 - Solaris Dynamic Host Configuration Protocol (DHCP) for diskless nodes
- Software included in the Foundation Services distribution:
 - Java Dynamic Management Kit (DMK)
 - Sun StorEdge™ Network Data Replicator (SNDR)

For information about supported software versions, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Release Notes*.

Installing and Configuring Software on the Cluster Using the `nhinstall` Tool

The `nhinstall` tool enables you to install the Solaris operating system and the Foundation Services on a cluster. This tool is flexible and provides various configuration options that you can adapt to your requirements.

Using the `nhinstall` tool, you can install a cluster that consists of master-eligible nodes and diskless nodes. This tool does not support the installation of dataless nodes. If you want to install a cluster with dataless nodes, see [Part III](#).

To install the software using the `nhinstall` tool, see the following chapters:

- [Chapter 3](#) describes how to install and configure the `nhinstall` tool. It also describes the main tasks involved in installing the software using the `nhinstall` tool.
- [Chapter 4](#) describes how to use the `nhinstall` tool to install the Solaris operating system and the Foundation Services on the nodes of the cluster.

Installing and Configuring the `nhinstall` Tool

The `nhinstall` tool enables you to install and configure the software and services on your cluster nodes. You install and configure the `nhinstall` tool on the installation server.

You can use the `nhinstall` tool to install a cluster that consists of master-eligible nodes and diskless nodes. If you want to install a cluster with dataless nodes, see [Part III](#).

For information about setting up the installation environment and configuring the `nhinstall` tool, see the following sections:

- [“Overview of Installing With the `nhinstall` Tool” on page 27](#)
- [“Preparing the Installation Environment” on page 28](#)
- [“Installing the `nhinstall` Tool” on page 30](#)
- [“Configuring the `nhinstall` Tool” on page 31](#)

Overview of Installing With the `nhinstall` Tool

The `nhinstall` tool enables you to install and configure the Foundation Services on the cluster. This tool must be installed on an installation server. The installation server must be connected to your cluster. For details on how to connect nodes of the cluster and the installation server, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

The `nhinstall` tool runs on the installation server. This tool installs the Solaris operating system and the Foundation Services on the nodes of the cluster. The `nhinstall` tool does not support the installation and configuration of dataless nodes in a cluster. For a description of the types of nodes in a cluster, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

The following table lists the tasks for installing the software with the `nhinstall` tool. The tasks should be performed in the order shown.

TABLE 3-1 Tasks for Installing the Software by Using the `nhinstall` Tool

Task	For Instructions
1. Choose the software.	Chapter 2
2. Prepare the installation environment.	"Preparing the Installation Environment" on page 28
3. Install the <code>nhinstall</code> tool on the installation server.	"Installing the <code>nhinstall</code> Tool" on page 30
4. Configure the <code>nhinstall</code> tool.	"Configuring the <code>nhinstall</code> Tool" on page 31
5. Install the software using the <code>nhinstall</code> tool.	Chapter 4
6. Verify that the cluster is configured correctly.	"Verifying the Installation" on page 52

Preparing the Installation Environment

Before installing the `nhinstall` tool on the installation server, you must create a Solaris distribution on the installation server. You must also prepare the installation server to install the Solaris operating system and the Foundation Services on the cluster nodes.

▼ To Create a Solaris Distribution on the Installation Server

To install the Solaris operating system on the cluster, create a Solaris distribution on the installation server. The Solaris distribution is used to install the Solaris operating system on the cluster nodes. If you are installing more than one Solaris distribution on the cluster, perform the steps in the procedure for each Solaris distribution.

1. **Make sure that you have at least 1.5 Gbytes of free disk space on the installation server.**
2. **Log in as superuser on the installation server.**
3. **Create a directory for the Solaris distribution:**

```
# mkdir Solaris-distribution-dir
```

where *Solaris-distribution-dir* is the directory where the distribution is to be stored on the installation server.

4. Change to the directory where the `setup_install_server` 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 8 or 9 depending on the Solaris version you want to install.

5. Run the `setup_install_server` command:

```
# ./setup_install_server Solaris-distribution-dir
```

For more information about the `setup_install_server` command, see the appropriate documentation:

- *Solaris 8 Advanced Installation Guide* and the `setup_install_server(1M)` man page
- *Solaris 9 Installation Guide* and the `setup_install_server(1M)` man page

▼ To Prepare the Installation Server

Before you begin the installation process, make sure that the installation server is configured correctly.

1. **Configure the installation server as described in the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.**
2. **If you are planning to install remotely from another system, open a shell window to connect to the installation server.**
3. **Confirm that the Solaris software packages that contain Perl 5.0 are installed on the installation server.**

Use the `pkginfo` command to check for the SUNWp15u, SUNWp15p, and SUNWp15m Perl packages.

4. Delete any entries for your cluster nodes in the following files:

- `/etc/hosts`
- `/etc/ethers`, if the file exists
- `/etc/bootparams`, if the file exists

5. Disable the installation server as a router by creating an `/etc/notrouter` file:

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

If a system running the Solaris operating system has two network interfaces, the system is configured as a router by default. However, for security reasons, a

Foundation Services cluster network must not be routed.

6. **Modify the `/etc/nsswitch.conf` file on the installation server so that `files` is positioned before `nis` in the `hosts`, `ethers`, and `bootparams` entries:**

```
hosts: files nis
ethers: files nis
bootparams: files nis
```

7. **From the installation server, open a terminal window to connect to the console of each cluster node.**

You can also connect to the consoles from the system that you use to connect to the installation server.

Installing the `nhinstall` Tool

Install the package containing the `nhinstall` tool on the installation server described in the following procedure.

▼ To Install the `nhinstall` Tool

1. **Log in to the installation server as superuser.**

2. **Install the `nhinstall` package, `SUNWnhins`:**

```
# pkgadd -d /software-distribution-dir/NetraHAS2.1/Packages/ SUNWnhins
```

where *software-distribution-dir* is the directory that contains the Foundation Services packages.

3. **To access the man pages on the installation server, install the man page package, `SUNWnhman`:**

```
# pkgadd -d /software-distribution-dir/NetraHAS2.1/Packages/ SUNWnhman
```

where *software-distribution-dir* is the directory that contains the Foundation Services packages.

Configuring the `nhinstall` Tool

After you have installed the package containing the `nhinstall` tool, configure the `nhinstall` tool to install the Foundation Services on your cluster. To configure the `nhinstall` tool, modify the following configuration files:

- `env_installation.conf`

Use this configuration file to define the installation environment. This file enables you to define the IP address of the installation server and the locations of the software distributions for the Solaris operating system and Foundation Services. You must modify this configuration file. For details on each option available, see the `env_installation.conf(4)` man page.
- `cluster_definition.conf`

Use this configuration file to define the cluster ID, cluster interfaces, hardware architecture, and addresses for each node. In this file, you can also specify the diskless nodes in your cluster. You must modify this configuration file. For details on each option available, see the `cluster_definition.conf(4)` man page.
- `addon.conf`

Use this configuration file to specify additional packages and patches that you want to install during the installation process. This file is optional. If this file is not configured, the `nhinstall` tool does not install any additional patches or packages. To benefit from the enhancements in the current patch level of this product, you must install patches. For more information, see the `addon.conf(4)` man page and the *Netra High Availability Suite Foundation Services 2.1 6/03 README*. When installing patches, see the README provided with each patch for details of modifications you must make to `addon.conf` for specific hardware.
- `nodeprof.conf`

Use this configuration file if you want to specify the set of Solaris packages to be installed on the cluster. The default package set is defined in the `nodeprof.conf.template` file. For more information, see the `nodeprof.conf(4)` man page.
- `diskless_nodeprof.conf`

If you do not create this file, the same set of Solaris packages is installed on the master-eligible and diskless nodes. Create the `diskless_nodeprof.conf` file, if you want to install a different set of Solaris packages on the diskless nodes to that which you install on the master-eligible nodes. For more information, see the `diskless_nodeprof.conf(4)` man page.

The following sections describe in detail the main configuration options of the `nhinstall` tool:

- “Configuring the Disk Partitions” on page 32
- “Configuring the Scoreboard Bitmaps” on page 33

- “Configuring the NFS Option `noac`” on page 34
- “Configuring a Direct Link Between the Master-Eligible Nodes” on page 34
- “Configuring Automatic Reboot for the Master-Eligible Nodes” on page 34
- “Configuring the Carrier Grade Transport Protocol” on page 35
- “Configuring the Environment for Diskless Nodes” on page 35
- “Configuring the Boot Policy for Diskless Nodes” on page 36
- “Configuring DHCP Configuration Files Locally on Master-Eligible Nodes” on page 36
- “Configuring the Watchdog Timer” on page 37
- “Configuring the Cluster IP Addresses” on page 37
- “Configuring the Floating External Address of the Master Node” on page 38
- “Configuring External IP Addresses for Cluster Nodes” on page 38
- “Configuring Volume Management” on page 39
- “Specifying the Version of the Operating System to be Installed on the Cluster” on page 41
- “Selecting the Solaris Package Set to be Installed” on page 41
- “Installing a Different Version of the Operating System on Diskless Nodes” on page 42
- “Configuring Reduced Duration of Disk Synchronization” on page 42
- “Configuring Masterless Cluster” on page 43
- “Configuring Delayed Synchronization” on page 43
- “Configuring Sanity Check of Replicated Slices” on page 43
- “Configuring a Data Management Policy” on page 42
- “Configuring Serialized Slice Synchronization” on page 44
- “Configuring the Default Router to the Public Network” on page 44

Configuring the Disk Partitions

Configure the `SLICE` parameter in the `cluster_definition.conf` file to specify the disk partitions on the master-eligible nodes.

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

TABLE 3-2 Example Disk Partitions of Master-Eligible Nodes

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

TABLE 3-2 Example Disk Partitions of Master-Eligible Nodes (Continued)

Disk Partition	File System Name	Description	Example Size
2	overlap	Entire disk.	Size of entire disk
3	/export	Exported file system reserved for diskless nodes. The /export file system must be mounted with the logging option. This partition is further sliced 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. The /SUNWcgha/local file system must be mounted with the logging option.	2 Gbytes
5	Reserved for Reliable NFS internal use	Bitmap partition reserved for nhrfsd. This volume is associated with the /export file system.	1 Mbyte
6	Reserved for Reliable NFS internal use	Bitmap partition reserved for nhrfsd. This partition is associated with the /SUNWcgha/local file system.	1 Mbyte
7	replica OR /test1	If you have configured volume management, this partition must be named replica. This partition is mounted with the logging option. See "Configuring Volume Management" on page 39.	The remaining space

Note – In a two-node cluster without diskless nodes, partition 3 and partition 5 in the preceding table are not required.

Configuring the Scoreboard Bitmaps

You can configure the `nhinstall` tool to store the scoreboard bitmaps of shared partitions either in memory or on the disk.

If the `BITMAP_IN_MEMORY` parameter is set to `YES` in the `cluster_definition.conf` file, the bitmaps are configured to be stored in memory. When the master node is shut down gracefully, the scoreboard bitmap is saved on the disk.

If the `BITMAP_IN_MEMORY` parameter is set to `NO`, the bitmaps are configured to be written on the disk at each update.

Configuring the NFS Option `noac`

You can configure the `nhinstall` tool to use the NFS option `noac` for the directories that are mounted remotely. The `noac` option suppresses data and attribute caching.

If the `NFS_USER_DIR_NOAC` parameter is set to `YES` in the `cluster_definition.conf` file, the `noac` option is configured when mounting remote directories.

If the `NFS_USER_DIR_NOAC` parameter is set to `NO`, the `noac` option is not configured, which enables data and attribute caching.

Configuring a Direct Link Between the Master-Eligible Nodes

You can configure the `nhinstall` tool to set up a direct link between the master-eligible nodes by using the serial port on each master-eligible node. Make sure that you have connected the serial ports with a cable before configuring the direct link. This connection prevents a *split brain* situation, where there are two master nodes in the cluster because the network between the master node and the vice-master node fails. For an illustration of the connection between the master-eligible nodes, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

The `DIRECT_LINK` parameter in the `cluster_definition.conf` file enables you to define the serial device on each master-eligible node, the speed of the serial line, and the heartbeat (in seconds) checking the link between the two nodes. For example:

```
DIRECT_LINK=/dev/ttya /dev/ttya 115200 20
```

Configuring Automatic Reboot for the Master-Eligible Nodes

You can configure the `nhinstall` tool to reboot the master-eligible nodes automatically during the installation.

If the `AUTO_REBOOT` parameter is set to `YES` in the `env_installation.conf` file, you are prompted to boot the master-eligible nodes the first time only. After the first boot, the master-eligible nodes are automatically rebooted by the `nhinstall` tool.

If `AUTO_REBOOT` is set to `NO`, the `nhinstall` tool prompts you to reboot the master-eligible nodes at different stages of the installation. This process requires you to move between console windows to perform tasks directly on the nodes.

Configuring the Carrier Grade Transport Protocol

You can configure the `nhinstall` tool to install and configure the Carrier Grade Transport Protocol (CGTP).

If the `USE_CGTP` parameter is set to `YES` in the `cluster_definition.conf` file, the `nhinstall` tool installs CGTP.

If the `USE_CGTP` parameter is set to `NO`, `nhinstall` does not install the CGTP packages and patches. In this case, your cluster is configured with a single network interface. You do not have a redundant cluster network. For information about the advantages of redundant network interfaces, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

Configuring the Environment for Diskless Nodes

You can configure the `nhinstall` tool to install diskless nodes.

If you define diskless nodes with the `NODE` parameter in the `cluster_definition.conf` file, the `nhinstall` tool installs the Solaris services for the diskless nodes. The tool also configures the boot options for each diskless node on the master-eligible nodes.

If you do not define any diskless nodes in the `cluster_definition.conf` file, the `nhinstall` tool gives you the choice of installing the Solaris services for diskless nodes anyway. Type `y` if you plan to add diskless nodes to the cluster at a later date. Otherwise, the `nhinstall` tool does not install the Solaris services for the diskless nodes on the master-eligible nodes. In this case, you cannot use `nhinstall` to add diskless nodes to the cluster at a later date without reinstalling the software on all nodes of the cluster. Therefore, try to include possible future nodes in your cluster configuration.

Note – You can manually add diskless nodes to a running cluster as described in [Chapter 10](#).

Configuring the Boot Policy for Diskless Nodes

You can configure the `nhinstall` tool to have the diskless nodes in the cluster boot dynamically, statically, or by using the node's client ID. The `DISKLESS_BOOT_POLICY` parameter in the `cluster_definition.conf` configuration file enables you to choose a boot policy for the diskless nodes in your cluster. All diskless nodes in a cluster are configured with the same boot policy.

The following table summarizes the boot policies supported by the `nhinstall` tool.

TABLE 3-3 Boot Policies for Diskless Nodes

Boot Policy	Description
DHCP dynamic boot policy	<p>IP address is dynamically assigned from a pool of IP addresses when the diskless node is booted.</p> <p>If you set the <code>DISKLESS_BOOT_POLICY</code> parameter to <code>DHCP_DYNAMIC</code>, <code>nhinstall</code> configures the diskless nodes with a dynamic boot policy. This option is configured by default if you do not define the <code>DISKLESS_BOOT_POLICY</code> parameter.</p>
DHCP static boot policy	<p>IP address based on the Ethernet address of the diskless node. The Ethernet address is specified in the <code>cluster_definition.conf</code> file.</p> <p>If you set the <code>DISKLESS_BOOT_POLICY</code> parameter to <code>DHCP_STATIC</code>, <code>nhinstall</code> configures the diskless nodes with a static boot policy.</p>
DHCP client ID boot policy	<p>IP address generated from the diskless node's client ID in a CompactPCI server.</p> <p>If you set the <code>DISKLESS_BOOT_POLICY</code> parameter to <code>DHCP_CLIENT_ID</code>, <code>nhinstall</code> configures the diskless nodes to use the client ID to generate the IP address.</p>

For further information about the boot policies for diskless nodes, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

Configuring DHCP Configuration Files Locally on Master-Eligible Nodes

By default, `nhinstall` configures diskless nodes so that the DHCP configuration files are stored in the replicated directory `/SUNWcgha/remote/var/dhcp` on the master-eligible nodes. You can configure the cluster to put the DHCP configuration files in a local directory, `/var/dhcp`, on the master eligible nodes by adding the following line to the `cluster_definition.conf` file.

```
REPLICATED_DHCP_FILES=NO
```

When you install with `nhinstall` and with this feature enabled, `nhinstall` copies the DHCP configuration files from the master to the vice-master node.

Note – Do not use this feature if the DHCP configuration is dynamic, that is if information is stored in the DHCP configuration files at run-time.

If you enable this feature, each time you update the DHCP configuration files on the master after initial cluster installation, you must copy these files to the vice-master node. For more information, see the `cluster_definition.conf(4)` and `nhadm(1M)` man pages.

Configuring the Watchdog Timer

You can configure the `nhinstall` tool to install the Foundation Services Watchdog Timer on each node in the cluster.

Set the `USE_WDT` parameter to `YES` in the `cluster_definition.conf` file only if you are using Netra servers that have hardware watchdogs at the Lights-Off Management (LOM) level. You might need to install additional software packages. For further information, see the `addon.conf.template` file. When this parameter is set to `YES`, the Foundation Services Watchdog Timer is installed and configured.

Set the `USE_WDT` parameter to `NO` if you are using Netra servers with hardware watchdogs at the OpenBoot™ PROM (OBP) level. These hardware watchdogs are monitored by the server's software. For a list of the types of watchdogs of different Netra servers, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

Configuring the Cluster IP Addresses

You can configure IPv4 addresses of any class for the nodes of your cluster by using the `nhinstall` tool. The `CLUSTER_NETWORK` parameter enables you to specify the netmask and the subnets for the `NIC0`, `NIC1`, and `cgtp0` interfaces of your nodes. For example, to define Class B IP addresses for the nodes, the `CLUSTER_NETWORK` parameter is defined as follows:

```
CLUSTER_NETWORK=255.255.0.0 192.168.0.0 192.169.0.0 192.170.0.0
```

Configuring the Floating External Address of the Master Node

You can configure the `nhinstall` tool to set a floating external address. A floating external address is an external IP address that is assigned to the master role rather than to a specific node. This IP address enables you to connect to the current *master node* from systems outside the cluster network.

If you specify an IP address and a network interface for the `EXTERNAL_ACCESS` parameter in the `cluster_definition.conf` file, the floating external address is configured. The Node State Manager daemon, `nhnsmd`, that monitors the master-eligible nodes for switchovers and failovers is also installed. This daemon makes sure that the external IP address is always assigned to the current master node. For more information, see the `nhnsmd(1M)` man page.

If you do not configure the `EXTERNAL_ACCESS` parameter in the `cluster_definition.conf` configuration file, the floating external address is not created. Therefore, the master node cannot be accessed by systems outside the cluster network.

Configuring External IP Addresses for Cluster Nodes

You can configure the `nhinstall` tool to set external IP addresses on network interfaces to a public network. Then, the nodes can be accessed from systems outside the cluster network.

To create an external IP address for a 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`.

▼ To Configure External IP Addresses for Cluster Nodes

1. **Set the `PUBLIC_NETWORK` parameter in the `cluster_definition.conf` file specifying the subnet and netmask for the subnet.**

This parameter also configures the network interface of the installation server. Therefore, the `SERVER_IP` parameter is an IP address that is on the same subnet as defined for `PUBLIC_NETWORK`. The `SERVER_IP` parameter is defined in the `env_installation.conf` file. For more information, see the `env_installation.conf(4)` man page.

2. **Specify the external IP address, external node name, and the external network interface for each `NODE` definition. For example:**

```
NODE=10 08:00:20:f9:c5:54 - - - FSNode1 192.168.12.5 hme1:5
NODE=20 08:00:20:f9:a8:12 - - - FSNode2 192.168.12.6 hme1:101
```

- 192.168.12.5 and 192.168.12.6 are the external IP addresses.
- FSNode1 and FSNode2 are the external node names.
- hme1:5 and hme1:101 are the external network interfaces.

Configuring Volume Management

The volume management feature enables you to do the following:

- Increase data availability because you can mirror disks locally
- Increase the number of available replicated partitions because you can create multiple soft partitions

The volume management software that is installed depends on the version of the Solaris operating system that you plan to install. For information on supported software versions, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Release Notes*.

For a Netra 20 server with a Fibre Channel-Arbitrated Loop (FC-AL) disk as a master-eligible node, you must install the Volume Management feature of the Solaris operating system. For more information, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

To install the Volume Management software on the nodes of your cluster, perform one of the following procedures:

- [“To Configure Basic Volume Management for Netra 20 Servers With FC-AL Disks”](#) on page 39
- [“To Configure Advanced Volume Management”](#) on page 40

▼ To Configure Basic Volume Management for Netra 20 Servers With FC-AL Disks

You can use the `nhinstall` tool to install and configure volume management for Netra 20 servers with FC-AL disks. Configure the `nhinstall` tool to support logical disk partitions for FC-AL disks by installing the volume management feature as follows:

1. In the `env_installation.conf` file, set `SOLARIS_INSTALL` to `ALL`.
2. Configure the `cluster_definition.conf` file:
 - a. Set `LOGICAL_SLICE_SUPPORT` to `YES`.
 - b. Set the `SLICE` definition for the last partition to `replica`.

For a detailed example, see the `cluster_definition.conf(4)` man page.

3. Run the `nhinstall` tool to install the Solaris operating system and Foundation Services on the master-eligible nodes.

For more information, see “[To Launch the `nhinstall` Tool](#)” on page 47.

The `nhinstall` tool installs and configures the appropriate volume management software depending on the version of the Solaris operating system you chose to install.

▼ To Configure Advanced Volume Management

To configure advanced volume management, install the Solaris operating system and configure the Volume Management feature to suit your needs and then configure `nhinstall` to install only the Foundation Services.

1. Install the Solaris operating system with volume management on the master-eligible nodes.

For more information, see the documentation for your volume management software:

- For Solaris 8, *Solstice DiskSuite 4.2.1 Installation and Product Notes*
- For Solaris 9, *Solaris Volume Manager Administration Guide*

This documentation is available at <http://docs.sun.com>.

Note – Install the same packages of the same version of the Solaris operating system on both master-eligible nodes.

Create identical disk partitions on the disks of both master-eligible nodes.

2. Configure a physical Ethernet card interface that corresponds to the first network interface, `NIC0`.

3. Configure the `/etc/netmasks` file.

See the `netmasks(4)` man page.

4. Configure the sizes of the disk partitions.

For more information, see [Table 3–2](#).

5. If you plan to include diskless nodes in the cluster, install the Solaris services for diskless nodes:

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

where *mount-path* is the directory where the Solaris distribution is mounted.

- If you have installed Solaris 8, also install the JDK™ (Java Development Kit) software for the diskless nodes:

```
# /usr/sbin/pkgadd -R /export/Solaris_8/usr_sparc.all \  
-M -d mount-path/Solaris_8/Product SUNWjdr
```

- If you have installed Solaris 9, the JDK for the diskless nodes is installed by the `nhinstall` tool automatically.

6. In the `env_installation.conf` file, set `SOLARIS_INSTALL` to `NONE`.

When `SOLARIS_INSTALL` is set to `NONE`, the Solaris services for the diskless environment are not installed, but the diskless nodes are configured.

7. In the `cluster_definition.conf` file, do the following:

- Set the `LOGICAL_SLICE_SUPPORT` parameter to `NO`.**
- For the `SLICE` parameter, specify the metadvice names of the disk partitions.**

For example:

```
SLICE=d1 2048 / - logging
```

For details on the `SLICE` parameter, see the `cluster_definition.conf(4)` man page.

8. Run the `nhinstall` tool to install the Foundation Services on the master-eligible nodes.

For more information, see [“To Launch the `nhinstall` Tool” on page 47](#).

Specifying the Version of the Operating System to be Installed on the Cluster

Some hardware types require specific or modified versions of the Solaris operating system that `nhinstall` is unable to detect automatically. In these cases, you must explicitly force `nhinstall` to recognize the version of the operating system you want to install on the cluster. To determine if your cluster hardware requires such action, see the README files in the Foundation Services patches you are installing on the cluster.

Selecting the Solaris Package Set to be Installed

To install a Solaris package set on cluster nodes other than the default package set, specify the Solaris package set to be installed. For a list of the contents of the default package set, see the `/opt/SUNWcgha/config.standard/nodeprof.conf.template` file. For

information about installing a Solaris package set on cluster nodes, see the `nodeprof.conf(4)` man page. For information about installing a different Solaris package set on the diskless nodes to that installed on the master-eligible nodes, see the `diskless_nodeprof.conf(4)` man page.

Installing a Different Version of the Operating System on Diskless Nodes

To install a different version of the Solaris operating system on diskless nodes to that which you are installing on master-eligible nodes, specify the location of the two Solaris distributions in the `env_installation.conf` file. For example:

```
SOLARIS_DIR=/export/su28u7fcs
DISKLESS_SOLARIS_DIR=/export/su29HW8a
```

By default, the value provided to the `DISKLESS_SOLARIS_DIR` parameter is set to be the same as that provided to the `SOLARIS_DIR` parameter. For more information, see the `env_installation.conf(4)` man page.

Configuring Reduced Duration of Disk Synchronization

By default `nhinstall` enables this feature which reduces the time taken for full synchronization between the master and the vice-master disks by synchronizing only the blocks that contain replicated data.

Note – Only use this feature with UFS file systems.

To disable this feature and have all blocks replicated, add the following line to the `cluster_definition.conf` file:

```
SLICE_SYNC_TYPE=RAW
```

For more information, see the `cluster_definition.conf(4)` man page and *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*.

Configuring a Data Management Policy

There are three data management policies available with the current patch level of the Foundation Services. By default, the `nhinstall` tool sets the data management policy to be Integrity. To choose another policy, change the value of the following variable in the `cluster_definition.conf` file.

DATA_MGT_POLICY=INTEGRITY | AVAILABILITY | ADAPTABILITY

For more information, see the `cluster_definition.conf(4)` man page and *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*.

Configuring Masterless Cluster

By default, diskless nodes reboot if there is no master in the cluster. If you do not want the diskless nodes to reboot in this situation, add the following line to the `cluster_definition.conf` file:

```
MASTER_LOSS_DETECTION=YES
```

For more information, see the `cluster_definition.conf(4)` man page and *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*.

Configuring Sanity Check of Replicated Slices

To activate the sanity check of replicated slices, add the following line to the `cluster_definition.conf` file:

```
CHECK_REPLICATED_SLICES=YES
```

By default, the `nhinstall` tool does not activate this feature. For more information, see the `cluster_definition.conf(4)` man page and *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*.

Configuring Delayed Synchronization

By default, with an `nhinstall` installation, disk synchronization starts automatically when the cluster software is installed. If you want to delay the start of disk synchronization, add the following line to the `cluster_definition.conf` file:

```
SYNC_FLAG=NO
```

You can trigger disk synchronization at a time of your choice using the `nhenablesync` tool. For more information, see the `cluster_definition.conf(4)` and `nhenablesync(1M)` man pages and *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*.

Configuring Serialized Slice Synchronization

By default, `nhinstall` configures the cluster so that slices are synchronized in parallel. Synchronizing slices one slice at a time reduces the network and disk overhead but increases the time it takes for the vice-master to synchronize with the master. During this time, the vice-master is not eligible to take on the role of master. To enable serialized slice synchronization, add the following line to the `cluster_definition.conf` file:

```
SERIALIZE_SYNC=YES
```

For more information, see the `cluster_definition.conf(4)` man page and *What's New in Netra High Availability Suite Foundation Services 2.1 6/03*.

Configuring the Default Router to the Public Network

By default, `nhinstall` configures the installation server to be the default router to the public network. To choose another machine as the router to the public network specify the IP address of the default router of your choice in the `cluster_definition.conf` file as follows:

```
DEFAULT_ROUTER_IP=IP address
```

For more information, see the `cluster_definition.conf(4)` man page.

Installing the Software by Using the `nhinstall` Tool

The `nhinstall` tool installs the Solaris operating system and the Foundation Services on the cluster according to the options that are set in the configuration files.

To use `nhinstall` to install the software, see the following sections:

- “Stages of the Installation Process” on page 45
- “Launching the `nhinstall` Tool” on page 47
- “Verifying the Installation” on page 52
- “Troubleshooting and Restarting the `nhinstall` Tool” on page 53
- “Resetting the `nhinstall` Tool for a New Installation” on page 54

Stages of the Installation Process

You can configure the `nhinstall` tool to install both the Solaris operating system and the Foundation Services on the cluster. You can also install the Solaris operating system manually and then configure the `nhinstall` tool to install only the Foundation Services on the cluster. For more information, see “Configuring the `nhinstall` Tool” on page 31.

After you have configured the installation server, you are ready to install the software on the nodes of the cluster. Table 4–1 describes the stages of the installation process in an example scenario. In this scenario, the `nhinstall` tool is configured with the following parameters defined in the `env_installation.conf` file:

- `SOLARIS_INSTALL=ALL`
- `AUTO_REBOOT=NO`

And the following parameters defined in the `cluster_definition.conf` file:

- `USE_CGTP=YES`
- `USE_WDT=NO`

Diskless nodes are specified in the `NODE` parameter.

For information about installation parameters, see the `env_installation.conf(4)` and `cluster_definition.conf(4)` man pages.

TABLE 4-1 Stages of the Installation Process

Stage	Action Carried Out By	Related Section
1. Launch the <code>nhinstall</code> tool.	You	“To Launch the <code>nhinstall</code> Tool” on page 47
2. Configure the network interfaces.	<code>nhinstall</code>	
3. Prepare the master-eligible nodes and the Solaris JumpStart environment (5 minutes).	<code>nhinstall</code>	
4. Boot the master-eligible nodes to install the Solaris operating system (30 minutes).	You	“To Boot the Master-Eligible Nodes to Install the Solaris Operating System” on page 48
5. Install the Foundation Services and the CGTP patches on the master-eligible nodes (20 minutes).	<code>nhinstall</code>	
6. Reboot the master-eligible nodes.	You	“To Reboot the First Master-Eligible Node” on page 50 “To Reboot the Second Master-Eligible Node” on page 50
7. Configure the Solaris services for diskless nodes on the master-eligible nodes (20 minutes).	<code>nhinstall</code>	
8. Install the Solaris packages, the Foundation Services packages, and the CGTP patches for diskless nodes (5 minutes).	<code>nhinstall</code>	
9. Reboot the master-eligible nodes and the diskless nodes.	You	“To Reboot the Master-Eligible Nodes After the Diskless Nodes Are Configured” on page 51 “To Boot the Diskless Nodes” on page 52
10. Run the <code>nhadm</code> tool on the master-eligible nodes to ensure that installation was successful.	You	“Verifying the Installation” on page 52

Note – The time guidelines are estimates only. The actual times that are required depend on the type of installation server, your configuration options, and the number of nodes in your cluster.

Launching the `nhinstall` Tool

Before running the `nhinstall` tool, make sure that you have configured the `nhinstall` tool and prepared the installation environment as described in [Chapter 3](#).

The following procedures are based on “[Stages of the Installation Process](#)” on page 45. These procedures must be carried out in the documented sequence.

▼ To Launch the `nhinstall` Tool

1. **Log in to the installation server as superuser.**
2. **Start the `nhinstall` tool on the installation server:**

```
# cd /opt/SUNWcgha/sbin
# ./nhinstall -r config-file-directory -l logfile
```

For details, see the `nhinstall(1M)` man page.

If you have chosen a two-node cluster configuration in the `cluster_definition.conf` file, you are prompted to install the Solaris services for diskless nodes:

```
Do you want to install the Solaris services for
diskless nodes anyway [y/n]:
```

If you type `y`, the `nhinstall` tool installs the Solaris services for diskless nodes, which gives you the option of adding diskless nodes to the cluster at a later stage.

After you have made this choice, the `nhinstall` tool configures the network interfaces, prepares the master-eligible nodes, and prepares the Solaris JumpStart™ environment. This process takes approximately 5 minutes.

Note – If the Solaris JumpStart procedure stops, the utility might not restart because the `/tmp/.install_client.lock` file prevents two Solaris JumpStart commands from being executed simultaneously. If Solaris JumpStart stops, make sure that there are no other Solaris JumpStart processes running. Then delete the lock file.

After the Solaris JumpStart environment has been prepared, the following instructions are displayed by the `nhinstall` tool:

```
Boot both master-eligible nodes.
On the console of each master-eligible node:
1. Get the ok prompt.
2. At the ok prompt, type:
    ok> boot net - install
Wait until both installations are complete.
Answer 'y' when the boot is complete on both nodes:
```

Follow these instructions by performing the following procedure.

▼ To Boot the Master-Eligible Nodes to Install the Solaris Operating System

1. At the console window of the first master-eligible node, get the `ok` prompt.

- To get the telnet prompt, press `Control-]`.
- To get the `ok` prompt, type `send brk` at the telnet prompt.

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

The first master eligible-node is the first node that is defined in the `cluster_definition.conf` file with the `NODE` definition. For details, see [“Configuring the `nhinstall` Tool” on page 31](#).

2. Set the boot variables by using the `setenv` command.

- Configure the processors to use local Ethernet (MAC) addresses:

```
ok> setenv local-mac-address? true
```

- Configure the processors to retry booting when autoboot fails:

```
ok> setenv auto-boot-retry? true
```

3. Make a note of the network device aliases:

```
ok> devalias
```

Note the device alias of the network adapter of the master-eligible node that is connected to the same switch as the installation server’s network interface. If there

is no device alias, define one using the `nvalias` command. In the case of Netra 20 servers, the network adapter used is not the native adapter. In this case, you need to define the device alias.

For more information, see the *OpenBoot 4.x Command Reference Manual*.

4. Repeat Step 1 through Step 3 for the second master-eligible node.

The second master-eligible node is the second node that is defined with the `NODE` parameter in the `cluster_definition.conf` file. For details, see “[Configuring the `nhinstall` Tool](#)” on page 31.

5. Start the installation of the Solaris operating system on the first master-eligible node:

```
ok> boot net - install
where net is the device alias.
```

6. At the same time, start the installation of the Solaris operating system on the second master-eligible node:

```
ok> boot net - install
Where net is the device alias.
```

The installation takes approximately 30 minutes for both master-eligible nodes. The progress of the installation and the packages that are being installed is displayed on the console window of each master-eligible node.

When the Solaris packages have been installed, each node is automatically rebooted. Several status messages are displayed regarding service startup and connectivity. Finally, this message is displayed on the console of each master-eligible node:

```
The system is ready.
```

7. When each node has reported a system ready status, continue the installation by typing `y` at this prompt:

```
Answer 'y' when they are finished: y
```

The `nhinstall` tool checks which version of the Solaris operating system has been installed. The `nhinstall` tool also checks whether the Foundation Services are already installed on the master-eligible nodes. If the Foundation Services are already installed, the `nhinstall` tool exits and displays an error message. If you want to upgrade to the new version of the Foundation Services, see [Part V](#). Otherwise, remove the existing Foundation Services packages and restart the installation as described in “[Resetting the `nhinstall` Tool for a New Installation](#)” on page 54.

The `nhinstall` tool then installs the Foundation Services and the CGTP packages on the master-eligible nodes.

Wait 15 to 20 minutes while the Foundation Services packages and the CGTP patches are installed on the master-eligible nodes.

Then, the following instructions are displayed by the `nhinstall` tool:

```
Reboot the master eligible node nodeid.
On the console of nodeid (login: root, password:), type:
# init 6
Wait for the console login prompt.
Answer 'y' when it has been displayed:
```

where *nodeid* is the node ID.

Follow these instructions by performing the following procedure.

▼ To Reboot the First Master-Eligible Node

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

2. **Reboot the node:**

```
# init 6
```

3. **When the boot is complete, type *y* at this prompt in the console window of the installation server:**

```
Answer 'y' when it has been displayed: y
```

After you type *y*, the following instructions are displayed by the `nhinstall` tool in the installation server console:

```
Reboot the master eligible node nodeid.
On the console of nodeid (login: root, password:), type:
# init 6
Wait for the console login prompt.
Answer 'y' when it has been displayed:
```

where *nodeid* is the node ID.

Follow these instructions by performing the following procedure.

▼ To Reboot the Second Master-Eligible Node

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

2. **Reboot the second master-eligible node:**

```
# init 6
```

3. **When the boot is complete, type *y* at this prompt in the console window of the installation server:**

```
Answer 'y' when it has been displayed: y
```

After you type *y*, the `nhinstall` tool installs the software for diskless nodes on the master-eligible nodes if one of the following is true:

- You have defined diskless nodes in the `cluster_definition.conf` file.
- You did not define diskless nodes in `cluster_definition.conf`, but you answered `y` to the following question at the beginning of the installation process:

```
Do you want to install the Solaris services for
diskless nodes anyway [y/n]: y
```

In the second case, only the Solaris services for diskless nodes are installed.

Wait approximately 20 minutes while the `nhinstall` tool installs the Solaris services for the diskless nodes on the master-eligible nodes. No status messages are displayed during this operation.

Wait an additional 5 minutes while the `nhinstall` tool configures the Foundation Services for each diskless node. You can see the installation status on the console window of each node.

The `nhinstall` tool automatically installs the Solaris packages, the Foundation Services packages, and the CGTP patches in the root directory of each diskless node.

At this stage, the Solaris operating system and the Foundation Services have been installed on the nodes of the cluster. The `nhinstall` tool prompts you to reboot both master-eligible nodes and to boot the diskless nodes. For instructions, see [“To Reboot the Master-Eligible Nodes After the Diskless Nodes Are Configured”](#) on page 51 and [“To Boot the Diskless Nodes”](#) on page 52.

▼ To Reboot the Master-Eligible Nodes After the Diskless Nodes Are Configured

1. Reboot the first master-eligible node:

```
# init 6
```

Wait until the login prompt is displayed on the first master-eligible node.

2. To continue with the installation process, type `y` at this prompt:

```
Answer 'y' when it has been displayed: y
```

3. Reboot the second master-eligible node:

```
# init 6
```

Wait until the login prompt is displayed on the second master-eligible node.

4. To continue with the installation process, type `y` at this prompt:

```
Answer 'y' when it has been displayed: y
```

▼ To Boot the Diskless Nodes

After you type `y` at the `nhinstall` prompt, the following instructions are displayed by the `nhinstall` tool:

```
The software installation is complete.
Setup the eeprom boot parameters on your diskless nodes:
At the ok prompt, type:
  ok> setenv local-mac-address? true
  ok> setenv auto-boot-retry? true
  ok> setenv boot-device net:dhcp,,,,,5 net2:dhcp,,,,,5
  ok> setenv diag-switch? false
You can now boot your diskless nodes.
```

To configure the boot parameters, follow this procedure.

1. Get the `ok` prompt on the diskless node.
2. Execute the following commands at the `ok` prompt on each diskless node:

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

3. Boot each diskless node:

```
ok> reset
```

While you are booting the nodes, the following information is displayed by the `nhinstall` tool:

```
17:32:21 Waiting for the disks of the master-eligible nodes to synchronize.
17:32:21   - Partitions to be replicated:
17:32:22     . md/rdisk/d4 (2099 MB)
17:32:22     . md/rdisk/d3 (2099 MB)
0%....10%....20%....30%....40%....50%....60%....70%....80%....90%....100%
17:44:18 Your cluster is ready.
```

This output describes the status of the initial synchronization of the disks of the master node and the vice-master node. After the diskless nodes are rebooted and after the disks are synchronized, your cluster is ready.

Verifying the Installation

After you have completed the installation and configuration, check that the cluster nodes have connectivity.

▼ To Verify the Installation

1. Become superuser on the master-eligible nodes.
2. Run the `nhadm` tool:

```
# /opt/SUNWcgha/sbin/nhadm check starting
```

If all checks pass the validation, the installation of the Foundation Services on the nodes of your cluster has been successful. For more information, see the `nhadm(1M)` and the `cluster_nodes_table(4)` man pages.

Troubleshooting and Restarting the `nhinstall` Tool

Most warnings displayed by the `nhinstall` tool do not require that any action be taken.

When the `nhinstall` tool is launched, the tool parses the configuration files. If the `nhinstall` tool encounters errors in the files, it exits and provides a list of error messages. A progress indicator monitors the progress of the installation so you can continue the installation from the point of failure when you restart the `nhinstall` tool.

If an error occurs during the installation process, fix the error and then relaunch the `nhinstall` tool:

```
# cd /opt/SUNWcgha/sbin
# ./nhinstall -r config_file_directory -l logfile
```

Note – If you modify the configuration files to correct an error, the `nhinstall` tool displays a warning that the configuration has changed. The tool then prompts you to reset the installation. For information, see [“Resetting the `nhinstall` Tool for a New Installation”](#) on page 54.

Resetting the `nhinstall` Tool for a New Installation

If you are installing a new version of the software on the cluster or a new cluster configuration, you must start the installation from the beginning. You can reset the `nhinstall` tool in one of two ways:

- By removing the progress indicator
- By clearing the installation files and directories, including the progress indicator

▼ To Remove the Progress Indicator and Reset the `nhinstall` Tool

To reset the `nhinstall` tool by removing the progress indicator, perform the following steps:

1. **Log in to the installation server as superuser.**
2. **Reset the `nhinstall` tool and remove the progress indicator:**

```
# cd /opt/SUNWcgha/sbin
# ./nhinstall -r config_file_directory reset
```

The next time that you launch the `nhinstall` tool, the installation starts from the beginning.

▼ To Clear the Installation Environment and Reset the `nhinstall` Tool

To reset the `nhinstall` tool and clear the installation directories and files, perform the following steps:

1. **Log in to the installation server as superuser.**
2. **Unshare all shared and exported directories, and remove the temporary files, including the progress indicator:**

```
# cd /opt/SUNWcgha/sbin
# ./nhinstall -r config_file_directory clear
```

The shared and exported directories are no longer shared or exported. All temporary files are deleted. The installation environment is cleared. The next time that you launch the `nhinstall` tool, the installation starts from the beginning.

Manually Installing and Configuring the Software on the Cluster

Manual installation enables you to customize the software installation depending on the purpose of the cluster.

You can install and configure the software manually on a cluster that consists of master-eligible nodes as well as diskless nodes and dataless nodes.

To install the software manually on the cluster, see the following chapters:

- [Chapter 5](#) explains how to set up the installation environment. This chapter also describes how to prepare to install the software manually on the cluster.
- [Chapter 6](#) describes how to install and configure the Solaris operating system and the Foundation Services manually on the master-eligible nodes.
- [Chapter 7](#) describes how to install and configure the Solaris operating system and the Foundation Services manually for the diskless cluster nodes.
- [Chapter 8](#) describes how to install and configure the Solaris operating system and the Foundation Services manually on the dataless cluster nodes.

Preparing to Install Manually

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

For more information, see the following sections:

- [“Overview of the Manual Installation Process” on page 57](#)
- [“Connecting the Installation Server” on page 58](#)
- [“Preparing the Installation Environment” on page 59](#)
- [“Choosing a Cluster Network” on page 61](#)

Overview of the Manual Installation Process

TABLE 5-1 Tasks for Installing and Configuring the Software Manually

Task	Refer To
Prepare the installation environment.	Chapter 5
Install the Solaris operating system and the Foundation Services on each master-eligible node manually.	Chapter 6
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 7
OR	
If you have dataless nodes in your cluster, install the Solaris operating system and the Foundation Services on the local disk of these nodes.	Chapter 8

Connecting the Installation Server

The installation server must be connected to the cluster through a switch.

▼ To Connect the Installation Server to the Cluster Network

1. **Connect the installation server's second interface, *NIC1*, to the Ethernet switch connecting the *NIC0* interfaces of the nodes.**

For an illustration of how to connect the various components of a cluster, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

2. **Log in to the installation server as superuser.**
3. **Create the file `/etc/hostname.cluster-network-interface-name` (`hme0` in this procedure) on the installation server:**

```
# touch /etc/hostname.hme0
```

4. **Edit the `/etc/hostname.hme0` file to add the host name of the installation server, for example, `installation-server-cluster`.**
5. **Choose an IP address for the network interface that is connected to the cluster, for example, `10.250.1.100`.**
6. **Edit the `/etc/hosts` file on the installation server to add the IP address that you chose in [Step 5](#).**
7. **Set the netmask of the cluster network in the `/etc/netmasks` file:**

```
10.250.1.0      255.255.255.0
```

▼ To Connect the Installation Server to the Public Network

- **Add the public host name and IP address of the installation server to the `/etc/hosts` file on your NIS server:**

```
192.168.12.253  installation-server-public
```

Note – Do not add the IP address of the network interface that is connected to the cluster to the NIS server.

Preparing the Installation Environment

Before you install the software manually on the cluster, you must create the Solaris distribution on the installation server and prepare the installation server for manual installation.

▼ To Create a Solaris Distribution on the Installation Server

To install the Solaris operating system on the cluster, create a Solaris distribution on the installation server. The Solaris distribution is used to install the Solaris operating system on the cluster nodes. If you are installing more than one Solaris distribution on the cluster, perform the steps in the procedure for each Solaris distribution.

1. **Make sure that you have at least 1.5 Gbytes of free disk space on the installation server.**
2. **Log in as superuser on the installation server.**
3. **Create a directory for the Solaris distribution:**

```
# mkdir Solaris-distribution-dir
```

where *Solaris-distribution-dir* is the directory where the distribution is to be stored on the installation server.

4. **Change to the directory where the `setup_install_server` 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 8 or 9 depending on the Solaris version you want to install.

5. **Run the `setup_install_server` command:**

```
# ./setup_install_server Solaris-distribution-dir
```

For more information about the `setup_install_server` command, see the appropriate documentation:

- *Solaris 8 Advanced Installation Guide* and the `setup_install_server(1M)` man page
- *Solaris 9 Installation Guide* and the `setup_install_server(1M)` man page

▼ To Prepare the Installation Server

Before you begin the installation process, make sure that the installation server is configured correctly.

1. **Configure the installation server as described in the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.**

2. **If you are planning to install remotely from another system, open a shell window to connect to the installation server.**

3. **Confirm that the Solaris software packages that contain Perl 5.0 are installed on the installation server.**

Use the `pkginfo` command to check for the `SUNWp15u`, `SUNWp15p`, and `SUNWp15m` Perl packages.

4. **Delete any entries for your cluster nodes in the following files:**

- `/etc/hosts`
- `/etc/ethers`, if the file exists
- `/etc/bootparams`, if the file exists

5. **Disable the installation server as a router by creating an `/etc/notrouter` file:**

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

If a system running the Solaris operating system has two network interfaces, the system is configured as a router by default. However, for security reasons, a Foundation Services cluster network must not be routed.

6. **Modify the `/etc/nsswitch.conf` file on the installation server so that `files` is positioned before `nis` in the `hosts`, `ethers`, and `bootparams` entries:**

```
hosts: files nis
ethers: files nis
bootparams: files nis
```

7. **From the installation server, open a terminal window to connect to the console of each cluster node.**

You can also connect to the consoles from the system that you use to connect to the installation server.

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 Foundation Services 2.1 6/03 Overview*.

Installing the Software on the Master-Eligible Nodes

After you have set up the installation environment, you are ready to 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 Foundation Services 2.1 6/03 Overview*.

To install and configure the Foundation Services manually on the master-eligible nodes of your cluster, see the following sections:

- “Defining Disk Partitions on the Master-Eligible Nodes” on page 64
- “Installing the Solaris Operating System on the Master-Eligible Nodes” on page 65
- “Setting Up the Master-Eligible Nodes” on page 67
- “Installing the Foundation Services on the Master-Eligible Nodes” on page 69
- “Configuring the Master-Eligible Node Addresses” on page 75
- “Configuring the Foundation Services on the Master-Eligible Nodes” on page 77
- “Setting Up File Systems on the Master-Eligible Nodes” on page 80
- “Installing the Man Pages on the Master-Eligible Nodes” on page 82
- “Starting the Master-Eligible Nodes” on page 83

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 6-1 Example Disk Partitions of Master-Eligible Nodes

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

TABLE 6-1 Example Disk Partitions of Master-Eligible Nodes (Continued)

Disk Partition	File System Name	Description	Example Size
5	Reserved for Reliable NFS internal use	Bitmap partition reserved for the <code>nhcrfsd</code> daemon. This partition is associated with the <code>/export</code> file system.	See Table 6-2
6	Reserved for Reliable NFS internal use	Bitmap partition reserved for the <code>nhcrfsd</code> daemon. This partition is associated with the <code>/SUNWcggha/local</code> file system.	See Table 6-2
7	<code>/mypartition</code>	For any additional applications.	The remaining space

For replication, create a bitmap partition for each partition containing an exported, replicated file system on the master-eligible nodes. The size of the bitmap partition must be equal to 512 bytes + 1 bit per 32 Kbytes of the data device size. 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 6-2 Example Bitmap Partitions

File System Name	Bitmap Partition	File System (Mbytes)	Bitmap File (Kbytes)	Bitmap Size (Block)
<code>/export</code>	<code>/dev/rdisk/c0t0d0s5</code>	2000	8512	18
<code>/SUNWcggha/local</code>	<code>/dev/rdisk/c0t0d0s6</code>	1512	6512	14

For information, see the *Sun StorEdge Availability Suite 3.1 Remote Mirror Software Installation Guide* in the Sun StorEdge 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 [“Preparing the Installation Environment”](#) on page 59.

▼ 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 8 Advanced Installation Guide*
 - *Solaris 9 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-dir
share -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 8 or 9 depending on the Solaris version installed.

7. Run the `add_install_client` command for each master-eligible node:

For information, see the `add_install_client(1M)` man page.

8. Connect to the console of each master-eligible node.

9. At the `ok` prompt, boot each master-eligible node 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 master-eligible nodes.

Setting Up the Master-Eligible Nodes

To prepare the master-eligible nodes for the installation of the Foundation Services, you must configure the master-eligible nodes. You must also mount the installation server directory that contains the Foundation Services 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 /noautosshutdown
```

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
```

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 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:

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

3. Share the directory containing the distributions for the Foundation Services 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 Foundation Services 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 Foundation Services and Solaris distribution directories on the installation server:**

```
# mount -F nfs \  
installation-server-IP-address:/software-distribution-dir/NetraHAS2.1 \  
/NetraHASuite  
# 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 Foundation Services packages.
- *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, install the necessary patches. The *Netra High Availability Suite Foundation Services 2.1 6/03 README* contains the list of Solaris patches delivered in the Foundation Services distribution that you must install.

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 61.

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 Foundation Services on the Master-Eligible Nodes

The following procedures explain how to install the Foundation Services on the master-eligible nodes:

- [“To Install the nhadm Tool”](#) on page 70

- “To Install the Carrier Grade Transport Protocol” on page 70
- “To Install the Node State Manager” on page 70
- “To Install the Cluster Membership Manager” on page 71
- “To Install the Reliable NFS” on page 71
- “To Install the Node Management Agent” on page 72
- “To Install the Daemon Monitor” on page 73
- “To Install the Watchdog Timer” on page 74

▼ 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 nhadm tool package on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhadm
```

▼ 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 61](#).

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 69](#).
2. As superuser, install the following CGTP packages on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhtpx SUNWnhtux
```

where *x* is 8 or 9 depending on the version of the Solaris operating system you install.

▼ To Install the Node State Manager

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

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhnsa SUNWnhnsb
```

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 Foundation Services.

For more information about the Node State Manager, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

▼ To Install the Cluster Membership Manager

- As superuser, install the following Cluster Membership Manager (CMM) packages on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhc dt SUNWnhhb \
SUNWnhcmd SUNWnhcma SUNWnhcmb
```

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 Foundation Services.

For instructions on configuring the CMM, see “Configuring the Foundation Services on the Master-Eligible Nodes” on page 77.

For information about the CMM, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

▼ To Install the Reliable NFS

Install the Reliable NFS packages to enable the Reliable NFS service and disk mirroring features of Foundation Services. For a description of the Reliable NFS service, see “File Sharing and Data Replication” in *Netra High Availability Suite Foundation Services 2.1 6/03 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 Foundation Services. Any use of this product other than on a Foundation Services 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 SUNWrdr SUNWrdr SUNWnhfsa SUNWnhfsb
```

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 Foundation Services 2.1 6/03 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 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 Foundation Services 2.1 6/03 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 `SUNWjdrct`, 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.

TABLE 6-3 NMA and Java DMK Packages Installed on the Master-Eligible Nodes

Package	Description	Installed On
SUNWjsnmp	Java DMK 5.0 Simple Network Management Protocol (SNMP) manager API classes	Both master-eligible nodes
SUNWjdrt	Java DMK 5.0 dynamic management runtime classes	First master-eligible node
SUNWnhmas	NMA configuration and startup script	Both master-eligible nodes
SUNWnhmaj	NMA Java classes	First master-eligible node
SUNWnhmal	NMA JNI libraries	First master-eligible node
SUNWnhmad	NMA Javadoc files	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/ SUNWnhmas SUNWjsnmp
```

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

```
# pkgadd -d /NetraHASuite/Packages/ \
-M -R /SUNWcgaha/local/export/services \
-a none SUNWjdrt SUNWnhmaj SUNWnhmal SUNWnhmad
```

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

3. You are asked to specify the **BASEDIR**.

Specify a path that identifies the version of the software you are installing, for example, /ha_v1/opt.

Therefore, the packages are installed in the directory /SUNWcgaha/local/export/services/ha_v1/opt.

4. To configure the NMA, see the *Netra High Availability Suite Foundation Services 2.1 6/03 NMA Programming Guide*.

▼ To Install the Daemon Monitor

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

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhpma SUNWnhpmb SUNWnhpms \
SUNWnhpmm SUNWnhpmm
```

For a description of the Daemon Monitor, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

▼ To Install the Watchdog Timer

Install and configure the Watchdog Timer provided with the Foundation Services *only* if you are using Netra servers that have hardware watchdogs at the LOM level. For a list of the types of watchdogs for different Netra servers, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

If you are using Netra servers with hardware watchdogs at the OBP level, do *not* install the Watchdog Timer provided with the Foundation Services. These hardware watchdogs are monitored by the server's software.

1. Before installing the Watchdog Timer, do the following:

- Check that the SUNWnhcdt package is already installed on each master-eligible node. For more information, see ["To Install the Cluster Membership Manager" on page 71](#).
- Check that the following LOM driver packages are installed:
 - SUNWlomr
 - SUNWlomu

2. As superuser, install the Watchdog Timer package on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhwdt
```

The Watchdog Timer can be configured differently on each node depending on your needs. See ["Configuring the nhfs.conf File" on page 77](#).

▼ To Install Service Enhancements

A number of service enhancements are available in the Foundation Services patches. The service enhancements include:

- Reduced Duration of Disk Synchronization
- Data Management Policy
- Masterless Cluster
- Sanity Check of Replicated Slices
- Delayed Synchronization
- Serialized Slice Synchronization
- Tool to copy local files from the master node to the vice-master node

1. Go into the Foundation Services patch directory:

```
# cd /NETRAHAS/Patches
```

2. Consult the README file in each Foundation Services patch for information about the patches you must install and instructions about how to install them.

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 Foundation Services 2.1 6/03 Overview*.

In the Foundation Services, 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 *cgtp(7D)* 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 Foundation Services on the Master-Eligible Nodes” on page 77.

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 76
- “To Update the Network ID Files” on page 76
- “To Configure External IP Addresses” on page 77

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
```

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 Foundation Services. 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 ID 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 master-eligible node's IP address.**
 - 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 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.**

Configuring the Foundation Services 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 Foundation Services. 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 `nhcmmmd` 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 `nhcmmmd` daemon, see the `nhcmmmd(1M)` 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 78](#)
- [“To Create Floating Address Triplet Assigned to the Master Role” on page 78](#)
- [“To Configure a Direct Link Between the Master-Eligible Nodes” on page 79](#)

▼ To Configure the `nhfs.conf` File Properties

The `nhfs.conf` file enables you to configure the node after you have installed the Foundation Services 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, the Watchdog Timer, 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, that is, 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.conf(4)` 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 Create 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 Foundation Services 2.1 6/03 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 Foundation Services 2.1 6/03 Hardware Guide*.

2. Configure the direct link parameters as described in the `nhfs.conf(4)` 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_table(4)` 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.conf(4)` 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.

When there is a change in the attribute of a node, the `cluster_nodes_table` file is updated by the `nhcmmmd` 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.

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
# mkdir /SUNWcgha/local
# 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 Foundation Services you install, for example, `ha_v1`.

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

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

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

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

3. 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_v1/opt \
- /SUNWcgha/services nfs - no rw,hard,fg,intr,noac

master-cgtp:/SUNWcgha/local/export/services - \
/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 Floating Address Triplet Assigned to the Master Role” on page 78](#).

- 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_v1/opt \
- /SUNWcgha/services nfs - no rw,hard,fg,intr,noac

master-nic0:/SUNWcgha/local/export/services - \
/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 Floating Address Triplet Assigned to the Master Role” on page 78](#).

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

4. Check the following in the `/etc/vfstab` file:

- The `mount at boot` field is set to `no` for all physical, replicated partitions.

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

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

```
/dev/dsk/c0t0d0s0 /dev/rdisk/c0t0d0s0 / ufs 1 no logging
```

Note – Only partitions identified in the `nhfs.conf` file can be replicated. For more information about the `nhfs.conf` file, see [“Configuring the `nhfs.conf` File” on page 77](#).

▼ 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 example, in the following table, the replicated file systems are `/dev/rdisk/c0t0d0s3` and `/dev/rdisk/c0t0d0s4`.

TABLE 6-4 Example File Systems Managed by the `nhcrfsd` Daemon

File System Name	Bitmap Partition	Size (in Mbytes)
<code>/export</code>	<code>/dev/rdisk/c0t0d0s3</code>	2000
<code>/SUNWcgha/local</code>	<code>/dev/rdisk/c0t0d0s4</code>	2000

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/ SUNWnhman
```

The man pages are installed in the `/opt/SUNWcgha/man` directory. To access the man pages, see [“To Access Man Pages on the Master-Eligible Nodes”](#) on page 162.

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

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 Foundation Services.

- After you have installed the Foundation Services 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 `umount(1M)` man page and [“To Mount an Installation Server Directory on the Master-Eligible Nodes”](#) on page 68.

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

```
# init 6
```

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

```
# init 6
```

This node becomes the vice-master node. To check the role of each node in the cluster, see the `nhcmmrole(1M)` 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 Foundation Services was successful. See the `nhadm(1M)` 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 [Chapter 8](#).

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

- [“Preparing to Install a Diskless Node” on page 85](#)
- [“Installing the Solaris Operating System for Diskless Nodes on the Master Node” on page 86](#)
- [“Installing the DHCP and the Reliable Boot Service” on page 91](#)
- [“Configuring the DHCP for a Diskless Node” on page 92](#)
- [“Configuring the DHCP Boot Policy for Diskless Nodes” on page 94](#)
- [“Installing the Foundation Services on a Diskless Node” on page 100](#)
- [“Configuring the Foundation Services for a Diskless Node” on page 102](#)
- [“Integrating a Diskless Node Into the Cluster” on page 107](#)
- [“Starting the Cluster” on page 109](#)

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, you 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 Foundation Services 2.1 6/03 Hardware 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 64.

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 the following packages: `SMEvplr.u`, `SUNWsiox.u`, `SUNWkvm.u`, `SMEvplu.u`. Install `SMEvplr.u` and `SUNWsiox.u` on the root file system for the diskless nodes. Install `SUNWkvm.u` and `SMEvplu.u` on the `/usr` directory for each diskless node.

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 87
- “To Create a Root File System for a Diskless Node on the Master Node” on page 88
- “To Configure the Trivial File Transfer Protocol on the Master-Eligible Nodes” on page 89
- “To Install Solaris Patches” on page 90

▼ 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 68.
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 `smc(1M)` man page.

4. **Run the `smoservice` command:**

```
# /usr/sadm/bin/smoservice 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`.

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

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

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

For more information, see the `smosservice(1M)` man page.

▼ To Install the `SUNWkvm.u` and `SMEvplu.u` Solaris Packages

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 68.

2. Log in to the master node as superuser.

3. Install the `SUNWkvm.u` package:

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

4. Install the `SMEvplu.u` package:

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

▼ 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 the root file system for each diskless node:

```
# /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_8 or sparc.sun4u.Solaris_9.
- *locale* is the language. For U.S. English, the value is en_US.

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

```
# /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
```

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

For more information, see the smdiskless(1M) man page.

▼ To Install the SMEvplr.u and SUNWsiox.u Solaris Packages for Diskless Nodes

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 68.

2. **Log in to the master node as superuser.**
3. **Install the SMEvplr.u package for each diskless node:**

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

4. **Install the SUNWsiox.u package:**

```
# pkgadd -R /export/root/<diskless-nodename> -d /mnt 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.conf(4)` 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 Foundation Services 2.1 6/03 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 61.

1. Log in to the master node as superuser.

2. Check that the directory containing the Foundation Services 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 Foundation Services packages.

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 68.

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 8 or 9 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 Foundation Services 2.1 6/03 Overview*.

The Reliable Boot Service is included in Foundation Services packages `SUNWnhrbs` and `SUNWnhrbb`. 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 `SUNWnhrbs` and `SUNWnhrbb` Reliable Boot Service packages on each master-eligible node:

```
# pkgadd -d /NetraHASuite/Packages/ SUNWnhrbs SUNWnhrbb
```

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 `dhcpconfig(1M)`, `dhtadm(1M)`, and `pntadm(1M)` 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 /SUNWcgha/remote/var/dhcp -n
```

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

```
DAEMON_ENABLED=TRUE
RUN_MODE=server
RESOURCE=SUNWnhrbs
PATH=/SUNWcgha/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.conf(4)` 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 -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:'
```

Note – If you are not planning to use CGTP, that is, you plan to configure a single network link for your cluster, 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-Netract \
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 75](#).

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 `dhtadm(1M)` 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 dynamic, static, or client ID boot policy. For further information about the DHCP boot policies, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

TABLE 7-1 Boot Policies for Diskless Nodes

Boot Policy	Description
DHCP dynamic boot policy	IP address is dynamically assigned from a pool of IP addresses when the diskless node is booted. See “To Configure the DHCP Dynamic Boot Policy” on page 94.
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 96.
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 97.

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 Dynamic 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: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* is the IP address of the *cgtp0* interface of the node.
- *os* is the operating system. Specify *Solaris_8* or *Solaris_9* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC0* subnet.

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

```

# dhtadm -A -m 10.250.1.30 -d \
':NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\
SrootPTH=/export/root/netraDISKLESS1:\
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.1.0:'

```

3. Update the DHCP network table for the *NIC0* interface of the diskless node:

```
# pntadm -A IP-address -f PERMANENT -m macro-name subnet
```

- *IP-address* is the *NIC0* IP address of the node.
- *macro-name* is the *NIC0* IP address of the node.
- *subnet* is the *NIC0* subnet.

For the diskless node with the *NIC0* IP address 10.250.1.30, type:

```
# pntadm -A 10.250.1.30 -f PERMANENT -m 10.250.1.30 10.250.1.0
```

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

```

# dhtadm -A -m macro-name -d \
':NhCgtpAddr=local-cgtp-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* is the IP address of the *cgtp0* interface of the node.
- *os* is the operating system. Specify *Solaris_8* or *Solaris_9* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC1* subnet.

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

```

# dhtadm -A -m 10.250.2.30 -d \
':NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\
SrootPTH=/export/root/netraDISKLESS1:\
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.2.0:'

```

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

```
# pntadm -A IP-address -f PERMANENT -m macro-name subnet
```

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

For the diskless node with the *NIC1* IP address 10.250.2.30, type:

```
# pntadm -A 10.250.2.30 -f PERMANENT -m 10.250.2.30 10.250.2.0
```

▼ 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:Include=Common:\br/>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* is the IP address of the *cgtp0* interface of the node.
- *os* is the operating system. Specify *Solaris_8* or *Solaris_9* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC0* subnet.

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

```
# dhtadm -A -m 10.250.1.30 -d \  
' :NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\br/>SrootPTH=/export/root/netraDISKLESS1:\br/>SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.1.0:'
```

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 upper-case
- *macro-name* is the *NIC1* IP address of the node.
- *subnet* is the *NIC0* subnet.

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

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

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

```
# dhtadm -A -m macro-name -d \
':NhCgtpAddr=local-cgtp-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* is the IP address of the *cgtp0* interface of the node.
- *os* is the operating system. Specify *Solaris_8* or *Solaris_9* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC1* subnet.

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

```
# dhtadm -A -m 10.250.2.30 -d \
':NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\
SrootPTH=/export/root/netraDISKLESS1:\
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.2.0:'
```

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.

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

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

▼ 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: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* is the IP address of the `cgtp0` interface of the node.
- *os* is the operating system. Specify `Solaris_8` or `Solaris_9` depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC0* subnet.

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

```
# dhtadm -A -m 10.250.1.30 -d \  
' :NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\   
SrootPTH=/export/root/netraDISKLESS1:\   
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.1.0:'
```

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.

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

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

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: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* is the IP address of the *cgtp0* interface of the node.
- *os* is the operating system. Specify *Solaris_8* or *Solaris_9* depending on the Solaris version you installed.
- *diskless-node-name* is the name of the node.
- *subnet* is the *NIC1* subnet.

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

```
# dhtadm -A -m 10.250.2.30 -d \
':NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\
SrootPTH=/export/root/netraDISKLESS1:\
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.2.0:'
```

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.

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

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

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

Installing the Foundation Services on a Diskless Node

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

TABLE 7-2 Foundation Services Packages for Diskless Nodes

Package Name	Package Description
SUNWnhadm	Cluster administration tool
SUNWnhhb	Probe heartbeat module
SUNWnhcmd	CMM developer package (.h and .so files)
SUNWnhcma	CMM binaries
SUNWnhcmb	CMM binaries
SUNWnhcdt	Trace library
SUNWnhtp8 or SUNWnhtp9	CGTP kernel drivers and modules
SUNWnhu8 or SUNWnhu9	CGTP user-space components, configuration scripts, and files
SUNWnhmas	NMA configuration and startup script
SUNWnhpma	Daemon monitor /opt file system
SUNWnhpmb	Daemon monitor root file system
SUNWnhpms	Daemon monitor scripts
SUNWnhpmn	Daemon monitor scripts
SUNWnhpmm	Daemon monitor driver
SUNWj snmp	Java DMK 5.0 SNMP manager API classes
SUNWnhwdt	Watchdog Timer

▼ To Install the Foundation Services Packages

1. Log in to the master node as superuser.
2. Install the Foundation Services packages.

For example, to install the Foundation Services packages and the Java DMK package on Solaris 9, run the following command:

```
# pkgadd -R /export/root/diskless-node-name -d /NetraHASuite/Packages \
SUNWnhadm SUNWnhtp9 SUNWnhthu9 SUNWnhhb SUNWnhcdt SUNWnhcmd SUNWnhcma \
SUNWnhcmb SUNWnhpma SUNWnhpmb SUNWnhpmm SUNWnhpms SUNWnhpmm \
SUNWnhmas SUNWjdrdt
```

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 61.

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

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

where *x* is 8 or 9 depending on the Solaris version installed.

4. Install the Watchdog Timer only if the diskless node is not a CompactPCI board.

Note – If the diskless node is a CompactPCI board, the platform’s software monitors the hardware watchdog and you do not need to install the Foundation Services Watchdog Timer.

- a. Install the following LOM driver packages:

- i. In the root directory of the diskless node, install the SUNWlomr package:

```
# pkgadd -R /export/root/diskless-node-name \
-d /NetraHASuite/Packages/ SUNWlomr
```

- ii. In the /usr directory of the diskless node, install the SUNWlomu package:

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

- b. Install the Watchdog Timer package:

```
# pkgadd -R /export/root/diskless-node-name \  
-d /NetraHASuite/Packages/ SUNWnhwdt
```

c. **To enable the Watchdog Timer, modify the `nhfs.conf` file.**

For instruction on how to configure the Watchdog Timer, see the `nhfs.conf(4)` man page. The Watchdog Timer can be configured differently on each node according to your requirements.

Configuring the Foundation Services for a Diskless Node

To configure the Foundation Services for a diskless node, see the following procedures:

- [“To Update the Network ID Files for the Diskless Node” on page 102](#)
- [“To Configure External IP Addresses” on page 103](#)
- [“To Disable the Router Feature” on page 104](#)
- [“To Set Up File Systems for a Diskless Node” on page 104](#)
- [“To Create the `nhfs.conf` File for a Diskless Node” on page 106](#)

▼ To Update the Network ID 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`, `/export/root/diskless-node-name/etc/hostname.NIC1`, `/export/root/diskless-node-name/etc/dhcp.NIC0`, and `/export/root/diskless-node-name/etc/dhcp.NIC1` files.**

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

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

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

Note – These 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`, `NIC01`, and `cgtp0` interfaces.

```
127.0.0.1          localhost
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

10.250.1.30       netraDISKLESS1-nic0
10.250.2.30       netraDISKLESS1-nic1
10.250.3.30       netraDISKLESS1-cgtp

10.250.1.1        master-nic0
10.250.2.1        master-nic1
10.250.3.1        master-cgtp
```

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 `cgtp0` interface, that is, `netraDISKLESS1-cgtp`.

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 Foundation Services 2.1 6/03 Overview*.

▼ To Set Up File Systems for a Diskless Node

To set up file systems for a diskless node, you 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.

Table 7-3 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 80.

TABLE 7-3 Mounted File Systems

Description	Exported Mount Point on the Master Node	Mount Point for Diskless Nodes
Root file systems	<code>/export/root/diskless-node-name</code>	<code>/</code>
Foundation Services data used locally	<code>/SUNWcgha/local</code>	Not exported
Foundation Services exported data	<code>/SUNWcgha/local/export/data</code>	<code>/SUNWcgha/remote</code>
Foundation Services exported data	<code>/SUNWcgha/local/export/services/ha_v1/opt</code>	<code>/SUNWcgha/services</code>

TABLE 7-3 Mounted File Systems (Continued)

Description	Exported Mount Point on the Master Node	Mount Point for Diskless Nodes
Foundation Services exported data	/SUNWcgha/local/export/services	/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 Floating Address Triplet Assigned to the Master Role” on page 78](#).
- 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_v1/opt \
- /SUNWcgha/services nfs - yes \
rw,hard,fg,intr
master-cgtp:/SUNWcgha/local/export/services - \
/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_v1/opt \
- /SUNWcgha/services nfs - yes \
rw,hard,fg,intr
master-nic0:/SUNWcgha/local/export/services - \
/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](#) and [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 this 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.

For more information, see the `nhfs.conf(4)` 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 107](#)
- [“To Add the Diskless Node to the `cluster_nodes_table` File” on page 108](#)
- [“To Update the Shared Directory Configuration” on page 108](#)

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

To declare the diskless node to all peer nodes in the cluster, follow this procedure:

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

```
IP-address-NIC0      nic0-diskless-node-name
IP-address-NIC1      nic1-diskless-node-name
IP-address-cgtp0     cgtp0-diskless-node-name
```

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 node that is part of the cluster, if a diskless node 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 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       diskless-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, see the `cluster_nodes_table(4)` 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:cgtp0-diskless-node-name, \
root=nic0-diskless-node-name:nic1-diskless-node-name: \
cgtp0-diskless-node-name /export/swap/diskless-node-name
```

```
Rnfs.Share.1=share -F nfs -o rw=nic0-diskless-node-name: \
nic1-diskless-node-name:cgtp0-diskless-node-name, \
root=nic0-diskless-node-name:nic1-diskless-node-name: \
cgtp0-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 `cgtp0-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, you delete the `not_configured` file and reboot the master-eligible nodes. When the Solaris operating system and the Foundation Services 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 Foundation Services.

- 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:

```
# init 6
```
3. After the master node has completed booting, log in to the vice-master node as superuser.

4. Reboot the vice-master node:

```
# init 6
```

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. Configure the OpenBoot PROM parameters:

```
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
```

7. Reboot the diskless node:

```
ok> boot
```

▼ 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 Foundation Services software was successful. For more information, see the `nhadm(1M)` 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 111
- “Installing the Solaris Operating System on a Dataless Node” on page 112
- “Installing the Foundation Services on a Dataless Node” on page 115
- “Configuring the Foundation Services on a Dataless Node” on page 116
- “Integrating a Dataless Node Into the Cluster” on page 121
- “Starting the Cluster” on page 122

Preparing to Install a Dataless Node

Consider the following before installing and configuring a dataless node:

▼ To Connect a Dataless Node to the Cluster

- **To connect a dataless node to a cluster, you 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 Foundation Services 2.1 6/03 Hardware 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 Foundation Services 2.1 6/03 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.

TABLE 8–1 Example Disk Partitions of a Dataless Node

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
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 [“Preparing the Installation Environment” on page 59](#).

▼ 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 8 Advanced Installation Guide*
 - *Solaris 9 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-dir
share -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 8 or 9 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_client(1M)` 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.

▼ To Install Solaris Patches

After you have completed the Solaris installation, install the necessary Solaris patches. The *Netra High Availability Suite Foundation Services 2.1 6/03 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 61](#).

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 68](#).

3. Install the patches on the dataless node:

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

Installing the Foundation Services on a Dataless Node

After the Solaris operating system has been installed on the dataless node, install the Foundation Services on the dataless node.

The set of services to be installed on the dataless node is a subset of the Foundation Services installed on the master-eligible nodes. Install the packages that are listed in the following table.

TABLE 8-2 Foundation Services Packages for Dataless Nodes

Package Name	Package Description
SUNWnhadm	Cluster administration tool
SUNWnhhb	Probe heartbeat module
SUNWnhcmd	CMM developer package (.h and .so files)
SUNWnhcma	CMM binaries
SUNWnhcmb	CMM binaries
SUNWnhcdt	Trace library
SUNWnhctp8 or SUNWnhctp9	CGTP kernel drivers and modules
SUNWnhctu8 or SUNWnhctu9	CGTP user-space components, configuration scripts, and files
SUNWjsnmp	Java DMK 5.0 SNMP manager API classes
SUNWnhmas	NMA configuration and startup script
SUNWnhpma	Daemon monitor /opt file system
SUNWnhpmb	Daemon monitor root file system
SUNWnhpms	Daemon monitor scripts
SUNWnhpmn	Daemon monitor scripts
SUNWnhpmm	Daemon monitor driver
SUNWlomr	LOM package required if you install the Watchdog Timer
SUNWlomu	LOM package required if you install the Watchdog Timer

TABLE 8-2 Foundation Services Packages for Dataless Nodes (Continued)

Package Name	Package Description
SUNWnhwdt	Watchdog Timer required only if the dataless node is not a CompactPCI board

▼ To Install the Foundation Services

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 68.
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 61.

Configuring the Foundation Services on a Dataless Node

The following procedures explain how to configure the Foundation Services on a dataless node.

- [“To Configure a Dataless Node”](#) on page 116
- [“To Configure an External IP Address”](#) on page 117
- [“To Update the Network ID Files on a Dataless Node”](#) on page 117
- [“To Create the `nhfs.conf` File for a Dataless Node”](#) on page 119
- [“To Set Up File Systems for a Dataless Node”](#) on page 119

▼ 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
```

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 ID 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 119 and ["To Update the Cluster Node Table"](#) on page 122.

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.conf(4)` 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 enable the Watchdog Timer, you must modify the `nhfs.conf` file. The Watchdog Timer can be configured differently on each node according to your requirements. For more information, see the `nhfs.conf(4)` man page.

▼ 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 Floating Address Triplet Assigned to the Master Role”](#) on page 78.

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_v1/opt - \
/SUNWcgha/services nfs - yes rw,hard,fg,intr

master-cgtp:/SUNWcgha/local/export/services - \
/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_v1/opt - \
/SUNWcgha/services nfs - yes rw,hard,fg,intr

master-nic0:/SUNWcgha/local/export/services - \
/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 `/SUNWcgha/remote`, `/SUNWcgha/services`, and `/SUNWcgha/swdb`:

```

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

```

```
# mkdir -p SUNWcgha/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 121
- [“To Update the Cluster Node Table”](#) on page 122

▼ 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-name  
IP-address-NIC1      nic1-dataless-node-name  
IP-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_table(4)` 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 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 Foundation Services.

- 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:

```
# init 6
```

2. After the master node has completed rebooting, reboot the vice-master node as superuser:

```
# init 6
```

3. **After the vice-master node has completed rebooting, boot the master-ineligible nodes as superuser:**

```
# init 6
```

▼ 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 Foundation Services was successful. For more information, see the `nhadm(1M)` man page.

Adding Nodes to a Running Cluster

To add nodes to your cluster, you must determine how the cluster was first installed. To determine whether a cluster was installed by the `nhinstall` tool or manually, consult the system operator who installed the cluster.

Depending on how your cluster was installed, see the appropriate chapter:

- [Chapter 9](#) describes how to add a diskless node to a cluster that was originally creating using the `nhinstall` tool.
- [Chapter 10](#) describes how to add a node to a cluster that was originally created manually.

Adding a Diskless Node to a Cluster Originally Created Using the `nhinstall` Tool

There are two ways that you can add a diskless node to a cluster that was originally created using the `nhinstall` tool:

- By using the `add` option of the `nhinstall` tool
- By manually adding the node to the cluster

For information, see the following sections:

- [“Adding a Diskless Node By Using the `nhinstall` Tool” on page 127](#)
- [“Manually Adding a Diskless Node” on page 130](#)

Adding a Diskless Node By Using the `nhinstall` Tool

To add a node to the cluster, you must first determine whether the cluster has predefined nodes. A predefined node is a node that you defined when you originally created the cluster, but this node was not physically connected to the cluster. For instructions on how to check whether your cluster has predefined nodes, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Cluster Administration Guide*.

However, if your cluster does not have predefined nodes and you want to add new diskless nodes to the cluster, you can use the `nhinstall add` command to do so.

▼ To Add a Predefined Diskless Node to the Cluster

1. **Verify that the hardware of the new node is supported for your cluster configuration.**

For information, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

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

For information, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

3. Physically connect the node to the cluster.

For information, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

4. On the console of the new node, configure the OBP parameters:

```
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
```

5. Boot the node:

```
# init 6
```

▼ To Add an Undefined Diskless Node to the Cluster

1. Confirm that the cluster was originally created using the `nhinstall` tool.

For information, see *Netra High Availability Suite Foundation Services 2.1 6/03 Cluster Administration Guide*.

2. Log in to the master node as superuser.

3. Verify that there is a Solaris environment for diskless nodes.

The Solaris environment for diskless nodes exists if there is a directory called `/export/os`, where `os` is `Solaris_8` or `Solaris_9`.

If the Solaris environment does not exist for diskless nodes, install it as described in [Chapter 7](#).

4. Verify that the Foundation Services are running:

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

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

5. Confirm that the `cluster_definition.conf`, `env_installation.conf`, and `addon.conf` files are present on the installation server, and that they conform to the original installation.

6. On the installation server, edit the `cluster_definition.conf` file to define the node that you want to add.

For example, on a cluster containing two master eligible nodes, `NODE=10` and `NODE=20`, add a diskless node, `NODE=30`.

```
NODE=10    08:00:20:f9:c5:54    - node10
NODE=20    08:00:20:f9:a8:12    - node20
NODE=30    -                      - node30
```

To add more than one node, define all the nodes that you want to add.

If you add a new node or nodes to your cluster, make sure that you are not going to create an unsupported cluster configuration. For information about supported cluster configurations, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

Ensure that the node ID is unique and does not already exist in the `cluster_nodes_table` file on the master node.

When you have a running cluster, do not edit any other parameters in the `cluster_definition.conf` file. For information, see the `cluster_definition.conf(4)` man page.

7. Remove the temporary installation files on the installation server before you add a new node to the cluster:

```
# nhinstall -r config-file-directory reset
```

8. On the installation server, add the new node:

```
# nhinstall -r config-file-directory add nodeid30 [ nodeid40 ...]
```

where `nodeid30` is the node ID of the first new diskless node that you want to add.

To add more than one node, specify the node ID of each new node [`nodeid40 nodeid50 ...`].

For more information about the `nhinstall add` command, see the `nhinstall(1M)` man page.

Note – Do not add more nodes to the `cluster_definition.conf` file than you are going to add to the cluster with the `nhinstall add` command.

9. Connect the Ethernet interfaces (`NIC0` and `NIC1`) of the new node to the switches.

10. Access the console of the new node and get the ok prompt:

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

11. On the console of the new node, configure the OBP parameters:

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

12. Boot the new node:

```
ok> boot
```

13. Become superuser.

14. Verify that the node is configured correctly:

```
# nhadm check
```

Manually Adding a Diskless Node

If your cluster was originally created using the `ninstall` tool, you can add a diskless node using manual installation procedures.

To add a diskless node to a cluster manually, see [Chapter 7](#). When you complete the procedure, your cluster configuration should be identical to that of a cluster created using the `ninstall` tool.

Adding a Diskless or a Dataless Node to a Cluster Originally Created Manually

This chapter describes how to add a diskless or dataless node to a cluster that was originally created manually.

Adding a Diskless or Dataless Node

1. **Verify that the hardware of the new node is supported.**
For information, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.
2. **Verify that after adding the node, your cluster configuration will be supported.**
For information, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware 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 Foundation Services 2.1 6/03 README*.
5. **Verify that the master node and vice-master node are running the Foundation Services.**
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 Foundation Services are running:**

```
# /opt/SUNWcgha/sbin/nhcommstat -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 7](#).
- To add a dataless node, use the procedure in [Chapter 8](#).

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

For information, see “Examining the Cluster Networking Configuration” in *Netra High Availability Suite Foundation Services 2.1 6/03 Cluster Administration Guide*.

Upgrading a Cluster

If you have a cluster running Foundation Services 2.1, you might want to upgrade to the new version, Foundation Services 2.1 6/03.

You can upgrade to the new version by manually installing the new and changed packages.

The upgrade procedure described in the following chapters is a *cold upgrade* because it involves taking the cluster offline. This procedure is manual and is independent of the installation method you used to install Foundation Services 2.1 on the cluster.

To upgrade the cluster, see the following chapters:

- [Chapter 11](#) describes how to prepare the installation server and the cluster nodes for an upgrade.
- [Chapter 12](#) describes how to upgrade the master-eligible nodes.
- [Chapter 13](#) describes how to upgrade the diskless nodes.
- [Chapter 14](#) describes how to upgrade the dataless nodes.

Preparing to Upgrade the Cluster

To successfully upgrade the cluster, the procedures described in this part of the book assumes the following:

- You have a cluster that is running the Foundation Services 2.1.
- You do not change the hardware configuration.
- You do not change the software configuration, that is, the version of the Solaris operating system, the volume management configuration, or the boot policy.
- You do not change the cluster addressing model of the cluster.

If these assumptions can be fulfilled, see the following sections to start upgrading your cluster:

- [“Preparing the Installation Server” on page 136](#)
- [“Checking the Cluster” on page 137](#)
- [“Stopping the Cluster” on page 141](#)

Note – If these assumptions cannot be fulfilled, reinstall the cluster. For instructions, see one of the following:

- To reinstall using the `nhinstall` tool, see [Part II](#)
 - To reinstall manually, see [Part III](#)
-

Preparing the Installation Server

▼ To Prepare the Installation Server

1. Log in to your installation server as superuser.

2. Check that the installation server is connected to the cluster network.

For more information, see [“To Connect the Installation Server to the Cluster Network”](#) on page 58.

3. 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:

```
# /usr/etc/inid.d/nfs.server start
```

4. Add the following line to the `/etc/dfs/dfstab` file to share the directory containing the software distributions for the Foundation Services 2.1 6/03 release and the Solaris operating system:

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

- `software-distribution-dir` is the directory that contains the Foundation Services 2.1 6/03 packages.
- `Solaris-distribution-dir` is the directory that contains the Solaris distribution.

5. Share the directories defined in the `/etc/dfs/dfstab` file:

```
# shareall
```

6. Log in to a master-eligible node as superuser.

7. Create the mount point directory, `NetraHASuite`, on the master-eligible node:

```
# mkdir /NetraHASuite
```

8. Mount the software distribution directory on the installation server:

```
# mount -F nfs \  
installation-server-IP-address:/software-distribution-dir/NetraHAS2.1 \  
/NetraHASuite
```

- *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 Foundation Services 2.1 6/03 packages.

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

10. Repeat [Step 7](#) and [Step 8](#).

Checking the Cluster

To check the cluster, you need to make a list of the Foundation Services 2.1 patches and packages installed on your cluster.

▼ To Check the Master Node and the Vice-Master Node

1. Log in to the master node as superuser.

2. List the packages and patches installed on the master node by using the `nhadm` tool:

```
# /opt/SUNWcgha/sbin/nhadm check  
OS and Software checking  
  
64-bit kernel mode          OK  
OS release                  OK  
  
Local packages  
  
Package SUNWnhtp9          OK  
Package SUNWnhtu9          OK  
Package SUNWnhadm          OK  
Package SUNWnhcdt          OK  
Package SUNWnhcmd          OK  
Package SUNWnhcma          OK  
Package SUNWnhcmb          OK  
Package SUNWscmr           OK  
Package SUNWscmu           OK
```

```

Package SUNWspsvr                                OK
Package SUNWspsvu                                OK
Package SUNWrdcr                                  OK
Package SUNWrdcu                                  OK
Package SUNWnhfsa                                OK
Package SUNWnhfsb                                OK
Package SUNWnhpma                                OK
Package SUNWnhpmb                                OK
Package SUNWnhpmn                                OK
Package SUNWnhpms                                OK
--> WARNING: package SUNWnhnsa not installed
--> WARNING: package SUNWnhnsb not installed
Package SUNWj3rt                                  OK
Package SUNWnhmas                                OK
Package SUNWjsnmp                                OK
Package SUNWnhrrb                                OK
Package SUNWnhrrs                                OK
Package SUNWnhsms                                OK

Shared packages (on /SUNWcgha/swdb)

Package SUNWjdrdt                                OK
Package SUNWnhmaj                                OK
Package SUNWnhmal                                OK
Package SUNWnhmad                                OK

Patches

Can take a long time ...

Patch 112233-03                                   OK
Patch 112902-06                                   OK
Patch 112904-01                                   OK
Patch 112917-01                                   OK
Patch 112918-01                                   OK
Patch 112919-01                                   OK
INST_RELEASE file for shared packages            OK

```

3. **Make a copy of this list of packages and patches because you reinstall only the packages and patches already installed on the node.**

The previous list might be slightly different from the actual output for your node.

4. **Check for the Watchdog packages:**

```
# pkginfo SUNWnhwdt SUNWlomu SUNWlomr
```

5. **Repeat Step 1 through Step 4 on the vice-master node.**

▼ To Check the Diskless Nodes

If you have diskless nodes in your cluster, check the packages and patches installed.

1. **Log in to a diskless node as superuser.**

2. List the packages installed in the root directory of the diskless node:

```
# /opt/SUNWcgha/sbin/nhadm check installation
OS and Software checking

    64-bit kernel mode                                OK
    OS release                                         OK

Local packages

    Package SUNWnhtp9                                  OK
    Package SUNWnhtu9                                  OK
    Package SUNWnhadm                                  OK
    Package SUNWnhcdt                                  OK
    Package SUNWnhcmd                                  OK
    Package SUNWnhcma                                  OK
    Package SUNWnhcmb                                  OK
    Package SUNWnhpma                                  OK
    Package SUNWnhpmb                                  OK
    Package SUNWnhpmn                                  OK
    Package SUNWnhpms                                  OK
    Package SUNWnhmas                                  OK
    Package SUNWnhsms                                  OK

Shared packages (on /SUNWcgha/swdb)

    Package SUNWjdrft                                  OK
    Package SUNWnhmaj                                  OK
    Package SUNWnhmal                                  OK
    Package SUNWnhmad                                  OK

Patches

Can take a long time ...

    Patch 112233-03                                    OK
    Patch 112902-06                                    OK
    Patch 112904-01                                    OK
    INST_RELEASE file for shared packages              OK
```

3. Make a copy of this list of packages and patches because you reinstall only the packages and updated version of patches already installed on the node.

The previous list might be slightly different from the actual output for your node.

4. Check for the Watchdog packages:

```
# pkginfo SUNWnhwdt SUNWlomu SUNWlomr
```

5. Check the patches installed in the /usr directory of the diskless nodes.

Some patches for the diskless nodes are installed in the /usr directory, which is mounted from the master node.

- a. For a list of these patches, log in to the master node as superuser.
- b. Get the list of patches.

```
# patchadd -p -s target-OS
Patch: 112233-01 Obsoletes: 112737-03 113150-03 113156-01 113158-01 \
113159-01 113163-01 Requires:Incompatibles: Packages: SUNWcsu SUNWcsxu
Patch: 112902-06 Obsoletes: 112653-04 Requires: 112233-01 \
Incompatibles: Packages: SUNWcarx SUNWcsr
Patch: 112917-01 Obsoletes: 112702-02 Requires: \
Incompatibles: Packages: SUNWcsu SUNWcsxu
Patch: 112918-01 Obsoletes: 112703-02 Requires: \
Incompatibles: Packages: SUNWcsu
Patch: 112919-01 Obsoletes: 112704-02 Requires: \
Incompatibles: Packages: SUNWcsu
where target-OS is Solaris_8 or Solaris_9.
```

▼ To Check the Dataless Nodes

Perform this procedure if you have dataless nodes in your cluster.

1. Log in to a dataless node as superuser.
2. List the packages and patches installed on the dataless node:

```
# /opt/SUNWcgha/sbin/nhadm check installation
OS and Software checking

64-bit kernel mode          OK
OS release                  OK

Local packages

Package SUNWnhttp9         OK
Package SUNWnhtu9          OK
Package SUNWnhadm          OK
Package SUNWnhcdt          OK
Package SUNWnhcmd          OK
Package SUNWnhcma          OK
Package SUNWnhcmb          OK
Package SUNWnhpma          OK
Package SUNWnhpmb          OK
Package SUNWnhpmm          OK
Package SUNWnhpms          OK
Package SUNWnhmas          OK
Package SUNWnhsms          OK

Shared packages (on /SUNWcgha/swdb)

Package SUNWjdrct          OK
Package SUNWnhmaj          OK
Package SUNWnhmal          OK
Package SUNWnhmad          OK

Patches
```

Can take a long time ...

```
Patch 112233-03          OK
Patch 112902-06          OK
Patch 112904-01          OK
Patch 112917-01          OK
Patch 112918-01          OK
Patch 112919-01          OK
INST_RELEASE file for shared packages  OK
```

3. **Make a copy of this list of packages and patches because you reinstall only the packages and updated version of patches already installed on the node.**

The previous list might be slightly different from the actual output for your node.

4. **Check for the Watchdog packages:**

```
# pkginfo SUNWnhwdt SUNWlomu SUNWlomr
```

5. **Repeat Step 1 through Step 4 on each dataless node.**

Stopping the Cluster

To upgrade the cluster, you stop the cluster on each node and then shut down each node in the cluster. When you reboot these nodes to install the Foundation Services 2.1 6/03 software, they will run only the Solaris operating system and not the Foundation Services.

▼ To Stop the Cluster

1. **As superuser, log in to a diskless node or dataless node in the cluster.**

2. **Create the `/etc/opt/SUNWcgaha/not_configured` file on the node.**

- For the dataless node, create the `not_configured` as follows:

```
# touch /etc/opt/SUNWcgaha/not_configured
```

- For the diskless node, log in to the master node and create the `not_configured` file as follows:

```
# touch /export/root/diskless-node-name/etc/opt/SUNWcgaha/not_configured
```

3. **Reboot the node.**

```
# init 6
```

The node boots and starts up without starting the Foundation Services.

4. Repeat **Step 1** through **Step 3** on each diskless or dataless node in the cluster.
5. Log in to the vice-master node as superuser.
6. Repeat **Step 2** and **Step 3** on the vice-master node.
7. Log in to the master node as superuser.
8. Repeat **Step 2** and **Step 3** on the master node.

Upgrading the Master-Eligible Nodes

To upgrade the master-eligible nodes, remove the Foundation Services 2.1 packages and then install the patches and packages required for the Foundation Services 2.1 6/03 release, as described in the following sections:

- “Upgrading the Patches” on page 143
- “Upgrading the Packages” on page 144
- “Updating the Configuration Files” on page 145
- “Booting the Master-Eligible Nodes” on page 146

Upgrading the Patches

Install the patches required for Foundation Services 2.1 6/03.

▼ To Upgrade the Patches

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

2. **Install the new patches.**

To know which versions of these patches to install, see the *Netra High Availability Suite Foundation Services 2.1 6/03 README*.

- If you are running Solaris 8, install this patch:

```
# patchadd -M /NetraHASuite/Patches/ 108727
```

- If you are running Solaris 9, install these patches:

```
# patchadd -M /NetraHASuite/Patches/ 112233
```

```
# patchadd -M /NetraHASuite/Patches/ 113318
```

3. **Repeat Step 1 through Step 2 on the other master-eligible node.**

Upgrading the Packages

To upgrade the packages, you remove the Foundation Services 2.1 packages and install the new Foundation Services 2.1 6/03 packages.

▼ To Upgrade the Packages

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

2. Remove all the local Foundation Services 2.1 packages.

Use the list generated by the `nhadm` tool in [“To Check the Master Node and the Vice-Master Node” on page 137](#). For example:

```
# pkgrm SUNWnhtp9 SUNWnhtu9 SUNWnhadm SUNWnhcdt SUNWnhcmd \  
SUNWnhcma SUNWnhcmb SUNWscmr SUNWscmu SUNWspsvr SUNWspsvu \  
SUNWrdr cr SUNWrdr cu SUNWnhf sa SUNWnhf sb SUNWnhp ma SUNWnhp mb SUNWnhp mn \  
SUNWnhp ms SUNWjdr t SUNWnhm as SUNWj snmp SUNWnh rbb \  
SUNWnh rbs SUNWnh s ms SUNWnh wd t
```

3. Remove the shared Foundation Services 2.1 packages.

Use the list generated by the `nhadm` tool in [“To Check the Master Node and the Vice-Master Node” on page 137](#).

```
# pkgrm -R /SUNWcgha/local/export/services SUNWjdr t SUNWnhmaj \  
SUNWnhmal SUNWnhmad
```

4. Install the new and updated local packages delivered with Foundation Services 2.1 6/03, for example:

```
# pkgadd -d /NetraHASuite/Packages SUNWnhtp9 SUNWnhtu9 SUNWnhadm \  
SUNWnhhb SUNWnhcdt SUNWnhcmd SUNWnhcma SUNWnhcmb SUNWscmr SUNWscmu \  
SUNWspsvr SUNWspsvu SUNWrdr cr SUNWrdr cu SUNWnhf sa SUNWnhf sb SUNWnhp ma \  
SUNWnhp mb SUNWnhp mn SUNWnhp ms SUNWnhp mm SUNWjdr t SUNWnhm as \  
SUNWj snmp SUNWnh rbb SUNWnh rbs SUNWnh s ms SUNWnh wd t
```

These new packages are installed:

- `SUNWnhpmm` includes the Daemon Monitor driver files
- `SUNWnhhb` includes the Probe heartbeat module

5. Reinstall the shared packages delivered with Foundation Services 2.1 6/03:

```
# pkgadd -d /NetraHASuite/Packages/ \  
-M -R /SUNWcgha/local/export/services \  
-a none SUNWjdr t SUNWnhmaj SUNWnhmal SUNWnhmad
```

6. Install the new SDR patches:

```
# patchadd -M /NetraHASuite/Patches/ 113054-04 113055-01 113057-03
```

7. Repeat **Step 1** through **Step 6** on the other master-eligible node.

Updating the Configuration Files

Update the configuration files on each master-eligible node.

▼ To Update the Configuration Files

1. Log in to a master-eligible node as superuser.
2. Update the `/etc/opt/SUNWcgha/nhfs.conf` file.
 - The following parameters are new:
 - Mandatory new parameters:
`Cluster.Master.ID`
`WATCHDOG.NhasWatchdog` if using the Watchdog Timer
 - Optional new parameters:
`Cluster.Direct-Link.Backend`
`Cluster.Direct-Link.Heartbeat`
`Node.Direct-Link.serial.Device`
`Node.Direct-Link.serial.Speed`
`WATCHDOG.ShutDownTimeout` if using the Watchdog Timer
`WATCHDOG.OsTimeout` if using the Watchdog Timer
`WATCHDOG.PattingIntvl` if using the Watchdog Timer
 - The following parameters are replaced by `Cluster.Master.ID`:
`Cluster.Master.DynamicAddress.NIC0`
`Cluster.Master.DynamicAddress.NIC1`
`Cluster.Master.DynamicAddress.CGTP`

For information about configuring these new parameters, see the `nhfs.conf(4)` man page.
3. Create a `/etc/hostname.cgtp0` file.

In this file, type the cluster network name of the master-eligible node on the `cgtp0` interface, for example, `netraMEN1-cgtp`.
4. If you are using the Watchdog Timer, delete the `/etc/opt/SUNWcgha/nhwdt.conf` file.

5. Repeat [Step 1](#) through [Step 4](#) on the other master-eligible node.

Booting the Master-Eligible Nodes

After you have reinstalled the Foundation Services packages and patches and have updated the configuration files on each master-eligible node, boot the nodes.

▼ To Boot the Master-Eligible Nodes

Delete the `/etc/opt/SUNWcgha/not_configured` file on each master-eligible node and boot the nodes. When the nodes complete booting, Foundation Services 2.1 6/03 is up and running.

1. **Log in to a master-eligible node as superuser.**
2. **Delete the `/etc/opt/SUNWcgha/not_configured` file on the node.**
3. **Verify that the node is functioning correctly:**

```
# /opt/SUNWcgha/sbin/nhadm check starting
```

If all checks pass the validation, the installation of Foundation Services 2.1 6/03 was successful. For more information, see the `nhadm(1M)` man page.

4. **Boot the master-eligible node:**

```
# init 6
```

This node becomes the master node.

5. **Repeat [Step 1](#) through [Step 4](#) on the other master-eligible node.**

This node becomes the vice-master node.

If you do not have diskless nodes or dataless nodes in your cluster, the upgrade is complete at this point.

If you have diskless nodes, see [Chapter 13](#). If you have dataless nodes, see [Chapter 14](#).

Upgrading the Diskless Nodes

To upgrade the diskless nodes, remove the Foundation Services 2.1 packages and then install the patches and packages required for the Foundation Services 2.1 6/03 release, as described in the following sections:

- “Upgrading the Patches” on page 147
- “Upgrading the Packages” on page 148
- “Updating the Configuration Files” on page 149
- “Booting the Diskless Nodes” on page 151

The updates for the diskless nodes are made on the master node. Because these files are stored on a disk partition that is replicated, the updates will be available on the vice-master node when the master node and the vice-master node synchronize disks.

Upgrading the Patches

Install the patches required for Foundation Services 2.1 6/03.

▼ To Upgrade the Patches

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

- If you are running Solaris 8, go to [Step 3](#).
- If you are running Solaris 9, install the following patches.

To know which versions of these patches to install, see the *Netra High Availability Suite Foundation Services 2.1 6/03 README*.

- a. **For the patches to be installed in the `/usr` directory of the diskless node, you must install the patches as follows on the master node.**

```
# patchadd -R /export/Solaris_9 /NetraHASuite/Patches/112233
# patchadd -R /export/Solaris_9 /NetraHASuite/Patches/113318
```

- b. For the patches to be installed in the root directory of the diskless node, install the patches as follows on the master node for each diskless node.

```
# patchadd -R /export/root/diskless-node-name \
/NetraHASuite/Patches/112233
# patchadd -R /export/root/diskless-node-name \
/NetraHASuite/Patches/113318
```

3. If you are running Solaris 8, install the following patch.

- a. For the patch to be installed in the /usr directory of the diskless node, install the patch as follows on the master node.

```
# patchadd -R /export/Solaris_8 /NetraHASuite/Patches/108727
```

- b. For the patch to be installed in the root directory of the diskless node, install the patch on the master node for each diskless node.

```
# patchadd -R /export/root/diskless-node-name \
/NetraHASuite/Patches/108727
```

Upgrading the Packages

To upgrade the packages, you remove the Foundation Services 2.1 packages and then install the new Foundation Services 2.1 6/03 packages.

▼ To Upgrade the Packages

1. Log in to the master node as superuser.
2. Remove the local Foundation Services 2.1 packages installed for the diskless nodes.

Use the list generated by the nhadm tool in [“To Check the Diskless Nodes”](#) on page 138. For example:

```
# pkgrm -R /export/root/diskless-node-name -d /NetraHASuite/Packages \
SUNWnhadm SUNWnhdp9 SUNWnhdu9 SUNWnhcdt SUNWnhcmd SUNWnhcma \
SUNWnhcmb SUNWnhpma SUNWnhpmb SUNWnhpms SUNWnhpms SUNWnhwdt SUNWnhmas
```

Note – Repeat this step for each diskless node.

3. Install the new and updated packages delivered with Foundation Services 2.1 6/03.

```
# pkgadd -R /export/root/diskless-node-name -d /NetraHASuite/Packages \  
SUNWnhadm SUNWnhtp9 SUNWnhtu9 SUNWnhhb SUNWnhcdt SUNWnhcmd SUNWnhcma \  
SUNWnhcmb SUNWnhpma SUNWnhpmb SUNWnhpmm SUNWnhpms SUNWnhwdt SUNWnhmas
```

These new packages are installed:

- SUNWnhpmm includes the Daemon Monitor driver files
- SUNWnhhb includes the Probe heartbeat module

Updating the Configuration Files

Update the Foundation Services configuration files and the DHCP configuration files for each diskless node.

▼ To Update the Foundation Services Configuration Files

1. Log in to the master node as superuser.
2. Edit the `/export/root/diskless-node-name/etc/opt/SUNWcgha/nhfs.conf` file.

The following parameters are new:

- Mandatory new parameters:
`WATCHDOG.NhasWatchdog` if using the Watchdog Timer
- Optional new parameters:
`WATCHDOG.ShutDownTimeout` if using the Watchdog Timer
`WATCHDOG.OsTimeout` if using the Watchdog Timer
`WATCHDOG.PattingIntvl` if using the Watchdog Timer

For information about configuring these new parameters, see the `nhfs.conf(4)` man page.

3. Create a `/export/root/diskless-node-name/etc/hostname.cgtp0` file.
In this file, type the cluster network name of the master-eligible node on the `cgtp0` interface, for example, `netraDISKLESS1-cgtp`.
4. Delete the `/export/root/diskless-node-name/etc/opt/SUNWcgha/nhwdt.conf` file.

▼ To Update the DHCP Configuration Files

For Foundation Services 2.1 6/03, update the DHCP configuration files with a new macro, `NhCgtpAddr`. In addition, update the `SUNWnhrbs1_dhcptab` file with the new macro for each network interface of each diskless node. To check the DHCP files, see the `/etc/inet/dhcpsvc.conf` file on the master node for the path to these DHCP files.

1. Log in to the master node as superuser.
2. Modify the DHCP configuration file, `SUNWnhrbs1_dhcptab`, to add the new macro:

```
# dhtadm -A -s NhCgtpAddr -d 'Site,128,IP,1,1'
```
3. Update the DHCP configuration file, `SUNWnhrbs1_dhcptab`, for each diskless node.

a. For the `NIC0` interface, run the following command:

```
# dhtadm -A -m macro-name -d \  
' :NhCgtpAddr=local-cgtp-addr:Include=Common:\  
BootFile=inetboot.sun4u.os:\  
SrootPTH=root-path-name:\  
SswapPTH=swap-path-name:Include=subnet:'
```

- `macro-name` is the IP address of the diskless node.
- `local-cgtp-addr` is the IP address of the `cgtp0` interface of the diskless node.
- `os` is the operating system. This parameter can have the value `Solaris_8` or `Solaris_9` for Solaris 8 or Solaris 9, respectively.
- `/export/root/diskless-node-name` is the path to the root directory for the diskless node.
- `/export/swap/diskless-node-name` is the path to the swap directory for the diskless node.
- `subnet` is the IP address of the `NIC0` interface.

For the diskless node, `netraDISKLESS1`, with the `NIC0` IP address `10.250.1.30` on a Solaris 9 cluster, run the `dhtadm` command as follows:

```
# dhtadm -A -m 10.250.1.30 -d \  
' :NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\  
SrootPTH=/export/root/netraDISKLESS1:\  
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.1.0:'
```

b. For the `NIC1` interface, run the following command:

```
# dhtadm -A -m macro-name -d \  
' :NhCgtpAddr=local-cgtp-addr:Include=Common:\  
BootFile=inetboot.sun4u.os:\  
SrootPTH=root-path-name:\  
SswapPTH=swap-path-name:Include=subnet:'
```

- `macro-name` is the IP address of the diskless node.

- *local-cgtp-addr* is the IP address of the *cgtp0* interface of the diskless node.
- *os* is the operating system. This parameter can have the value *Solaris_8* or *Solaris_9* for Solaris 8 or Solaris 9, respectively.
- */export/root/diskless-node-name* is the path to the root directory for the diskless node.
- */export/swap/diskless-node-name* is the path to the swap directory for the diskless node.
- *subnet* is the IP address of the *NIC1* interface.

For the diskless node, *netraDISKLESS1*, with the *NIC1* IP address *10.250.2.30* on a Solaris 9 cluster, run the *dhtadm* command as follows:

```
# dhtadm -A -m 10.250.2.30 -d \  
' :NhCgtpAddr=10.250.3.30:Include=Common:BootFile=inetboot.sun4u.Solaris_9:\  
SrootPTH=/export/root/netraDISKLESS1:\  
SswapPTH=/export/swap/netraDISKLESS1:Include=10.250.2.0:'
```

4. **Reload the DHCP table, *SUNWnhrbs1_dhcptab*, on the master node and the vice-master node:**

```
# pkill -HUP in.dhcpd
```

Booting the Diskless Nodes

After you have reinstalled the Foundation Services packages and patches and have updated the configuration files for each diskless node, boot the nodes.

▼ To Boot the Diskless Nodes

Delete the */etc/opt/SUNWcgha/not_configured* file for each diskless node and boot the node. When the node completes booting, Foundation Services 2.1 6/03 is up and running.

1. **Log in to the master node as superuser.**
2. **Delete the *not_configured* file for each diskless node.**

```
# rm /export/root/diskless-node-name/etc/opt/SUNWcgha/not_configured
```

3. **Log in to the diskless node as superuser.**
4. **Reboot the diskless node:**

```
# init 6
```

5. Repeat [Step 3](#) through [Step 4](#) for each diskless node.

Upgrading the Dataless Nodes

To upgrade the dataless nodes, remove the Foundation Services 2.1 packages and then install the patches and packages required for the Foundation Services 2.1 6/03 release, as described in the following sections:

- “Upgrading the Patches” on page 153
- “Upgrading the Packages” on page 154
- “Updating the Configuration Files” on page 155
- “Booting the Dataless Nodes” on page 155

Upgrading the Patches

Install the patches required for Foundation Services 2.1 6/03.

▼ To Upgrade the Patches

1. **Log in to a dataless node as superuser.**

2. **Install the following new patches.**

To know which versions of these patches to install, see the *Netra High Availability Suite Foundation Services 2.1 6/03 README*.

- If you are running Solaris 8, install the following patch:

```
# patchadd -M /NetraHASuite/Patches/ 108727
```

- If you are running Solaris 9, install the following patches:

```
# patchadd -M /NetraHASuite/Patches/ 112233
```

```
# patchadd -M /NetraHASuite/Patches/ 113318
```

3. **Repeat Step 1 through Step 2 on each dataless node.**

Upgrading the Packages

To upgrade the packages, you remove the Foundation Services 2.1 packages and then install the new Foundation Services 2.1 6/03 packages.

▼ To Upgrade the Packages

1. Log in to a dataless node as superuser.

2. Remove all the local Foundation Services 2.1 packages.

Use the list generated by the `nhadm` tool in [“To Check the Dataless Nodes”](#) on page 140. For example:

```
# pkgrm SUNWnhtp9 SUNWnhtu9 SUNWnhadm SUNWnhcdt SUNWnhcmd SUNWnhcma \
SUNWnhcmb SUNWnhpma SUNWnhpmb SUNWnhpmm SUNWnhpms SUNWnhmas SUNWnhsms \
SUNWnhwdt
```

3. Remove all the shared Foundation Services 2.1.

Use the list generated by the `nhadm` tool in [“To Check the Dataless Nodes”](#) on page 140. For example:

```
# pkgrm -R /SUNWcgha/local/export/services SUNWjdrt SUNWnhmaj \
SUNWnhmal SUNWnhmad
```

4. Install the new and updated local packages, for example:

```
# pkgadd -d /NetraHASuite/Packages SUNWnhtp9 SUNWnhtu9 SUNWnhadm SUNWnhhb \
SUNWnhcdt SUNWnhcmd SUNWnhcma SUNWnhcmb SUNWnhpma SUNWnhpmb \
SUNWnhpmm SUNWnhpms SUNWnhpmm SUNWnhmas SUNWnhsms SUNWnhwdt
```

These new packages are installed:

- `SUNWnhpmm` includes the Daemon Monitor driver files
- `SUNWnhhb` includes the Probe heartbeat module

5. Reinstall the shared packages delivered with Foundation Services 2.1 6/03:

```
# pkgadd -d /NetraHASuite/Packages/ \
-M -R /SUNWcgha/local/export/services \
-a none SUNWjdrt SUNWnhmaj SUNWnhmal SUNWnhmad
```

6. Repeat [Step 1](#) through [Step 5](#) on each dataless node.

Updating the Configuration Files

Update the configuration files on each dataless node.

▼ To Update the Configuration Files

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

2. **Update the `/etc/opt/SUNWcgha/nhfs.conf` file.**

The following parameters are new:

■ **Mandatory new parameters:**

`WATCHDOG.NhasWatchdog` if using the Watchdog Timer

■ **Optional new parameters:**

`WATCHDOG.ShutDownTimeout` if using the Watchdog Timer

`WATCHDOG.OsTimeout` if using the Watchdog Timer

`WATCHDOG.PattingIntvl` if using the Watchdog Timer

For information about configuring these new parameters, see the `nhfs.conf(4)` man page.

3. **Create a `/etc/hostname.cgtp0` file.**

In this file, type the cluster network name of the dataless node on the `cgtp0` interface, for example, `netraMEN1-cgtp`.

4. **If you are using the Watchdog Timer, delete the `/etc/opt/SUNWcgha/nhwdt.conf` file.**

5. **Repeat [Step 1](#) through [Step 4](#) on each dataless node in the cluster.**

Booting the Dataless Nodes

After you have reinstalled the Foundation Services packages and patches and have updated the configuration files on each dataless node, boot the nodes.

▼ To Boot the Dataless Nodes

Delete the `/etc/opt/SUNWcgha/not_configured` file on each dataless node and boot the nodes. When the nodes complete booting, Foundation Services 2.1 6/03 is up and running.

1. **Log in to a dataless node as superuser.**
2. **Delete the `/etc/opt/SUNWcgha/not_configured` file.**
3. **Verify that the node is functioning correctly:**
 - `# /opt/SUNWcgha/sbin/nhadm check starting`
 - If all checks pass the validation, the installation of Foundation Services 2.1 6/03 was successful. For more information, see the `nhadm(1M)` man page.
4. **Boot the dataless node:**
 - `# init 6`
5. **Repeat [Step 1](#) through [Step 4](#) on each dataless node.**

Installation Directory Structure

The directories that contain the Foundation Services are created on the master-eligible nodes. Most of the Foundation Services software is installed in the `/opt/SUNWcgha` and `/etc/opt/SUNWcgha` directories. However, device drivers in the Foundation Services 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>ninstall</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</code> <code>\$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.

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

Directory	Description
<code>/SUNWcgha/remote/lib/locale/ \$NLS_LANG/LC_MESSAGES/</code>	Message catalogs shared across multiple diskless nodes, for example, from middleware applications.
<code>/SUNWcgha/services</code>	Packages shared by the master-eligible nodes.
<code>/SUNWcgha/swdb</code>	Shared package repository.
<code>/var/opt/SUNWcgha</code>	Standard log files.
<code>/var/run/SUNWcgha</code>	Temporary files that are deleted when the node reboots.
<code>/var/tmp</code>	Temporary files that are not deleted when the node reboots.

Installing and Accessing the Documentation

The documentation for the Foundation Services is provided as a set of portable document format (PDF) and hypertext markup language (HTML) files. The Foundation Services daemons, configuration files, and API are also described in a collection of man pages. You can install the documentation on the installation server or another system running the Solaris operating system. The `nhinstall` tool installs the man pages on the master-eligible nodes.

To install and access the documentation, see the following sections:

- [“Installing the Documentation Packages” on page 159](#)
- [“Accessing the Documentation” on page 160](#)
- [“Accessing the Man Pages” on page 161](#)

Installing the Documentation Packages

The following table shows the documentation packages that are included in the software distribution.

Package Name	Description
SUNWnhpdf	Documentation in PDF format
SUNWnhhtm	Documentation in HTML format
SUNWnhman	Man pages

▼ To Install the Documentation Packages

1. As superuser, log in to the installation server or another system running the Solaris operating system.
2. Install the documentation packages:

```
# pkgadd -d /software-distribution-dir/NetraHAS2.1/Packages/ SUNWnhpdf
# pkgadd -d /software-distribution-dir/NetraHAS2.1/Packages/ SUNWnhhtm
# pkgadd -d /software-distribution-dir/NetraHAS2.1/Packages/ SUNWnhman
```

Where *software-distribution-dir* is the directory that contains the Foundation Services packages.

Accessing the Documentation

The Foundation Services documentation is installed in the `/opt/SUNWcgha/` directory. The documentation can be accessed by using a web browser to view the `/opt/SUNWcgha/doc/html/index.html` page.

The PDF version of the documentation is installed in the `/opt/SUNWcgha/doc/pdf` directory. Access the books in PDF by using the Adobe[®] Acrobat Reader.

The HTML version of the books is installed in the `/opt/SUNWcgha/doc/html` directory. Access the documentation in HTML by using a web browser.

The following books are installed in the `/opt/SUNWcgha/doc/html` and `/opt/SUNWcgha/doc/pdf` directories respectively.

Book Title	HTML Entry Point	PDF File
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Overview</i>	NHASFSVIEW/toc.html	NHASFSVIEW.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Glossary</i>	NHASKLOSS/toc.html	NHASKLOSS.pdf
<i>What's New in Netra High Availability Suite Foundation Services 2.1 6/03</i>	NHASKWNEW/toc.html	NHASKWNEW.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Quick Start Guide</i>	NHASKFSQS/toc.html	NHASKFSQS.pdf

Book Title	HTML Entry Point	PDF File
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide</i>	NHASFSHW/toc.html	NHASFSHW.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide</i>	NHASFSINST/toc.html	NHASFSINST.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Cluster Administration Guide</i>	NHASFSADMIN/toc.html	NHASFSADMIN.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Troubleshooting Guide</i>	NHASFSTG/toc.html	NHASFSTG.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 CMM Programming Guide</i>	NHASFSAPROG/toc.html	NHASFSAPROG.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 NMA Programming Guide</i>	NHASFSNMAPROG/toc.html	NHASFSNMAPROG.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Standalone CGTP Guide</i>	NHASCOTP/toc.html	NHASCOTP.pdf
<i>Netra High Availability Suite Foundation Services 2.1 6/03 Reference Manual</i>	NHASFSREFMAN/a.html	NHASFSREFMAN.pdf

The *Netra High Availability Suite Foundation Services 2.1 6/03 README* and the *Netra High Availability Suite Foundation Services 2.1 6/03 Release Notes* are delivered as HTML files. These files are available when you download and extract the Foundation Services software distribution.

Accessing the Man Pages

The man pages are installed in the `/opt/SUNWcgha/man` directory.

▼ To Access the Man Pages

1. To access the man pages from the command line, add this directory to your **MANPATH** environment variable:

```
$ export MANPATH=${MANPATH}:/opt/SUNWcgha/man
```

2. (Optional) To permanently add the Foundation Services man pages to your **MANPATH** environment variable, add the `/opt/SUNWcgha/man` directory to your `.cshrc` or `.login` file.

▼ To Access Man Pages on the Master-Eligible Nodes

The software package containing the online man pages is automatically installed on the master-eligible nodes when you install by using the `nhinstall` tool.

To access the man pages on the master-eligible nodes, you configure the **MANPATH** on each master-eligible node. Include the Solaris operating system man pages and the Foundation Services man pages.

1. As superuser, log in to a master-eligible node.

2. Check the **MANPATH** environment variable:

```
# echo $MANPATH  
  
#
```

3. Set the **MANPATH** to include the Solaris man pages:

```
# export MANPATH=/usr/man
```

4. Set the **MANPATH** to include the Foundation Services man pages:

```
# export MANPATH=${MANPATH}:/opt/SUNWcgha/man
```

5. Check the **MANPATH** environment variable:

```
# echo $MANPATH  
/usr/man:/opt/SUNWcgha/man  
#
```

6. Repeat [Step 1](#) through [Step 5](#) on the other master-eligible node.

You can now view the man pages on the master-eligible nodes by using the `man` command. For more information, see the `man(1M)` man page.

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