



Netra™ High Availability Suite 3.0 1/08 Foundation Services Installation Guide

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Preface

The *Netra High Availability Suite 3.0 1/08 Foundation Services Installation Guide* provides a quick and efficient way to install and evaluate the Netra™ High Availability (HA) Suite 3.0 product. This book provides instructions for installing the Solaris™ Operating System (Solaris OS), Wind River Carrier Grade Linux (CGL), or MontaVista Linux Carrier Grade Edition (CGE) and the Foundation Services on a basic cluster.

This book does not describe all of the installation and configuration options available with the Foundation Services. This restriction enables you to have a basic Foundation Services cluster up and running in a short time so that you can evaluate the product.

Who Should Use This Book

To install Netra HA Suite software, you must be familiar with the process of installing the Solaris Operating System.

Before You Read This Book

Read the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide* for guidance in choosing your software setup, and the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview* for an overview of the product.

How This Book Is Organized

Chapter 1 provides an overview of the tasks involved in installing the Foundation Services with the `nhinstall` tool. It also provides instructions for installing, configuring, and connecting a cluster running the Netra HA Suite software, the installation server, and the development server (optional). Instructions address the hardware and software for each of these systems. In addition, a detailed example describes how to create and install a four-node cluster using virtualization and Logical Domain technology.

Chapter 2 describes how to prepare the installation environment by creating the OS distribution to be installed on the cluster. It also describes how to install and configure the `nhinstall` tool.

Chapter 3 describes how to launch the `nhinstall` tool, verify the installation, and how to troubleshoot and restart the tool.

Chapter 4 describes some administration tasks to determine whether the cluster is functioning correctly and to further evaluate the product.

Using UNIX Commands

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

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

`http://docs.sun.com`

Shell Prompts

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

Typographic Conventions

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

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

Related Documentation

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

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

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

Documentation, Support, and Training

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

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

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Please include the title and part number of your document with your feedback:

Netra™ High Availability Suite 3.0 1/08 Foundation Services Installation Guide, part number 819-5242-13.

Installing, Configuring, and Connecting the Cluster to the Installation and Development Servers

After you have chosen your cluster configuration (including hardware and software) and your installation server (hardware and software), as described in the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*, install and configure the hardware for both.

Once you have installed and configured the hardware, install and configure the software on your installation server. Then, connect the installation server to the cluster through a private or a public network. After completing these tasks, you are ready to install the software on the cluster (including the operating system and the Netra™ HA Suite software) using the installation method of your choice.

For detailed instructions on performing the preceding tasks, see the following sections:

- [“Overview of Installing With the `nhinstall` Tool” on page 2](#)
- [“Installing and Configuring the Cluster Hardware and Network Topology” on page 3](#)
- [“Installing and Configuring the Installation Server Hardware and Software” on page 9](#)
- [“Connecting the Cluster and the Installation Server” on page 10](#)
- [“Installing the OS and the Netra HA Suite Software on the Cluster” on page 13](#)
- [“Installing Netra HA Suite Software on LDomS” on page 13](#)
- [“Installing LDomS 1.0” on page 14](#)
- [“Installing a Development Host” on page 22](#)

Note – Wherever possible, URLs are provided to relevant online documentation. Where no URL is provided, see the documentation that is provided with the hardware.

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 [“Connecting the Cluster and the Installation Server” on page 10](#).

The `nhinstall` tool, running on the installation server, installs the Solaris Operating System (Solaris OS), Wind River Carrier Grade Linux (CGL), or MontaVista Linux Carrier Grade Edition (CGE) and the Foundation Services on the cluster nodes. For a description of the types of nodes in a cluster, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

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

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

Task	For Instructions
1. Install the cluster and installation server hardware.	“Installing and Configuring the Cluster Hardware and Network Topology” on page 3 and “Installing and Configuring the Installation Server Hardware and Software” on page 9
2. Connect the cluster to the installation server.	“Connecting the Cluster and the Installation Server” on page 10
3. Install an OS on the installation server.	“Installing and Configuring the Installation Server Hardware and Software” on page 9
4. Choose the OS distribution you want to install on the cluster.	<i>Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide</i>
5. Prepare the installation environment on the installation server.	“Preparing the Installation Environment on a Solaris OS Installation Server” on page 23 or “Preparing the Installation Environment on a Linux SLES9 Installation Server” on page 29 depending on the OS you have installed on the installation server.

TABLE 1-1 Tasks for Installing the Software by Using the `nhinstall` Tool (Continued)

Task	For Instructions
6. Install the <code>nhinstall</code> tool on the installation server.	“Installing the <code>nhinstall</code> Tool” on page 33
7. Configure the <code>nhinstall</code> tool.	“Configuring the <code>nhinstall</code> Tool” on page 35. Note that <code>env_installation.conf</code> and <code>cluster_definition.conf</code> are the only required configuration files. See examples of configurations that can be used for evaluation purposes in the versions of these files that are included in the <i>Netra High Availability Suite 3.0 1/08 Foundation Services Reference Manual</i> .
8. Install the software using the <code>nhinstall</code> tool.	Chapter 3
9. Verify that the cluster is configured correctly.	“Verifying the Installation” on page 61

Installing and Configuring the Cluster Hardware and Network Topology

The following sections describe how to install and configure the cluster hardware and network topology.

Installing and Configuring Rackmounted Servers

To install rackmounted server hardware, see the documentation that is provided with the hardware or go to the following web site for more information:

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

When using rackmounted server hardware as the master-eligible or master-ineligible nodes of your cluster, you must connect them to a terminal server and Ethernet switches.

Installing and Configuring the Terminal Server

A *terminal server* is a console access device that connects the console ports of several nodes to a TCP/IP network. This enables you to access the console of a node from a workstation that is connected to the TCP/IP network, which is connected to the terminal server.

Note – Terminal servers are also called remote terminal servers (RTS), system console servers, or access servers.

For the Foundation Services, each cluster must have one terminal server. You can use any terminal server with your cluster. You can share a terminal server across clusters, where the number of nodes you can have per terminal server depends on the server model. Install your terminal server using the documentation that is provided with your terminal server.

Netra HA Suite software has been tested on clusters that use terminal servers such as the Cisco 2511 Access Server, the Annex, and the PERL CS9000. The examples in this section are for the Cisco 2511 Access Server. The documentation for this terminal server is located at:

http://cisco.com/univercd/cc/td/doc/product/access/acs_fix/cis2500/

▼ To Configure the Cisco 2511 Access Server

1. **Turn on the power for the Cisco 2511 Access Server, and connect to it by using a terminal console window.**

Startup information is displayed in the console window.

```
14336K/2048K bytes of memory.
Processor board ID 21448610, with hardware
revision 00000000
Bridging software.
X.25 software, Version 2.0, NET2, BFE and
GOSIP compliant.
1 Ethernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
16 terminal line(s)
32K bytes of non-volatile configuration
memory.
8192K bytes of processor board System flash
(Read ONLY)
...
```

```
Default settings are in square brackets '[']'.  
Would you like to enter the initial  
configuration dialog? [yes]:
```

- 2. When asked if you want to enter the initial configuration dialog, type No.**

```
Would you like to enter the initial configuration dialog? [yes]: No
```

- 3. Enter the configuration mode to modify the configuration on the terminal server:**

```
router> enable
```

When you are in the configuration mode, the prompt changes to `router#`.

- 4. Display the running-config configuration file for the terminal server:**

```
router# show running-config
```

The configuration file is displayed.

- 5. Copy and paste the entire configuration file into a text editor.**

- 6. In the text editor, customize the configuration file for your network.**

Change the parameters that are marked in italics in the following example:

```
!  
version 11.2  
no service password-encryption  
no service udp-small-server  
no service tcp-small-servers  
!  
hostname machine-hostname  
!  
enable password access-password  
!  
no ip routing  
ip domain-name IP-domain-name  
ip name-server IP-name-server  
!  
interface Ethernet0  
ip address IP-address 255.255.255.0  
no shutdown  
!  
interface Serial0  
no ip address  
no ip route-cache
```

```
shutdown
!
ip default-gateway IP-default-gateway
ip classless
ip route 0.0.0.0 0.0.0.0 IP-default-gateway
snmp-server community public R0
snmp-server trap-authentication
snmp-server location snmp-server-location
snmp-server contact contact-email-address
!
line con 0
  transport preferred none
line 1 16
  no exec
  exec-timeout 0 0
  transport preferred none
  transport input all
  stopbits 1
line aux 0
line vty 0 4
  no login
!
```

7. Enable the configuration file to be modified from the console window:

```
router# config terminal
```

8. Copy and paste the modified configuration file into the console window.

9. Exit the configuration mode:

```
router(config)# end
```

10. Verify that the configuration file has been modified:

```
router# show running-config
```

Verify that the output contains the configuration information that you specified in [Step 6](#).

11. Save the configuration as the startup configuration file:

```
router# copy running-config startup-config
```

12. Press Return to confirm and to save the changes to the configuration.

The terminal server, the Cisco 2511 Access Server, is now configured to be used by your cluster. You can access a console window to the terminal server on a port using telnet as follows:

```
% telnet terminal-concentrator-hostname 20port-number
```

Installing and Configuring Ethernet Switches

A Foundation Services cluster must have a redundant network: that is, two network interfaces that back each other up. To make a network redundant, a cluster requires two Ethernet switches. Netra HA Suite software has been validated on Cisco Catalyst 29x0 Desktop switches.

If you use other switches, check that the switches support the following:

- Simple Network Management Protocol (SNMP)
- Management information base (MIB) RFC 1213 and RFC 1493
- Ability to disable Spanning Tree Protocol

The documentation for Cisco Catalyst 29x0 Desktop Switches is located at:

<http://www.cisco.com/univercd/cc/td/doc/product/lan/cat2900/>

▼ To Assign IP Addresses to Cisco 29x0 Ethernet Switches

If IP addresses are not assigned manually to the Cisco 29x0 switches, the Dynamic Host Configuration Protocol (DHCP) attempts to assign IP addresses, which might result in errors.

1. Connect to the console of the switch.

2. Type the following series of commands on the console window:

```
switch1>enable
switch1#config term
Enter configuration commands, one per line. End with CNTL/Z.
switch1(config)#ip address IP-address 255.255.255.0
switch1(config)#interface VLAN1
switch1(config-if)#hostname switch-hostnameswitch1(config)#end
switch1#copy run start
Destination filename [startup-config]?
```

Where:

switch-hostname is the host name that you assign to the switch

IP-address is the IP address that you associate with the host name. This address should be an IP address on your company's network.

- 3. Press Return to confirm these commands and that the configuration file is startup-config.**
- 4. Repeat [Step 1](#) through [Step 3](#) for the other switch to assign the second IP address.**

▼ **To Disable the Spanning Tree Protocol for Cisco 29x0 Ethernet Switches**

The Spanning Tree Protocol (STP) ensures that a loop occurs when you have redundant paths in your network. There should be no loops between the redundant networks in the Foundation Services cluster network because such networks are completely separate. There should be no crossover link between the two redundant switches. Therefore, you must disable the STP.

To disable the STP, see the documentation that is supplied with your Ethernet switch. The STP should also be disabled for any additional virtual local area networks (VLANs) used in your cluster. An example of the commands that you can use is as follows:

- 1. Connect to the console of the switch.**
- 2. Type the following series of commands on the console window of the switch:**

```
switch1>enable
switch1#config term
Enter configuration commands, one per line. End with CNTL/Z.
switch1(config)#no spanning-tree vlan 1
```



```
switch1(config)#end  
switch1#copy run start  
Destination filename [startup-config]?
```

3. **Press Return to confirm that the STP has been disabled and that the configuration file is startup-config.**
4. **Repeat [Step 1](#) through [Step 3](#) for the other switch to disable the STP.**

Installing and Configuring ATCA Blade Servers

To install ATCA blade server hardware (either a Sun Netra CT 900 chassis or a chassis from a third-party provider), see the documentation that is provided with the hardware or go to the following web site for more information:

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

To install ATCA blades (Netra CP3010, Netra CP3020, or Netra CP3060) in your chassis, see the documentation provided with the blade or go to the site referenced above.

When using ATCA blade servers, you can access the consoles of each blade through either direct serial links to each blade or through the shelf manager blades delivered with the chassis. In the prior case, you need to connect the serial links to a terminal server (see [“Installing and Configuring the Terminal Server” on page 4](#)). In the latter case, there is no need for a terminal server because you can access the consoles of the blades from a PC or workstation connected through Ethernet to the shelf managers.

Regarding switches, there is no need for external switches to be installed. However, blades must be connected to the fabrics (switches) provided with the chassis (either base or extended fabrics).

For information about configuring ATCA switches, refer to the documentation that is delivered with the ATCA blade server hardware.

Installing and Configuring the Installation Server Hardware and Software

To install and configure the installation server hardware, see the documentation that is provided with the hardware or go to the following web site for more information:

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

After installing and configuring the installation server hardware, install either the Solaris OS or a Linux distribution. It is not required that you install the same version of the Solaris OS on the installation server as you are going to install on your cluster. However, if you choose to install a Linux distribution on the installation server, you must also install the Linux OS on your cluster.

At the time of this release, the only Linux distribution that you can install on your installation server is a SuSe 9 distribution. Installing the Solaris OS on your installation server (at least Solaris 8 2/02, Solaris 9, or 10) enables you to install either the Solaris OS or a Linux distribution on your cluster.

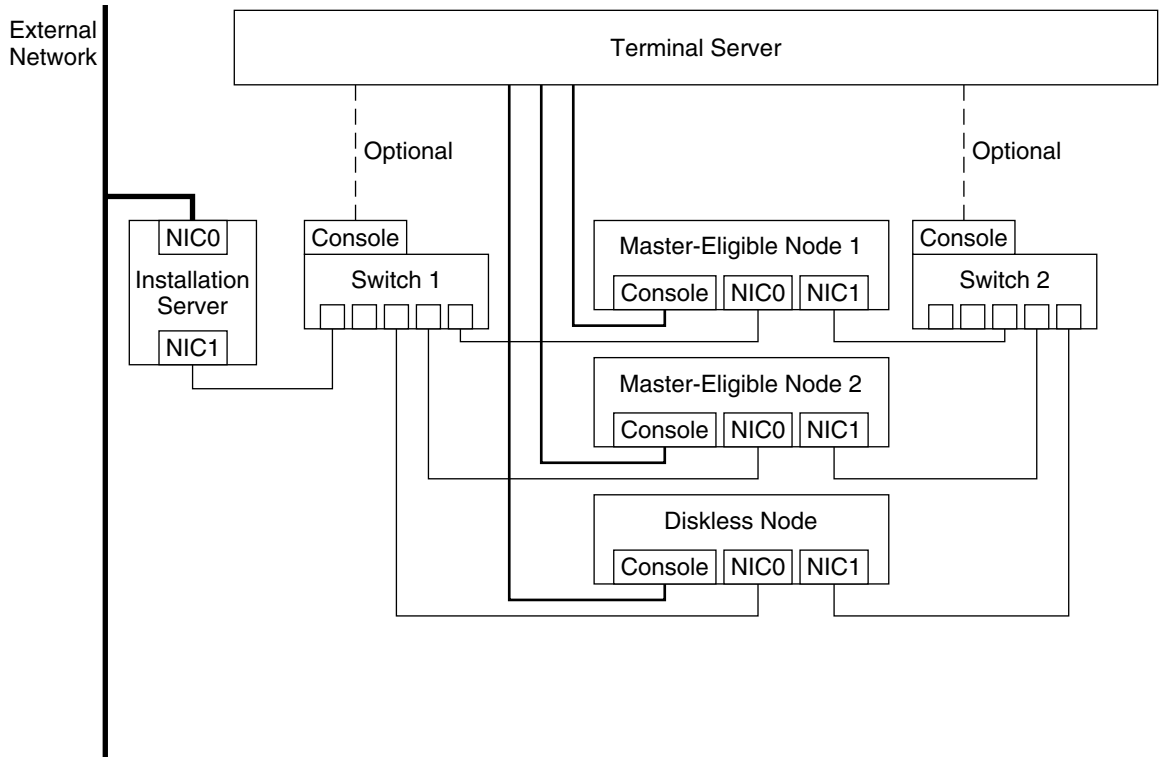
For the final step involved in preparing the installation server (installing the software on the cluster), you must copy the Solaris or Linux packages, as well as the Netra HA Suite packages, that you want to install on your cluster.

Connecting the Cluster and the Installation Server

The nodes of your cluster are connected to each other through switches. You can connect the console of each node to the terminal server to provide access to the console of the node. To install the software on the cluster, connect the installation server to the cluster network through a switch. For more information, see [“To Connect the Installation Server to the Cluster Network”](#) on page 12.

The following figure provides an example for connecting the cluster hardware and the installation hardware.

FIGURE 1-1 Example of Connecting the Hardware for Installation and Development



NIC0 = Interface to the first network card.

NIC1 = Interface to the second network card.

In addition, you can directly connect the serial ports of the master-eligible nodes. 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. The direct link between the master-eligible nodes must then be configured as described in the *Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS*.

The cluster nodes must not be on the same physical wire as the nodes of another cluster. When a diskless node boots, it sends a broadcast message to find the master node. If two clusters share the same wire, the diskless node could receive messages from the wrong master node.

▼ 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.
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.

Installing the OS and the Netra HA Suite Software on the Cluster

When the cluster hardware and installation server (hardware and OS) have been installed, configured, and connected, you are ready to install the OS and the Netra HA Suite software on the cluster. Use the installation method of your choice to install the software.

If you use the `nhinstall` tool to install the OS and Netra HA Suite software, follow the instructions in this document to install the software. If you decide, instead, to install the software manually, refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS* for this information. If you want to install a NHAS cluster on a HW supporting virtualization and the logical domain (LDoms) technology, see [“Installing Netra HA Suite Software on LDoms” on page 13](#).

Installing Netra HA Suite Software on LDoms

The LDoms installation process involves checking and updating firmware, checking operating system revisions, and installing the Logical Domains Manager and associated packages. Refer to the *Logical Domains (LDoms) Administration Guide* for general information about installing, configuring, and using LDoms. You can find LDoms documentation here:

`http://docs.sun.com/app/docs/prod/ldoms.mgr`

This section describes how to create a four-node cluster using only two Netra CP3060 blades or two Netra T2000 servers with logical domains. Most of the steps shown here require superuser access to the Solaris Operating System.

Example Installation

In this example, each of the two Netra CP3060 blades or Netra T2000 servers are configured to run the following three logical domains:

- Control/service domain
- Guest domain for a master-eligible node

■ Guest domain for a non master-eligible node

With this configuration, you can create a four-node cluster using only two physical machines. The cluster will be configured for running CGTP. The following example shows how network interfaces and disk drives are configured for each domain.

CODE EXAMPLE 1-1 LDom Configuration for a Four-Node Netra HA Suite Cluster

	System 1	System 2
	-----	-----
control domain	primary	primary
	e1000g0: 10.130.1.10	10.130.1.20
	e1000g1: 10.130.2.10	10.130.2.20
guest domain 1	men15	men25
	vnet0: 10.130.1.15	10.130.1.25
	vnet1: 10.130.2.15	10.130.2.25
	vdisk1: c0d0s2	c0d0s2
guest domain 2	nmen35	nmen45
	vnet0: 10.130.1.35	10.130.1.45
	vnet1: 10.130.2.35	10.130.2.45
	vdisk1: c0d0s2	c0d0s2

Installing LDom 1.0

Installing LDom in an environment that is running the Netra HA Suite software involves the following tasks:

- Downloading the required software
- Installing the Solaris OS
- Installing the LDom 1.0 software
- Configuring the control domain and creating guest domains
- Installing the Netra HA Suite software
- (optional) Automating node boot

Note – The example installation presented in this section assumes that two Netra CP3060 ATCA blades or two Netra T2000 servers with at least a six-core UltraSPARC® T1 processor and 6 Gbytes RAM each are used.

▼ To Download the Software

Note – Refer to the LDomS release notes for information about required patches.

1. **Download the LDomS software from the Sun Software Download Center from the following website:** <http://www.sun.com/download>
2. **Download the Solaris 10 11/06 OS SPARC or newer from the following website:** <http://www.sun.com/software/solaris>
3. **Download the following Solaris patches from SunSolveSM at:**
<http://sunsolve.sun.com>
4. **Download the SunTM system firmware version 6.4.4 or newer from SunSolve at:**
<http://sunsolve.sun.com>

▼ To Install the Solaris OS

- **Install the Solaris 10 11/06 OS as usual on two systems.**

To enable CGTP, the systems must be configured to use two network interfaces. On the first system, use 10.130.1.10 as the IP-address on the e1000g0 interface, and 10.130.2.10 as the IP-address on the e1000g1 interface.

For the second system, use IP-address 10.130.1.20 and 10.130.2.20 for network interface e1000g0 and e1000g1, respectively.

Refer to the *Solaris Installation Guide* for details on how to install the Solaris OS.

▼ To Install the LDomS Software

Note – Refer to the LDomS release notes for information about required patches.

1. Copy the LDom software package to the machine where it will be installed and unpack the software.

On the Netra HA Suite installation server, copy the software as follows:

```
# rcp LDoms_Manager-1_0-RR.zip 10.130.1.10:/var/tmp/  
# rcp 118833-36.zip 10.130.1.10:/var/tmp/  
# rcp 125043-01.zip 10.130.1.10:/var/tmp/  
# rcp 124921-02.zip 10.130.1.10:/var/tmp/
```

On the console of the systems that will run LDom (for example, on 10.130.1.10 and 10.130.1.20), unzip the software as follows:

```
# cd /var/tmp  
# unzip LDoms_Manager-1_0-RR.zip  
# unzip 118833-36.zip  
# unzip 125043-01.zip  
# unzip 124921-02.zip
```

2. Patch the Solaris to include the latest Logical Domains updates.

- Login on the console and apply the patches in single-user mode as follows:

```
# init S  
# cd /var/tmp/  
# patchadd 118833-36  
# touch /reconfigure  
# shutdown -i6 -g0 -y
```

- Install patches for virtual console and LDom drivers and utilities when the system has rebooted:

```
# cd /var/tmp/  
# patchadd 125043-01  
# patchadd 124921-02
```


3. Ensure that the system firmware version on your system is up to date. LDoms 1.0 software requires system firmware 6.4.4 or newer for Netra CP3060 blades or Netra T2000 servers.

To check which firmware is present on your system, connect to the system controller (ALOM) on your Netra CP3060 or Netra T2000 server and run the following command:

```
sc> showhost
System Firmware 6.4.4 Netra CP3060 2007/04/20 10:15
Host flash versions:
Hypervisor 1.4.1 2007/04/02 16:37
OBP 4.26.1 2007/04/02 16:25
Netra[TM] CP3060 POST 4.26.0 2007/03/26 16:47
sc>
```

The instructions, binary files, and tools needed to perform a firmware upgrade are located in the patch package, as shown in the following code example.

```
# rcp 126402-01.zip 10.130.1.10:/var/tmp
# cd /var/tmp
# unzip 126402-01.zip
# more /var/tmp/126402-01/sysfwdownload.README
```

4. Install the LDoms Manager software.

```
# cd /var/tmp/LDoms_Manager-1_0-RR
# ./Install/install-ldm
```

When prompted, select the recommended settings for the Solaris Security Toolkit.

5. Reboot the system to activate the patches and to start the LDoms Manager software.

```
# shutdown -i6 -g0 -y
```

After the reboot, LDoms will be active with one logical domain named 'primary' running on the system. This domain is the control domain.

The control domain can be accessed through the serial console, or by using Secure Shell. All other ports have been disabled by the Solaris™ Security Toolkit to ensure that the control domain is as secure as possible.

▼ To Configure the Control Domain and Create Guest Domains

1. **Log in on the control domain and set the path to access the LDom Manager command line tool:**

```
# ssh 10.130.1.10
# export PATH=/opt/SUNWldm/bin:$PATH
```

2. **Set up virtual services in control domain.**

These services provide console, disk, and network access for the guest domains.

- a. **For the virtual disk server:**

```
# ldm add-vdiskserver primary-vds0 primary
```

- b. **For the virtual console server:**

```
# ldm add-vconscon port-range=5000-5100 primary-vcc0 primary
```

- c. **Configure two virtual network switches to enable CGTP:**

```
# ldm add-vswitch net-dev=e1000g0 primary-vsw0 primary
# ldm add-vswitch net-dev=e1000g1 primary-vsw1 primary
```

- d. **Set the resources available to the control domain to limit the resources used by the control domain so that they are free to be used by the guest domains.**

```
# ldm set-mau 2 primary
# ldm set-vcpu 8 primary
# ldm set-memory 2G primary
```

- e. **Save the LDom configuration:**

```
# ldm add-config nhas
```

- f. **Reboot the system:**

```
# shutdown -i6 -g0 -y
```

- g. **After rebooting the system, start up the virtual console service:**

```
# svcadm enable vntsd
```

3. Create a guest domain named `men15`. This domain will be a master-eligible node in the Netra HA Suite cluster.

```
# ldm create men15
# ldm set-mau 2 men15
# ldm set-vcpu 8 men15
# ldm set-memory 2G men15
# ldm ldm add-vnet vnet0 primary-vsw0 men15
# ldm add-vnet vnet1 primary-vsw1 men15
```

4. Create the disk image that will be used as the virtual disk for the master-eligible node.

The virtual disk is mapped to normal file in the control domain.

```
# mkfile 16G /test1/bootdisk_men15.img
# ldm add-vdiskserverdevice /test1/bootdisk_men15.img
  vol1@primary-vds0
# ldm add-vdisk vdisk1 vol1@primary-vds0 men15
# ldm set-variable auto-boot\?=false men15
# ldm bind-domain men15
```

5. Create a guest domain named `nmen35`. This domain will be a non-master eligible node.

```
# ldm create nmen35
# ldm set-mau 2 nmen35
# ldm set-vcpu 8 nmen35
# ldm set-memory 2G nmen35
# ldm add-vnet vnet0 primary-vsw0 nmen35
# ldm add-vnet vnet1 primary-vsw1 nmen35
# ldm set-variable auto-boot\?=false nmen35
# ldm bind-domain nmen35
```

6. Create the virtual disk for the node.

Note that this non-master eligible node will be a dataless node. To create a diskless node instead of a dataless node, do not perform the following tasks:

```
# mkfile 4G /test1/bootdisk_nmen35.img
# ldm add-vdiskserverdevice /test1/bootdisk_nmen35.img vol2@primary-vds0
# ldm add-vdisk vdisk1 vol2@primary-vds0 nmen35
```

7. Start the guest domains:

```
# ldm start men15
# ldm start nmen35
```

The virtual console of the guest domains are only accessible through the control domain.

8. Use the following commands to access the consoles of the guest domains from outside the control domain:

```
men15:  ssh 10.130.1.10 telnet localhost 5000
nmen35: ssh 10.130.1.10 telnet localhost 5001
```

The nodes should now be at the ok-prompt in Open Boot PROM.

9. Repeat [Step 2](#) and [Step 3](#) to set up the second Netra CP3060 or Netra T2000 system so a four-node cluster is ready to install Netra HA Suite.

▼ To Install the Netra HA Suite Software

Using the `nhinstall` tool, install Netra HA Suite as described in this guide, using the IP-addresses and names listed in [CODE EXAMPLE 1-1](#), with the following changes:

1. In `cluster_definition.conf`, use `vnet0` and `vnet1` as network interfaces for all nodes. Use the `ldm ls-bindings` command in the control domain to get the MAC addresses for `vnet0` and `vnet1` in each domain:

```
MEN_INTERFACES=vnet0 vnet1
NMEN_INTERFACES=vnet0 vnet1
```

2. Use `c0d0s0`, `c0d0s1`, and the like as disk slice names:

SLICE=c0d0s0	3072	/	-	logging	MEN, DATALESS
SLICE=c0d0s3	128	unnamed	-	-	MEN
SLICE=c0d0s4	128	unnamed	-	-	MEN
SLICE=c0d0s5	2048	/SUNWcggha/local	c0d0s3	logging	MEN
SLICE=c0d0s6	8192	/export	c0d0s4	logging	MEN
SLICE=c0d0s1	free	swap	-	-	MEN, DATALESS

3. Add the patches required by LDomS to `addon.conf`:

```
SMOSSERVICEPATCH=118833-36 <path to patch directory> - I USR_SPECIFIC Y Y Y
```

```
PATCH_WITH_PKGADDPATCH=118833-36 <path to patch directory> - S LOCAL N Y N
PATCH=125043-01 <path to patch directory> - I LOCAL Y Y Y SMOSSERVICE
PATCH=T124921-02 <path to patch directory> - I LOCAL Y N Y SMOSSERVICE
```

4. Use the following command to jump-start the nodes instead of using the more commonly used `boot net - install` command:

```
ok boot /virtual-devices@100/channel-devices@200/network@0 - install
```

5. Use the following command to boot the diskless nodes after the master-eligible nodes are installed:

```
ok ldm set-variable boot-device=\
"/virtual-devices@100/channel-devices@200/network@0:dhcp,,,,,5 \
/virtual-devices@100/channel-devices@200/network@1:dhcp,,,,,5" nmen35
ok boot
```

▼ To Automate Node Boot

1. In the control domain, update the OpenBoot™ PROM variables to make the nodes boot automatically.

For diskless nodes, type the following:

```
# ldm set-variable \
boot-device=/virtual-devices@100/channel-devices@200/disk@0 men15
# ldm set-variable auto-boot\?=true men15
```

For dataless nodes, type the following:

```
# ldm set-variable \
boot-device=/virtual-devices@100/channel-devices@200/disk@0 nmen35
# ldm set-variable auto-boot\?=true nmen35
```

2. Repeat the preceding step for `men25` and `nmen45`.

Installing a Development Host

Installing a development host is not required, however, if you choose to do so, you can use the installation server, or you can install a server that is separate from the installation server. Refer to the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide* for information about choosing hardware and for development host software requirements.

After choosing the hardware to use for a development host, install it as described in the documentation that accompanied the product you selected.

Installing Software on a Development Host

After you have installed a development host, install software on it as described in the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started Guide*.

Connecting the Development Host

After you have installed the software on the development host, connect it as described in [“Connecting the Cluster and the Installation Server”](#) on page 10.

Installing and Configuring the `nhinstall` Tool

The `nhinstall` tool enables you to install and configure software and services on the nodes of a cluster, whatever type and number of nodes there are. You install and configure the `nhinstall` tool on the installation server.

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

- [“Preparing the Installation Environment on a Solaris OS Installation Server” on page 23](#)
- [“Preparing the Installation Environment on a Linux SLES9 Installation Server” on page 29](#)
- [“Installing the `nhinstall` Tool” on page 33](#)
- [“Configuring the `nhinstall` Tool” on page 35](#)

Preparing the Installation Environment on a Solaris OS Installation Server

Before installing the `nhinstall` tool on an installation server running the Solaris OS, you must prepare the selected OS and the Netra HA Suite software for future installation the cluster nodes. This involves creating a Solaris, Wind River CGL, or MontaVista CGE distribution on the installation server.

▼ To Create a Solaris Distribution on the Installation Server

To install the Solaris Operating System on the cluster nodes, create a Solaris distribution on the installation server. 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 1.8 Gbytes of free disk space for the Solaris 9 OS and 3 Gbytes of free disk space for the Solaris 10 OS 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 9 or 10 depending on the Solaris version you want to install.

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

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

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

- *Solaris 9 Installation Guide* and the `setup_install_server(1M)` man page
- *Solaris 10 Release and Installation Collection* and the `setup_install_server(1M)` man page

▼ To Create a MontaVista Distribution on the Installation Server

To install the MontaVista Linux CGE on the cluster, get two CD-ROM images from MontaVista for the Netra HA Suite and install them on the installation server.

1. Get the Linux Support Package (LSP) CD-ROM image:

```
lsp-x86-pc_target-x86_amd64--xxxxxxx.iso
```

This package contains preconfigured kernel binaries, kernel modules, kernel headers, and kernel sources for the Netra™ CP3020 hardware.

2. Get the Target Distribution Package (TDP) CD-ROM image:

```
target-x86_amd64-tdp-xxxxxxx.iso
```

This package contains the file system with prebuilt applications and the MontaVista installer.

3. Make sure that you have at least 600 Mbytes of free disk space on the installation server.

4. Log in as superuser on the installation server.

5. Mount the target TDP CD-ROM images:

```
# /usr/sbin/lofiadm -a path_to_cdrom_image/target-x86_amd64-tdp-xxxxxxx.iso
```

The command will return a device, such as `/dev/lofi/1` for example.

6. Mount the device returned in the preceding step:

```
# /usr/sbin/mount -F hsfs /dev/lofi/1 path_you_chose_to_mount_the_target_TDP
```

7. Copy the mounted directory to a directory that can be exported through NFS:

```
TDP># /usr/bin/cp path_to_the_mounted_target_TDP path_for_copying_the_target
```

8. Mount the LSP CD-ROM images:

```
xxxxxxx.iso# /usr/sbin/lofiadm -a path_to_cdrom_image/lsp-x86-pc_target-x86_amd64-
```

The command will return a device, such as `/dev/lofi/2` for example

9. Mount the device returned in the preceding step:

```
# /usr/sbin/mount -F hsfs /dev/lofi/2 path_you_chose_to_mount_the_LSP
```

10. Copy the mounted directory to a directory that can be exported through NFS:

```
# /usr/bin/cp path_to_the_mounted_LSP path_for_copying_the_LSP
```

11. Modify the MontaVista LSP to use the Netra HA Suite LSP package.

The Netra HA Suite provides a MontaVista package named `lsp-x86-pc_target-x86_amd64-2.6.10_mvlcge401-1.2.1.xxxxxxx.x86_amd64.mvl`, which contains Linux kernel modules, as well as a MontaVista Linux kernel patch to include the Netra HA Suite Carrier Grade Transport Protocol (CGTP), a reliable IP transport mechanism based on transparent multirouting using redundant routes.

For Netra HA Suite, you must use this package instead of the original MontaVista LSP package by copying it into the LSP distribution as follows.

a. Install the Netra HA Suite kernel package:

```
# /usr/bin/rpm2cpio NHAS-software-distribution-dir/Product/NetraHASuite_3.0/  
FoundationServices/mvlcge40/x86_amd64/Packages/sun-nhas-kernel-source-3.0-  
6.x86_amd64.rpm | /usr/bin/cpio -id
```

where *NHAS-software-distribution-dir* is the directory that contains the Netra HA Suite distribution.

b. Copy the Netra HA Suite LSP in your MontaVista target distribution to replace the original LSP:

```
# cp ./usr/src/sun/nhas/LSP/target/lsp-x86-pc_target-x86_amd64-2.6.10_  
mvlcge401-1.2.1.xxxxxxx.x86_amd64.mvl path_where_you_copied_the_LSP  
/x86_amd64/lsp/x86-pc_target-x86_amd64/target/
```

▼ To Create a Wind River CGL Distribution on a Solaris Installation Server

To create a Wind River CGL distribution on the installation server, follow these steps:

1. Ensure that the installation server has at least 73 Mbytes of free disk space.
2. Log in as superuser on the installation server.

3. Create a directory for the Wind River CGL distribution:

```
# mkdir Wind-River-distribution-dir
```

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

4. Install the Netra HA Suite kernel package:

```
# /usr/bin/rpm2cpio NHAS-software-distribution-  
dir/Product/NetraHASuite_3.0/FoundationServices/wr11_4/i686/Packag  
es/sun-nhas-kernel-source-3.0-*.i686.rpm | /usr/bin/cpio -id
```

where *NHAS-software-distribution-dir* is the directory that contains the Netra HA Suite distribution.

Note – The command shown in the preceding example should appear on one line, but wraps in the printed text due to page size limitations.

The following files, will be installed under
./usr/src/sun/nhas/distribution:

- sun_netra_cp3020-linux-modules-WR1.4aq_cgl-nhas.tar.bz2 contains the kernel modules.
- System.map-netra_cp3020 contains the symbol table.
- bzImage-netra_cp3020 is used to boot the Sun Netra CP3020 hosts.

5. Copy these files to the *Wind-River-distribution-dir* directory you created in [Step 3](#) for the Wind River CGL distribution:

```
# cp ./usr/src/sun/nhas/distribution/sun_netra_cp3020-linux-modules-  
WR1.4aq_cgl-nhas.tar.bz2 Wind-River-distribution-dir  
# cp ./usr/src/sun/nhas/distribution/System.map-netra_cp3020 Wind-River-distribution-  
dir  
# cp ./usr/src/sun/nhas/distribution/bzImage-netra_cp3020 Wind-River-distribution-dir
```

6. To the *Wind-River-distribution-dir* directory, copy a compressed tar of the root file system of Wind River Linux CGL 1.4 for Sun Netra CP3020 nodes.

This file is provided by Wind River with the Wind River Platform For Network Equipment Linux Edition 1.4 BSP for Sun CP3020. For more information, refer to http://windriver.com/products/bsp_web/bsp_vendor.html?vendor=Sun

```
# cp sun_netra_cp3020-dist.tar.bz2 Wind-River-distribution-dir
```

7. To the *Wind-River-distribution-dir* directory, copy a lilo boot loader rpm, as required by the Netra High Availability Suite installer. For example, you can use `lilo-22.7-19.x86_64.rpm`, or any other lilo version. You can download this lilo rpm file from <http://rpmfind.net/>

```
# cp lilo-22.7-19.x86_64.rpm Wind-River-distribution-dir
```

Note – There is no constraint on the lilo version you use.

▼ To Prepare the Installation Server Running the Solaris OS

Before you begin the installation process, make sure that the installation server is configured as described in [Chapter 1](#).

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

3. 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
4. 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.

5. 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
netmasks: files nis
```

6. **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.

Preparing the Installation Environment on a Linux SLES9 Installation Server

Before installing the `nhinstall` tool on the installation server running the Linux SLES9 OS, you must install a MontaVista CGE or Wind River CGL distribution on the installation server. You must also prepare the installation server to install the OS and Netra HA Suite software on the cluster nodes.

▼ To Create a MontaVista Distribution on the Installation Server

To install the MontaVista Linux CGE on the cluster, get two CD-ROM images from MontaVista for the Netra HA Suite and install them on the installation server.

1. **Get the following Linux Support Package (LSP) CD-ROM image:**

```
lsp-x86-pc_target-x86_amd64--xxxxxxx.iso
```

This package contains preconfigured kernel binaries, kernel modules, kernel headers, and kernel sources for the Netra™ CP3020 hardware.

2. **Get the following Target Distribution Package (TDP) CD-ROM image:**

```
target-x86_amd64-tdp-xxxxxxx.iso
```

This package contains the file system with prebuilt applications and the MontaVista installer.

3. **Make sure that you have at least 600 Mbytes of free disk space on the installation server.**
4. **Log in as superuser on the installation server.**

5. Mount the target TDP CD-ROM images:

```
# /bin/mount -oro -o loop -t iso9660 path_to_cdrom_image/target-x86_amd64-xxxxxxx.iso path_you_chose_to_mount_the_target_TDP
```

6. Copy the mounted directory to a directory that can be exported through NFS:

```
# /bin/cp path_to_the_mounted_target_TDP path_for_copying_the_target_TDP
```

7. Mount the LSP CD-ROM images:

```
xxxxxxx.iso# /bin/mount -oro -o loop -t iso9660 path_to_cdrom_image/lsps-x86-pc_target-x86_amd64- path_you_chose_to_mount_the_LSP
```

8. Copy the mounted directory to a directory that can be exported through NFS:

```
# /bin/cp path_to_the_mounted_LSP path_for_copying_the_LSP
```

9. Modify the MontaVista LSP to use the Netra HA Suite LSP package.

The Netra HA Suite provides a MontaVista package named `lsp-x86-pc_target-x86_amd64-2.6.10_mvlcge401-1.2.1.xxxxxxx.x86_amd64.mvl`, which contains Linux kernel modules, as well as a MontaVista Linux kernel patch to include the Netra HA Suite CGTP, a reliable IP transport mechanism based on transparent multirouting using redundant routes.

For Netra HA Suite, you must use this package instead of the original MontaVista LSP package by copying it into the LSP distribution as follows.

a. Install the Netra HA Suite kernel package:

```
# rpm -i NHAS-software-distribution-dir/Product/NetraHASuite_3.0/FoundationServices/mvlcge40/x86_amd64/Packages/sun-nhas-kernel-source-3.0-24.x86_amd64.rpm
```

where *NHAS-software-distribution-dir* is the directory that contains the Netra HA Suite distribution.

b. Copy the Netra HA Suite LSP in your MontaVista target distribution to replace the original LSP:

```
# cp /usr/src/sun/nhas/LSP/target/lsp-x86-pc_target-x86_amd64-2.6.10_mvlcge401-1.2.1.xxxxxxx.x86_amd64.mvl path_where_you_copied_the_LSP  
/x86_amd64/lsps/x86-pc_target-x86_amd64/target/
```

▼ To Create a Wind River CGL Distribution on a SLES9 Installation Server

To create a Wind River CGL distribution on the installation server, follow these steps:

1. Ensure that the installation server has at least 73 Mbytes of free disk space.
2. Log in as superuser on the installation server.
3. Create a directory for the Wind River CGL distribution:

```
# mkdir Wind-River-distribution-dir
```

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

4. Install the Netra HA Suite kernel package:

```
# rpm -i --nodeps --ignorearch NHAS-software-distribution-  
dir/Product/NetraHASuite_3.0/FoundationServices/wr11_4/i686/Packag  
es/sun-nhas-kernel-source-3.0-*.i686.rpm | /usr/bin/cpio -id
```

where *NHAS-software-distribution-dir* is the directory that contains the Netra HA Suite distribution.

Note – The command shown in the preceding example should appear on one line, but wraps in the printed text due to page size limitations.

The following files, will then be installed under
/usr/src/sun/nhas/distribution:

- sun_netra_cp3020-linux-modules-WR1.4aq_cgl-nhas.tar.bz2 contains the kernel modules.
- System.map-netra_cp3020 contains the symbol table.
- bzImage-netra_cp3020 is used to boot the Sun Netra CP3020 hosts.

5. Copy these files to the *Wind-River-distribution-dir* directory you created in [Step 3](#) for the Wind River CGL distribution:

```
nhas.tar.bz2 # cp /usr/src/sun/nhas/distribution/sun_netra_cp3020-linux-  
modules-WR1.4aq_cgl-nhas.tar.bz2 Wind-River-distribution-dir  
distribution-dir# cp /usr/src/sun/nhas/distribution/System.map-netra_cp3020 Wind-  
River-distribution-dir  
dir# cp /usr/src/sun/nhas/distribution/bzImage-netra_cp3020 Wind-River-distribution-dir
```

6. To the *Wind-River-distribution-dir* directory, copy a compressed tar of the root file system of Wind River Linux CGL 1.4 for Sun Netra CP3020 nodes.

This file is provided by Wind River with the Wind River Platform For Network Equipment Linux Edition 1.4 BSP for Sun CP3020. For more information, refer to: http://windriver.com/products/bsp_web/bsp_vendor.html?vendor=Sun

```
# cp sun_netra_cp3020-dist.tar.bz2 Wind-River-distribution-dir
```

7. To the *Wind-River-distribution-dir* directory, copy a lilo boot loader rpm (lilo-22.7-19.x86_64.rpm) required by the Netra High Availability Suite installer.

You can download this lilo rpm file from <http://rpmfind.net/>

```
# cp lilo-22.7-19.x86_64.rpm Wind-River-distribution-dir
```

Note – There is no constraint on the lilo version you use.

▼ To Prepare the Installation Server Running the Linux SLES9 Operating System

Before you begin the installation process on a Suse SLES9 installation server, make sure it is configured as described in [Chapter 1](#).

1. If you are planning to install remotely from another system, open a shell window to connect to the installation server.
2. Confirm that the Perl 5 RPM package is installed on the installation server.
Use the `rpm -qa perl` command to confirm that Perl is installed.
3. Confirm that the ISC DHCP server RPM package is installed on the installation server.
Use the command `rpm -qa dhcp-server` to confirm that the DHCP server is installed.
4. Confirm that the TFTP RPM package is installed on the installation server.
Use the command `rpm -qa tftp` to confirm that tftp is installed.
5. Enable tftp:

```
/sbin/chkconfig tftp on#  
/etc/init.d/xinetd restart#
```


6. Start the NFS server as follows:

```
# /usr/sbin/rcnfsdserver restart
```

7. 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

8. 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
netmasks: files nis
```

9. 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, `SUNWnhas-installer`:

On the Solaris OS:

```
# pkgadd -d /software-distribution-dir/Product/NetraHASuite_3.0/  
FoundationServices/  
Solaris_x/arch/Packages/SUNWnhas-installer
```

where *software-distribution-dir* is the directory that contains Netra HA Suite packages, *x* is 9 or 10 depending on the version of the Solaris OS in use on the installation server, and where *arch* is *sparc* or *x64*, depending on the installation server architecture.

On Linux SLES9:

```
# rpm -i /software-distribution-dir/Product/NetraHASuite_3.0/  
FoundationServices/  
SLES9/arch/Packages/sun-nhas-installer-3.0-24.arch.rpm
```

where *software-distribution-dir* is the directory that contains Netra HA Suite packages, and where *arch* is *i686* or *x86_64*, depending on the installation server architecture.

3. To access the man pages on the installation server, install the man page package, `SUNWnhas-manpages`:

On the Solaris OS:

```
# pkgadd -d /software-distribution-dir/Product/NetraHASuite_3.0/  
FoundationServices/ Solaris_x/arch/Packages/SUNW  
nhas-manpages
```

where *software-distribution-dir* is the directory that contains the Netra HA Suite packages, *x* is 9 or 10 depending on the version of the Solaris OS in use on the installation server, and where *arch* is *sparc* or *x64* depending on the installation server architecture.

On Linux SLES9:

```
# rpm -i /software-distribution-  
dir/Product/NetraHASuite_3.0/FoundationServices/ SLES9/arch/Pack  
ages/sun-  
nhas-manpages-3.0-24.arch.rpm
```

where *software-distribution-dir* is the directory that contains the Netra HA Suite packages and where *arch* is *i686* or *x86_64* depending on the installation server architecture.

4. Modify the shell variable `MANPATH` to include the path `/opt/SUNWcggha/man`.

5. Check SunSolve to download any `nhinstall` patches for this release.

If there are patches, see the associated Readme file for installation directions.

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 IP address of the installation server and the locations of the software distributions for the operating system and the Foundation Services.

You must modify this configuration file. For details on each available option, see the `env_installation.conf(4)` man page.

- `cluster_definition.conf`

Use this configuration file to define the nodes, disks, and options in your cluster configuration. You must modify this configuration file. For details on each available option, 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. You must configure your `addon.conf` file with packages specific to your hardware. For help with your specific configuration, contact your Foundation Services representative. This file is optional. If this file is not configured, the `nhinstall` tool does not install any additional patches or packages. For more information, see the `addon.conf(4)` man page.

- `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.

- `dataless_nodeprof.conf`

If you do not create this file, the same set of Solaris packages is installed on the master-eligible and dataless nodes. Create the `dataless_nodeprof.conf` file, if you want to customize the Solaris installation on the dataless nodes. For more information, see the `dataless_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 customize the Solaris installation on the diskless 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:

- “Selecting the Type of Architecture” on page 37
- “Configuring the Disk Partitions on Master-Eligible Nodes” on page 37
- “Configuring Disk Partitions on Dataless Nodes” on page 39
- “Configuring the Scoreboard Bitmaps on the Solaris OS” on page 40
- “Configuring the NFS Option `noac`” on page 41
- “Configuring a Direct Link Between the Master-Eligible Nodes” on page 41
- “Configuring Automatic Reboot for the Master-Eligible Nodes” on page 41
- “Configuring the Carrier Grade Transport Protocol” on page 42
- “Configuring the Environment for Diskless Nodes on the Solaris OS” on page 42
- “Configuring the Boot Policy for Diskless Nodes on the Solaris OS” on page 43
- “Configuring DHCP Configuration Files Locally on Solaris OS Master-Eligible Nodes” on page 43
- “Configuring the Default Router to the Public Network” on page 44
- “Configuring the Cluster IP Addresses” on page 44
- “Configuring the Floating External Address of the Master Node” on page 44
- “Configuring External IP Addresses for Cluster Nodes” on page 45
- “Sharing Physical Interfaces Between CGTP and IPMP Using VLAN” on page 46
- “Configuring Volume Management” on page 47
- “Selecting the Solaris Package Set to be Installed” on page 50
- “Installing a Different Version of the Operating System on Diskless and Dataless Nodes” on page 50
- “Configuring a Data Management Policy” on page 51
- “Configuring a Masterless Cluster” on page 51
- “Configuring Reduced Duration of Disk Synchronization on the Solaris OS” on page 52
- “Configuring Sanity Check of Replicated Slices” on page 52
- “Configuring Delayed Synchronization” on page 52
- “Configuring Serialized Slice Synchronization” on page 53
- “Mirroring Shared Disks on the Solaris OS” on page 40
- “Configuring the Disk Fencing on the Solaris OS” on page 40

- “Installing the Node Management Agent (NMA) on the Solaris OS” on page 53
- “Installing the Node State Manager (NSM)” on page 53
- “Installing the SA Forum Cluster Membership API (SA Forum/CLM)” on page 53

Selecting the Type of Architecture

If you are using AMD64-based hardware or SPARC-based sun4v hardware, use the `HARDWARE` parameter to specify the type of node. Specifying this information is not required for SPARC-based sun4u hardware.

For more information, see the `cluster_definition.conf(4)` man page and *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Configuring the Disk Partitions on Master-Eligible Nodes

Use the `SLICE` (for both Linux and the Solaris OS) or `SHARED_SLICE` (for the Solaris OS only) parameters to specify the disk partitions on the master-eligible nodes.

If you plan to use Netra High Availability Suite for replicating NFS-served data over IP, use the `SLICE` parameter for all partitions.

On the Solaris OS, it is also possible to locate NFS-served data on shared disks. If you plan to do so, use the `SHARED_SLICE` parameter for the partition storing this data and use `SLICE` for the local partitions (the root file system, for example).

TABLE 2-1 through TABLE 2-3 list the space requirements on the Solaris OS for sample disk partitions of master-eligible nodes in a cluster with diskless nodes, either with IP-replicated data or with a shared disk. TABLE 2-4 lists the space requirements on Linux for sample disk partitions of master-eligible nodes. TABLE 2-5 lists the space requirements for example disk partitions of dataless nodes. *

TABLE 2-1 Example Disk Partitions of Solaris OS Master-Eligible Nodes With NFS-Served Data Replicated Over IP

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
3	/export	Exported file system reserved for diskless nodes. The <code>/export</code> file system must be mounted with the <code>logging</code> option. This partition is further sliced if diskless nodes are added to the cluster.	2.8 Gbyte + 160 Mbytes per diskless node
4	/SUNWcgha/local	This partition is reserved for NFS status files, services, and configuration files. The <code>/SUNWcgha/local</code> file system must be mounted with the <code>logging</code> option.	2 Gbytes
5	Reserved for Reliable NFS internal use	Bitmap partition reserved for <code>nhcrfsd</code> . This volume is associated with the <code>/export</code> file system.	1 Mbyte
6	Reserved for Reliable NFS internal use	Bitmap partition reserved for <code>nhcrfsd</code> . This partition is associated with the <code>/SUNWcgha/local</code> file system.	1 Mbyte
7	replica OR /test1	If you have configured volume management, this partition must be named <code>replica</code> . This partition is mounted with the <code>logging</code> option. See “Configuring Volume Management” on page 47 .	The remaining space

TABLE 2-2 Local Disk Partitions of Solaris OS Master-Eligible Nodes With NFS-Served Data on Shared Disks

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
7	replica	Partition used to store SVM meta database.	8 Mbytes

TABLE 2-3 Shared Disk Partitions of Solaris OS Master-Eligible Nodes With NFS-Served Data on Shared Disks

Disk Partition	File System Name	Description	Example Size
0	/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.	2.8 Gbyte + 160 Mbytes per diskless node
1	/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
7	replica	Partition used to store SVM meta database.	8 Mbytes

Note – Partition 2 is reserved for overlapping the entire disk. It is automatically created and must not be defined.

TABLE 2-4 Disk Partitions of Linux Master-Eligible Nodes With NFS-Served Data Replicated Over IP

Disk Partition	File System Name	Description	Example Size
1	/	The root file system, boot partition, and volume management software.	2 Gbytes
2	swap	Minimum size when physical memory is less than 1 Gbyte.	1 Gbyte
5	/SUNWcgha/local	This partition is reserved for NFS status files, services, and configuration files.	2 Gbytes
6	/export	Exported file system.	4 Gbytes
7	unamed	Bitmap partition reserved for nhcrfsd. This volume is associated with the /export and /SUNWcgha/local file systems that will be replicated over IP.	256 Mbytes

Configuring Disk Partitions on Dataless Nodes

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

TABLE 2-5 lists the space requirements for example disk partitions of dataless nodes.

TABLE 2-5 Example Disk Partitions of Dataless 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

Note – Partition 2 is reserved for overlapping the entire disk. It is automatically created and must not be defined.

Mirroring Shared Disks on the Solaris OS

Configure the `MIRROR` parameter to mirror a shared disk to another shared disk on the Solaris OS.

Configuring the Disk Fencing on the Solaris OS

On the Solaris OS, to prevent simultaneous access to the shared data in case of split-brain, SCSI disk reservation is used. The SCSI version is configured by the `SHARED_DISK_FENCING` parameter. It can be set to `SCSI2` or `SCSI3`.

Configuring the Scoreboard Bitmaps on the Solaris OS

On the Solaris OS, you can configure the `nhinstall` tool to store the scoreboard bitmaps of IP-replicated 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 3.0 1/08 Foundation Services Getting Started 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/ttyb 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 3.0 1/08 Foundation Services Overview*.

Configuring the Environment for Diskless Nodes on the Solaris OS

If you define diskless nodes with the `NODE` or `DISKLESS` parameters 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 does not install the Solaris services for diskless nodes. If you plan to add diskless nodes to the cluster at a later date, set the `INSTALL_DISKLESS_ENV` parameter in add the `cluster_definition.conf` to specify on which platform you want `nhinstall` to set up the Solaris services for diskless nodes.

If you do not set this parameter, the `nhinstall` tool does not install the Solaris services for diskless nodes on 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. Therefore, try to include possible future nodes in your cluster configuration.

Note – On the Solaris OS, you can manually add diskless nodes to a running cluster as described in the *Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS*.

Configuring the Boot Policy for Diskless Nodes on the Solaris OS

You can configure the `nhinstall` tool to have the diskless nodes in the cluster boot 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 2-6 Boot Policies for Diskless Nodes

Boot Policy	Description
DHCP static boot policy	IP address based on the Ethernet address of the diskless node. The Ethernet address is specified in the <code>cluster_definition.conf</code> file. 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.
DHCP client ID boot policy	IP address generated from the diskless node's client ID in a CompactPCI server. 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.

For further information about the boot policies for diskless nodes, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Overview* and the *Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS*.

Configuring DHCP Configuration Files Locally on Solaris OS Master-Eligible Nodes

By default, `nhinstall` configures diskless nodes so that the DHCP configuration files are stored in the highly available 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.

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 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.

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.

As an option, IPMP (IP Multipathing) on the Solaris OS or bonding on Linux, can be used to support a floating external address on dual redundant links.

- `EXTERNAL_MASTER_ADDRESS` controls an external floating address not managed by IPMP or bonding. It makes `EXTERNAL_ACCESS` (the former directive) obsolete.

- `EXTERNAL_IPMP_MASTER_ADDRESS` on the Solaris OS controls an external floating address managed by IPMP.
- `EXTERNAL_BONDING_MASTER_ADDRESS` on Linux controls an external floating address managed by the bonding driver.

If you specify an IP address and a network interface for the external address parameter in the `cluster_definition.conf` file, the floating external address is configured. The External Address Manager daemon, `nheamd`, which monitors floating addresses and IPMP groups or bonding interfaces on master-eligible nodes 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 `nheamd(1M)` man page.

If you do not configure the external address 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 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.**

If the installation server has to be configured to use this public network for the cluster nodes installation, the `SERVER_IP` parameter must also be defined in `env_installation.conf` to specify an IP address for the installation server on the same subnetwork as defined for `PUBLIC_NETWORK`.

If `SERVER_IP` is not defined in `env_installation.conf`, the installation server will be configured to use the private network for the cluster nodes installation, and the configuration of the public network will be done on cluster nodes only, not on the installation server.

For more information about `SERVER_IP`, refer to 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:

MEN=10	08:00:20:f9:c5:54	-	-	-	-	FSNode1	192.168.12.5	hme1
MEN=20	08:00:20:f9:a8:12	-	-	-	-	FSNode2	192.168.12.6	hme1

- 192.168.12.5 and 192.168.12.6 are the external IP addresses.
- FSNode1 and FSNode2 are the external node names.
- hme1 is the external network interface.

Sharing Physical Interfaces Between CGTP and IPMP Using VLAN

Physical links can be shared between CGTP and IPMP only when CGTP is used over a VLAN. Before using this configuration, refer to detailed information about Solaris VLAN and IPMP in the *Solaris System Administration Guide: IP Services*.

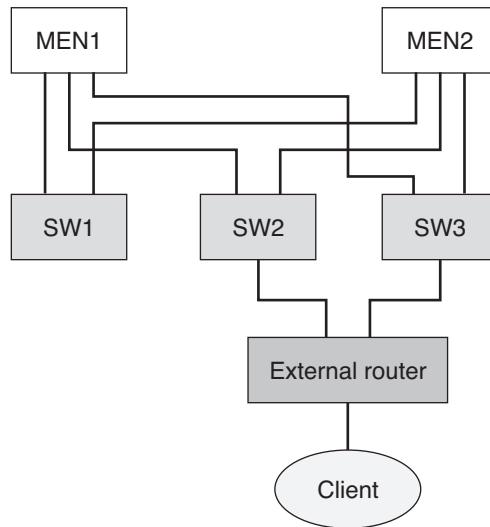
Not all network interfaces support VLAN. Check that your interfaces support this use.

Solaris shows VLAN interfaces as separate physical interfaces, even though there is only one. Since VLANs are configured by using special names for the interfaces, you must define the topology and the interface names for that topology. Keep the following points in mind when defining your topology:

- Be careful not to set the booting interface on a VLAN. Installation is impossible unless the installation server and boot server are both configured to be part of the VLAN.
- Do not set the IPMP interfaces on a VLAN unless all other interfaces on all nodes in the group can belong to the same VLAN (including the clients).
- CGTP can be configured with both links on a VLAN, or with only one.
- The VLANs on the switches must be configured before starting the installation.
- It is IMPORTANT to have a third node (the client, for example, or a router) with an address in the same subnetwork as the IPMP test addresses, as a reference. Many reference nodes are available in order to avoid SPOFs.

For example, consider the three-node cluster shown in [FIGURE 2-1](#). Three `ce` NICs are on each MEN. In both MENs, `ce0` is connected to switch 1, `ce1` to switch 2 and `ce2` to switch 3. The external router, to which clients connect, is connected to switches 2 and 3. This restricts `ce1` and `ce2` for external access. CGTP can be used on any two NICs. In this case, `ce0` and `ce1` were chosen, making `ce1` a shared interface.

FIGURE 2-1 Cluster Sharing CGTP and IPMP



The VLAN is created with VID 123 over the interface `ce1` by plumbing an interface called `ce123001`. In this example, `ce0` and `ce123001` will be used for CGTP, and `ce1` and `ce2` for IPMP. Create the tagged VLAN on SW2 (for information on how to create a VLAN, refer to your switch's documentation), create a `cluster_definition.conf` file respecting these interfaces, and launch the installation as for any other case.

Configuring Volume Management

The volume management feature enables you to do the following:

- On both Linux OS and the Solaris OS, increase the number of available replicated partitions, because you can create multiple soft partitions.
- On the Solaris OS only, increase data availability, because you can mirror disks locally.

On MontaVista Linux CGE 4.0 and Wind River CGL 1.4, the volume management software that is installed is LVM2.

On the Solaris OS, the volume management software that is installed depends on the version of the Solaris OS that you plan to install. For information on supported software versions, see the *Netra High Availability Suite 3.0 1/08 Release Notes*.

If both servers do not have the same disk configuration (for example, if they have a different number of disks, or if disks are numbered differently on the bus), you must install the Volume Management feature of the OS you are using. For more information, see the *Netra High Availability Suite 3.0 1/08 Foundation Services Getting Started 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 Servers With Different Disk Configurations” on page 48](#)
- [“To Configure Advanced Volume Management” on page 49](#)

▼ To Configure Basic Volume Management for Servers With Different Disk Configurations

You can use the `nhinstall` tool to install and configure volume management to use soft partitions. The use of volume management is mandatory for servers with different disk configurations (for example, servers that have a different number of disks, or servers that use FC-AL disks). This situation can result in different minor device numbers on both servers, preventing Reliable-NFS from performing a failover. An NFS file handler contains the minor device number of the disk supporting a file and it must be the same on both servers. Using volume management hides the disk numbering and enables you to ensure that files that are duplicated on both servers have the same NFS file handler.

Configure the `nhinstall` tool to support logical disk partitions by installing the volume management feature as follows:

1. In the `env_installation.conf` file, set `OS_INSTALL` to `ALL`.
2. Configure the `cluster_definition.conf` file:
 - a. Set `LOGICAL_SLICE_SUPPORT` to `YES`.
 - b. For the Solaris OS only, 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 operating system and Foundation Services on the master-eligible nodes.

For more information, see [“To Launch the `nhinstall` Tool” on page 57](#).

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

▼ To Configure Advanced Volume Management

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

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

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

- For Solaris 9 or Solaris 10, *Solaris Volume Manager Administration Guide*
This documentation is available at <http://docs.sun.com>.
- For MontaVista CGE 4.0, see the MontaVista documentation at <http://support.mvista.com>
- For Wind River CGL 1.4, see the man pages or generic LVM2 configuration “how tos,” such as those at: <http://www.tldp.org/HOWTO/LVM-HOWTO>

Note – Install the same packages of the same version of the 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 sizes of the disk partitions.

For more information, see [TABLE 2-1](#) for the Solaris OS and [TABLE 2-4](#) for Linux.

4. In the `env_installation.conf` file, set `OS_INSTALL` to `DISKLESS_DATALESS_ONLY`.

The operating system is configured on the dataless nodes and the Solaris OS, services will be configured for the diskless environment.

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

- a. Set the `LOGICAL_SLICE_SUPPORT` parameter to `NO`.
- b. For the `SLICE` parameter, specify the metadvice names of the partitions.
For example:

<code>SLICE=d1 2048 /</code>	<code>-</code>	<code>logging</code>
------------------------------	----------------	----------------------

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

6. 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 57](#).

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/templates/nhinstall/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 customized Solaris package set on the diskless nodes, see the `diskless_nodeprof.conf(4)` man page. For information about installing a customized Solaris package set on the dataless nodes, see the `dataless_nodeprof.conf(4)`.

Installing a Different Version of the Operating System on Diskless and Dataless Nodes

To install a version of the Solaris OS on diskless nodes that is different from the version 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/s10DISKLESS_SOLARIS_DIR=/export/s9u8
```

To install a version of the Solaris OS on dataless nodes that is different from the versions 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/s10DATALESS_SOLARIS_DIR=/export/s9u8
```

By default, the values provided to the `DISKLESS_SOLARIS_DIR` and `DATALESS_SOLARIS_DIR` parameters are set to be the same as that provided to the `SOLARIS_DIR` parameter. For more information, see the `env_installation.conf(4)` man page.

To install the Solaris OS on master-eligible nodes and install the MontaVista CGE Linux Operating System on dataless nodes, specify the location of the Solaris distribution, the MontaVista target distribution, and the MontaVista LSP distribution in the `env_installation.conf` file using the parameters `SOLARIS_DIR`, `DATALESS_MVISTA_TARGET_DIR`, and `DATALESS_MVISTA_LSP_DIR`. For example:

```
SOLARIS_DIR=/export/s10DATALESS_MVISTA_TARGET_DIR=  
/export/mvista/target_tdpDATALESS_MVISTA_LSP_DIR=/export/mvista/lsp
```

To install Wind River CGL on master-eligible nodes and the Solaris OS on dataless nodes, specify the location of the Wind River CGL, the directory where a root NFS file system will be created for each type of platform, and the path to the Solaris distribution in the `env_installation.conf` file using the parameters `WINDRIVER_IMAGES_DIR`, `WINDRIVER_ROOTNFS_DIR`, and `DATALESS_SOLARIS_DIR`. For example:

```
WINDRIVER_IMAGES_DIR=/dist/WindRiverWINDRIVER_ROOTNFS_DIR=  
/export/root/WindRiverDATALESS_SOLARIS_DIR=/export/s10
```

Configuring a Data Management Policy

There are three data management policies available with the Foundation Services. By default, the `nhinstall` tool sets the data management policy to be `Integrity` for data replication over IP, and `Availability` when using shared disks. 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 *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Configuring a Masterless Cluster

By default, diskless and dataless nodes reboot if there is no master in the cluster. If you do not want the diskless and dataless 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 *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Configuring Reduced Duration of Disk Synchronization on the Solaris OS

By default `nhinstall` enables this feature. It 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 on the Solaris OS 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 *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

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 *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Configuring Delayed Synchronization

By default, 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 *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

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 *Netra High Availability Suite 3.0 1/08 Foundation Services Overview*.

Installing the Node Management Agent (NMA) on the Solaris OS

By default, the Node Management Agent is installed on systems running the Solaris OS. This feature is not yet supported on Linux.

Set the `INSTALL_NMA` parameter to `NO` to avoid installing this agent on systems running the Solaris OS.

Installing the Node State Manager (NSM)

By default, the Node State Manager is not installed.

Set the `INSTALL_NSM` parameter to `YES` to install NSM.

Installing the SA Forum Cluster Membership API (SA Forum/CLM)

By default, the SA Forum/CLM API is not installed.

Set the `INSTALL_SAFCLM` parameter to `YES` to install the SA Forum/CLM API.

Installing the Software by Using the `nhinstall` Tool

The `nhinstall` tool installs the 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 55](#)
 - [“Launching the `nhinstall` Tool” on page 57](#)
 - [“Verifying the Installation” on page 61](#)
 - [“Troubleshooting and Restarting the `nhinstall` Tool” on page 62](#)
 - [“Resetting the `nhinstall` Tool for a New Installation” on page 62](#)
-

Stages of the Installation Process

You can configure the `nhinstall` tool to install both the operating system and the Foundation Services on the cluster. You can also install the 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 35](#).

After you have configured the installation server, you are ready to install the software on the nodes of the cluster. [TABLE 3-1](#) 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:

- `OS_INSTALL=ALL`
- `AUTO_REBOOT=YES`

The following parameter is defined in the `cluster_definition.conf` file:

■ USE_CGTP=YES

Diskless and dataless nodes are specified in the `NODE` parameter or by the `DISKLESS` and `DATALESS` parameters.

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

The following table lists the stages of an automatic installation using the `nhinstall` tool. The times quoted are guidelines only.

TABLE 3-1 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 57
2.	Configure the network interfaces.	<code>nhinstall</code>	
3.	Configure TFTP, DHCP, Solaris JumpStart™, or MontaVista target distribution package to enable master-eligible <code>nhinstall</code> nodes and the dataless nodes (5 minutes).	<code>nhinstall</code>	
4.	Boot the master-eligible nodes and the dataless nodes to install the operating system (30 minutes–1 hour).	You	“To Boot the Master-Eligible Nodes and Dataless Nodes to Install the Operating System” on page 58
5.	Install Netra HA Suite software and CGTP patches on the master-eligible nodes (20 minutes).	<code>nhinstall</code>	
6.	Reboot the master-eligible nodes.	<code>nhinstall</code>	“To Boot the Master-Eligible Nodes and Dataless Nodes to Install the Operating System” on page 58
7.	Configure the Solaris services for diskless nodes on the master-eligible nodes (20–45 minutes).	<code>nhinstall</code>	
8.	Install the Solaris packages, Netra HA Suite packages, and the CGTP patches for diskless nodes (5 minutes) and Netra HA Suite packages, and the CGTP patches for dataless nodes.	<code>nhinstall</code>	

TABLE 3-1 Stages of the Installation Process

	Stage	Action Carried Out By	Related Section
9.	Reboot the master-eligible and dataless nodes.	You	“To Boot the Master-Eligible Nodes and Dataless Nodes to Install the Operating System” on page 58
10.	Boot the diskless nodes.	You	“To Boot the Diskless Nodes” on page 60
11.	Run the <code>nhadm</code> tool on the master-eligible nodes to ensure that installation was successful.	You	“Verifying the Installation” on page 61

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 2](#).

The following procedures are based on [“Stages of the Installation Process” on page 55](#). These procedures must be carried out in the documented sequence.

Note – The steps in the following processes describe the operating system installation of SPARC boards from an OpenBoot PROM (OBP). If your board does not have an OBP, see the corresponding board documentation on <http://docs.sun.com> to see how to perform a network installation or modifications to the BIOS setup. Some of the steps also reference the `auto-boot-retry` variable. If this variable exists on your system, it must be set to `true`; if it does not exist on your system, disregard references to it.

▼ To Launch the `nhinstall` Tool

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

2. Start the `nhinstall` tool on the installation server.

On the Solaris OS:

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

On Linux OS:

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

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

The `nhinstall` tool configures the network interfaces and prepares the environment to set up the server as an installation server for the master-eligible and dataless nodes. This process takes approximately five minutes.

Note – On the Solaris OS, 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, ensure that there are no other Solaris JumpStart processes running. Then delete the lock file.

After the installation environment has been prepared, the `nhinstall` tool displays instructions. Follow these instructions by performing the following procedure.

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

Perform the following steps on both master eligible nodes and on each dataless node listed in the `nhinstall` output.

1. At the console window of the node, get the `ok` prompt.

a. Press `Control-]` to get the `telnet` prompt.

- b. Type `send brk` at the telnet prompt to get the `ok` prompt.**

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

The first master eligible-node is the first master-eligible node that is defined in the `cluster_definition.conf` file with the `NODE` definition or with the `MEN` parameter. For details, see [“Configuring the `nhinstall` Tool” on page 35](#).

- 2. Set the following boot variables by using the `setenv` command, if they exist on your system.**
- a. Configure the processors to use local Ethernet (MAC) addresses:**

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

- b. 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. Start the installation of the operating system on the node:**

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

where `net` is the device alias.

5. When you have started the installation of the operating system on the node, continue the installation by typing `y` at this prompt:

Answer 'y' after the command has been entered on all nodes: `y`

The installation takes between 30 minutes and one hour for the master-eligible nodes and dataless nodes, depending on the operating system. The progress of the installation and the packages that are being installed are displayed on the console window of each master-eligible node.

When the operating system has been installed, each node is automatically rebooted. Several status messages are displayed regarding service startup and connectivity.

The `nhinstall` tool checks which version of the 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 more detailed instructions in the *Netra High Availability Suite 3.0 1/08 Foundation Services Manual Installation Guide for the Solaris OS*. Otherwise, remove the existing Foundation Services packages and restart the installation as described in [“Resetting the `nhinstall` Tool for a New Installation” on page 62](#).

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

Wait 15 to 20 minutes while the Foundation Services packages and the CGTP patches are installed on all nodes. After installing packages and patches on the master-eligible and dataless nodes, these nodes are rebooted and `nhinstall` waits for the data to be ready.

▼ To Boot the Diskless Nodes

After installation, the `nhinstall` tool displays the following instructions:

```
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.
```

Perform the following procedure to configure the boot parameters.

1. Get the `ok` prompt on each diskless node.

2. Execute the following commands at the `ok` prompt on each diskless node for those parameters that exist on your system:

```
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
```

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

3. Boot each diskless node:

```
ok> reset
```

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 all nodes.
2. Run the `nhadm` tool:

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhadm check
```

If all checks pass the validation, the installation of Netra HA Suite 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 you to take any action.

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 restart the `nhinstall` tool.

On the Solaris OS:

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

On Linux:

```
# cd /opt/sun/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 62](#).

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

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

On the Solaris OS:

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

On Linux:

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

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

Running Administration Tasks on the Cluster

After you have installed the software on the cluster, run some administration tasks to check that the cluster is functioning correctly and to further evaluate the product.

To check your cluster, perform the following administration tasks:

- [“Checking the Cluster Nodes” on page 65](#)
- [“Managing Switchovers and Failovers” on page 69](#)

Checking the Cluster Nodes

The Foundation Services product is delivered with tools to check different aspects of a cluster, including the status of cluster nodes, the network connection between nodes, and the IP addresses of nodes.

▼ To Check the Status of the Cluster Nodes

You can check the nodes of your cluster with the `nhcmmstat` command.

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

2. Check the nodes by using the nhcmmstat command.

```
# nhcmmstat -c all
Executed Command: all
-----
node_id      = 10      [This is the current node]
domain_id    = 250
name         = node10
role         = MASTER
qualified    = YES
synchro.     = READY
frozen       = NO
excluded     = NO
eligible     = YES
incarn.      = 1038420771 (27/11/2002 - 19:12:51)
swload_id    = 1
CGTP @      = 10.240.3.10
-----
node_id      = 30
domain_id    = 250
name         = node30
role         = IN
qualified    = YES
synchro.     = READY
frozen       = NO
excluded     = NO
eligible     = NO
incarn.      = 1038422116 (27/11/2002 - 19:35:16)
swload_id    = 1
CGTP @      = 10.240.3.30
-----
node_id      = 20
domain_id    = 2540
name         = node20
role         = VICE-MASTER
qualified    = YES
synchro.     = READY
frozen       = NO
excluded     = NO
eligible     = YES
incarn.      = 1038420945 (27/11/2002 - 19:15:45)
swload_id    = 1
CGTP @      = 10.240.3.20
-----
```

In the preceding example, the output from the nhcmmstat command displays

information about all the peer nodes in the console window. This information includes the role of each node. The peer nodes must include the master and vice-master nodes.

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

▼ To Check the Network Connection Between Nodes

You can check that the cluster network is functioning correctly with the `nhadm` command.

1. **Log in to a peer node as superuser.**
2. **Verify that the nodes in the cluster are communicating through a network.**

On the Solaris OS:

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

On Linux OS:

```
# /opt/sun/sbin/nhadm check
```

If any peer node is not accessible from any other peer node, the `nhadm` command displays an error message in the console window.

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

▼ To Check Node Addresses

Each node has an IP address assigned to the `NIC0`, `NIC1`, and `cgtp0` network interfaces. To identify and ping each network interface of a node, follow this procedure.

1. **Log in to the node that you want to examine.**

2. Type the `ifconfig` command.

```
# ifconfig -a
```

The `ifconfig` command displays configuration information about the network interfaces to the console window. Sample output for the `ifconfig` command on a peer node is as follows:

```
hme0: flags=1004843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 \
index 1
    inet 10.250.1.30 netmask ffffffff broadcast 10.250.1.255
    ether 8:0:20:f9:b4:b0
lo0: flags=1000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232
index 2
    inet 127.0.0.1 netmask ff000000
hme1: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500
index 3
    inet 10.250.2.30 netmask ffffffff broadcast 10.250.2.255
    ether 8:0:20:f9:b4:b1
cgtp0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 4
    inet 10.250.3.30 netmask ffffffff broadcast 10.250.3.255
    ether 0:0:0:0:0:0
```

Each peer node has at least three network interfaces configured. If a node has external access configured or if the node is the master, more network interfaces are displayed by the `ifconfig` command.

3. Retrieve the cluster ID, that is, the *domainid*, by using the output from the `ifconfig` command.

The *domainid* in this example is 250.

4. Retrieve the node ID, that is, the *nodeid*, by using the output from the `ifconfig` command.

The *nodeid* in this example is 30.

5. Retrieve the network interface names and corresponding IP addresses by using the output from the `ifconfig` command.

The network interfaces *NIC0* and *NIC1* in this example are the physical interfaces `hme0` and `hme1`, respectively. The third interface is the virtual physical interface, `cgtp0`.

The IP addresses for the three network interfaces in this example are as follows:

<code>hme0</code>	<code>10.250.1.30</code>
<code>hme1</code>	<code>10.250.2.30</code>
<code>cgtp0</code>	<code>10.250.3.30</code>

The Ethernet addresses for *NIC0* and *NIC1* in this example are as follows:

<code>hme0</code>	<code>8:0:20:f9:b4:b0</code>
<code>hme1</code>	<code>8:0:20:f9:b4:b1</code>

6. Log in to another peer node as superuser.
7. Ping each network interface address of the node 30.

```
# ping 10.250.1.30
# ping 10.250.2.30
# ping 10.250.3.30
```



Managing Switchovers and Failovers

You can trigger a *switchover* to swap the master and vice-master roles of the master-eligible nodes. A switchover is useful when you plan to take the master node down for maintenance. To trigger a switchover, see [“To Trigger a Switchover” on page 70](#).

However, if there is a problem on the master node, the master role fails over automatically to the vice-master node. In this case, the master and vice-master roles are also swapped, but because the cause is an unplanned problem, the swap is called a *failover*. To cause a failover, see [“To Reboot the Master Node Causing a Failover” on page 71](#).

▼ To Trigger a Switchover

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

2. **Identify the master node.**

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhcmmstat -c all
```

The `nhcmmstat` command prints information on each peer node to the console window.

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

4. **Trigger a switchover.**

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhcmmstat -c so
```

If there is a vice-master node qualified to become master in the cluster, this node is elected master. The old master node becomes the vice-master node. If there is no potential master, `nhcmmstat` does not perform a switchover.

5. **After the switchover is complete, verify that the roles of the master and vice-master nodes have been switched.**

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhcmmstat -c vice
```

If the switchover is successful, the current node is the vice master. This command also verifies that the current node is synchronized with the new master node.

6. Verify the cluster configuration.

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhadm check
```

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

▼ To Reboot the Master Node Causing a Failover

If you reboot the master node, you trigger a failover.

1. Log in to a peer node as superuser.
2. Run the `nhcmmstat` command to identify the master node.

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhcmmstat -c all
```

3. Log in to the master node as superuser.
4. Shut down the master node.

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

The vice-master node becomes the master. Because one of the two master-eligible nodes in the cluster is shut down, you lose the redundancy of the cluster. To recover redundancy, restart the stopped node.

5. Log in to a peer node as superuser.

6. **Verify that the vice-master node became the master node when the old master node was shut down.**

```
# nhcmmstat -c master
Executed Command: master
-----
node_id      = 20      [This is the current node]
domain_id    = 250
name         = node20
role         = MASTER
qualified    = YES
synchro.     = NEEDED !!!
frozen       = NO
excluded     = NO
eligible     = YES
incarn.      = 1038481013 (28/11/2002 - 11:56:53)
swload_id    = 1
CGTP @      = 10.250.3.20
-----
```

The output shows that the vice-master node is now the master node. In addition, the new master node displays a requirement for synchronizing its state with the vice-master node.

7. **Restart the old master node, which you shut down in [Step 4](#).**

This node now automatically becomes the vice-master node.

8. **Run the `nhcmmstat` command to verify that the current node is the vice-master node.**

```
# nhcmmstat -c all
Executed Command: all
-----
node_id      = 30
domain_id    = 250
name         = node30
role         = IN
qualified    = YES
synchro.     = READY
frozen       = NO
excluded     = NO
eligible     = NO
incarn.      = 1038422116 (27/11/2002 - 19:35:16)
swload_id    = 1
CGTP @      = 10.250.3.30
-----
node_id      = 20
```



```

domain_id   = 250
name        = node20
role        = MASTER
qualified   = YES
synchro.    = READY
frozen      = NO
excluded    = NO
eligible     = YES
incarn.     = 1038481013 (28/11/2002 - 11:56:53)
swload_id   = 1
CGTP @      = 10.250.3.20
-----
-----
node_id      = 10    [This is the current node]
domain_id    = 250
name        = node10
role        = VICE-MASTER
qualified    = YES
synchro.    = READY
frozen      = NO
excluded    = NO
eligible     = YES
incarn.     = 1038481383 (28/11/2002 - 12:03:03)
swload_id   = 1
CGTP @      = 10.250.3.10
-----

```

9. Log in to the new vice-master node as superuser.

10. Verify that the node has started correctly.

On the Solaris OS:

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

On Linux:

```
# /opt/sun/sbin/nhadm check
```

For more information on the tests run by `nhadm check`, see the `nhadm(1M)` man page.

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