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Netra High Availability Suite Foundation Services 2.1 6/03 Standalone CGTP Guide

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Preface

The *Netra High Availability Suite Foundation Services 2.1 6/03 Standalone CGTP Guide* introduces the standalone Carrier Grade Transport Protocol (CGTP). This book describes how to install standalone CGTP on a node that is not part of a Foundation Services cluster.

The Netra™ High Availability (HA) Suite Foundation Services 2.1 6/03 product is described in the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

Use standalone CGTP for reliable transport between nodes over dual redundant network links. CGTP is the only service running on these nodes. Standalone CGTP has all the features of the CGTP in the Foundation Services.

Standalone CGTP can be installed with or without the Reliable Boot Service. If you want to run CGTP on diskless nodes, the Reliable Boot Service enables the nodes to be booted by a *master node*. This master node is backed up by a *vice-master node*. These nodes, called *master-eligible nodes*, remove the single point of failure for standalone nodes running the CGTP.

To install standalone CGTP with the Reliable Boot Service, you install the Foundation Services on the master-eligible nodes. The diskless nodes are installed only with the CGTP but are configured to be booted by the master node. You can install the standalone CGTP with the Reliable Boot Service by using one of the following methods:

- `nhinstall` tool
- Manual installation

For more information, see Part II.

Alternatively, you can install CGTP manually without the Reliable Boot Service on standalone nodes. For more information, see Part I.

Who Should Use This Book

Use this book if you are an operator or system administrator who plans to install, configure, or maintain standalone CGTP on nodes.

Do not use this book if you are using CGTP as part of the Foundation Services. When CGTP is used on cluster nodes that are running the Foundation Services, CGTP is configured by the Cluster Membership Manager at cluster startup.

How This Book Is Organized

This book is organized as follows:

Part I describes how to install and configure standalone CGTP without the Reliable Boot Service.

- Chapter 1 describes how to define the topology of your standalone nodes. This chapter also lists the installation prerequisites.
- Chapter 2 explains how to install the standalone CGTP patches and packages.
- Chapter 3 describes how to configure standalone CGTP.

Part II describes how to install and configure standalone CGTP with the Reliable Boot Service.

- Chapter 4 outlines the prerequisites for installing standalone CGTP with the Reliable Boot Service.
- Chapter 5 describes how to install and configure standalone CGTP with the Reliable Boot Service. You can install CGTP using the `nhinstall` tool, or by manual installation.

Related Documentation

When working through this book, you might want to consult the Solaris 9 documentation set.

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

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

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Typographic Conventions

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

TABLE P–1 Typographic Conventions

Typeface or Symbol	Meaning	Example
`AaBbCc123`	The names of commands, files, and directories, and onscreen computer output	Edit your `.login` file. Use `ls -a` to list all files. `machine_name% you have mail.`
`AaBbCc123`	What you type, contrasted with onscreen computer output	`machine_name%` **`su`** `Password:`
AaBbCc123	Command-line placeholder: replace with a real name or value	The command to remove a file is `rm` *filename*.
AaBbCc123	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. Do *not* save the file. (Emphasis sometimes appears in bold online.)

Shell Prompts in Command Examples

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

TABLE P–2 Shell Prompts

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

TABLE P–2 Shell Prompts *(Continued)*

Shell	Prompt
Bourne shell and Korn shell superuser prompt	#

Standalone CGTP Without the Reliable Boot Service

You can install and configure standalone CGTP on nodes that do not have any other Foundation Services installed. These nodes do not form a Foundation Services cluster. In addition, these nodes are not configured with reliable services such as Reliable NFS and the Reliable Boot Service.

For a description of how to install and configure standalone CGTP on nodes, see the following chapters:

- Chapter 1 describes the prerequisites for installing and configuring standalone CGTP.
- Chapter 2 describes how to install standalone CGTP on a node.
- Chapter 3 describes how to configure the interfaces and routes between nodes installed with standalone CGTP.

Preparing to Install Standalone CGTP Without the Reliable Boot Service

Before you manually install standalone CGTP without the Reliable Boot Service, define the topology of your standalone nodes and verify that you have the necessary prerequisites.

For more information, see these sections:

Note – Make certain that you understand the introductory material in the Preface before proceeding.

Defining the Topology

CGTP provides reliable transport by duplicating packets and sending the duplicates along two networks, where one of these networks is redundant. For an overview of CGTP, see "Cluster Addressing and Networking" and "Carrier Grade Transport Protocol" in the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

Before configuring standalone CGTP, choose your topology. To minimize data loss, use a star topology as shown in Figure 1–1. This topology uses two identical, but physically distinct, redundant-100 Mbps networks around switches.
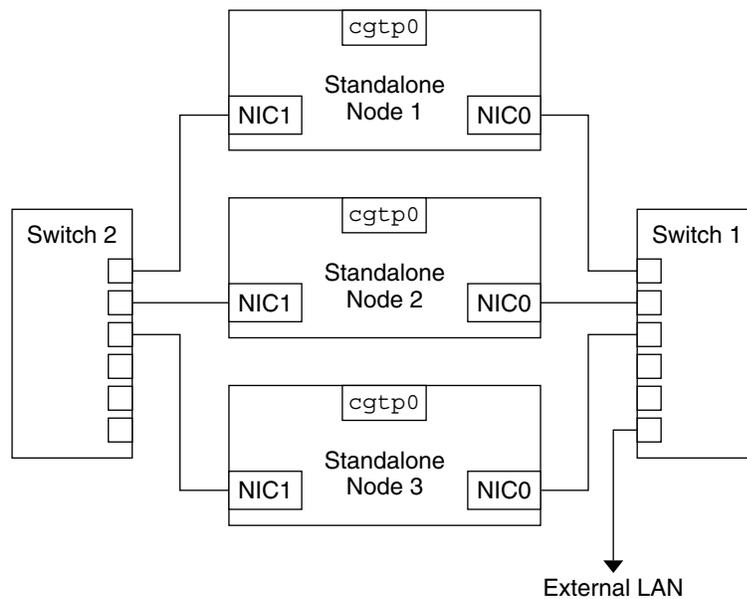
FIGURE 1–1 Star Topology of Three Standalone CGTP Nodes

Hubs can be used instead of switches, but using hubs might impact CGTP performance by increasing the collision rate and network latency. CGTP can be used to remove single points of failure. However, if redundant routes share switching equipment or communication links, these common network components might constitute single points of failure.

IP over ATM or IP over CompactPCI can be used with standalone CGTP because both mediums support the IP protocol. However, depending on the selected medium, standalone CGTP might not support broadcasts.

Avoid using IP gateways between nodes because gateways might introduce unpredictable latencies and additional packet fragmentation.

Packets that are sent to a CGTP address are replicated by CGTP. The mtu value represents the maximum size of packets that you can send to avoid asymmetry when fragmenting. For CGTP, the mtu value on the redundant physical networks must be the same for each interface.

Duplicate packets that reach the CGTP destination address are filtered by the filtering module.

Installation Prerequisites

Hardware requirements

- A Sun4U™ architecture server
- Two network interface cards

Operating system   Solaris™ 9 operating system

Software requirements   CGTP packages and patches from the Foundation Services software distribution

See "Standalone CGTP Patches and Packages" on page 19.

Disk capacity   Minimum 1.5 Gbytes for the Solaris distribution

Free space   Minimum 1.5 Gbytes after the Solaris operating system has been installed

Standalone CGTP Patches and Packages

As part of the Foundation Services software delivery, you receive the following CGTP patches and packages.

TABLE 1–1 CGTP Patches and Packages

Patches and Packages	Description
Patches for CGTP on Solaris 9	See the *Netra High Availability Suite Foundation Services 2.1 6/03 README*
SUNWnhtp9 package	CGTP kernel drivers and modules
SUNWnhtu9 package	CGTP user-space components, configuration scripts, and configuration files

See your Sun contact for licensing information.

Installing Standalone CGTP Without the Reliable Boot Service

This chapter describes how to install the standalone CGTP patches and packages on the Solaris operating system.

You must perform the procedures on each node on which you want to use standalone CGTP. Do not perform these procedures on a node on which you are using the Foundation Services. Perform the procedures in the order presented.

For more information, see these sections:

Installing the CGTP Patches

▼ To Install the CGTP Patches

Before installing the CGTP patches, you must have installed the Solaris operating system.

1. **As superuser, log in to the node on which you want to install standalone CGTP.**

2. **Install the patches, using the following command to install each patch:**

   # **patchadd** *software-distribution-dir patch-number*

   software-distribution-dir is the directory containing the Foundation Services patches and packages. For a list of patches required for the CGTP, see *Netra High Availability Suite Foundation Services 2.1 6/03 README*.

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

After successful installation, the following message is displayed:

```
Checking installed patches...
Verifying sufficient filesystem capacity (dry run method)...
Installing patch packages...
Patch number patch-number has been successfully installed.
See /var/sadm/patch/patch-number/log for details
```

3. **Verify that the patches were successfully installed:**

   # **patchadd -p**

   If installation was successful, the following message is displayed:

   ```
   Patch patch-number Obsoletes:  Requires: Incompatibles:
   Packages: SUNWcarx SUNWcsr SUNWcsu SUNWhea SUNWcsxu SUNWmipu
   ```

Installing the CGTP Packages

▼ To Install the CGTP Packages

Before installing the CGTP packages, you must have installed the Solaris operating system and the CGTP patches.

1. **As superuser, log in to the node on which you want to install standalone CGTP.**

2. **Install the CGTP packages:**

   # **pkgadd -d** *software-distribution-dir* **SUNWnhtp9 SUNWnhtu9**

   software-distribution-dir is the directory containing the Foundation Services patches and packages.

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

   The installation of the SUNWnhtp9 package begins as follows:

   ```
   Netra HAS Sun CGTP drivers, Solaris9, 32 and 64-bit
   (sparc) 1.0.0
   Copyright 2003 Sun Microsystems, Inc.  All rights reserved.
   Use is subject to license terms.
   Using </> as the package base directory.
   ## Processing package information.
   ## Processing system information.
      6 package pathnames are already properly installed.
   ## Verifying package dependencies.
   ## Verifying disk space requirements.
   ## Checking for conflicts with packages already installed.
   ## Checking for setuid/setgid programs.
   ```

```
This package contains scripts which will be executed with super-user
permission during the process of installing this package.
```

3. **When the system asks if you want to continue with the installation of the SUNWnhtp9 package, type y:**

```
Do you want to continue with the installation of <SUNWnhtp9> [y,n,?] y
```

The following messages are displayed:

```
Installing Netra HAS Sun CGTP drivers, Solaris9, 32 and 64-bit
as <SUNWnhtp9>

## Executing preinstall script.
## Installing part 1 of 1.
/kernel/drv/cgtp
/kernel/drv/cgtp.conf
/kernel/drv/sparcv9/cgtp
/kernel/strmod/cgtp_flt
/kernel/strmod/sparcv9/cgtp_flt
[ verifying class <none> ]
## Executing postinstall script.
exit status = 0
devfsadm[131192]: verbose: mknod /devices/pseudo/clone@0:cgtp 0l/3l/20600
Driver (cgtp) installed.

Installation of <SUNWnhtp9> was successful.
```

Then, the installation of the SUNWnhtu9 package begins as follows:

```
Netra HAS Sun CGTP user-space utilities for Solaris9
(sparc) 1.0.0
Copyright 2003 Sun Microsystems, Inc.  All rights reserved.
Use is subject to license terms.
Using </> as the package base directory.
## Processing package information.
## Processing system information.
   3 package pathnames are already properly installed.
## Verifying package dependencies.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

This package contains scripts which will be executed with super-user
permission during the process of installing this package.
```

4. **When the system asks if you want to continue with the installation of the SUNWnhtu9 package, type y:**

```
Do you want to continue with the installation of <SUNWnhtu9> [y/n]? y
```

The following messages are displayed:

```
Installing Netra HAS Sun CGTP user-space utilities for Solaris9
as <SUNWnhtu9>
```

```
## Installing part 1 of 1.
/etc/init.d/cgtpfilter
[ verifying class <none> ]
/etc/rc2.d/S02cgtpfilter <linked pathname>
## Executing postinstall script.

Installation of <SUNWnhtu9> was successful.
```

5. Verify that the packages have been correctly installed:

pkginfo | **grep SUNWnht**

If the installation was successful, you see the following output:

```
system    SUNWnhtp9    Netra HAS Sun CGTP drivers, Solaris9, 32 and 64-bit
system    SUNWnhtu9    Netra HAS Sun CGTP user-space utilities for Solaris9
```

6. Reboot the node:

init 6

Configuring Standalone CGTP
Without the Reliable Boot Service

This chapter describes how to configure standalone CGTP without the Reliable Boot Service. The examples in this chapter use IPv4.

For more information, see these sections:

- "Introducing CGTP Configuration" on page 25
- "Preparing to Configure Standalone CGTP" on page 26
- "Configuring the `cgtp0` Virtual Physical Interface" on page 29
- "Configuring Additional CGTP Virtual Logical Interfaces" on page 31
- "Creating Routes for CGTP" on page 32
- "Disabling CGTP" on page 34

Introducing CGTP Configuration

This chapter describes the steps that you perform on nodes that are to run standalone CGTP. All examples in this chapter describe the configuration of two nodes, `machine A` and `machine B`, as shown in Figure 3–1. When configured, these nodes communicate through dual network links that form a CGTP network. You must decide the number of nodes that you want to configure to be part of this CGTP network.
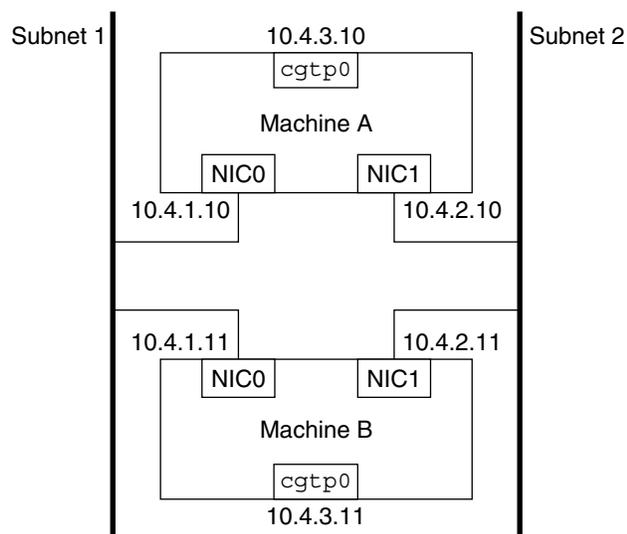
FIGURE 3–1 CGTP Configuration for `machine A` and `machine B`

Preparing to Configure Standalone CGTP

To have a CGTP network, each node on the network must be configured to have three interfaces:

- Two interfaces, *NIC0* and *NIC1*, that can be either physical or logical. These interfaces can be hme, eri, or le depending on the hardware you use. For more information and the interface type for specific supported hardware, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Hardware Guide*.

- One virtual physical interface, cgtp0.

Configure CGTP on the node's local file system. Do not configure CGTP on a remote shared file system because a remote file system might become unreachable if the network fails. Before configuring CGTP interfaces and routes, configure the interface names, addresses, netmasks, and the database search on each node.

Perform the following procedures on each node that you are configuring for standalone CGTP.

- "To Configure Interface Names" on page 27
- "To Configure an Ethernet Address Per Network Interface" on page 27

▼ To Configure Interface Names

Configure the interface names manually to enable creation of interfaces, and redundant routes, at first boot.

Note – You cannot enable the autoconfiguration of routes on subsequent reboots.

---

1. **Log in to the node that you want to configure for CGTP.**

2. **Register the host names for each local IP interface.**

   To ensure that the devices that you configure for CGTP are located in subsequent reboots, create five files:

   - `/etc/hostname.`*NIC0*
   - `/etc/hostname.`*NIC1*
   - `/etc/hostname.cgtp0`
   - `/etc/dhcp.`*NIC0*
   - `/etc/dhcp.`*NIC1*

   These files must be empty.

   Note – Network interfaces, such as *NIC0*, might have been created during the installation process.

▼ To Configure an Ethernet Address Per Network Interface

Configure the network interfaces of the node to use the Ethernet address on the card and not the Ethernet address stored in its NVRAM.

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

2. **Enable the `ok` prompt.**

   a. To get the `telnet` prompt, press Control-]:

      `# `**`Control-]`**

   b. To get the `ok` prompt, type `send brk` at the `telnet` prompt:

```
telnet> send brk
Type 'go' to resume
ok>
```

3. **Configure the processors to use local Ethernet (MAC) addresses:**

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

▼ To Configure Node Addresses

Manually configure the node addresses so that the interfaces and the redundant routes are created at first boot.

1. **Log in to the node that you want to configure for CGTP.**

2. **Open /etc/inet/hosts in a text editor.**

3. **Define the set of IP addresses for** *NIC0*, *NIC1*, **and cgtp0 in the /etc/inet/hosts file as described in** "To Configure Interface Names" on page 27.

4. **Save the /etc/inet/hosts file and exit the text editor.**

5. **Reboot the node.**

6. **Check that the node addresses are automatically assigned to the interface:**

```
% ifconfig -a
```

For more information on the ifconfig command, see the ifconfig(1M) man page.

▼ To Configure Netmasks

1. **Log in to the node that you want to configure for CGTP.**

2. **Open /etc/inet/netmasks in a text editor.**

3. **Declare the subnet masks in the /etc/inet/netmasks file by adding an entry in the following format:**

```
xx.yy.0.0        255.255.255.0
```

This step assumes that all the CGTP subnet masks share a common Class C network prefix.

4. **Save the /etc/inet/netmasks file and exit the text editor.**

▼ To Configure the NIS Database Search

1. **Log in to the node that you want to configure for CGTP.**

2. **Open the `/etc/nsswitch.conf` file in a text editor.**

3. **For entries that concern hosts, replace this line:**

   ```
   hosts      ...
   ```
   with the line

   ```
   hosts      ...files nis
   ```
   This forces the system to use the modified network configuration by placing a local search as first choice.

4. **For entries that concern netmasks, replace this line:**

   ```
   netmasks      ...
   ```
   with the line

   ```
   netmasks      ...files nis
   ```

5. **Save the file and exit the text editor.**

Configuring the `cgtp0` Virtual Physical Interface

This section describes how to create a `cgtp0` interface on two nodes. `cgtp0` is a virtual physical interface. You must create a `cgtp0` interface on each node on which you want to use standalone CGTP.

Note – Before performing this procedure, you must configure your interfaces, nodes, and netmasks as explained in "To Configure Interface Names" on page 27, "To Configure Node Addresses" on page 28, and "To Configure Netmasks" on page 28.

▼ To Configure the `cgtp0` Interface

1. **As superuser, log in to a node on which you want to configure CGTP.**
   In Figure 3–1, the node could be `machine A`.

2. **Create the virtual physical interface for CGTP by using the `plumb` option of `ifconfig`:**

```
# ifconfig cgtp0 plumb
```

The plumb option opens the device that is associated with the physical interface name. This option then sets up the streams needed for IP to use the device. For further information, see the ifconfig(1M) man page.

3. **View the new interface on machine A:**

```
# ifconfig -a
```

A result similar to the following is displayed:

```
lo0: flags=1000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232 index 1
inet 127.0.0.1 netmask ff000000
hme0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
inet 10.4.1.10 netmask ffffff00 broadcast 10.4.1.255
 ether 8:0:20:da:6:58
hme1: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4>mtu 1500 index 4
inet 10.4.2.10 netmask ffffff00 broadcast 10.4.2.255
ether 8:0:20:da:6:59
cgtp0: flags=1000842<BROADCAST,RUNNING,MULTICAST,IPv4>mtu 1500 index 5
inet 0.0.0.0 netmask 0
ether 0:0:0:0:0:0
```

You can observe that no IP address has been assigned to the cgtp0 interface, inet 0.0.0.0. Also, no MAC address is assigned to the interface, ether 0:0:0:0:0:0, because this interface is a virtual physical interface. For further information, see the cgtp(7D) man page.

To display a shortened form of this result, displaying only the (as yet unassigned) cgtp0 interface values, use this command:

```
# ifconfig -a cgtp0
```

A shorter result similar to the following is displayed on the console window:

```
cgtp0: flags=1000842<BROADCAST,RUNNING,MULTICAST,IPv4>mtu 1500 index 5
inet 0.0.0.0 netmask 0
ether 0:0:0:0:0:0
```

Note – Before an interface is plumbed, the interface is not listed in the output of ifconfig -a.

---

4. **Assign an IP address, a netmask, and a broadcast address on machine A.**

The up option enables the cgtp0 interface.

```
# ifconfig cgtp0 10.4.3.10 netmask 0xffffff00 broadcast 10.4.3.255 up
```

In this example, the IP address is 10.4.3.10, the netmask is 0xffffff00, and the broadcast address is 10.4.3.255.

5. **View the details of the cgtp0 interface on machine A:**

```
# ifconfig -a cgtp0
```

```
cgtp0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 2
inet 10.4.3.10 netmask ffffff00 broadcast 10.4.3.255
ether 0:0:0:0:0:0
```

Note – You can modify the broadcast address and the netmask, if necessary, by using the `ifconfig` command.

---

6. **As superuser, log in to the second machine, `machine B`.**

7. **Create the standard interface for CGTP by using the `plumb` option of `ifconfig`:**

   # **`ifconfig cgtp0 plumb`**

8. **Assign an IP address, a netmask, and a broadcast address to `machine B`.**

   The `up` option enables the `cgtp0` interface.

   # **`ifconfig cgtp0 10.4.3.11 netmask 0xffffff00 broadcast 10.4.3.255 up`**

   In this example, the IP address is `10.4.3.11`, the netmask is `0xffffff00`, and the broadcast address is `10.4.3.255`.

9. **View the newly created `cgtp0` interface on `machine B`:**

   # **`ifconfig -a`**

   ```
   cgtp0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 2
   inet 10.4.3.11 netmask ffffff00 broadcast 10.4.3.255
   ether 0:0:0:0:0:0
   hme0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
   inet 10.4.1.11 netmask ffffff00 broadcast 10.4.1.255
   ether 8:0:20:da:6:62
   hme1: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 4
   inet 10.4.2.11 netmask ffffff00 broadcast 10.4.2.255
   ether 8:0:20:da:6:63
   ```

Configuring Additional CGTP Virtual Logical Interfaces

In addition to the `cgtp0` interface, you can configure additional CGTP interfaces. These additional interfaces are virtual logical interfaces that are associated with `cgtp0`, such as `cgtp0:1` and `cgtp0:2`. You might want to create such an additional interface if you want to have services using different interfaces, but want to maintain the redundancy.

The cgtp0 and cgtp0:*x* interfaces on a node must have the same subnet prefix. This means that the primary CGTP address and the logical, or aliased, addresses must only differ by their hostid. Routes to the aliased interfaces can accordingly be set up on the other cluster nodes.

▼ To Configure Additional CGTP Interfaces

1. **As superuser, log in to machine A.**

2. **Create the logical interface for CGTP:**

   ```
   # ifconfig cgtp0 addif \
   ```
   destination-address **netmask** *netmask* **broadcast** *broadcast-address*

   The addif option creates the next unused logical interface associated with the interface you specify. For example, if you specify cgtp0, the next unused logical interface is cgtp0:1. This option replaces the plumb option. In addition, the addif option avoids conflicts because it assigns the next available interface name. For further information, see the ifconfig(1M) man page.

   Alternatively, you can still specify the logical interface name by using the plumb and up options:

   ```
   # ifconfig cgtp0:1 plumb
   ```

   ```
   # ifconfig cgtp0:1 destination-address \
   ```
   netmask *netmask* **broadcast** *broadcast-address* **up**

3. **Create logical interfaces for the gateways (destinations) on machine A:**

   ```
   # ifconfig hmex addif \
   ```
   destination-address **netmask** *netmask* **broadcast** *broadcast-address* **up**

4. **As superuser, log in to machine B.**

5. **Repeat Step 2 and Step 3 for machine B.**

Creating Routes for CGTP

This section describes how to create routes for CGTP between two nodes, machine A and machine B. CGTP routes should not cross physical interfaces that are part of a CompactPCI network interface, IPMP group.

You must configure all CGTP interfaces before configuring CGTP routes.

▼ To Create Routes Between Two Machines

In this procedure `machine B` is the destination address or *gateway*.

1. **As superuser, log in to `machine A`.**

2. **Create routes from `machine A` to `machine B` using the general notation:**

   ```
   # route add destination-cgtp-address \
   gateway-address -multirt -setsrc src-cgtp-address
   ```

   Routes must be separately configured for each CGTP target on the network. The `-setsrc` option is used to specify a source address. For further information on the `-multirt` and `-setsrc` options, see the `route(1M)` man page in the Solaris 9 documentation set.

   Note that all commands for adding routes from `machine A` to `machine B` are executed on `machine A`.

   ```
   # route add 10.4.3.11 10.4.1.11 -multirt -setsrc 10.4.3.10
   ```

   ```
   # route add 10.4.3.11 10.4.2.11 -multirt -setsrc 10.4.3.10
   ```

3. **Examine the routing table on `machine A`:**

   ```
   # netstat -rn
   ```

   Table 3–1 gives an example of the routing table for `machine A`. Note that the two routes have the same destination address, but different gateways.

   TABLE 3–1 Sample Routing Table for `machine A`

Destination	Gateway	Flags	Ref	Use	Interface
10.4.3.11	10.4.1.11	UGHMS	1	0	
10.4.3.11	10.4.2.11	UGHMS	1	0	
10.4.2.0	10.4.2.10	U	1	0	hme1
10.4.3.0	10.4.3.10	U	1	0	cgtp0
10.4.1.0	10.4.1.10	U	1	0	hme0
224.0.0.0	10.4.1.10	U	1	0	hme0
127.0.0.1	127.0.0.1	UH	2	8	lo0

   The Flags column contains the letter M to indicate that the routes are marked as `multirt`. The letter S indicates that the route is declared with the `setsrc` option. The routing table provides this information to enable you to check whether your manual configuration is correct.

4. **Create routes from `machine B` to `machine A`.**

   Note that all commands in adding routes from `machine B` to `machine A` are executed on `machine B`.

```
# route add 10.4.3.10 10.4.1.10 -multirt -setsrc 10.4.3.11
```

```
# route add 10.4.3.10 10.4.2.10 -multirt -setsrc 10.4.3.11
```

Routes must be separately configured for each CGTP target on the network, in both directions.

5. **Examine the routing table on machine B:**

```
# netstat -rn
```

Table 3–2 gives an example of the routing table for machine B.

TABLE 3–2 Sample Routing Table for machine B

Destination	Gateway	Flags	Ref	Use	Interface
10.4.3.10	10.4.1.10	UGHMS	1	0	
10.4.3.10	10.4.2.10	UGHMS	1	0	
10.4.2.0	10.4.2.11	U	1	0	hme1
10.4.3.0	10.4.3.11	U	1	0	cgtp0
10.4.1.0	10.4.1.11	U	1	0	hme0
127.0.0.1	127.0.0.1	UH	2	8	lo0

The filtering module is now configured because routes are declared to the CGTP destination address that is filtering packets from that address.

Disabling CGTP

This section describes how to disable the CGTP interfaces, and the asssociated routes, on two machines where each machine is attached to two subnets. The CGTP interfaces that can be disabled are as follows:

- Virtual logical interfaces (cgtp0:*x*), where you have assigned more than one IP address to the cgtp0 virtual physical interface, or hme0:*x* for hme0
- Virtual physical interface (cgtp0)

▼ To Disable Virtual Logical Interfaces

1. **As superuser, log in to machine A.**

2. **Remove the routes that you set up in "To Create Routes Between Two Machines" on page 33:**

```
# route delete machine-B-cgtp-address  gateway-address
```

3. **Use the `ifconfig` command to disable your logical interfaces.**

   - The following command disables the logical interface hme0:1:

     ```
     # ifconfig hme0:1 down unplumb
     ```

   - The following command disables the logical interface cgtp0:1:

     ```
     # ifconfig cgtp0:1 down unplumb
     ```

▼ To Disable the Virtual Physical Interface, `cgtp0`

1. **As superuser, log in to `machine A`.**

2. **Remove the routes between `machine A` and `machine B`:**

   ```
   # route delete machine-B-cgtp-address  gateway-address
   ```
   On machine A, the following commands remove the routes.

   ```
   # route delete 10.4.3.11 10.4.1.11
   ```

   ```
   # route delete 10.4.3.11 10.4.2.11
   ```

3. **As superuser, log in to `machine B`.**

4. **Remove routes between `machine B` and `machine A`.**
   On machine B, the following commands remove the routes.

   ```
   # route delete 10.4.3.10 10.4.1.10
   ```

   ```
   # route delete 10.4.3.10 10.4.2.10
   ```

5. **As superuser, log in to `machine A`.**

6. **Remove the interfaces that you configured for CGTP.**
   For example, to remove the cgtp0 interface on machine A, type the following:

   ```
   # ifconfig cgtp0 down unplumb
   ```

7. **As superuser, log in to `machine B`.**

8. **Remove the interfaces that you configured for CGTP on `machine B`.**

Standalone CGTP With the Reliable Boot Service

You can install and configure standalone CGTP on diskless nodes that do not have any other Foundation Services installed. These nodes do not form a Foundation Services cluster. However, these nodes are configured to access a two-node cluster that is installed with the Foundation Services. The main advantages of configuring standalone nodes to access a two-node cluster are the reliable services Reliable NFS and Reliable Boot Service. Standalone nodes connected to a two-node, Foundation Services cluster can be reliably booted.

For a description of how to install and configure standalone CGTP on diskless nodes, see the following chapters:

- Chapter 4 describes the prerequisites for installing and configuring standalone CGTP with the Reliable Boot Service.
- Chapter 5 describes how to install and configure standalone CGTP nodes with the Reliable Boot Service.

Preparing to Install Standalone CGTP With the Reliable Boot Service

To provide standalone CGTP nodes with Reliable NFS and the Reliable Boot Service, install the Foundation Services on a two-node cluster. You can use the `nhinstall` tool, or manually install and configure both the standalone node and the cluster nodes.

The following sections describe the main requirements for the installation. For further information about the hardware and software requirements, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.

For a list of the main hardware and software requirements, see the following sections:

- "Installation Server Requirements" on page 39
- "Cluster Node Requirements" on page 40
- "Standalone Node Requirements" on page 40
- "Connecting the Nodes" on page 41

Installation Server Requirements

You require an *installation server* to install the Foundation Services. An installation server enables you to install the Solaris operating system and the Foundation Services on the cluster by using the Solaris JumpStart™ software.

The installation server requires the following:

Hardware requirements

- UltraSPARC® platform
- Two network devices

  One network device is used to connect the installation server to an external network. The other network device is used to connect the installation server to the

cluster network.

Operating system	Solaris
Software requirements	Perl Version 5, which is available with the Developer Solaris Software Group.
Disk capacity	Minimum 1.5 Gbytes for a Solaris software distribution
	This size does not include applications that you might want to deploy on the cluster.
Free space	Minimum 1.5 Gbytes after the Solaris operating system has been installed

To connect the installation server to the cluster and the standalone nodes, see

Cluster Node Requirements

The hardware and software requirements for the two-node cluster to be installed with the Foundation Services are as follows:

Hardware requirements

- Two Netra servers

  For example, Netra T1 servers.
- Two Ethernet switches
- A terminal server to manage the consoles

Operating system   Solaris 9

Software requirements

- The Solaris distribution
- The Foundation Services software distribution

Standalone Node Requirements

The hardware and software requirements for the diskless nodes to be installed with standalone CGTP are as follows:

Hardware requirements

- Two Netra servers

  For example, Netra T1 servers.
- Two Ethernet cards

Operating system   Solaris 9 operating system

Software requirements   The following CGTP packages and patches from the
                              Foundation Services software distribution:

- CGTP patches

  For exact patch numbers, see the *Netra High
  Availability Suite Foundation Services 2.1 6/03 README*.
- `SUNWnhtp9` package, CGTP kernel drivers and
  modules
- `SUNWnhtu9` package, CGTP user-space components,
  configuration scripts and files
- `SUNWnhdbs` package, scripts to configure the routes
  for the standalone diskless nodes

Connecting the Nodes

Connect the nodes as shown in the following figure.
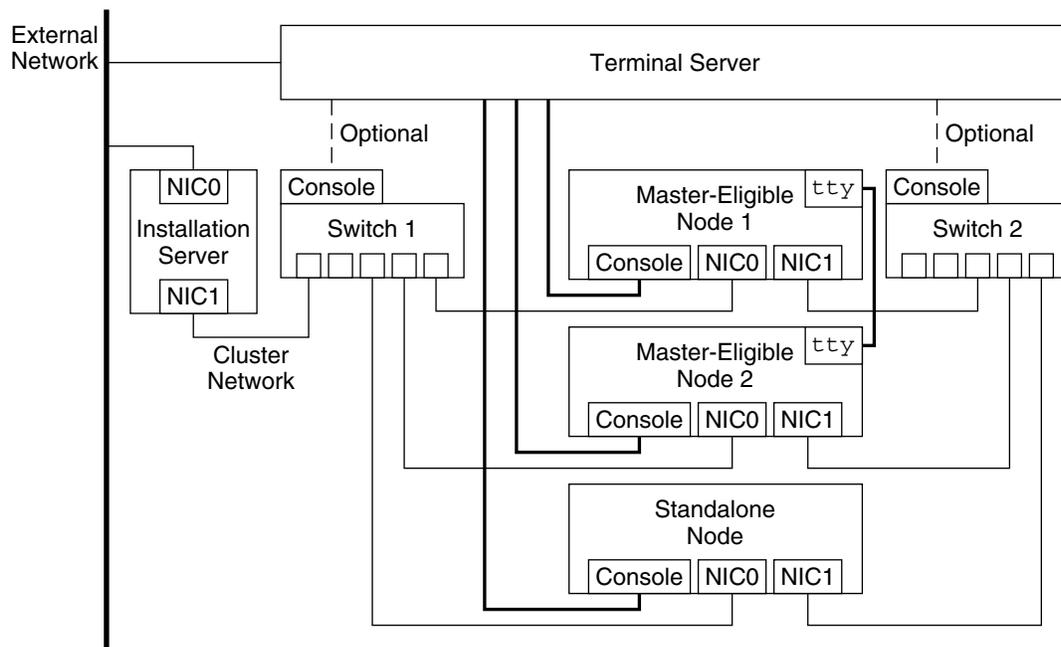
NIC0 = Interface to the first network card.

NIC1 = Interface to the second network card.

FIGURE 4–1 Connecting the Standalone Nodes to a Two-Node Cluster

Installing Standalone CGTP With the Reliable Boot Service

After you have installed and connected the hardware for your standalone diskless nodes and the two-node cluster, you are ready to install the software on the nodes.

You can install the software using the `nhinstall` tool, or by manual installation. For introductory information about each type of installation, see the *Netra High Availability Suite Foundation Services 2.1 6/03 Overview*.

Use one of the following procedures to install and configure CGTP on the standalone nodes and the Foundation Services on the two-node cluster:

- "To Install With the `nhinstall` Tool" on page 43
- "To Install Manually" on page 44

Installing With the Reliable Boot Service

▼ To Install With the `nhinstall` Tool

1. **Install and set up the `nhinstall` tool as described in the** *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide***.**

2. **In the `cluster_definition.conf` file, specify that you are installing standalone nodes:**

   ```
   DISKLESS_TYPE=STANDALONE
   ```

   For a description of all parameters in the `cluster_definition.conf` file, see the `cluster_definition.conf`(4) man page.

3. **Complete the installation and configuration procedure as described in Part II of the** *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation*

Guide.

▼ To Install Manually

1. **Check that you have the necessary hardware.**
    See Chapter 4.

2. **Prepare the installation environment for a two-node cluster.**
    For information, see "Preparing to Install Manually" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.

3. **Install the Solaris operating system and the Foundation Services on the master-eligible nodes.**
    See "Installing the Software on the Master-Eligible Nodes" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.

4. **Prepare to install the diskless node.**
    See "Preparing to Install a Diskless Node" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*

5. **Install the Solaris operating system for the diskless node on the master node.**
    See "Installing the Solaris Operating System for Diskless Nodes on the Master Node" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.

6. **Install and configure the DHCP and the Reliable Boot Service.**
    - "Installing the DHCP and the Reliable Boot Service" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.
    - "Configuring the DHCP for a Diskless Node" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*

7. **Configure the DHCP boot policy for the diskless node.**
    See "Configuring the DHCP Boot Policy for Diskless Nodes" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.

8. **Install the Standalone CGTP packages on the diskless node:**

    # **pkgadd -d** *pkg-dir* **SUNWnhtp9 SUNWnhtu9 SUNWnhcdt SUNWnhdbs**

    pkg-dir is the directory where the CGTP packages are located.

9. **Install the Standalone CGTP patches on the diskless node using the following command to install each patch:**

    # **patchadd -d** *patch-dir patch-list*

    For the list of patches for CGTP, see the *Netra High Availability Suite Foundation Services 2.1 6/03 README*.

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

After successful installation, the following message is displayed:

```
Checking installed patches...
Verifying sufficient filesystem capacity (dry run method)...
Installing patch packages...
Patch number patch-number has been successfully installed.
See /var/sadm/patch/patch-number/log for details
```

10. **Configure the diskless node:**

   - "To Update the Network ID Files for the Diskless Node" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*

   - "To Configure External IP Addresses" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*

   - "To Set up File Systems for a Diskless Node" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*

11. **Declare the diskless node to the master-eligible nodes.**

   See "Integrating a Diskless Node Into the Cluster" in *Netra High Availability Suite Foundation Services 2.1 6/03 Custom Installation Guide*.

12. **Boot the master-eligible nodes.**

13. **Boot the diskless node.**

   When you boot the nodes, the scripts in the SUNWnhdbs package create routes from the diskless nodes to the master node by using the floating address triplet of the master node. These routes are used to provide the Reliable Boot Service to the standalone diskless nodes running CGTP.

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