HP-UX Operating System: LAN Configuration Guide

HP-UX version 11.00.03
Stratus Technologies
R1011H-04

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Contents

Preface

The *HP-UX Operating System: LAN Configuration Guide* (R1011H) describes how to configure a LAN on Continuum Series 400 and 400-CO systems.

Revision Information

This manual has been revised to reflect support for Continuum systems using suitcases with the PA-8600 CPU modules and/or additional PCI card models, company and platform[1] name changes, and miscellaneous corrections to existing text.

Audience

This document is intended for system administrators who install and configure LAN networks.

Notation Conventions

This document uses the following conventions and symbols:

- The following font conventions apply both to general text and to text in displays:
  - `Monospace` represents text that would appear on your screen (such as commands and system responses, functions, code fragments, file names, directories, prompt signs, messages). For example,

    ```
    Broadcast Message from ...
    ```

[1] Some Continuum systems were previously called Distributed Network Control Platform (DNCP) systems. References to DNCP still appear in some documentation and code.

- **`Monospace bold`** represents user input in screen displays. For example,

  `ls -a`

- *`Monospace italic`* represents variables in commands for which the user must supply an actual value. For example,

  `cp` *`filename1 filename2`*

  It also represents variables in prompts and error messages for which the system supplies actual values. For example,

  `cannot create temp filename` *`filename`*

- Helvetica represents all window titles, fields, menu names, and menu items in `swinstall` windows and System Administration Manager (SAM) windows. For example,

  Select Mark Install from the Actions menu.

- *Italic* emphasizes words in text. For example,

  …does *not* support…

  It is also used for book titles. For example,

  HP-UX Operating System: LAN Configuration Guide (R1011H)

- **Bold** introduces or defines new terms. For example,

  An **object manager** is an OSNM process that …

- The notation Ctrl – char indicates a control–character sequence. To type a control character, hold down the control key (usually labeled Ctrl) while you type the character specified by char. For example, Ctrl – c means hold down the Ctrl key while pressing the c key; the letter c does not appear on the screen.

- Angle brackets (< >) enclose input that does not appear on the screen when you type it, such as passwords. For example,

  <*`password`*>

- Brackets ([ ]) enclose optional command arguments. For example,

  `cflow [-r] [-ix] [-i_] [-d` *`num`*`] `*`files`*

- The vertical bar (|) separates mutually exclusive arguments from which you choose one. For example,

  `command` `[`*`arg1 | arg2`*`]`

- Ellipses (…) indicate that you can enter more than one of an argument on a single command line. For example,

  `cb [-s] [-j] [-l` *`length`*`] [-V] [`*`file`* `…]`

- A right-arrow (>) on a sample screen indicates the cursor position. For example,

  ```
  >install - Installs Package
  ```

- A name followed by a section number in parentheses refers to a man page for a command, file, or type of software. The section classifications are as follows:
  - 1 – User Commands
  - 1M – Administrative Commands
  - 2 – System Calls
  - 3 – Library Functions
  - 4 – File Formats
  - 5 – Miscellaneous
  - 7 – Device Special Files
  - 8 – System Maintenance Commands

  For example, *init*(1M) refers to the man page for the `init` command used by system administrators.

- Document citations include the document name followed by the document part number in parentheses. For example, *HP-UX Operating System: LAN Configuration Guide* (R1011H) is the standard reference for this document.

- Note, Caution, Warning, and Danger notices call attention to essential information.

NOTE

Notes call attention to essential information, such as tips or advice on using a program, device, or system.

CAUTION

Caution notices alert the reader to conditions that could damage a program, device, system, or data.

WARNING

Warning notices alert the reader to conditions that are potentially hazardous to people. These hazards can cause personal injury if the warnings are ignored.

DANGER

Danger notices alert the reader to conditions that are potentially lethal or extremely hazardous to people.

Product Documentation

The HP-UX™ operating system is shipped with the following documentation:

- *HP-UX Operating System: Peripherals Configuration* (R1001H) — provides information about configuring peripherals on a Continuum system
- *HP-UX Operating System: Installation and Update* (R1002H) — provides information about installing or upgrading the HP-UX operating system on a Continuum system
- *HP-UX Operating System: Read Me Before Installing* (R1003H) — provides updated preparation and reference information, and describes updated features and limitations
- *HP-UX Operating System: Fault Tolerant System Administration* (R1004H) — provides information about administering a Continuum system running the HP-UX operating system
- *HP-UX Operating System: LAN Configuration Guide* (R1011H) — provides information about configuring a LAN network on a Continuum system running the HP-UX operating system
- *HP-UX Operating System: Site Call System User's Guide* (R1021H) — provides information about using the Site Call System utility
- *Managing Systems and Workgroups* (B2355-90157) — provides general information about administering a system running the HP-UX operating system (this is a companion manual to the *HP-UX Operating System: Fault Tolerant System Administration* (R1004H))

Additional platform-specific documentation is shipped with complete systems (see "Related Documentation").

Online Documentation

When you install the HP-UX operating system software, the following online documentation is installed:

- notes files
- manual (man) pages

Notes Files

The `/usr/share/doc/RelNotes.fts` file contains the final information about this product.

The `/usr/share/doc/known_problems.fts` file documents the known problems and problem-avoidance strategies.

The `/usr/share/doc/fixed_list.fts` file lists the bugs that were fixed in this release.

Man Pages

The operating system comes with a complete set of online man pages. To display a man page on your screen, enter

`man` *`name`*

`name` is the name of the man page you want displayed. The `man` command includes various options, such as retrieving man pages from a specific section (for example, separate `term` man pages exist in Sections 4 and 5), displaying a version list for a particular command (for example, the `mount` command has a separate man page for each file type), and executing keyword searches of the one-line summaries. See the *man*(1) man page for more information.

Related Documentation

In addition to the operating system manuals, the following documentation contains information related to administering a Continuum system running the HP-UX operating system:

- The *Continuum Series 400 and 400-CO: Site Planning Guide* (R454) provides a system overview, site requirements (for example, electrical and environmental requirements), cabling and connection information, equipment specification sheets, and site layout models that can assist in your site preparation for a Continuum Series 400 or 400-CO system.
- The *HP-UX Operating System: Continuum Series 400 and 400-CO Operation and Maintenance Guide* (R025H) provides detailed descriptions and diagrams, along with instructions about installing and maintaining the system components on a Continuum Series 400 or 400-CO system.
- The *D859 CD-ROM Drive Installation and Operation Guide* (R720) describes how to install, operate, and maintain CD-ROM drives on a Continuum Series 400 or 400-CO system.
- The *Continuum Series 400 and 400-CO: Tape Drive Operation Guide* (R719) describes how to operate and maintain tape drives on a Continuum Series 400 or 400-CO system.
- The *U512 Ethernet PCI-Card Installation Guide* (R711) and the *U522 Ethernet PCI-Card Installation Guide* (R753) describe how to install Ethernet PCI cards into Continuum Continuum Series 400 or 400-CO system.
- The *sam*(1M) man page provides information about using the System Administration Manager (SAM).
- The *HP-UX Operating System: Redundant Network Interface* (R1006H) describes how to pair network cards through the RNI layered product.
- For information about manuals available from Hewlett-Packard™, see the Hewlett-Packard documentation web site at `http://www.docs.hp.com`.

Ordering Documentation

HP-UX operating system documentation is provided on CD-ROM (except for the *Managing Systems and Workgroups* (B2355-90157) which is provided as a separate printed manual). You can order a documentation CD-ROM or other printed documentation in either of the following ways:

- Call the CAC (see "Customer Assistance Center (CAC)").
- If your system is connected to the Remote Service Network (RSN), add a call using the Site Call System (SCS). See the *scsac*(1) man page for more information.

When ordering a documentation CD-ROM please specify the product and platform documentation you desire, as there are several documentation CD-ROMs available. When ordering a printed manual, please provide the title, the part number, and a purchase order number from your organization. If you have questions about the ordering process, contact the CAC.

Commenting on This Guide

Stratus welcomes any corrections or suggestions for improving this guide. Contact the CAC to provide input about this guide.

Customer Assistance Center (CAC)

The Stratus Customer Assistance Center (CAC), is available 24 hours a day, 7 days a week. To contact the CAC, do one of the following:

- Within North America, call 800-828-8513.
- For local contact information in other regions of the world, see the CAC web site at http://www.stratus.com/support/cac and select the link for the appropriate region.

1

Overview

This chapter gives a brief overview on LAN support and LAN device naming.

LAN Support

The HP-UX operating system provides support to access networks using the Carrier-Sense, Multiple-Access with Collision Detection (CSMA/CD) method. Computer nodes check the Local Area Network (LAN) for busy signals before sending messages in CSMA/CD LANs. When nodes send messages at the same time, the system software notices and fixes the problem before the messages jam the LAN.

Ethernet and IEEE 802.3 LANs are supported bus network LANs that use the CSMA/CD access method. You can extend support to Wide Area Networks (WANs) through bridges and routers.

Internet Services/ARPA Services and NFS Services are supported through the TCP/IP protocol. X.400, File Transfer, Access and Management (FTAM), and the Manufacturing Message Specification (MMS) are supported through the OSI protocol. Reverse Address Resolution Protocol (RARP) is also supported.

These networking services are installed as part of the operating system; you do not need to perform any additional installation steps for Ethernet support. Other LAN services are layered products that require you to install additional software. Regardless of the LAN service, you need to configure the software before you can send messages on a Continuum system LAN.

NOTE

The optional Redundant Network Interface (RNI) software must be installed and logical LAN pairs must be configured to make the LAN fault tolerant. See the *HP-UX Operating System: Redundant Network Interface* (R1006H) and the *lconf*(1M) and *conf*(4) man pages for more information.

This document describes how to configure and administer LAN services, in particular Ethernet services.

NOTE

Most administrative commands and utilities reside in standard locations. In this guide, only the command name, not the full path name, is provided if that command resides in a standard location. The standard locations are `/sbin`, `/usr/sbin`, `/bin`, `/usr/bin`, and `/etc`. Full path names are provided when the command is located in a nonstandard directory.

LAN Device Naming

This section describes how LAN devices are identified by the I/O subsystem.

Hardware Addresses

The system identifies hardware components through both physical and logical hardware addresses. The following subsections describe the addressing scheme and how to determine the hardware address for a LAN device. See Chapter 5, "Fault Tolerant System Administration," in the *HP-UX Operating System: Fault Tolerant System Administration* (R1004H) for more information about physical and logical hardware paths.

Physical Hardware Paths

Physical hardware addresses represent the electrical path that the system must traverse to find a LAN device. Figure 1-1 shows the top three address levels of a Continuum Series 400/400-CO system hardware path.

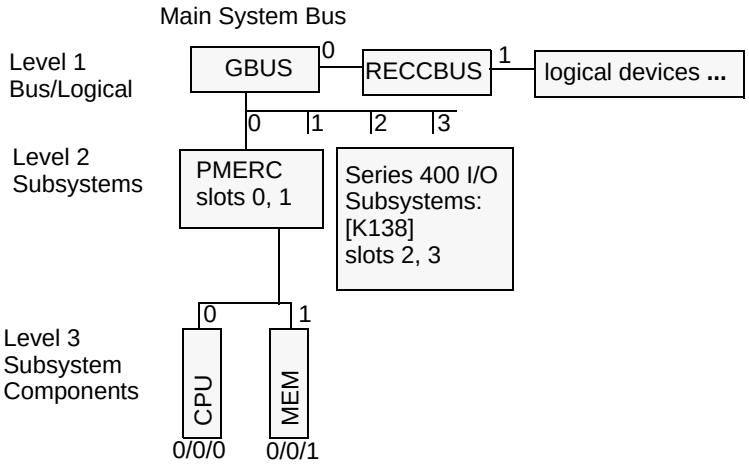

Figure 1-1. System-Level Hardware Addresses

Figure 1-2 extends the hardware path to illustrate possible LAN port addresses. In Figure 1-2, the paths for the LAN devices are highlighted. The LAN device addresses through the LAN bridge are 0/3/3/0/6 and 0/3/3/0/7. The address for the LAN device connected directly is 0/3/5/0. In both cases the LAN address includes an identifier for the transparent slot level.

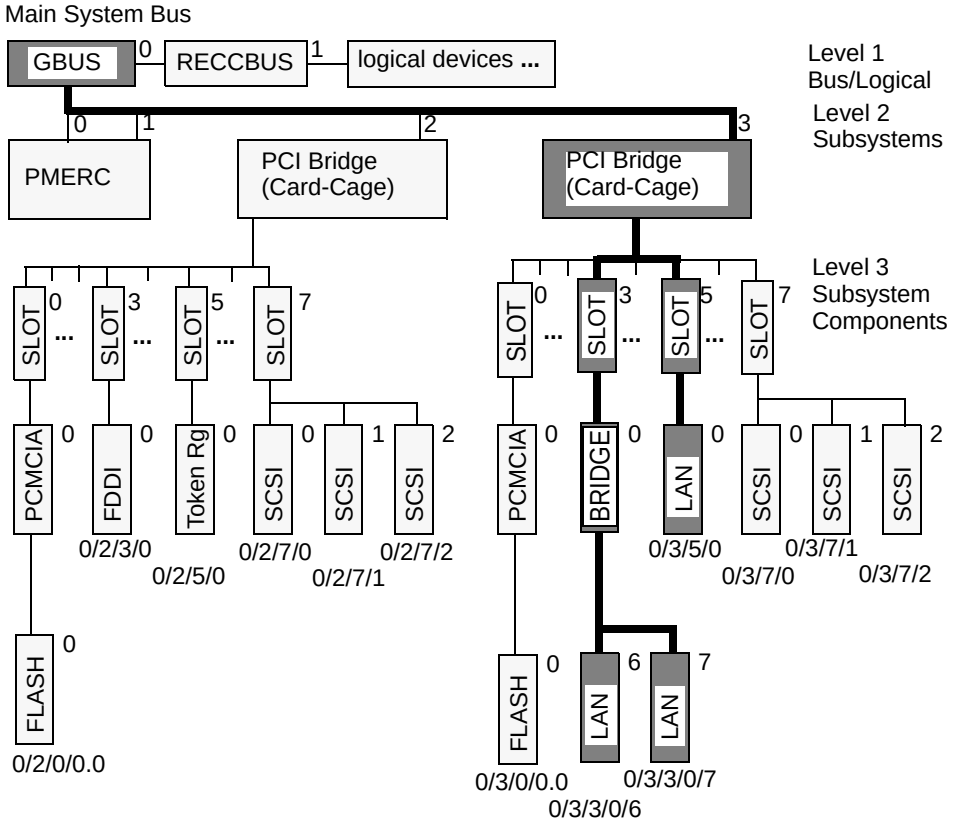

Figure 1-2. LAN Port Addresses

A LAN port has the following physical path:

```
GBUS / IObus / slot / port
```

or:

```
GBUS / IObus / slot / bridge / port
```

The path fields correspond to the following elements:

GBUS	Specifies the system bus number, which is always 0.
IObus	Specifies the I/O bus number. On a Continuum Series 400/400-CO system, this is 2 or 3 (corresponding to the two card-cage numbers).
slot	Specifies the slot number. On a Continuum Series 400/400-CO system, this is 1 through 7 (corresponding to the card-cage slot numbers).
bridge	Specifies a bridge. This is 0.
port	Specifies a port number on the card.

The following hardware paths correspond to the highlighted LAN port locations in Figure 1-2:

0/3/3/0/6	Specifies the lower port on a dual-port LAN card connected to the PCI bus through a bridge.
and	
0/3/3/0/7	Specifies the upper port on a dual-port LAN card connected to the PCI bus through a bridge. (The two-port U512 PCI card uses port numbers 6 and 7 while the four-port U522 PCI card uses port numbers 4-7.)
0/3/5/0	Specifies the port on a single-port LAN card connected directly to the PCI bus.

Logical Hardware Paths

The system assigns logical addresses to each physical component. The system uses the logical LAN manager (LNM) to map physical hardware addresses for LAN ports to logical hardware addresses. This is a virtual mapping scheme that the LNM uses to configure LAN interfaces. All logical LAN addresses use the following form:

13/0/*LAN_inst*

LAN_inst is the logical network instance number 0–15 for the LAN port.

NOTE

The maximum number of logical LAN networks per system is 16.

Logical paths are assigned automatically if there is not a single logical LAN name in the Logical Interface File (LIF) `CONF` file (on the flash card). You can dynamically configure logical paths using the `lconf` command, and you can maintain logical configurations across reboots by editing the `/stand/conf` file and copying the file to the `CONF` file. See "Configuring Logical LANs" in Chapter 2, "Configuration," for these procedures.

NOTE

The logical (not physical) hardware path is used for configuring LAN interfaces. For example, the `lanscan` command only recognizes LAN interfaces with logical hardware paths.

Instance Numbers

An instance number uniquely identifies a device within a class. A class of devices is a logical grouping of similar devices. All LAN devices belong to the same LAN class, even if they are controlled by different device drivers. For example, Ethernet, FDDI, and Token Ring are in the same LAN class.

The instance number is displayed in the device driver file names (`/dev/lan#` and `/dev/ether#`, where # is the instance number) and under `Crd In#` and in the `NamePPA` number (for example, the `1` in `lan1`) in `lanscan` output.

Determining Hardware Paths

To determine the physical and logical hardware paths for an Ethernet (or any LAN) port, and the associated logical LAN interfaces, do the following:

1. Log in as `root`.
2. Determine the physical locations for all Ethernet cards in the system. To do this, enter

   `ftsmaint ls`

   Look for the U512 and U522 lines and note the `H/W Path` entries, for example, `0/2/1/0` for a U512 card in slot 1 of card-cage 2 of a Continuum Series 400 system.

3. Determine the associated logical LAN interfaces for the Ethernet ports. To do this, enter

   `lconf lnm -l`

   In the following example, there are two Ethernet ports configured as logical LAN interfaces (`lan0` and `lan1`):

```
# lconf lnm -l
lan0=0/2/1/0:lantype=ENET
lan1=0/2/2/0:lantype=ENET
lan2=0/2/5/0:lantype=FDDI
```

   If there are Ethernet ports listed in step 2 that do not appear in this list, you need to configure them (as described in "Configuring Logical LANs" in Chapter 2, "Configuration").

4. Determine the associated logical hardware address. To do this, enter

   `lanscan`

   The logical hardware address is in the `Hardware Path` column, as illustrated in the following sample output:

```
Hardware Station       Crd Hdw   Net-Interface  NM  MAC      HP-DLPI DLPI
Path     Address       In# State NamePPA        ID  Type     Support Mjr#
13/0/0   0x0000BC0F071A 0   UP    lan0 snap0     1   ETHER    Yes     52
13/0/1   0x0000BC0F1149 1   UP    lan1 snap1     2   ETHER    Yes     52
13/0/2   0x0000BC0E1122 2   UP    lan2           3   FDDI     Yes     52
```

   This example shows that the logical addresses for the Ethernet ports in `0/2/1/0` and `0/2/2/0` (which are configured as `lan0` and `lan1`) are `13/0/0` and `13/0/1`, respectively.

LAN Device Files

The system uses LAN device files to directly access the LAN driver. A device file identifies the LAN card, the LAN driver, and the data link protocol used. By convention, device files are kept in a directory called `/dev` with each device file having a name and a device number to uniquely identify the above characteristics. For example, a system with four Ethernet cards might have the following device files:

```
crw-rw-rw-  1 bin bin    52 0x000000 Sep 5 16:13 /dev/lan0
crw-rw-rw-  1 bin bin    52 0x010000 Sep 5 16:13 /dev/lan1
crw-rw-rw-  1 bin bin    52 0x020000 Sep 5 16:13 /dev/lan2
crw-rw-rw-  1 bin bin    52 0x030000 Sep 5 16:13 /dev/lan3
crw-rw-rw-  1 bin bin    52 0x000001 Sep 5 16:13 /dev/ether0
crw-rw-rw-  1 bin bin    52 0x010001 Sep 5 16:13 /dev/ether1
crw-rw-rw-  1 bin bin    52 0x020001 Sep 5 16:13 /dev/ether2
crw-rw-rw-  1 bin bin    52 0x030001 Sep 5 16:13 /dev/ether3
```

Device files are used by Link Level Access users to access the LAN driver, and some network services and diagnostic tools. To create LAN device files, see the "Verifying LAN Device Files" in Chapter 3, "Verification," and the *mknod*(1M) man page.

Major Number

The major number for all LAN drivers on a Continuum system is 52.

Minor Number

The system uses standard conventions when creating LAN device files automatically. To create the LAN driver minor number manually, use the following syntax:

`0x`*`nn`*`000`*`y`*

nn is the byte for the card instance number, and *y* is either `0` for IEEE 802.3 Data Link protocol or `1` for Ethernet Data Link protocol.

2

Configuration

This chapter describes how to add ethernet cards, and how to configure LAN cards with SAM or manually.

Adding Ethernet Cards

If you are adding Ethernet cards after installing the operating system, complete the following procedure before configuring the cards:

1. Install the Ethernet card(s) and connect the cables. See the hardware installation documentation, the *U512 Ethernet PCI-Card Installation Guide* (R711), or the *U522 Ethernet PCI-Card Installation Guide* (R753) for instructions on installing the card and connecting cables.
2. Configure the card(s) into your system. To do this, enter

   `addhardware`

   The operating system software automatically recognizes the installed Ethernet hardware.

You can verify that the installation was successful by checking that the hardware path (for example, `0/2/1/0`) and driver for the Ethernet card (for example, `lan4`) are listed in `ioscan -f` output. For more information on verifying that the cards were installed correctly, see Chapter 3, "Verification."

After the installation is completed, the Ethernet cards must be configured as described in the remainder of this chapter.

Configuring Logical LANs

Before configuring a LAN card, each port on the card must have a logical LAN interface name with a logical hardware path.

When the system boots, the system either sets up the logical LAN interfaces specified in the `CONF` file or the system provides logical LAN interface names for all the LAN cards present in the system if there are no LAN cards specified in the `CONF` file. For LAN cards present in the system but not specified in the `CONF` file, you must configure logical LAN interface names.

If you are planning to configure RNI or if you want to maintain logical LAN names for specific interfaces when LAN cards are installed in lower numbered slots, you must save the logical configuration in the `/stand/conf` file as described in this procedure.

NOTE

If you purchased RNI, see the *HP-UX Operating System: Redundant Network Interface* (R1006H) for instruction on how to pair network cards through RNI.

Use the following procedure to specify logical LAN interfaces for network cards that you add after booting the system and (optionally) to save the configuration across system boots.

1. Log in as `root`.
2. List the logical LAN names that are configured on the system. To do this, enter

   `lconf lnm -l`

   See the *lconf*(1M) man page for more information.

   – If the physical hardware path for the card(s) is not listed, go to step 3 to configure a logical interface name for the card and assign an address to the interface.

   – If the physical hardware paths for all ports on the card(s) are listed, skip to step 4.
3. Configure the logical LAN interface for each port. To do this for an Ethernet card, enter

   `lconf lnm "`*`name`*`=`*`hwpath`*`:lantype=ENET"`

   `name` is the logical LAN interface name `lan#` (where # is 0–15 for the LAN instance number), and *`hwpath`* is the physical hardware address of the port. The `lan#` and hardware path must be unique in the configuration. For example, if `lan0` and `lan1` are the currently defined LAN interfaces (as

determined in step 2) and the new card is in `0/2/3/0`, you can add the following configuration:

```
lconf lnm "lan2=0/2/3/0:lantype=ENET"
```

Repeat this step for every port that is not currently defined.

NOTE

Once configured, the `lantype` definition cannot be changed for the logical LAN interface name and the slot until the system is rebooted. For example, only an Ethernet card can replace the card in the example above where `lantype=ENET`.

4. Enter the `lanscan` command to see that the logical network name LAN card instance number appears in the logical hardware path.

   For example, the `Crd In#` is `2`, `Net-Interface NamePPA` is `lan2` (the logical network name) and the `Hardware Path` is `13/0/2` (the logical hardware path):

```
Hardware Station        Crd Hdw   Net-Interface  NM MAC   HP-DLPI DLPI
Path     Address        In# State NamePPA        ID Type  Support Mjr#
13/0/2   0x080009428D99 2   UP    lan2           4  ETHER Yes     52
```

NOTE

`ETHER` and `ENET` designate Ethernet in Stratus HP-UX operating system LAN configurations.

5. Note the `Net-Interface NamePPA` (`lan#`, where # is the LAN instance number) for the network card because you will need it for the configuration procedure.

NOTE

Complete the remaining steps to maintain the current configuration (or to define a different configuration) across system boots.

6. Save the logical LAN configuration across system boots by updating the `/stand/conf` file with the new `lconf lnm -l` listing (see the *conf*(4) man page for more information). For example, to define an Ethernet card in `0/2/3/0` as `lan2` across reboots, add the following entry to the `/stand/conf` file:

```
lan2=0/2/3/0:lantype=ENET
```

NOTE

Remove old entries in the `/stand/conf` file that do not match what you want for the new configuration. See the *conf*(4) man page for more information.

7. Remove the old LIF `CONF` file. To do this, enter

   `lifrm` *`flashcard`*`:CONF`

   `flashcard` is the booting flash card device file name, either `/dev/rflash/c2a0d0` or `/dev/rflash/c3a0d0`. (Use the `showboot` command to list the booting device; see the *showboot*(1M) man page for more information.)

8. Copy the updated `/stand/conf` file to the `CONF` file. To do this, enter

   `lifcp /stand/conf` *`flashcard`***`:CONF`**

CAUTION

Copy the updated `/stand/conf` file to only one flash card until the updated flash card has been booted successfully.

When the system reboots, the new configuration will be activated.

Configuring LAN Cards Using SAM

Usually, the simplest way to configure a LAN card is through SAM, the System Administration Manager.

To configure the Ethernet link, complete the following procedure:

1. Log in as `root`.
2. Verify that `/usr/bin`, `/usr/sbin`, and `/sbin` are listed in your `PATH`. For example (using Bourne shell), enter the following command to print your `PATH`:

   `echo $PATH`

   If these directories are not in your current path, enter

   `set PATH=$PATH:/usr/bin:/usr/sbin:/sbin`
3. Record the following information for the Ethernet card (this information is needed later in this procedure):
   - IP/Internet Address
   - alias
   - subnet mask (if the system is on a subnetwork)

   See Appendix A, "Network Commands and Addresses," for information on these parameters.
4. Start SAM. To do this, enter

   `sam`

   The SAM interface main window appears. If you have an X-Window system interface, point and click to navigate to SAM fields. If you have a text terminal interface, use arrow keys to navigate to SAM fields. See the *sam*(1M) man page for more information about the interface.
5. Select Networking and Communications in the SAM interface main window.
6. Select Network Interface Cards.
7. Select the `Net-Interface NamePPA` for the Ethernet card in the `Card Name` list (as determined previously in the "Configuring Logical LANs" procedure). For example, the Ethernet card appears as `lan0` in the list with logical hardware path `13/0/0`.
8. Select Configure from the Actions menu.
9. The Configure LAN Card window appears with the Card Name, Hardware Path, and Station Address specified for the Ethernet card. Verify that the Ethernet interface type (IEEE802.3/Ethernet is the default) is selected.

10. Select the field for the Internet address. Enter the address you wrote in step 3.

NOTE

If you have moved or removed any LAN cards from the system, verify the IP address of every installed LAN card.

11. If the Ethernet card is installed in a subnetwork, select the subnetwork mask field and enter the subnet mask you wrote in step 3.
12. If more than one card is installed in the system, select Add Aliases.

    The Add Aliases window appears. Enter aliases for the local host and for the Ethernet card, then select OK to return to the Configure LAN Card window.
13. If you want to configure your station address or Internet broadcast address, select Advanced Options (maximum transmission unit (MTU) can only be configured manually).

    The Configure Advanced Options window appears. Enter the information, then select OK to return to the Configure LAN Card window.
14. Select OK in the Configure LAN Card window to configure the new settings.
15. The Network Card Configuration object list appears. Verify that Enabled appears in the status field for the card. If an error message is displayed, review all settings and repeat this procedure.
16. Select Exit from the File menu in the Network Interface Cards window. The Networking and Communications window appears.
17. Select Exit SAM from the File menu in the Networking and Communications window.

The Ethernet configuration is activated. The default system connections will be configured to establish communication with other systems in the network.

System Connection Configuration

System connections can be changed using SAM to establish communication with other systems in the network. For example, to configure a new system gateway connection using SAM, complete the following procedure (see the previous section for instructions on how to get to the SAM interface main window):

1. Select Hosts in the SAM interface main window.
2. Select Local Hosts File from the Hosts menu.
3. Select Modify Default Gateway from the Actions menu.

4. Enter the Internet address of the remote gateway system to which you want to connect and select OK.
5. Select Exit from the Local Hosts File menu.
6. Select Exit SAM from the Hosts menu.

Reconfiguring IP Addresses

If you have rearranged any network interface cards in the system, you need to reconfigure the IP addresses. Follow the steps below:

1. Log in as `root`.
2. Start SAM. To do this, enter

   `sam`

   The SAM interface main window appears. If you have a X-Window system interface, point and click to navigate to SAM fields. If you have a text terminal interface, use the arrow keys to navigate to SAM fields. See the *sam*(1M) man page for more information about the interface.
3. Select Networking and Communications in the SAM interface main window.
4. Select Network Interface Cards.
5. Verify the IP addresses of all the adapters in the system by reviewing the Card Name, Hardware Path, and Internet Address displayed in the Network Interface Cards window.
6. For each adapter with an incorrect IP address, do the following:

   a. Select the adapter you wish to modify.

   b. Select Configure from the Actions menu.

   c. Correct the IP address and select OK.
7. Select Exit from the File menu in the Network Interface Cards window.
8. The Networking and Communications window appears. Select Exit SAM from the File menu in the Networking and Communications window.

Configuring LAN Cards Manually

You can also configure LAN cards manually, without using SAM. To configure an Ethernet card manually, complete the following procedure:

1. Log in as `root`.
2. Verify that `/usr/bin`, `/usr/sbin`, and `/sbin` are listed in your `PATH`. For example (using Bourne shell), enter the following command to print your `PATH`:

   `echo $PATH`

   If these directories are not in your current path, enter

   `set PATH=$PATH:/usr/bin:/usr/sbin:/sbin`
3. Record the following information for the Ethernet card (this information is needed later in this procedure):
   - IP/Internet Address
   - alias
   - subnet mask (if the system is on a subnetwork)

   See Appendix A, "Network Commands and Addresses," for information on these parameters.
4. Update (using a text editor) the `/etc/rc.config.d/netconf` file as follows:
   a. Add the `INTERFACE_NAME[#]=lan#` entry for this card (as determined previously in the "Configuring Logical LANs" procedure). Use the next available index entry (designated by `[#]`). For example, if the Ethernet card is `lan3`, and the last index entry in the `netconf` file is `[3]`, enter

      `INTERFACE_NAME[4]=lan3`

      The index value serves to group all the parameters for a single interface. When you have more than one interface, you must assign a different index value to each set of parameters for each interface. Each interface must have a complete set of configuration parameters with a unique index value.

b. Add the `IP_ADDRESS` and (optionally) `SUBNET_MASK`, `BROADCAST_ADDRESS`, `INTERFACE_STATE`, and `DHCP_ENABLE` entries for the Ethernet card on the appropriate lines with the same index number, as illustrated in the following example:

```
IP_ADDRESS[4]=192.6.1.1
SUBNET_MASK[4]=255.255.255.0
BROADCAST_ADDRESS[4]=""
INTERFACE_STATE[4]=""
DHCP_ENABLE[4]=0
```

c. To communicate with gateways, add appropriate entries, as illustrated in the following example:

```
ROUTE_DESTINATION[4]=default
ROUTE_MASK[4]=""
ROUTE_GATEWAY[4]=134.111.22.1
ROUTE_COUNT[4]=1
ROUTE_ARGS[4]=""
```

d. If you intend to set other capabilities (for example, start the `gated` daemon), you might need to add or modify other entries in the `netconf` file. Also, if this is your first entry in this file, verify that `HOSTNAME`, `OPERATING_SYSTEM`, and `LOOPBACK_ADDRESS` entries are correct.

See the comments in the `/etc/rc.config.d/netconf` file for more information.

5. If you want to set the optional parameters, continue to the next section. To set the new configuration that is described in this procedure, you can use the optional procedures described in the next section, or preferably, reboot the system. To do this, enter

```
shutdown -r
```

When the system reboots, the LAN configuration is activated.

NOTE

You must reboot with the LAN software configured to use NFS/9000 or Internet Services/9000.

Setting Optional Parameters

To change the preset station address or MTU of any LAN interface card, go to the section, "Changing the Station Address or MTU." Otherwise, proceed to the section, "Executing the Network Configuration Script," for alternative ways to set the configuration.

Changing the Station Address or MTU

CAUTION

Customers rarely need to modify LAN card station addresses or the MTU. Stratus does not support modifying LAN card station addresses or the MTU. To avoid the possibility of destroying connections and losing data, be sure to change station addresses when the LAN card is inactive. Use `ftsmaint disable` to inactivate the card.

The station address and MTU setting can be changed by editing the `hpetherconf` file.

Editing the /etc/rc.config.d/hpetherconf file

When you edit the `hpetherconf` file, the system changes the preset station address and MTU to the address and MTU you specified in the `hpetherconf` file each time the system reboots.

CAUTION

Stratus does not support editing the `hpetherconf` file. To avoid the possibility of destroying connections and losing data, be sure to change station addresses when the LAN card is inactive. Use `ftsmaint disable` to inactivate the card. Make sure there are no duplicate addresses in your network.

The station address configuration parameters have an index value, `[x]`, that groups the station address parameters together. The index value must be different for each additional interface.

The MTU is by default 1500, the maximum supported. The MTU is set by adding the following entry to the `hpetherconf` file, where *`number`* is 46 to 1500:

```
HP_ETHER_MTU[0]=number
```

The following is a sample `hpetherconf` entry:

```
HP_ETHER_INTERFACE_NAME[0]="lan1"
HP_ETHER_STATION_ADDRESS[0]="0x022345678901"
HP_ETHER_MTU[0]=1500
```

Notice that the index value, `[0]`, is the same for each parameter in the sample. The index value serves to group all the station address parameters for a single interface. When you have more than one interface, you must assign a different index value to each set of parameters for each station address/interface. Each station address/interface card must have a complete set of configuration parameters with a unique index value.

NOTE

You can use the `lanadmin` command to dynamically change the station address and MTU for the Ethernet card until the next system reboots (see the *lanadmin*(1M) man page for more information).

Executing the Network Configuration Script

After you add the LAN and routing configuration information into the `netconf` file, you must change the new configuration using one of the following methods:

- Rebooting the system automatically executes the network script and manages any network initialization dependencies. This is the recommended method.
- If the system cannot be rebooted right away without being disruptive to end users, the `ifconfig`, `lanadmin`, and `route` commands can be used to dynamically change network configuration until a reboot of the system can be performed. Refer to the *lanadmin*(1M), *ifconfig*(1M), and *route*(1M) man pages for more information.
- Directly change the station address. Enter the following commands:

```
/sbin/init.d/hpether start
/sbin/init.d/net start
```

CAUTION

These commands only source the `netconf` and `hpetherconf` files, and will not specifically reinitialize other networking subsystems. Using this method alone can cause network problems. To initialize the networking subsystems properly, reboot the system.

Configuring RARP

Reverse Addressing Resolution Protocol (RARP) is used to allow the `/etc/rc.config.d/netconf` file to be updated automatically on client systems. To configure RARP, complete the following procedure:

1. Enter **`RARP`** as the definition for `IP_ADDRESS[#]` in the client's `/etc/rc.config.d/netconf` file.
2. Enter **`1`** as the `RARPD` variable in the RARP server's `/etc/rc.config.d/netconf` file.
3. Add the client's hardware address and IP/Internet address to the RARP server's `/etc/rarpd.conf` file.

See the *rarpd*(1M) man page for more information.

Changing the Configuration

After the software is configured, the configuration can only be changed by repeating the entire configuration procedure. For example, if you want to add a new Ethernet card or move an Ethernet card into a slot previously filled by another interface type, you must complete the "Configuring LAN Cards Using SAM" procedure or the "Configuring LAN Cards Manually" procedure including a system boot, using new configuration information.

If you are replacing an Ethernet card, do the following:

1. Disable the card. To do this, enter (before disconnecting and reconnecting cables from the interface and from the interface at a hub)

   `ftsmaint disable` *`hwpath`*

2. Disconnect the cables, remove the card, insert the new card, and reconnect the cables. See the *U512 Ethernet PCI-Card Installation Guide* (R711) or the *U522 Ethernet PCI-Card Installation Guide* (R753) for the card installation procedure.
3. Enable the card. To do this, enter

   `ftsmaint enable` *`hwpath`*

   See the *ftsmaint*(1M) man page for more information.

If you only want to delete a gateway for a specific destination, do the following:

1. Delete the target gateway. To do this, enter

   `route delete` *`destination_hostname gateway_hostname`*

2. Using a text editor, remove the Internet routing configuration parameters for the default gateway in the `/etc/rc.config.d/netconf` file.

3

Verification

This chapter describes how to verify the LAN configuration and troubleshooting procedures.

Verifying LAN Configuration

To verify that the LAN is properly configured before using the network, check the following items:

- LAN Device Files
- Remote Configuration

When the LAN configuration has been verified, and network errors still occur, refer to the troubleshooting procedures in this chapter. If the troubleshooting procedures do not fix the problems, follow the procedure for preparing to contact the CAC.

Verifying LAN Device Files

The system uses device files to identify the LAN driver and Ethernet (or other LAN) port. All device files are in the `/dev` directory. When the system boots, device files are created for each port that is successfully configured with the I/O subsystem. To verify Ethernet device files, complete the following procedure:

1. List the LAN interface and Ethernet device files. To do this, enter

   ```
   ls -l /dev/lan# /dev/ether#
   ```

Two device files, `/dev/lan#` and `/dev/ether#`, should exist for each Ethernet port. In the following sample output, `lan0` through `lan3` LAN interface device files correspond to `ether0` through `ether3` Ethernet port device files:

```
lrwxr-xr-x 1 root sys 10 Sep 5 16:13 /dev/lan -> //dev/dlpi
crw-rw-rw- 1 bin bin 52 0x000000 Sep 5 16:13 /dev/lan0
crw-rw-rw- 1 bin bin 52 0x010000 Sep 5 16:13 /dev/lan1
crw-rw-rw- 1 bin bin 52 0x020000 Sep 5 16:13 /dev/lan2
crw-rw-rw- 1 bin bin 52 0x030000 Sep 5 16:13 /dev/lan3
crw-rw-rw- 1 bin bin 52 0x000001 Sep 5 16:13 /dev/ether0
crw-rw-rw- 1 bin bin 52 0x010001 Sep 5 16:13 /dev/ether1
crw-rw-rw- 1 bin bin 52 0x020001 Sep 5 16:13 /dev/ether2
crw-rw-rw- 1 bin bin 52 0x030001 Sep 5 16:13 /dev/ether3
```

The fifth column lists the major number (`52`) for each LAN device file. The sixth column lists the minor number with format `0x`*`nn`*`0000`, where *`nn`* indicates the card instance number. The card instance numbers for the corresponding `lan#` and `ether#` device files should match.

2. List the defined LAN interfaces. To do this, enter

   `lanscan`

   The following sample output corresponds to the sample device files listed in step 1:

```
Hardware Station       Crd Hdw   Net-Interface  NM  MAC      HP-DLPI DLPI
Path     Address       In# State NamePPA        ID  Type     Support Mjr#
13/0/0   0x0000BC110208 0   UP    lan0 snap1     1   ETHER    Yes     52
13/0/1   0x0000BC110207 1   UP    lan1 snap1     2   ETHER    Yes     52
13/0/2   0x0000BC110206 2   UP    lan2 snap2     3   ETHER    Yes     52
13/0/3   0x0000BC110205 3   UP    lan3 snap3     4   ETHER    Yes     52
```

   Compare the `lanscan` output with the device file listing. For the corresponding LAN interfaces (`/dev/lan#` and `Crd In#` number), verify that the card instance numbers (in the device file column six for the minor number and in the `Crd In#` column) match.

NOTE

The LAN interfaces are specified by port, not by card. For example, the preceding sample output could represent a hardware configuration of two 2-port Ethernet cards or one 4-port Ethernet card.

3. If the major numbers, minor numbers, or device file names are not correct, delete the device file entries from your `/dev` directory and re-create them with the correct numbers using the `mknod` command. The following sample command makes the `/dev/lan4` character special device file for a device with `52` as the major number and `04` as the minor number:

   `mknod lan4 c 52 04`

   See the *mknod*(1M) man page for more information.

Verifying Remote System Configuration

When your LAN software is fully configured and running, use the following commands to verify the hardware and software configuration. See the associated man pages for complete descriptions of these commands.

1. Verify the remote system configuration. To do this, enter

   `more /etc/hosts`

   You may use another appropriate command. See your HP-UX operating system command information. See the *hosts*(4) man page for more information on the `/etc/hosts` file.

2. Verify a route exists to the system in the routing table. To do this, enter

   `netstat -nr`

   See the *route*(1M) man page for information on adding entries to the table.

3. Check the LAN I/O. To do this, enter

   `netstat -i`

   `Ipkts` and `Opkts` list the number of I/O packets sent and received.

4. Check the state of all LAN hardware and interfaces. To do this, enter

   `lanscan`

   `Hdw State` should be `UP`.

5. Test for link level loopback connectivity using the `NamePPA` number and `Station Address` of the interface you want to test (as determined in the previous step). To do this, enter

   `linkloop -i` *`PPA_number station_address`*

   For example:

   `linkloop -i 5 0x080009266C3F`

   The status `OK` should be displayed.

6. Verify that your system can communicate with other systems. To do this, enter

   ping *IP_address*

   Type Ctrl-C to stop `ping`. In the following example, `191.2.1.2` is the IP address of the remote system:

   ping 191.2.1.2

   An error is displayed if packets cannot be sent successfully to the remote system.

7. Check the IP/Internet address and subnet mask. To do this, enter

   ifconfig *lan#*

8. Check the hardware status. To do this, enter

   ftsmaint ls *hw_path*

9. Check the cable and physical connections.

If these steps are not successful, complete the troubleshooting procedures in the next section.

Troubleshooting

This section describes the troubleshooting procedures you can use to troubleshoot problems with the LAN configuration, Ethernet (or other LAN) card, and system hardware.

Error Messages

The following error message can be sent to the `/var/adm/syslog/syslog.log` file:

Message:

```
Sep  8 13:16:46 anante vmunix: SRA[LANR,c1] (0/2/5/0)
rns_iac: 6001 Too many interrupts. Disabling ...
```

Description:
The adapter is disabled when more than 6000 interrupts per second occur.

Action:
Check for problems with the hardware and in the network (even an adapter that is not disabled could be sending the interrupts on the network).

Configuration Problems

To troubleshoot your Ethernet links and network connections, complete the following procedure:

1. Determine if the two device files (`/dev/lan#` and `/dev/ether#`) are present. To do this, enter

   ```
   cd /dev; ls -l lan* ether*
   ```

2. If the Ethernet device files are not present, create them. To do this, enter

   ```
   insf -e
   ```

   CAUTION

   The `insf -e` command is executed as part of the normal boot scripts. This command can disrupt the system when executed separately from the boot scripts. For more information, see the *insf*(1M) man page.

3. Repeat the configuration procedure.

If any problems still arise in the configuration, contact the CAC.

Card Indicates Fault

If the card is showing a red light, but the card slot shows a green or yellow light, the card is out of service. The fault tolerant software did not register an error. In this case, do the following:

1. Determine the hardware status of the card. To do this, enter one of the following:

   ```
   ftsmaint ls hw_path
   lanscan
   ```

   Check the `Status` or `Hdw State` columns.

2. Check the `/var/adm/syslog/syslog.log` file for entries describing the error found on the card.

3. If you think the error is transient, enable the card. To do this, enter

   ```
   ftsmaint enable hw_path
   ```

4. If the card shows no activity, check the cabling connections. See the *U512 Ethernet PCI-Card Installation Guide* (R711) or the *U522 Ethernet PCI-Card Installation Guide* (R753) for cabling information.

5. If the card continues to be out of service or go out of service, call the CAC for further assistance.

CAUTION

It can be useful to change the Mean Time Between Failures (MTBF) threshold for the card by using the `ftsmaint threshold` command. However, you should use the `ftsmaint threshold numsecs` *`hw_path`* command only under the direction of the CAC. Call the CAC for directions on changing the threshold and see the *ftsmaint*(1M) man page.

System Indicates Fault

If the card slot is showing a red light, the fault tolerant software took the device out of service. The CAC and your local system administrator should have been notified of the fault. In this case, do the following:

1. Determine the hardware status of the card. To do this, enter one of the following:

   `ftsmaint ls` *`hw_path`*
   `lanscan`

   Check the `Status` or `Hdw State` columns.

2. Check the `/var/adm/syslog/syslog.log` file for entries describing the error found on the card.
3. If you think the error is transient, enable the card. To do this, enter

   `ftsmaint enable` *`hw_path`*

4. If the card continues to be out of service or go out of service, call the CAC for further assistance.

CAUTION

It can be useful to change the Mean Time Between Failures (MTBF) threshold for the card by using the `ftsmaint threshold` command. However, you should use the `ftsmaint threshold numsecs` *`hw_path`* command only under the direction of the CAC. Call the CAC for directions on changing the threshold and see the *ftsmaint*(1M) man page.

Preparing to Contact the CAC

Contact your Stratus service representative when you need to report a problem. Follow these steps to document the problem before contacting the CAC:

1. List the events leading up to problem.
2. List the software version information. For example, enter

   `what /stand/vmunix >` *`version_file`*
3. List the version of your kernel. For example, enter

   `uname -r >>` *`version_file`*
4. Make copies of configuration files. For example, enter

   `cat /etc/hosts /etc/rc.config.d/netconf \`
   `/etc/rc.config.d/hpetherconf >` *`conf_file`*
5. Make a copy of `lanscan` output. For example, enter

   `lanscan >` *`lanscan_file`*
6. List the current I/O configuration. For example, enter

   `ioscan -fk >` *`io_file`*
7. Make a copy of any trace files that are active when the problem occurs. Ethernet (or any LAN) errors can be traced and logged using the `nettladm` GUI facility, or the `nettl`, `nettlconf`, and `netfmt` command line utilities.
   a. To view the default network error log, enter

      `netfmt -f /var/adm/nettl.LOG00`
   b. To view the default log with a description of the possible actions you can take to resolve the error, enter

      `netfmt -v -f /var/adm/nettl.LOG00`
   c. To check the status of network error logging and tracing activity, enter

      `nettl -status`
   d. To trace Ethernet errors and put them in a file named `/tmp/ethertrace.TRC0` (`TRC0` is appended automatically), enter

      `nettl -traceon all -entity ether -file /tmp/ethertrace`
   e. To format the trace file and put it into a file named `/tmp/ethertracefile`, enter

      `nettl -f /tmp/ethertrace.TRC0 > /tmp/ethertracefile`

f. To stop Ethernet error tracing, enter

```
nettl -traceoff -entity ether
```

8. Perform the following commands to record the output:

```
netstat -in >> /tmp/filename
netstat -nr >> /tmp/filename
netstat -s >> /tmp/filename
swverify * >> /tmp/filename
arp -a >> /tmp/filename
lanscan >> /tmp/filename
what /stand/vmunix >> /tmp/filename
uname -a >> /tmp/filename
ifconfig lan# >> /tmp/filename
```

9. Describe the events that result in specific error messages. Record the error messages and numbers that appear at the user terminal or console.
10. Describe your workaround solution, if you have one. The cause of the problem can sometimes be found by comparing the circumstances in which the problem occurs with the circumstances in which it does not occur.
11. In the case of system failure, if possible, obtain a full memory dump. If you have created a `/var/adm/crash` directory after system installation, and the system fails, the `/sbin/savecrash` utility automatically saves the memory dump to this directory during reboot.
12. Call the Customer Assistance Center (CAC). See "Customer Assistance Center (CAC)" in the Preface for CAC contact information.

A

Network Commands and Addresses

This appendix describes the network commands and addresses that are used during network configuration and verification, and troubleshooting procedures. Many of the network commands can be used with different network software products. The network addresses can be used with all the network software products supported on Continuum systems. The network node names need to be added to each node's `/etc/hosts` file on the network in order to be accessible.

Network Commands

While you configure or troubleshoot a network or LAN card configuration, you can use the network commands provided by the HP-UX operating system software. Refer to the online man pages for information on the commands used for networking.

Networking Man Pages

To display a man page, type the following at the system prompt:

man *command_name*

Table A-1 and Table A-2 list the man pages for the standard HP-UX operating system commands and the added Stratus commands used for networking.

Table A-1. Standard HP-UX Operating System Commands and Files

Man Page	Description
arp(1M)	Displays and modifies the Internet-to-Ethernet/Token Ring/FDDI address translation tables used by the Address Resolution Protocol.

Table A-1. Standard HP-UX Operating System Commands and Files *(Continued)*

Man Page	Description
hosts(4)	A database that contains a single line entry for each host name entry.
ifconfig(1M)	Assigns an address to a network interface and configures parameters, such as the netmask, broadcast address, and trailer support.
ioscan(1M)	Scans system hardware, usable I/O system devices, or kernel I/O system data structures as appropriate, and lists the results.
lanadmin(1M)	Administers, resets and self-tests LAN cards.
lanscan(1M)	Displays information about LAN adapters that are successfully bound to the system.
linkloop(1M)	Verifies network connectivity through the Data Link Layer.
mknod(1M)	Creates device files with user-specified major and minor numbers.
netfmt(1M)	Formats the `nettl` tracing and logging binary files.
netstat(1M)	Provides network statistics and information about the network connections.
nettladm(1M)	Captures and controls network tracing and logging information.
networks(4)	Associates the IP/Internet addresses with official network names.
ping(1M)	Verifies network connectivity through the Network Layer and reports round-trip time of communications between the local and remote hosts.
protocols(4)	Associates protocol numbers with official protocol names.
route(1M)	Adds and deletes entries to the network routing table, allowing your system to communicate through a gateway.
routing(7)	Describes support for local network packet routing.
sam(1M)	Configures networking software.
services(4)	Associates service names with the port number and the protocol that the services use.
swinstall(1M)	Loads software filesets onto 11.x systems.

Table A-2. Stratus Networking Commands and Files

Man Page	Description
articdload(1M)	Downloads firmware to network interface cards on Continuum Series 400/400-CO systems.
conf(4)	Bootloader configuration file used to define logical SCSI and logical LAN devices.
downloadd(1M)	The `downloadd` daemon that downloads firmware to network interface cards.
ftsftnprop(1M)	Sets or gets the property of an ARTIC card.
ftsmaint(1M)	Scans system hardware, usable I/O system devices, or kernel I/O system data structures as appropriate, and lists the results.
lconf(1M)	Lists or dynamically adds logical SCSI and logical LAN device configuration.
rsdinfo(4)	Supplementary information file for dynamic configuration of RSD (remote service driver) drivers.
telrsd(1M)	Defines mapping table between HP-UX operating system and communications adapter stream device driver instances.

IP/Internet Addresses

IP/Internet addresses are unique addresses for each node's interface card in a network. The IP/Internet address is associated with the node's system name and the network the address is in. The IP/Internet address is used in the OSI Network Layer for routing and switching. Every IP/Internet address includes a unique network number that is obtained from the Internet Network Information Center (InterNIC).

You must contact your ISP or InterNIC for a unique address to communicate over the Internet. To obtain an address from InterNIC, complete the following procedure:

1. Go to the InterNIC web site and get the registration form for requesting new addresses. The InterNIC web site is at:

   `http://www.internic.net`

2. When you have received the registration form, fill it out and send it back to InterNIC. Among other things, you will need to specify a network name containing a maximum of 12 characters and the network class that the address should accommodate in the next few years:

   Class A is for a large number of hosts, such as a university or large corporation (assigned net numbers 0–127).

   Class B is for a network with over 255 hosts, such as a medium sized company with many hosts (assigned net numbers 128–191).

   Class C is for a network with a maximum of 255 hosts (assigned net numbers 192–223).

NOTE

An official Internet host database is kept by the Network Information Control Center (NIC) for ARPA Internet networks. The NIC database can be searched at the following web site address:
`http://rs.internic.net/cgi-bin/whois`

IP/Internet addresses have 32 bits in four equal fields expressed in dotted decimal notation and have the following format, where *n* is for the network address assigned by InterNIC and *h* is for the host address that you assign:

nnn.hhh.hhh.hhh for a Class A network

nnn.nnn.hhh.hhh for a Class B network

nnn.nnn.nnn.hhh for a Class C network

The 0 and 255 net addresses are reserved for broadcasting.

If you have a Class A network and InterNIC assigns 11 as your net address, then you can assign 11.30.0.107 or 11.1.1.255 as your system address (but not 11.0.0.0 or 11.255.255.255 because the addresses 1 and 255 are reserved for broadcasting).

If you have a Class B network and InterNIC assigns 132.6 as your net address, then you can assign 132.6.42.7 or 132.6.90.25 as your system address (but not 132.6.0.0 or 132.6.255.255).

If you have a Class C network and InterNIC assigns 192.9.90 as your net address, then you can assign 192.9.90.2 or 192.9.90.25 as your system address (but not 192.9.90.0 or 192.9.90.255).

For more information on IP/Internet addresses, see the *routing*(7) man page.

The network address obtained from InterNIC is needed for network interface card configuration and for the `/etc/hosts` and `/etc/networks` files.

Aliases

The network interface card has an IP/Internet address and host where the card resides. The host also has an IP/Internet address. The host's IP/Internet address can be nicknamed, or aliased, and the alias can be used instead if the IP/Internet address in many commands. The alias for a host must be unique in the network. The alias name can consist of numbers and letters in the alphabet, and cannot contain any white space, newline characters, or comment characters.

Subnet Masks

The subnet mask determines which part of the IP/Internet address represents the subnetwork. For subnetworks, the `umask` default setting is 255.255.255.0 for a fixed-length subnet.

Class A network default mask = 255.0.0.0

Class B network default mask = 255.255.0.0

Class C network default mask = 255.255.255.0

Network Names

Each computer system on a network can have a variety of names. For example, a computer system can have a system name, a host name, and an alias name.

- System Name—The cluster configuration name or UUCP communication name. The System Name is set by the `uname -S` command. See the *uname*(1) man page for more information.

- Host Name—The Internet or Intranet name used for network communications. The Host Name is defined for each system in the second field in `/etc/hosts` file entries and in the `HOSTNAME=` definition in the `/etc/rc.config.d/netconf` file on the system. The Host Name also appears as the system name in the `swinstall` screen. The Host Name can be the full domain extended name, for example, `hpdxsg.xsg.hp.com`.
- Alias Name—The alias for the Host Name. The Alias Name is defined for each system in the third field in `/etc/hosts` file entries.

The /etc/hosts File

When you install a LAN card, you must add the LAN card's IP address and host name to the `/etc/hosts` file on each computer system in which the card is installed and on each computer system that is networked to the card.

NOTE

The `/etc/rc.config.d/netconf` file (which is copied to your system when the HP-UX operating system software is first installed) automatically sets the `HOSTNAME` entry, the `/etc/hosts` entry, the `hostname`, and `uname -S`.

The IP addresses for every installed LAN card are associated with their respective host and alias names in the `/etc/hosts` file. The `/etc/hosts` file also includes the IP addresses of all the other nodes your system will communicate with on the network. Many commands and software products, such as LAN/9000 diagnostics, Internet Services, NFS, and the `netstat` and `ping` commands, read the `/etc/hosts` file.

NOTE

Change `/etc/hosts` on the name server system when using the Domain Name Service (DNS) or Network Information Service (NIS) naming service. For information on naming services, see the Hewlett-Packard documentation for NFS or Internet Services.

Editing the /etc/hosts File

The `/etc/hosts` file lists the IP address, host name, and alias name of each node recognized by the local host.

The `/etc/hosts` file should have the following ownership and permissions:

```
-r--r--r--    1 bin    bin    #### month day /etc/hosts
```

To add a node to the `/etc/hosts` file, use the following syntax:

```
IP_address host_name [alias]
```

For example,

```
192.6.4.1 host23.host2.site2.region4 greatone
```

The `192.6.4.1` address shows that InterNIC assigned the net address 192.6.4 and you assigned 1 as the host address.

See the *hosts*(4) man page for more information.

Configuring Optional Features

You can optionally add configurations to `/etc/services`, `/etc/protocols`, and `/etc/networks`.

CAUTION

When using NIS, change only the `/etc/services`, `/etc/networks`, and `/etc/protocols` files on the NIS Master Server. Refer to the NIS documentation for more information.

Changing the /etc/services File

The `/etc/services` file is configured automatically when the operating system is configured. The `/etc/services` file lists all service names, protocol names, and port numbers recognized by the local host. Internet Services, NFS, and the `netstat` command rely on `/etc/services`.

The `/etc/services` file should have the following ownership and permissions:

```
-r--r--r--    1 bin    bin    #### month day /etc/services
```

To add a service to the /etc/services file, use the following syntax:

```
service_name port_number/protocol [alias]
```

For example,

```
shell 514/tcp cmd
```

See the *services*(4) man page for more information.

Changing the /etc/protocols File

The /etc/protocols file is configured automatically when the operating system is configured. The /etc/protocols file lists all protocol names, and numbers recognized by the local host. Internet Services and NFS rely on /etc/protocols.

The /etc/protocols file should have the following ownership and permissions:

```
-r--r--r--   1 bin   bin   #### month day /etc/protocols
```

To add a protocol to the /etc/protocols file, use the following syntax:

```
protocol_name protocol_number [alias]
```

For example,

```
tcp 6 TCP
```

See the *protocols*(4) man page for more information.

Creating the /etc/networks File

The /etc/networks file lists the Internet names and addresses recognized by the local host. The netstat and route command require an /etc/networks file for symbolic network names.

You can create a new file or copy an existing file from another system and update it.

The /etc/networks file should have the following ownership and permissions:

```
-r--r--r--    1 bin    bin    #### month day /etc/networks
```

To add a network to the /etc/networks file, use the following syntax:

```
network_name network_address [alias]
```

The network_address is the number obtained from NIC. For example,

```
loop 192.6.4 testlan1
```

See the *networks*(4) man page for more information.

Index

M

N

O

P

R

S

T

V