Symbolics UNIX Chaosnet Software Installation Guide (for 4.2BSD UNIX)

symbolics

Symbolics UNIX Chaosnet Software Installation Guide (for 4.2BSD UNIX)
998021

April 1985

Table of Contents

1. Overview of UNIX Chaosnet Software Installation

Symbolics Lisp Machines can communicate with each other using Chaos network protocols, thus enabling users of one machine to take advantage of services provided by another machine. For example, one Symbolics Lisp Machine can be designated as a file server for many users at one site. The file server is backed up regularly, precluding the need to back up each individual Symbolics Lisp Machine. Users can easily share files among themselves.

The Chaosnet software package enables Symbolics Lisp Machines to communicate with a 4.2BSD UNIX system, using Chaosnaet protocols. The UNIX system becomes a host on the Chaosnet, able to provide network services to Lisp Machine users, and services offered by the Lisp Machines to the UNIX users. The most important capabilities include:

Remote login   Lisp Machine users can log in to the UNIX host; UNIX users can
                 log in to a Lisp Machine on the Chaosnet.

File transfer   Lisp Machine users can read files from, and write them to the
                 UNIX host; UNIX users have similar file access to Lisp Machines.

For a more detailed explanation of the capabilities provided by Chaosnet: See the section "The Lisp Machine Generic Network System" in *Networks*.

The UNIX Chaosnet software package consists of bug fixes to the 4.2BSD kernel, software to be added to the kernel, server programs, and user programs. The installation procedure is geared toward a standard, unmodified 4.2BSD UNIX system. The body of the installation is done automatically, by a Makefile.

If you have altered the kernel, this installation will be more difficult. In those cases, the installer should read this document (and refer to the Makefile itself) to fully understand the installation process before proceeding. For the most part, an installer who is knowledgeable about the configuration of the site, and familiar with UNIX system maintenance commands, should be able to resolve any problems.

The installation requires UNIX super-user privileges. All Chaos network servers should be shut off during the installation. The system will need to be rebooted toward the end of the installation.

If you are unfamiliar with any of the UNIX system maintenance operations mentioned in the installation steps, refer to the UNIX manual pages. Many 4.2BSD systems also contain online documentation on the various utilities in the directory /usr/doc. The documentation on *config* and *make* is most useful for this installation.

This document describes the procedure for performing the software installation, for both new Chaos sites and sites that have Release 5.0 Chaos software running. The procedure for upgrading Chaos from Release 5.0 to Release 6.0 requires fewer steps than a new installation.

Sections describing an upgrade installation:

> See the section "Overview of UNIX Chaosnet Software Installation".
> See the section "Upgrade UNIX Chaosnet Software Installation".
> See the section "Verifying the UNIX Chaosnet Installation".

Sections describing a new installation:

> See the section "Choosing a Chaosnet Addressing Scheme".
> See the section "Initial UNIX Chaosnet Software Installation".
> See the section "Updating the Namespace System for Chaosnet".
> See the section "Configuring the Lisp Machine for Chaosnet".
> See the section "Verifying the UNIX Chaosnet Installation".
> See the section "Finalizing the UNIX Chaosnet Installation".

Sections with background information:

> See the section "UNIX Chaosnet Electronic Mail Capability".
> See the section "User and Server Programs in UNIX Chaosnet".
> See the section "Filemodes for UNIX Chaosnet Server Programs".
> See the section "Diagnosing Problems During the Installation".
> See the section "Diagnosing Problems After the Installation".
> See the section "Format of Host Table Source Files".
> See the section "UNIX Chaosnet Distribution Tape Contents".

2. Upgrade UNIX Chaosnet Software Installation

Change to the Chaosnet source directory, where you originally extracted the Release 5.0 Chaosnet software.

Sites that have removed Release 5.0 Chaos Software

If you have removed the Release 5.0 Chaos software, follow the instructions for new Chaosnet installations. There is one shortcut you can take, to avoid redoing the host tables. After you have extracted the software with *tar x*, give the command:

```
touch hosttable
```

Sites that still have Release 5.0 Chaos Software

1. Set umask to 0 for the duration of the installation.

   The server programs will be set up with special file modes that are meaningful to the programs themselves. For that reason, it is important that the installer does not inadvertently alter the file modes by virtue of having the umask set to any value other than zero. Give the UNIX command:

   ```
   umask 0
   ```

2. Preserve the Release 5.0 Makefile. Give the command:

   ```
   mv Makefile Makefile.5.0
   ```

3. Load the distribution tape.

   The distribution tape was created by the UNIX *tar* facility with the standard blocking factor of 20. Upgrade installations should install the new software in the same directory where the Release 5.0 software now resides, replacing the old with the new. Be sure you are in the Release 5.0 Chaos source directory.

   To extract the sources from the tape, type:

   ```
   tar xv .
   ```

4. Shut off all Chaos network servers.

5. Complete the upgrade.

   This step extracts some pathnames from Makefile.5.0, then compiles and installs the new software. Give the command:

   ```
   make upgrade-to-rel-6
   ```

6. Verify the installation.

The file /etc/rc.local contains several lines that automatically bring up the Chaosnet. Before proceeding to verify the installation, edit /etc/rc.local to comment out those lines. Once you have verified the installation, you can put those lines into /etc/rc.local again. For details on what those lines are: See the section "Finalizing the UNIX Chaosnet Installation".

To ensure that the Chaosnet software is properly installed: See the section "Verifying the UNIX Chaosnet Installation".

3. Choosing a Chaosnet Addressing Scheme

3.1 Format of Chaosnet Addresses

A Chaos address is a 16-bit quantity, in which the high-order 8 bits represent the subnet number, and the low-order 8 bits represent the host number on that subnet. Chaos addresses are expressed in octal.

Chaos Address 401

```
  15  14  13  12  11  10  9   8   7   6   5   4   3   2   1   0
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

|<-------Subnet number--------->|<---------Host number--------->|

    The subnet number is 1.
    The host number is 1.
    The Chaos address is 401 octal.
```

3.2 Configuring Chaos Sites Not Connected to the Internet

This section discusses how to assign Chaos addresses to hosts on a Chaos network that is not connected to the Internet, and has no plans to be connected to the Internet in the future. If a site plans to be connected to the Internet sometime in the future, it would be advantageous to request an Internet address now, and set up the Chaos network configuration using the Internet-to-Chaosnet address mapping scheme. See the section "Configuring Chaos Sites That Are Also on the Internet".

If your site plans to be a stand alone Chaos network, it is easy to assign a Chaos address to each host. We recommend starting with Chaos subnet 1, host 1. The first host would therefore have the Chaos address 401; the next host would have Chaos address 402, and so on.

When assigning Chaos addresses, make sure that all hosts on the same Ethernet cable are in the same Chaos subnet. Chaos hosts on different subnets cannot communicate using Chaosnet protocols.

Each Chaos host needs an unique Chaos address. The address is used in the following contexts:

- Namespace database.
- Set Chaos-Address command in boot file.
- Chaosnet host table.

3.3 Configuring Chaos Sites That Are Also on the Internet

This section proposes a scheme for convenient handling of network addresses, for sites using both Chaosnet and Internet protocols. The scheme is also recommended for sites that use Chaosnet now, and plan to use Internet in the future. The scheme is a mapping of Internet address to Chaosnet address, such that if you know one address, you can derive the other. The site administrator will then have one method for assigning network addresses for hosts.

To request a Class B or Class C Internet address for your host, contact:

> Joyce Reynolds
> USC - Information Sciences Institute
> 4676 Admiralty Way
> Marina del Rey, California 90292
> (213) 822-1511
> ARPANET: jkreynolds@sri-nic.arpa

Format of Internet Address

Internet addresses are expressed in decimal, in four sections separated by periods. For example, 192.10.2.200.

A Class B Internet address is a 32-bit quantity, in which the two high-order bytes represent the network number, the next byte represents the imp number, and the low-order byte is the host number. The first segment of a Class B network is greater than 28 and less than 192.

A Class C Internet address is a 32-bit quantity, in which the high-order 24 bits represent the network number, and the low-order 8 bits represent the host number. The first segment of a Class C network is equal to or greater than 192.

Examples of Internet addresses:

- 115.41.0.3 is host 3 on imp 0 on Class B network 115.41.

- 192.10.0.200 is host 200 on Class C network 192.10.0.

Mapping an Internet address to a Chaos address

Once you have an Internet address for a host, you can map that into a Chaos address. You can then assign sequential Chaos addresses for all Chaos hosts on the network. If you are on the Internet, you can use each host's Internet address to

derive a Chaos address. If you are not on the Internet, it is sufficient to map the UNIX host's Internet address into a Chaos address, then assign sequential Chaos addresses to each Chaosnet host. At any point in the future, should ·⁻⁻· decide to be an active member of the Internet, you can use the already assigned Chaos addresses to derive Internet addresses for your host.

The mapping process is best explained by example. The following two examples show the mapping of a Class B and Class C Internet address into a Chaosnet address:

Class C Internet address: 192.10.41.48 decimal.

Step 1:   Get the Chaos subnet number and host number.

```
192.10.41.48  is the Internet address.
192           is unused in the mapping.
    10        is unused in the mapping.
       41     is the Chaos subnet number.
         48   is the Chaos host number.
```

Step 2:   Convert the decimal subnet and host numbers to octal.

```
The subnet number (41 decimal) is 51 octal.
The host number (48 decimal) is 60 octal.
```

Step 3:   Insert subnet and host numbers into two eight-bit bytes.

```
  15  14  13  12  11  10  9   8   7   6   5   4   3   2   1   0
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

|<-------Subnet number--------->|<---------Host number--------->|
```

Step 4:   Express the quantity in octal notation; this is the Chaos address.

```
0 010 100 100 110 000    (binary representation)
  2   4   4   6   0      (octal representation)
```

The resulting Chaos address is 24460 octal.

Class B Internet address: 115.41.2.3 decimal.

The subnet number is 2 decimal, which is 2 octal.
The host number is 3 decimal, which is 3 octal.

```
 15  14  13  12  11  10  9   8   7   6   5   4   3   2   1   0
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

|<-------Subnet number--------->|<--------Host number-------->|
```

The resulting Chaos address is 10003 octal.

4. Initial UNIX Chaosnet Software Installation

1. Make a UNIX kernel from source code.

   If you have never generated a UNIX kernel from sources on your 4.2BSD
   UNIX system, it is important to do so now, before modifying the source code in
   any way.

   a. Create a config file with certain options.

      The config file is usually the file named YOURVAX (the name of your
      host, all in uppercase) in the directory /usr/sys/conf, or
      /usr/src/local/sys/conf, depending on where your system sources are stored.
      Berkeley provides sample config files in the conf directory, with names
      like MATISSE and ERNIE. Copy one of those sample files to
      YOURVAX, and start editing it to reflect your host's configuration.

      The config file should contain a line beginning with ident that identifies
      the name of your host. The host name must be all in uppercase. It
      should be exactly the same as YOURVAX, the name of the config file
      you are currently editing. If these conditions are not met, config will fail
      to identify the Chaosnet devices, and certain include files will be missing
      in the subsequent make vmunix stage.

      Check that the config file contains "options INET". This option ensures
      that the network interface will be initialized. The config file should
      contain pseduo-devices pty, inet, and loop. The config file should also
      include the Ethernet device. The following line is an example of an
      Ethernet device entry in the config file:

      ```
      device        il0     at uba? csr 0164000 vector ilrint ilcint
      ```

      If you do not have "options INET" in the config file, you will be able to
      complete the installation without any obvious problems, but the Chaos
      software will not come up when you try to verify the installation. This
      occurs because certain conditional compilation of system sources does not
      happen without the "options INET".

   b. Give this host an Internet address.

      An Internet address for this host is required at this point, whether or
      not the host is actually on the Internet. The "options INET", which
      must be in the config file to run Chaos software, indicates to UNIX that
      this host is an Internet host. If this host does not have an Internet
      address, and does not intend to use Internet protocols, it is an easy
      matter to use a dummy Internet address.

You can borrow the Internet address of a Symbolics host in order to bring up the Chaos software. Should you ever decide to join the Internet, be sure to apply for a valid Internet address of your own.

Edit a file named /etc/hosts. Add the following line to the file, replacing <host-name> with the name of your host:

```
192.10.1.1    <host-name>.arpa <host-name>
```

c. Build a new UNIX system.

If you encounter any problems in this step, resolve them before proceeding in the installation. You must be able to build a new vmunix system from scratch to ensure that your sources are good. Any problems encountered so far are unrelated to the UNIX Chaosnet installation.

2. Load the distribution tape.

The distribution tape was created by the UNIX *tar* facility with the standard blocking factor of 20.

a. Decide on a directory in which the Chaosnet sources will be stored. The filesystem must have 2500 free blocks. Throughout this document, this directory is known as the Chaosnet source directory.

b. Make the Chaosnet source directory.

c. Change to that directory.

d. To extract the sources from the tape, type

```
tar xv .
```

This step makes several subdirectories, including:

```
SRCSYS = usr/src/sys
SRCCMD = usr/src/cmd/chaos
SRCHOSTS = usr/src/lib/libhosts
```

3. Set umask to 0 for the duration of the installation.

The server programs will be set up with special file modes that are meaningful to the programs themselves. For that reason, it is important that the installer does not inadvertently alter the file modes by virtue of having the umask set to any value other than zero. Give the UNIX command:

```
umask 0
```

4. Customize Makefile for your site.

Most of the installation work is done by a Makefile, which is located in the Chaosnet source directory. The Makefile must be edited to reflect the configuration of your system. Specifically, you will edit the Makefile to instruct *make* where to install the Chaos software.

Invoke an editor on the Makefile. Search for the make variables listed below. For each, read the description of the variable's significance, and decide what its value should be. In many cases, the default value will be appropriate. Alter the variables to reflect the state of your host, and save the Makefile.

```
KERNEL = /usr/src/local/sys
```

${KERNEL} is where you will build your new kernel. It is the same directory where you built the vmunix system in the previous step. This is the parent directory of the system source directories, such as conf, vax, and vaxif.

```
YOURVAX = CUPID
```

${YOURVAX} is the name of the system you want to build with /etc/config. ${YOURVAX} must be all uppercase. If it is not, the special configuration file that will be built in this installation, ${KERNEL}/files.${YOURVAX}, will not be read by the *etc/config* command, and some necessary system include files will not be created.

```
HARDWARE = ETHERHARDWARE # CHAOSHARDWARE BRDBRIDGE
```

${HARDWARE} specifies your hardware configuration. If you do not have any one of these kinds of hardware, delete it from ${HARDWARE} or comment it out by preceding it with the # character. If you have an Interlan board, you have ETHERHARDWARE. If you have one of the older 4Mbit CN-11 boards, you have CHAOSHARDWARE. You might have both. If you have more than one interface, you can enable bridging of BRD packets if the HARDWARE variable includes BRDBRIDGE.

```
DESTUSERS = /usr/local
DESTSERVERS = /usr/local/lib/chaos
```

These two variables indicate where the user and server compiled programs will be located. If these pathnames do not already exist, they will be created by *make install*. ${DESTUSERS} should be in the search path of every user who will be using Chaosnet.

```
CMD = /usr/src/local/cmd/chaos
```

${CMD} indicates where the user program sources will be stored. The

preferred location is the default /usr/src/local/cmd/chaos. Alternate locations are /usr/src/cmd/chaos and /usr/local/src/cmd/chaos.

```
HOSTNAME = CUPID
```

Choose a host name for your system. This need not be the same name as ${YOURVAX}, and it need not be uppercase, but it must be the same as it will appear in the Internet host table file (/etc/hosts) and the Chaos file hosts.local that you will be editing ahead.

```
LHOSTS = /usr/src/local/lib/libhosts
```

The ${LHOSTS} variable is the directory where the host table library is stored. The preferred place is the default; alternatives are: /usr/src/lib/libhosts and /usr/local/src/lib/libhosts.

5. Adjust for any special devices at your site.

This step is essential. If it is ignored, there is a possibility of destroying data on the disks.

During the course of the installation, several new special devices are added to the file ${KERNEL}/vax/conf.c. The installation tools assume that this host is a standard, unmodified 4.2BSD UNIX system configured with no special devices. If you have added special devices to your system, you must edit your special devices into the configuration file provided on the tape.

Edit the file usr/src/sys/vax/conf.c.chaos. The Chaos-specific lines you might need to alter are in the character device switch section, near the end of the file. (There is one more block of Chaos-specific commands starting with *#include "chaos.h"* and ending with *#endif NCHT*. Although these lines need no special attention, they are required to be in the file.)

Search for the word "chropen". This is the first Chaos special device; it is configured to be major device 33. If you have configured any other device to be major device 33 (or any greater than 33), merge this information from your file ${KERNEL}/vax/config.c into the file usr/src/sys/vax/conf.c.chaos. The comments in the file show the major device number for each device. The two Chaos entries should appear at the end of the table. Therefore, they will no longer be numbered 33 and 34, but rather some higher number. Your special devices will start being numbered at 33. Note the major device number of the first Chaos entry (chropen). This number will be the value of ${CHRMAJOR} in the next step.

Next, edit the file usr/src/cmd/chaos/Makefile. In that file, the variable ${CHRMAJOR} is set to 33. Change the 33 to be the major device number of the first Chaos entry (chropen).

6. Edit the Chaosnet Host Table Source Files.

   Change to the directory usr/src/lib/libhosts under the Chaos source directory. This directory contains the source files necessary to build the executable Chaosnet host table file, to be stored in /etc/hosttab. This file is independent of the Internet host table, which is stored in /etc/hosts.

   The file /etc/hosttab will be built automatically by *make install*, once you have edited the following two files to reflect the state of your host: hosts.global, hosts.local.

   hosts.global

   If your host is on the Internet, the file hosts.global should contain a current copy of the global host table distributed by SRI. If your host is not on the Internet hosts.global should be empty. Although you probably will not be altering the contents of this file, it is important to ensure that it is either empty (perhaps containing some comments), or contains a current global host table.

   hosts.local

   The file hosts.local contains hosts not known to SRI and not in the global host table, but accessible from this host. Each site will edit the hosts.local file to add the local hosts. The network name for these local hosts must end with -CHAOS, as you will see from the sample file.

   Both hosts.local and hosts.global are in the same format. For details of the format of these files: See the section "Format of Host Table Source Files".

7. Compile and Install the Chaos Programs

   The next step will compile and install the user and server programs that comprise Chaosnet. Most of the work of the installation is done by the Makefile in the Chaosnet source directory, the same Makefile edited in Step 2 of this installation. Any UNIX wizards interested in the installation procedure are welcome to read the Makefile before running it.

   Change to the Chaos source directory. As super-user, give the command:

   ```
   make install
   ```

   This command will take some time to finish.

8. Edit the /etc/ttys file.

   Add to the end of the /etc/ttys file the following lines:

```
12ttyq0
12ttyq1
12ttyq2
12ttyq3
12ttyq4
12ttyq5
12ttyq6
12ttyq7
12ttyq8
12ttyq9
12ttyqa
12ttyqb
12ttyqc
12ttyqd
12ttyqe
12ttyqf
```

5. Updating the Namespace System for Chaosnet

This section is intended for new Chaosnet sites only. Existing Chaos sites should already have the namespace database set up to reflect the configuration of the site.

If you are unfamiliar with the namespace system: See the section "Namespace System" in *Networks*.

From a Symbolics Lisp Machine, choose Namespace from the System Menu to begin editing the namespace database.

1. Add a new network object to the namespace database.

   The type of the network object should be CHAOS. By clicking on the fields of the record, you can add the site name and optional nicknames. The final record looks similar to this:

   ```
   Type*: CHAOS
   Nickname: CHAOSNET
   Nickname: Name
   Site: YOUR-SITE
   Subnet: Pair: Token Set: Pair: Global-name Token
   User Property: Pair: Global-name Token
   ```

2. Create a host object for each UNIX host that will run Chaosnet software.

   The system type should be UNIX42. Enter the machine type of the host. One example of machine type is VAX-11/750. Add the Chaos address of the host. The first entries of the host object should resemble:

   ```
   System Type*: UNIX42
   Nickname: Name
   Machine Type: VAX-11/750
   Address: Pair: CHAOS 24433
   ```

   Add the service entries. The resulting entries are:

   ```
   Service: Set: MAIL-TO-USER CHAOS CHAOS-MAIL Global-name
   Service: Set: FILE CHAOS QFILE Global-name
   Service: Set: UPTIME CHAOS-SIMPLE UPTIME-SIMPLE Global-name
   Service: Set: LOGIN CHAOS SUPDUP Global-name
   Service: Set: LOGIN CHAOS TELENT Global-name
   Service: Set: TAPE CHAOS RTAPE Global-name
   Service: Set: SHOW-USERS CHAOS NAME Global-name
   Service: Set: HARDCOPY-STATUS CHAOS LGP-QUEUE Global-name
   Service: Set: HARDCOPY-STATUS CHAOS LGP Global-name
   Service: Set: CHAOS-STATUS CHAOS-SIMPLE CHAOS-STATUS Global-name
   ```

```
Service: Set: SEND CHAOS SEND Global-name
Service: Set: REMOTE-SERIAL CHAOS REMOTE-SERIAL-IO Global-name
```

Find the entry "Server Machine". Change the value of that entry to be YES. The resulting entry is:

```
Server Machine:  YES
```

3. Create a host object for each Lisp Machine host that will use Chaosnet.

Add the Chaos network address of the host, the system type, and the machine type. The first entries of the host object should resemble:

```
System Type*: LISPM
Nickname: Name
Machine Type: 3600
Address:  Pair: CHAOS 24460
```

Add the same service entries to the Lisp Machine host objects that you added to the UNIX host objects.

6. Configuring the Lisp Machine for Chaosnet

This step is necessary only for sites that are connecting Lisp Machines to a Chaosnet for the first time.

Edit the boot file for each Symbolics Lisp Machine that will be running Chaosnet. Add a line to the boot file that sets the Chaos address of the Lisp Machine.

    Set Chaos-Address *address*

For example, a Lisp Machine with Chaos address 24460 has this line in the boot file:

    Set Chaos-Address #o24460

7. Verifying the UNIX Chaosnet Installation

Follow the instructions below to test the Chaosnet software installation.

1. Reboot UNIX with the new kernel.

   Bring up the system as you always would with a new kernel. Typically this involves copying the new ${KERNEL}/${YOURVAX}/vmunix to the root directory.

2. Log in as root.

3. Bring up the network manually.

   a. If you have ETHERHARDWARE, use the 4.2BSD code to bring up the interface. Give the commands, replacing <host-name> with the name of your host:

      ```
      /bin/hostname <host-name>

      /etc/ifconfig il0 'hostname' -trailers -arp up
      ```

      If this fails, check the Internet host table, /etc/hosts, for any errors.

   b. Bring up the Chaos NCP with this command:

      ```
      /etc/chinit
      ```

      If this fails, check your Chaos host tables for errors.

   c. If you have ETHERHARDWARE, give the command:

      ```
      /etc/cheaddr il0 <chaosnet-address>
      ```

      Replace <chaosnet-address> above with the Chaos address of this host, represented in octal.

4. Test to ensure this host can communicate with itself over Chaosnet. Use the following commands:

   ```
   hoststat <host-name>
   chup <host-name>
   ```

5. Next, bring up the servers. Substitute for ${DESTSERVERS} the value it is given in the Makefile in the Chaos source directory.

   ```
   /etc/chserver >& ${DESTSERVERS}/log &
   ```

6. Test a server. A simple server to try is NAME:

    ```
    finger @<host-name>
    ```

7. Test file transfer from a Lisp Machine.

    From a Lisp Machine, try to get a copy of a file residing on the UNIX host.
    You can do this within Zmacs, by using the Find File command and specifying
    a file on the UNIX host.

When these tests complete successfully, the installation is verified. New Chaos sites
should go on to finalize the installation.

8. Finalizing the UNIX Chaosnet Installation

Once the intallation is verified, this final step ensures that the Chaosnet is brought
up automatically when the UNIX system is booted.

Edit the file /etc/rc.local. You should see two lines that use the */bin/hostname* and
/etc/ifconfig commands. Change those two lines in /etc/rc.local to the following,
replacing <host-name> with the name of your host:

```
/bin/hostname <host-name>
/etc/ifconfig il0 'hostname' -trailers -arp up
```

Add the following lines to /etc/rc.local, replacing <chaosnet-address> with the
Chaosnet address of your host:

```
if [ -f /etc/chserver ]; then
        /etc/chinit && /etc/cheaddr il0 <chaosnet-address> &&\
        /etc/chserver > /usr/local/lib/chaos/log 2>&1 &
        echo 'chserver too'                     >/dev/console
fi
```

9. UNIX Chaosnet Electronic Mail Capability

Symbolics provides some software on the UNIX Chaosnet distribution tape that offers the potential for full electronic mail service, to customers who can support it themselves.

For sites that fully enable Chaos mail, the Chaosnet mail server (located in /usr/local/lib/chaos/MAIL) receives any mail coming in via the Chaosnet, and passes it to sendmail. If the message is for a local recipient, sendmail calls /bin/mail for local delivery. Both programs must be setuid root so they can change the owner of the /usr/spool/mail files for different users. If the message is destined for another host on the Chaosnet, sendmail gives the message to /usr/lib/mailers/chaosmail, which then sends the spooled messages out over the Chaosnet.

The first step is to give the *make mail* command from the Chaos source directory. Once you have done so, your site has limited capabilities related to electronic mail. Specifically, Lisp Machine users can store their mailbox files on the UNIX host, and use the Zmail program locally to read and send electronic mail messages. Users who store their mailboxes on Lisp Machines can send mail to users who store their mailboxes on the UNIX host. But, users who store their mailboxes on the UNIX host cannot reply to, or send mail to, users who store their mailboxes on a Lisp Machine.

In order to enable the UNIX host to send outgoing mail, the sendmail configuration file must be altered. The file usr/src/cmd/sendmail/chaos.cf (in the Chaos source directory) is a sample sendmail configuration file, to give you an example that works for one UNIX host. A UNIX system administrator who is familiar with the sendmail process is welcome to start with the sample file and develop a file that works for the local UNIX system. Once the configuration file is refined for your site, those users who store their mailboxes on the UNIX host can both send mail and reply to users who store their mailboxes on a Lisp Machine.

Appendix A
Diagnosing Problems During the Installation

This section describes certain problems that might occur during the installation, and their solutions.

1. Configuration is different than expected.

   This is the mildest and most common installation problem, for both initial installations and upgrades. The Makefiles that do the job of installation have many built-in parameters that should reflect the configuration of your system. Everything from the name of the host to the location of sources and programs must be specified in the Makefile exactly as it exists on your UNIX host. In upgrades, any change in the host's configuration since the Release 5.0 installation could provoke an error.

   In these cases, read the error message, try to figure out what the Makefile expected, and alter the Makefile accordingly. The Makefile is well commented.

2. Can't find file chch.h. (or other header file)

   During the compilation of system sources, UNIX cannot find one or more necessary header files. This error occurs if any of the following conditions is true:

   - The host name indicated in the ident line of the config file is not in uppercase only.

   - The name of the config file is not in uppercase only.

   - The value of ${YOURVAX} is not all in uppercase.

   - The /etc/config program is not the 4.2BSD version.

   Fix whichever condition is wrong, and run *make* again.

3. Many configuration-related error messages during *make*.

   If you are having a difficult installation, and have resorted to using the *make clean* program, it is possible that duplicate lines have been added to the config file. Edit the files ${KERNEL}/conf/${YOURVAX} and ${KERNEL}/conf/files.${YOURVAX} by hand. If you see duplicate lines in either file, delete any of the extra entries.

4. Server programs do not work.

If the installer had umask set to a value other than zero, or somehow the filemodes of the server programs were set incorrectly, the server programs simply will not work. See the section "Filemodes for UNIX Chaosnet Server Programs".

Another possiblity is that the config file did not have "options INET" or the host didn't have an Internet address. Both are required. See the section "Initial UNIX Chaosnet Software Installation".

Appendix B
Diagnosing Problems After the Installation

This section describes some simple tests to help isolate Chaosnet problems between a
VAX running UNIX and a Symbolics 3600-family Lisp Machine. Before running
these tests, you should already have completed the installation of the Chaosnet
software on the UNIX host, as described in this document.

1. Did UNIX find the interface board in the proper place on the UNIBUS?

   Check the boot-time messages to be sure you see where it found the network
   interface (usually an Interlan board).

2. Can each host communicate with itself?

   A common installation problem occurs when a machine gets confused about its
   own Chaos address. This is easy to check. Suppose the VAX's name is
   "cupid" (at Chaos address 401) and the Lisp Machine's name is "quabbin" (at
   Chaos address 402).

   From the UNIX host named cupid, the following two commands should yield
   the host status of itself:

   ```
   hostat cupid

   hostat 401
   ```

   Similarly, the following two commands given on the Lisp Machine host named
   quabbin should yield the host status of itself:

   ```
   (hostat 'quabbin)

   (hostat #o402)
   ```

   If either test fails, you can suspect an error in the software installation.

   Another possibility is that you forgot to initialize the network with *chinit* and
   cheaddr. This step should have been done manually as you were verifying the
   installation, and then automatically by /etc/rc.local when you finalized the
   installation.

3. Can the hosts communicate with each other?

   a. Can the Lisp Machine communicate with the VAX?

From the Lisp Machine, the following two commands try to get the status of the VAX:

```
(hostat #o401)

(hostat 'cupid)
```

b. Can the VAX communicate to the Lisp Machine?

From the VAX, the following two commands try to get the status of the Lisp Machine:

```
hostat 402

hostat quabbin
```

If the hosts can talk to themselves, but not to each other, you can   ect the hardware.

4. Can the VAX use its own server programs over Chaosnet?

   a. Give the *chup cupid* command, which uses the Chaos UPTIME service. This command uses the UPTIME service over Chaosnet. It should print how long the VAX host believes it has been up.

   ```
   chup cupid
   ```

   b. Try using the NAME service, which should print a list of users on the VAX. Give the following UNIX command:

   ```
   finger @cupid
   ```

   If these two tests fail, check that ${DESTUSERS} is in your search path. ${DESTUSERS} is one of the variables in the Makefile in the Chaosnet source directory that must be customized for each site.

   c. Can the VAX send a file to itself?

   This tests the UNIX user programs *chserver*, *cftp*, and the FILE server. The following example contains prompts from various programs, but the general idea should be straightforward:

```
% cftp cupid
cftp>login root
Password: arrowroot      (this will not be echoed)
cftp>get /etc/passwd
To local file: /tmp/passwd
(etc)
cftp>disconnect
% diff /etc/passwd /tmp/passwd
%
```

If all of these tests run succesfully, the Chaosnet software installation is probably fine. Continue on to perform some hardware tests.

5. Perform hardware tests.

Open the VAX cabinet so that you can see the Interlan board. It has a group of 4 lights near the edge of the board. These light are, from the edge,

- Carrier Sense (CS) — a host is talking on the network.

- Collision Detect (CD) — two hosts are talking at the same time.

- Transmit (XMIT) — this host is sending a packet to the network.

- Receive (RCV) — this host is receiving a packet from the network.

When the UNIX host hostats the Lisp Machine for the first time, an address-resolution packet is sent (CS and XMIT light up), an address-resolution packet is received (CS + RCV light up), the STATUS request is sent (CS + XMIT again), and the reply is received (CS + RCV light up). Then the data is displayed by hostat on your terminal.

When the Lisp Machine hostats the VAX for the first time, it sends an address-resolution packet (VAX's CS + RCV come on), the VAX replies (CS + XMIT come on), the Lisp Machine asks for status (CS + RCV on the VAX), and the VAX replies (CS + XMIT).

The most common problems here are:

a. No lights come on ever - usually a dead Interlan board.

b. RCV light never lights up, Lisp Machine does not receive packets (see PEEK display) - usually a broken wire somewhere in the cabling, or a broken transceiver.

c. RCV light never lights, but Lisp Machine is receiving packets - usually dead Lisp Machine transmit section.

d. A complex series (described below) indicates that the Lisp Machine's receiver section is probably dead.

When the VAX hostats the Lisp Machine: XMIT light blinks; RCV does not blink; the Lisp Machine is said to be "not responding".

When the Lisp Machine hostats the VAX: the VAX's CD and RCV blink (indicating that the VAX hears the address-resolution packet); then CD and XMIT blink (as the VAX sends its AR reply); nothing happens for a bit; then this scenario repeats as the Lisp Machine retries, finally saying VAX "not responding". This usually indicates a dead Lisp Machine receiver section.

Appendix C
User and Server Programs in UNIX Chaosnet

User Programs

The following user programs are provided. During the installation, UNIX-style manual pages for the starred (*) programs are installed in the directory /usr/man/man1, which makes them accessible via the UNIX *man* command.

*cftp	User file transfer program for Chaosnet
*chlgp	send a file to remote laser graphics printer
*chsend	Send message to user(s)
*chname	Request user information via Chaosnet
*telnet	User telnet program for Arpa or Chaosnet, enabling remote login
*supdup	User supdup program for Arpa or Chaosnet, enabling remote login
finger	Print useful information about users
hostat	Get the host status of a specified host
chup	Print how long a host has been up
chtime	Print a host's idea of the current time
chinit	Initialize the NCP with my name and number (to be part of /etc/rc.local)
chserver	Bring up the servers on this host (to be part of /etc/rc.local)
cheaddr	Enable an Ethernet interface (to be part of /etc/rc.local)

Server Programs

The server programs provided include:

FILE	Qfile file transfer service
LGP	Hardcopy service
MAIL	Electronic mail server
NAME	Show-users service
RTAPE	Tape service
SEND	Send an interactive message to user on this host
SUPDUP	Login service
TELNET	Login service

Appendix D
Format of Host Table Source Files

This appendix describes the format of the two source files that are used to build the Chaosnet host table, which is stored in /etc/hosttab. The two source files are stored in the subdirectory usr/src/lib/libhosts under the Chaos source directory. Their names are hosts.global and hosts.local.

Both files are in the same format. The hosts.global file should be empty if this site is not connected to the Internet; if it is an Internet site, this file should be a current copy of the hosts.global file distributed by SRI-NIC. In neither case should you have to edit by hand the hosts.global file.

The hosts.local file contains entries in the format described below, for hosts accessible on this network that are not in the SRI-NIC hosts.global file. You will probably be editing the hosts.local file, to enter local hosts. It should be an easy matter to edit the hosts.local file provided on the distribution tape to reflect the configuration of your own site.

These two files begin with a network table, composed of one-line entries in this format:

```
NET <name>,  <network #>
```

The entries are sorted alphabetically by network name. All fields should be in uppercase. The fields are:

<name>	Official name·of this network, which must have the suffix -CHAOS. For example: OURNET-CHAOS
<network #>	A single network number, in DECIMAL.

After the network table comes a host table composed of one line entries in this format:

```
HOST <name>,<addresses>,<status>,<system>,<machine>,[<nicknames>]
```

The entries are sorted alphabetically by host name. All fields should be in uppercase. The fields are:

<name>	Official name of this host
<addresses>	A single <address> or a list of them in brackets and separated by commas, with no spaces in between.
	A single <address> is an octal number, preceded by a network name (ARPA, CHAOS, DIAL, LCS, RCC, SU) and a space. The default network name is ARPA.

Arpanet host numbers are represented in as H/I where H and I
are 8-bit DECIMAL numbers. H is the host number, I is the
IMP number.

Chaosnet host numbers are in octal.

Dialnet host "numbers" are 10-digit telephone network numbers.

LCSnet addresses are represented as LCS S/H, where S and H
are 8-bit OCTAL numbers. S is the LCSnet subnet, H is the
host.

RCCnet addresses are in the same format as Arpanet addresses.

SUnet addresses are represented as SU S#H, where S and H are
8-bit octal numbers. S is the SUnet subnet, H is the host.

<status>   Whether USER or SERVER. Time sharing machines should be
                SERVER; workstations (single user machines) should be USER.

<system>   Operating system name (for example, TENEX, ITS, MULTICS,
                UNIX, TOPS-20, LISPM)

<machine>   Actual machine type (for example, PDP10, IBM-370, PDP11,
                LISPM, VAX). By convention, KA-10, KI-10, KL-10, and KL-20
                are all considered to be PDP10s. No "-" should be after "PDP";
                this is so it fits in one 36-bit word.

<nicknames>   Nicknames for this host. The list is in square brackets and each
                name is delimited by a comma.

Here is a simple example of a hosts.local file for a site called SCRC with one VAX
and two Lisp Machines:

```
NET     SCRC-CHAOS,    1
HOST    SCRC-VAX,      SCRC-CHAOS 401,SERVER,UNIX,VAX,[VAX,V]
HOST    SCRC-LM1,      SCRC-CHAOS 403,USER,LISPM,LISPM,[LM1,L1]
HOST    SCRC-LM2,      SCRC-CHAOS 405,USER,LISPM,LISPM,[LM2,L2]
```

Appendix E
Filemodes for UNIX Chaosnet Server Programs

The executable server programs are stored in the ${DESTSERVERS} directory in files that have filemodes that reflect the task of the server itself. Only the group permission bits are significant to the server programs. If a server's task required it to write to the network, the w bit is set. Similarly, if the server reads from the network, its group r bit is set. If a server both reads from and writes to the network, the group r and w bits are both set.

The following table lists the intended group bits for each server. If something happens to change the group bits, you should use *chmod* to set them back to these values.

- Mode 730: NAME

- Mode 750: SEND, LGP

- Mode 770: FILE, RTAPE, TELNET, SUPDUP

- Mode 4755: MAIL

Appendix F
UNIX Chaosnet Distribution Tape Contents

This section lists the files included on the distribution tape, and a brief description of their purpose. Several of the directories below contain README text files giving further details.

sys/h/chaos.h
> Header file needed by the kernel and user programs dealing with the Chaos network.

usr/src/lib/libhosts/*
> These files create a library of host table manipulation routines and actually build and install new host tables. The source file from which the actual host table is built also resides here.

usr/src/cmd/chaos/*
> This directory contains all sources for user programs, and the Makefile to compile and install them.

usr/src/sys/chncp/*
> This directory contains sources for the part of the kernel code that is largely independent of the operating system on which it runs.

usr/src/sys/chunix/*
> This directory contains the UNIX interface to the network, which implements the network software as a UNIX device driver.

usr/src/sys/conf/files.chaos
> This file contains extra lines to be added to the "files" file for the VAX configuration system. In 4.2BSD, this "files" file is named "files.MACHINE" if its target processor is MACHINE.

usr/src/sys/conf/{GENERIC,CHAOS,ETHER}.chaos
> These files contain the extra lines to append to MACHINE's config file.

usr/src/sys/vax/conf.c.chaos
> This file contains the lines necessary to append to the configuration file "vax/conf.c".

usr/src/sys/sys/sys_inode.c.chaos and kern_descrip.c.chaos
> These files fix small bugs in the distributed code required for the Chaosnet code to share certain system routines. Not included in distributions for non source licensees.

usr/src/sys/vax/autoconf.c.chaos and locore.s.chaos
> These files fix a bug to allow the autoconfiguration system to work with Chaosnet interfaces. Not needed for Ethernet-only sites. Not included in distributions for non-source licensees.

usr/src/cmd/sendmail/chaos.cf

> This is a sendmail configuration file that works for Chaosnet mail. Basically this configuration tells sendmail that it is running on an Arpanet host with the Chaosnet mailer as the mail sending program.

Index