Digital UNIX

Sharing Software on a Local Area Network

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This manual describes the Remote Installation Services (RIS) and the Dataless Management Services (DMS). RIS is used for installing software kits across a network instead of using locally mounted distribution media. DMS allows client systems to share the usr file system on a server over a network while maintaining their own root and var file systems.

Digital Equipment Corporation
Maynard, Massachusetts

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About This Manual

This manual describes the Digital UNIX® Remote Installation Services (RIS) and Dataless Management Services (DMS) utilities and environments. RIS is a utility for installing software kits across a network instead of using locally mounted distribution media. DMS contains a utility called `dmu` that lets client systems share the `usr` and `var` file systems on a server over a network while still maintaining their own `root` file system.

Audience

This manual is written for anyone using the remote installation service or the dataless management utility, typically the system administrator. The following assumptions are made:

- Your hardware is working properly.
- You have read the owner's manuals supplied with your hardware.
- You know the location and function of the controls and indicators on your hardware.
- You understand how to load and unload the installation media and any disks needed during the installation.
- You know how to use the Digital UNIX operating system software.

New and Changed Features

This manual has been revised for the current release. The following list describes the major changes made to this book:

- The RIS startup process has been modified.
- C2-Security is enabled in RIS.
- The ability to install graphics device kits is available in RIS.
- The `bootpd` daemon has been replaced by the `joind` daemon.
- The ability to register a RIS client for a cloned installation has been added. A cloned installation lets installers duplicate the system configuration from a similar type system.

Organization

This manual contains thirteen chapters, two appendixes, a glossary, and an index. A brief description of the contents follows:

Chapter 1	Introduces the concept of servers and clients. This chapter explains what a server is, what a client is, and how they work together. It also describes the basic architecture of the server/client environment.
Chapter 2	Describes the relationship between the RIS server and clients.
Chapter 3	Lists the formats in which distribution media are available and describes the preliminary setup procedures for DMS and RIS.
Chapter 4	Describes the procedure for setting up a RIS server, including installing and updating software.
Chapter 5	This chapter explains how to create the initial Configuration Description File (CDF) used for cloning, cloning prerequisites, and CDF management.
Chapter 6	Describes processes and procedures for maintaining and managing a DMS or RIS system, including adding, deleting, and modifying clients and clients' setups.
Chapter 7	Describes networking-related files and daemons that the RIS utility uses and the process a client goes through when it boots over the network.
Chapter 8	Provides information on troubleshooting problems with RIS clients.
Chapter 9	Provides the introduction to Dataless Management Services and the dataless management utility (dmu).
Chapter 10	Describes how to prepare a server system for DMS.
Chapter 11	Describes the steps necessary to configure a DMS server including how to install software into a DMS environment.
Chapter 12	Describes how to use the dataless management utility to add, modify, remove, and list DMS clients. It also describes how to show and delete a DMS environment, and how to apply a binary patch to the kernel.
Chapter 13	Provides information on troubleshooting problems with DMS clients.
Appendix A	Contains a worksheet for your use in the RIS installation process.
Appendix B	Contains worksheets to calculate space requirements on DMS servers and clients. Also included is a client setup worksheet.

Related Documents

You should have the following documentation available:

- The hardware documentation for your system
- *Release Notes*
- *Reference Pages Section 8 and 1m*
- *System Administration*
- *Installation Guide*
- *Network Administration*

The printed version of the Digital UNIX documentation set is color coded to help specific audiences quickly find the books that meet their needs. (You can order the printed documentation from Digital.) This color coding is reinforced with the use of an icon on the spines of books. The following list describes this convention:

Audience	Icon	Color Code
General users	G	Blue
System and network administrators	S	Red
Programmers	P	Purple
Device driver writers	D	Orange
Reference page users	R	Green

Some books in the documentation set help meet the needs of several audiences. For example, the information in some system books is also used by programmers. Keep this in mind when searching for information on specific topics.

The *Documentation Overview, Glossary, and Master Index* provides information on all of the books in the Digital UNIX documentation set.

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```
/usr/doc/readers_comment.txt
```

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- The section numbers and page numbers of the information on which you are commenting.
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Conventions

The following typographical conventions are used in this manual:

`#`	A number sign represents the superuser prompt.
`% cat`	Boldface type in interactive examples indicates typed user input.
file	Italic (slanted) type indicates variable values, placeholders, and function argument names.
[|] **{ | }**	In syntax definitions, brackets indicate items that are optional and braces indicate items that are required. Vertical bars separating items inside brackets or braces indicate that you choose one item from among those listed.
. . .	In syntax definitions, a horizontal ellipsis indicates that the preceding item can be repeated one or more times.

`cat`(1)	A cross-reference to a reference page includes the appropriate section number in parentheses. For example, `cat`(1) indicates that you can find information on the `cat` command in Section 1 of the reference pages.

Introduction to Sharing Software 1

This chapter describes the concept of software sharing and the components that make up a software sharing environment.

1.1 What is Software Sharing?

A **server** is a computer system that serves another system by providing something that the other system wants or needs. The other system is called a **client**. A given server can serve one or many clients. Computers in a network can share disk space, lists of names, software kits, processing services, and other entities.

For sharing software using Dataless Management Services (DMS) and Remote Installation Services (RIS), the server supplies software, software kits, and disk space for clients to use.

The DMS and RIS services let you share software in the following ways:

- DMS sets up a system in which you can save disk space by sharing the actual operating system software between computers. Without DMS, each computer has a copy of its operating system software on its own disk. With DMS, one computer, acting as a **DMS server**, stores the software in a special area (called the **DMS area**) on its disk. Other computers, called **DMS clients**, run by accessing the software across the Local Area Network (LAN) instead of from their local disks.
- RIS sets up a system similar to the DMS system except that what is shared is one or more installable software kits instead of the actual operating system. With RIS, you can buy only one copy of a given kit. One computer, the **RIS server**, stores the kit in a special area (called the **RIS area**) on its disk. Other computers, called **RIS clients**, install the software onto their own disks by accessing it across the network instead of from locally mounted distribution media (such as a CD-ROM).

The DMS and RIS utilities share architectural similarities; the primary differences are in the contents of their respective server disk areas.

1.2 Benefits of Sharing Software

You can reduce your software and hardware costs by sharing software between computers. When you share software, several of the computers in your local area network (LAN) use a single copy of a given piece of software. This reduces the need for multiple copies of the same software and reduces the disk space required for software storage.

You are not limited to sharing one piece of software; you can share virtually all of your Digital UNIX system software.

1.3 Software Sharing Environment

The following components make up the environment for software sharing:

- A server

  The server's system administrator prepares the server for RIS or DMS by installing the Digital UNIX operating system and ensuring that the server is connected to a LAN. A single server can serve both DMS and RIS clients, however a client cannot be registered to both DMS and RIS.

- A distribution device on the server

  For Digital UNIX servers, the distribution device is a CD–ROM optical disk drive. You transfer or link the software subsets for one or more specific products and architectures from the distribution media to the RIS or DMS areas on the server. Registered clients can then access the software.

- A Local Area Network (LAN)

  You must set up the server and all client processors as hosts on the LAN (using Ethernet, FDDI, or Token Ring for RIS and Ethernet or FDDI for DMS). Clients use the LAN to access the server's RIS and DMS areas.

- Clients

  RIS clients are systems that can run the operating system for which the server provides kits. Typically, clients are systems that run the Digital UNIX operating system; only these processors can install the base operating system from a Digital UNIX server. Layered products can be installed after the client's operating system is running if the processor supports the `setld` utility.

  DMS clients must be capable of booting over Ethernet or FDDI using the `bootp` and `tftp` protocols. Most Alpha workstations and deskside servers have this capability, but some data center servers cannot be configured as DMS clients. Consult your system's user guide and related documentation to determine whether it supports `bootp` and `tftp` over Ethernet or FDDI.

RIS Servers and Clients 2

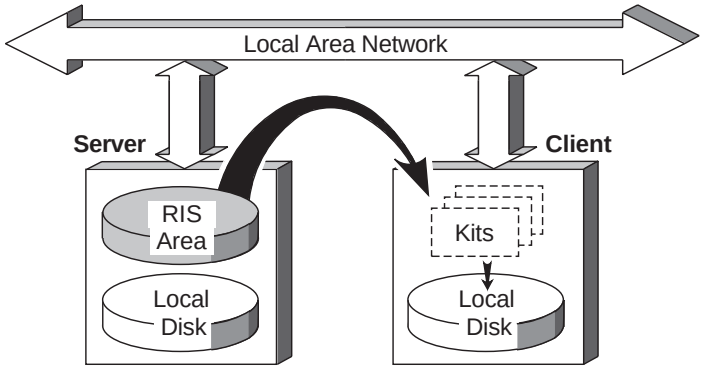
This chapter describes the Remote Installation Services (RIS) utility and the relationship between the RIS servers and clients.

2.1 What is RIS?

The `ris` utility is used to install software kits stored on a central computer system (known as a server) on to multiple computer systems (known as clients) in a Local Area Network (LAN).

With RIS, the server has a disk area set aside as the RIS area. The RIS area contains copies of software kits to be made available for installation on to clients. Figure 2-1 shows how the RIS system works.

Figure 2-1: RIS Server and Client



In the RIS area, the server maintains information about what software kits the clients can access. Kits are organized so that a software product can supply several different versions to allow for the differences between multiple hardware platforms (such as Digital UNIX on Alpha systems, ULTRIX MIPS, etc.). The server's RIS area is made available for read-only access to clients by means of the Network File System (NFS) .

The server is a passive partner in the day-to-day operation of a RIS system. Beyond verifying clients' identities and their kit load requests, and managing accepted requests, the server does not interact directly with the clients. A system does not have to be a dedicated RIS server; it can also support local timesharing users.

A RIS client installs software kits on to the server by using the `ris` utility; the utility copies the kit contents across the network from the server instead of from local media.

Some of the features and benefits of DMS and RIS follow:

- Installation and setup of servers and clients are done by scripts, thereby simplifying the server system administrator's task. Maintenance of the server's disk areas is similarly straightforward. The system interface is the same regardless of system type.
- Because the DMS and RIS software supports different hardware platforms and different software versions, it is adaptable to a wide variety of client systems and requirements. Servers running a given version of the Digital UNIX system can serve clients running the same version or an earlier version of the system. In addition, if the ris utility on the server is updated to the current version using the `utilupdate` utility, servers running an earlier version of the system can support the current version.
- RIS uses a single set of kit files for all clients having the same architecture.
- The ability to register a RIS client using a cloned installation has been added. A cloned installation lets you duplicate a system configuration from a similar type system.

2.2 RIS Startup

When RIS starts up, it checks the status of the RIS areas. If RIS can access all the products it was able to access the last time RIS was started, it displays the following message:

```
Checking accessibility of RIS areas...  done
```

If RIS cannot access all the products, it was able to access previously, it displays the following message:

```
No Products Available in /var/adm/ris/ris0.alpha

Delete RIS environment? [y]:
```

This may have occurred because the source for this RIS environment is no longer mounted. This can be corrected by remounting the source. If the source is no longer available, you may choose to delete this RIS

environment. If you remount the source, you must restart RIS so that the environment is available.

2.2.1 RIS Startup Messages

When you invoke RIS and you are not superuser, the following message may be displayed:

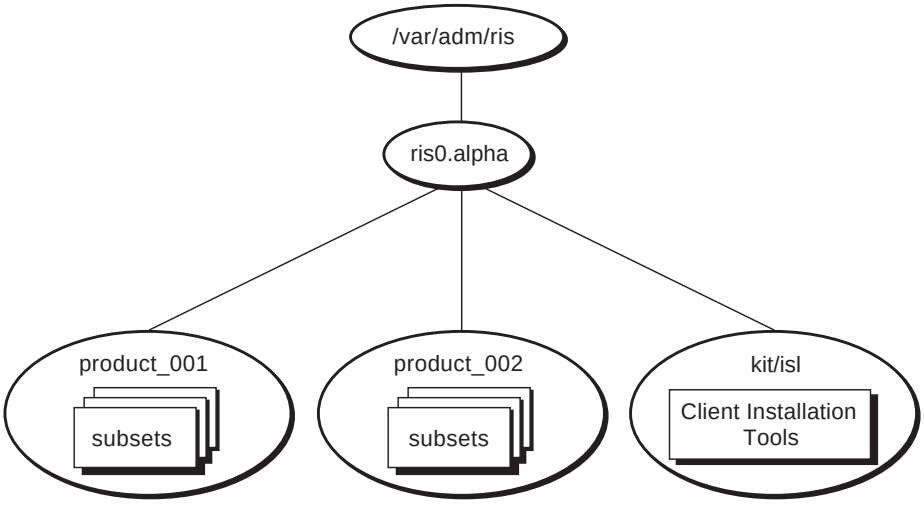
```
Checking accessibility of RIS areas...
No permission to write /usr/var/adm/ris/ris0.alpha/ProdNames
done
```

You can correct this problem by invoking RIS again as superuser.

2.3 RIS Disk Area

In addition to the server's normal disk area, a partition or area is reserved on the server to hold RIS software kits. This RIS area contains one or more **product environments**. Each product environment contains one or more software kits suitable for installation on a given hardware/software platform. See Figure 2-2 for a generalized illustration of the RIS area.

Figure 2-2: Overview of the RIS Area



In Figure 2-2, the RIS area, `/var/adm/ris`, contains one product environment, `ris0.alpha`. Each product environment contains products for a specific platform. In Figure 2-2, the target platform is Alpha processors. Multiple product environments can exist in a single RIS area. Each product

environment contains one or more product directories, each product directory contains several product kit archives, called software **subsets**. Figure 2-2 shows a product environment named `ris0.alpha` containing directories called `product_001`, `product_002`, `product_003`, and so on.

Figure 2-2 also shows the `kit/isl` directory. The `kit/isl` directory contains installation tools required by clients when they install software over the network. If your environment is in Direct CD-ROM(DCD) format the `kit/isl` directory does not exist. An environment in DCD format is the same as a system disk format it includes `/,/usr,...`

The server itself usually does not use any of the RIS area. System administrators can access the product area as required for maintenance and for installation or removal of product kits.

2.4 Multiple RIS Areas on a Server

For more flexibility, you can establish multiple RIS areas in separate partitions. RIS areas on a given server can be exported to other servers using the Network File System (NFS). Servers that import such RIS areas can use them as if they were local, supplying the imported subsets to their own set of clients. Section 4.4 describes how to use NFS to mount a RIS area. The *Network Administration* guide describes how to export and import file systems.

2.5 Characteristics of a RIS Client

A RIS installation uses the LAN as its installation media instead of the Digital UNIX distribution CD–ROM. A RIS client can install any software kit for which it is registered on the server. The installation procedure runs entirely on the client and, after the necessary software is installed, no continuing relationship is required between the RIS server and client.

The Digital UNIX operating system itself can be among the kits that are available from the server. To install the operating system, the client processor is booted across the network using a generic minimal kernel and file system, both of which are part of the software kit. The special kernel and file system become resident in the client's memory. Once booted, the client runs the installation utility, called `setld`, that is used to install kits on an already-running, configured platform. For more information about the `setld` utility, see the `setld`(8) reference page. After the installation is complete, the system is rebooted using the newly installed software. For additional information on installation procedures, see the *Installation Guide*.

2.6 Client Registration

A client must be registered with only one server for the base operating system. If you register a client with more than one server for the base operating system, each server with which the client is registered tries to respond to the client's network boot request (with unpredictable results).

To change the server with which a client is registered for the base operating system, first remove the client from the current server's client database and then register it with the new server. See Chapter 6 for information about registering and removing RIS clients.

A client can be registered with multiple servers for optional subsets and products other than the base operating system. When you load optional subsets or layered products with the `setld` command, you specify the name of the server from whom to copy the kits.

Preparing for RIS Server Setup 3

This chapter provides the information you need before setting up a Digital UNIX RIS server. The topics include:

- Server/client compatibility
- Tasks you must complete before installing RIS
- Names of distribution media and device special files
- Disk space requirements for RIS

3.1 Server/Client Compatibility

When installing Digital UNIX Version 4.0 or higher into a RIS environment and the RIS server is running a previous version of the operating system, you must perform the following procedure as superuser on the server:

1. If your distribution media is CD–ROM, enter a `mount` command similar to the following:

   ```
   # mount -rd /dev/rz4c /mnt
   ```

   This example uses a CD–ROM drive that is unit 4 and specifies `/mnt` as the mount point; if your drive is a different unit, substitute the device special file name for that unit.

   If you are uncertain of your CD–ROM's unit number, enter the `file` command, specifying the raw device, as follows:

   ```
   # file /dev/rrz*c

   /dev/rrz1c: char special (8/1026) SCSI #0 RZ25 disk #8 (SCSI ID #1)
   /dev/rrz2c: char special (8/2050) SCSI #0 RZ25 disk #16 (SCSI ID #2)
   /dev/rrz3c: char special (8/3074) SCSI #0 RZ25 disk #24 (SCSI ID #3)
   /dev/rrz4c: char special (8/4098) SCSI #0 RRD43 disk #32 (SCSI ID #4)
   /dev/rrz9c: char special (8/17410) SCSI #1 RZ57 disk #72 (SCSI ID #1)
   ```

   The CD–ROM device corresponds to an RRD device, in this example RRD43.

2. To update RIS on the server, assuming the distribution media is mounted at `/mnt` enter the following:

   ```
   #/mnt/isl/utilupdate -r -m /mnt
   ```

   In the above example the `-r` copies the new RIS utility from the distribution CD to the server in `/usr/sbin`.

   The `-m <directory>` is the mount point of the distribution media. In this example it is `/mnt.` This is a required parameter.

   The command copies the existing files in `/usr/sbin` to files with a `*.pre-V4.0` suffix, for example: `/usr/sbin/setld` is copied to `/usr/sbin/setld.pre-V4.0`.

When the script completes, the server can serve a Digital UNIX Version 4.0 or higher RIS client.

If the utility finds existing `*.pre-V4.0` Digital UNIX files on your system, the existing utilities are updated with no changes to the `*.pre-V4.0` files. If the server is already running Version 4.0 or higher, a confirmation is displayed and no copies will be made.

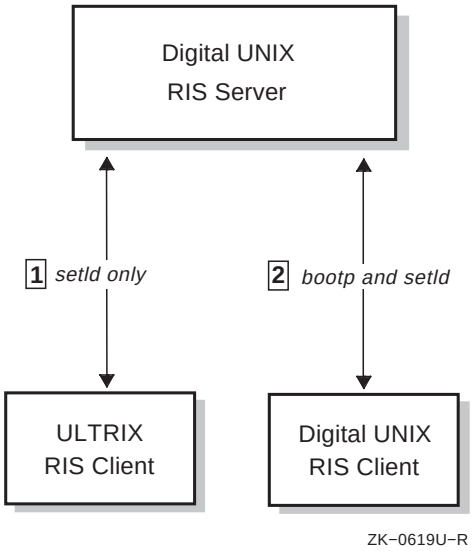
Support of differing bootstrap protocols restricts the use of the Digital UNIX and ULTRIX operating systems together in RIS environments.

Alpha-based clients can broadcast `bootp` requests. VAX-based or MIPS-based clients broadcast only Maintenance Operation Protocol (MOP) requests, which means they cannot boot from Digital UNIX servers.

After a client's operating system is installed and running, a server running Digital UNIX software can serve additional product subsets to a client running either an ULTRIX or a Digital UNIX operating system. The client loads the additional subsets by using the `setld` utility.

Figure 3-1 shows these relationships:

Figure 3-1: System Compatibility



1 ULTRIX RIS clients cannot be booted by Digital UNIX RIS servers. This means that a Digital UNIX server cannot serve the ULTRIX base operating system over the network. However, after the ULTRIX operating system is up and running on the client, the Digital UNIX server can serve an ULTRIX client additional product subsets. The ULTRIX client loads additional product subsets by using the `setld` utility.

2 A Digital UNIX RIS client can be booted by a Digital UNIX RIS server by using the `bootp` protocol. This means that a Digital UNIX server can serve both the Digital UNIX base operating system as well as additional product subsets to the Digital UNIX client over the network. The Digital UNIX client loads additional product subsets by using the `setld` utility.

3.2 Using RIS with C2-Security Enabled

If a server is using `ris` with C2-Security enabled, the `ris` user file must be changed to ensure that the `ris` password does not expire. If the password expires, client access is denied. Perform the following steps on the server to modify the `ris` user file:

1. Edit the file `/tcr/files/auth/r/ris`

2. Set the current password field `u_pwd` to * (an asterisk).
3. Set the `u_succhg` value to non-zero. This value is a `time_t` type printed with `%ld`.
4. Set the `u_life` and `u_exp` fields to zero.

The following is an example of the modified user file `/tcb/files/auth/r/ris:`

```
ris:u_name=ris:u_id#11:u_oldcrypt#0:u_pwd=*:u_exp#0:u_life#0:
u_succhg#79598399:u_suclog#79598399:u_lock@:chkent:
```

When these changes are made, the RIS password should never expire causing a denial of service to clients.

3.3 Prerequisite Server Setup Tasks

Before you configure and install the RIS area and software on the server, you must perform the following tasks:

1. Install the Digital UNIX operating system.
2. Set up your Ethernet, FDDI, or Token Ring Local Area Network (LAN).
3. Load and register the Digital UNIX Server Extensions (OSF-SRV) license.

3.3.1 Installing the Digital UNIX Operating System on the Server

The *Installation Guide* describes how to install the Digital UNIX operating system on the server. It also lists all of the standard Digital UNIX supported software subsets with subset names, sizes, and descriptions of their contents. You will need this information to install the operating system, as well as to install RIS software.

Because RIS areas are created in `/var/adm/ris`, you may want to specify a separate `/var` file system during the installation to get extra disk space. To specify a separate file system for `/var`, you must perform a custom installation (not a default installation).

To be a RIS server, a system must have the `Remote Installation Service` and `Additional Networking Services` subsets installed. These subsets contain the `tftp` networking utility and the `bootpd` or `joind` bootstrap daemon.

Enter the following command to see if these subsets are installed:

```
# /usr/sbin/setld -i | egrep "RIS|INET"
```

Information similar to the following should be displayed:

```
OSFCLINET400    installed       Basic Networking Services
OSFINET400      installed       Additional Networking Services
OSFRIS400       installed       Remote Installation Service
```

The `Basic Networking Services` subset is mandatory and is installed automatically. If the `Additional Networking Services` and `Remote Installation Service` subsets are not installed, you must install them by using the `setld` utility.

See the *Installation Guide* for more information about using the `setld` utility to install subsets.

3.3.2 Setting Up a Local Area Network

You must connect the RIS server and all of the client processors to a LAN using either Ethernet, FDDI, or Token Ring. The server and clients must all be on the same network or subnetwork unless the router connecting the networks or subnetworks can forward `bootp` requests.

For instructions on setting up a local area network, refer to the *Network Administration* guide.

3.3.3 Loading and Registering the Server Extensions License

The Digital UNIX Server Extensions license (OSF-SVRor UNIX-SERVER) provides the right to use the RIS software on Digital UNIX systems. A product authorization key (PAK) accompanies the license. You must register the PAK information for your system before it can be configured as a RIS server. Register the PAK information by using the License Manager application. Refer to `dxlicense(8)` for additional information.

See the *Software License Management* guide and the License Manager online help page for more information about registering license PAKs.

After you enter the data, complete the server setup tasks described in Chapter 4.

3.4 Distribution Media and Device Special File Names

The Digital UNIX distribution kit contains CD–ROM media. The device special file name for a CD–ROM reader is `/dev/rz`*n*`c`, where the character *n* represents the unit number.

3.5 Planning Disk Space for RIS

Before beginning an installation you must calculate the amount of disk storage required for the software subsets in the RIS areas on the server. If space on the server's system disk is an issue and your server's distribution media is a CD–ROM, you might want to create symbolic links from the RIS server area to the software on the CD–ROM. Section 4.1 briefly describes the advantages and disadvantages of establishing symbolic links instead of extracting the software subsets into the RIS server area.

See Chapter 1 for a description of the RIS area's contents. A given server can have multiple RIS areas, in which some of the subsets can be duplicated. To organize your RIS server's disk space, perform the following steps:

1. Determine how many RIS environments you want.
2. Choose the software subsets you want to install, organizing them by the environments where they are to be installed.
3. Use the subset size information in the *Installation Guide* to ensure that you have adequate disk space.

Setting Up a RIS Area 4

This chapter describes how to use the RIS utility to configure a Digital UNIX RIS server. After completing this chapter, you will be able to:

- Establish a new RIS server area using the `ris` utility
- Install software kits in existing RIS area
- Install graphics hardware device kits in existing RIS area

The `ris` utility can be invoked in two ways:

- Interactively through a menu-driven interface
- From the command line by issuing commands to perform the various tasks one at a time

This chapter describes how to use the utility's menu-driven interface. Chapter 6 describes how to use individual `ris` commands.

4.1 Installing Software into a New RIS Area

After you create a RIS area and install the first software kit there, you can install more kits into that area or create other areas as you need them. (Section 4.2 describes how to install additional software into an existing RIS environment.)

Use the following procedure to create a new `ris`*n*`.alpha` environment and install the first software kit into it:

1. If your distribution media is CD–ROM, enter a `mount` command similar to the following before starting the utility:

   ```
   # mount -rd /dev/rz4c /mnt
   ```

   This example uses a CD–ROM drive that is unit 4 and specifies `/mnt` as the mount point; if your drive is a different unit, substitute the device special file name for that unit.

If you are uncertain of your CD–ROM's unit number, enter the `file` command, specifying the raw device, as follows:

```
# file /dev/rrz*c

/dev/rrz1c: char special (8/1026) SCSI #0 RZ25 disk #8 (SCSI ID #1)
/dev/rrz2c: char special (8/2050) SCSI #0 RZ25 disk #16 (SCSI ID #2)
/dev/rrz3c: char special (8/3074) SCSI #0 RZ25 disk #24 (SCSI ID #3)
/dev/rrz4c: char special (8/4098) SCSI #0 RRD43 disk #32 (SCSI ID #4)
/dev/rrz9c: char special (8/17410) SCSI #1 RZ57 disk #72 (SCSI ID #1)
```

The CD–ROM device corresponds to an RRD device, in this example RRD43.

2. Enter the following command to invoke the RIS utility from the root system prompt:

```
# /usr/sbin/ris
```

The RIS Utility Main Menu is displayed. Each available menu item is preceded by a letter. The first time you invoke the utility, the display looks similar to the following:

```
Checking accessibility of RIS areas.... done

*** RIS Utility Main Menu ***

Choices without key letters are not available.

  ) ADD a client
  ) DELETE software products
 i) INSTALL software products
  ) LIST registered clients
  ) MODIFY a client
  ) REMOVE a client
  ) SHOW software products in remote installation environments
 x) EXIT

Enter your choice:
```

The RIS Utility Main Menu does not display option letters for menu items that cannot be accessed.

As you add environments, software, and clients to the system, options that were not available become available, and the menu displays their option letters.

3. Choose the `Install software products` option by entering `i` at the prompt:

```
Enter your choice: i
```

   The RIS Installation menu displays the installation options. Choose option 1, the `Install software into a new area` option.

```
RIS Software Installation Menu:

    1)  Install software into a new area
    2)  Add software into an existing area
    3)  Return to previous menu

Enter your choice: 1
You have chosen to establish a new remote installation
environment.
```

4. Enter the full pathname or the device special file name for the distribution media. If your distribution media is CD–ROM mounted on `/mnt,` the directory where the software is located is `/mnt/ALPHA/BASE`. Enter a device specific file name only for magnetic tape media.

```
Enter the device special file name or the path of the
directory where the software is located (for example,
/dev/rmt0h): /mnt/ALPHA/BASE
```

5. The utility lets you choose whether you want to create symbolic links to the software or to extract the software into the RIS area.

```
Choose one of the following options:

    1)  Extract software from /mnt/ALPHA/BASE
    2)  Create symbolic link to /mnt/ALPHA/BASE

Enter your choice:
```

   – If you choose to extract subsets (by choosing option 1), the subsets you select are copied from the device or directory specified into the RIS area. You must know which specific subsets to extract and the amount of disk space required. See Section 3.5 for information about planning disk space for RIS. Clients can install only the subsets that were extracted into RIS product areas for which they are registered. Using extracted subsets improves the performance of the RIS environment. This is because copying software from magnetic media as opposed to optical media is faster. You must provide an extracted RIS area if you want to install a graphics kit for a graphics device not currently supported by Digital UNIX . See Section 4.3 for additional information.

   – If you choose to link to the device or directory specified, symbolic links are created in the RIS area that point to the subset directories on

the device or directory specified. Disk space planning is not required because the subsets reside on the device or directory specified. However, the device or directory specified must be on line and mounted for clients to access the subsets. Unlike subset extraction, no subset selection is required. Clients registered for RIS product areas that are links to the device or directory specified can access all subsets.

Caution

Unmounting, deleting, or switching the device or directory where the RIS area is linked corrupts the RIS area. To restore the RIS area, remount the area pointed to by the RIS area.

You are prompted to enter the client architecture for products that are not part of base operating system that the RIS environment will serve:

```
Choose the architecture of the clients that the environment
will serve:

    1) alpha
    2) custom
    3) mips

Enter your choice: 1

The new environment is in /usr/var/adm/ris/ris0.alpha.
```

6. If you chose to extract subsets, the utility lists the mandatory and optional software subsets you can install. Choose the subsets that you want from the list. The utility displays your list for confirmation. In the example below, only the mandatory software subsets are chosen. Your screen will look similar to this:

```
*** Enter subset selections ***

The following subsets are mandatory and will be extracted
automatically unless you choose to exit without extracting
any subsets:

      * Adobe Fonts
      * Base System
      * Base System - Hardware Support
      * Base System Management Applications and Utilities
      * Basic Networking Configuration Applications
      * Basic Networking Services
      * Basic X Environment
      * CDE Desktop Environment
      * CDE Mail Interface
      * CDE Minimum Runtime Environment
      * Compiler Back End
      * DECwindows 100dps Fonts
      * Graphical Base System Management Utilities
      * Graphical Print Configuration Application
```

```
      * Graphical System Administration Utilities
      * Hardware Kernel Header and Common Files
      * Hardware Kernel Modules
      * Kernel Header and Common Files
      * Keyboard Support
      * Local Printer Support
      * NFS(tm) Configuration Application
      * NFS(tm) Utilities
      * Netscape Navigator V1.12I
      * Old X Environment
      * Standard Kernel Modules
      * Tcl Commands
      * Tk Toolkit Commands
      * X Fonts
      * X Servers Base
      * X Servers for TurboChannel, PCI, or QVision

Press RETURN to display the next screen:


Free space remaining after mandatory subsets (root/usr/var):
30.4 MB/1.7 GB/12MB

Optional subsets are listed below.  There may be more optional
subsets than can be presented on a single screen.  If this is
the case, you can choose subsets screen by screen, or all at
once on the last screen.  All of the choices you make will be
collected for your confirmation before any subsets are installed.

 - General Applications:
 1) Additional Terminfo databases
 2) Computer Aided System Tutor
 3) DOS tools
 4) GNU Emacs
 5) Local Area Transport (LAT)
 6) UNIX(tm) SVID2 Compatibility
 7) UNIX(tm) to UNIX(tm) Copy Facility

 - Kernel Build Environment:
 8) ATM Kernel Header and Common Files
 9) ATM Kernel Modules
10) Logical Storage Manager Kernel Header and Common Files
11) Logical Storage Manager Kernel Modules
12) POLYCTR advfs Kernel Modules

 - Mail Applications:
13) DECwindows Mail Interface
14) RAND Corp. Mail Handler (MH)


Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Network-Server/Communications:
15) ATM Commands
16) Additional Networking Services
17) Dataless Management Services
18) Remote Installation Service
```

```
 - Printing Environment:
19) Adobe Font Metric Files

 - Reference Pages:
20) Ref Pages: Admin/User
21) Ref Pages: CDE Admin/User
22) Ref Pages: CDE Development
23) Ref Pages: Programming
24) Ref Pages: Realtime
25) Ref Pages: Windows Admin/User
26) Ref Pages: Windows Programming


Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Software Development:
27) CDA(tm) Software Development
28) CDA(tm) for X/Motif Development
29) CDE Software Development
30) GNU Revision Control System
31) Ladebug Debugger Version 4.0-11
32) Ladebug Debugger Version 4.0-11 Release Notes
33) Ladebug Debugger Window Interface
34) Ladebug Debugger remote server
35) Programming Examples
36) Realtime Software Development
37) Software Development Desktop Environment
38) Software Development Tools and Utilities
39) Source Code Control System
40) Standard Header Files
41) Standard Programmer Commands
42) Static Libraries
43) X Window and X/Motif Header Files
44) X Window and X/Motif Programming Examples
45) X Window and X/Motif Software Development
46) X Window and X/Motif Static Libraries


Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Supplemental Documentation:
47) XIE Version 5 Online Documentation

 - System Administration:
48) C2-Security
49) C2-Security GUI
50) Kernel Debugging Tools
51) Logical Storage Manager
52) Logical Storage Manager GUI
53) Logical Volume Manager
54) Obsolete Commands and Utilities
55) Obsolete Locale databases
56) POLYCTR advfs
57) Single-Byte European Locales
58) System Accounting Utilities
59) System Exercisers
```

```
 - Text Processing:
60) Doc. Preparation Tools
61) Doc. Preparation Tools Extensions

Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Windowing Environment:
62) DECwindows 75dpi Fonts
63) LK201 Keyboard Support
64) LK411 Keyboard Support
65) LK421 Keyboard Support
66) LK444 Keyboard Support
67) PCXAL Keyboard Support
68) X Customizations for OEM
69) X Servers for Open3D
70) X Servers for PCbus
71) X/Motif 1.1

 - Windows Applications:
72) Additional DECwindows Applications
73) Additional X Applications
74) CDE Additional Applications
75) Demo X Applications
76) Nested X Server
77) Old Additional DECwindows Applications
78) Virtual X Frame Buffer

Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):


The following choices override your previous selections:
79) ALL mandatory and all optional subsets
80) MANDATORY subsets only
81) CANCEL selections and redisplay menus

Add to your choices, or press RETURN to confirm previous choices.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

Enter your choices or press RETURN to redisplay menus.

Choices (for example, 1 2 4-6): 80

You are installing the following mandatory subsets:



      * Adobe Fonts
      * Base System
      * Base System - Hardware Support
      * Base System Management Applications and Utilities
      * Basic Networking Configuration Applications
      * Basic Networking Services
      * Basic X Environment
      * CDE Desktop Environment
      * CDE Mail Interface
```

```
      * CDE Minimum Runtime Environment
      * Compiler Back End
      * DECwindows 100dps Fonts
      * Graphical Base System Management Utilities
      * Graphical Print Configuration Application
      * Graphical System Administration Utilities
      * Hardware Kernel Header and Common Files
      * Hardware Kernel Modules
      * Kernel Header and Common Files
      * Keyboard Support
      * Local Printer Support
      * NFS(tm) Configuration Application
      * NFS(tm) Utilities
      * Netscape Navigator V1.12I
      * Old X Environment
      * Standard Kernel Modules
      * Tcl Commands
      * Tk Toolkit Commands
      * X Fonts
      * X Servers Base
      * X Servers for TurboChannel, PCI, or QVision
Is this correct? (y/n):
```

If you enter `y`, the subset extraction process begins. If you enter `n`, the list of subsets is displayed again and you can restart your selection process.

When you confirm your selections, the `ris` utility extracts the subsets and displays the name of the new RIS environment. The RIS Utility main menu is then displayed.

Once you set up the RIS areas and register clients in those areas, the clients can access the areas they need. Client registration is discussed in Chapter 6.

4.1.1 The /etc/exports File

Client RIS installations of the base operating system Version 2.0 and prior to Digital UNIX Version 4.0 rely on files located in the server's `/var/adm/ris/ris`*`n.arch`*`/kit` directory. Therefore the server must export that directory. In the case of a Digital UNIX Version 4.0 operating system base product the directory that is exported, the `/var/adm/ris/ris`*`n.arch`*`/product_1` is the product directory which contains the Direct CD (DCD) image of the distribution. In this directory path, *`n`* is the number of the RIS area and *`arch`* is the architecture of the client systems that the area serves. When you create the RIS area, `ris`*`n.arch`* , the `ris` utility supplies you with a name based on the choices you make during the area's creation.

The server's `/etc/exports` file must include an entry for each RIS area that it is exporting. When you create a RIS area, the `ris` utility automatically edits the `/etc/exports` file and adds the correct entry for that area. However, if you modify the path to a RIS area, you must also modify the corresponding line in the `/etc/exports` file. See Section

4.1.1.1 for an example of editing the /etc/exports file.

The RIS area entries in the /etc/exports file of a system that acts as a RIS server for two Alpha environments and one MIPS RISC environment look similar to the following:

```
/var/adm/ris/ris0.alpha/kit  -root=0  -ro
/var/adm/ris/ris1.alpha/kit  -root=0  -ro
/var/adm/ris/ris0.mips/kit  -root=0  -ro
/ris/ris2.a/product_1     -root=0 -ro
```

The entry in the previous example shows an entry in /etc/exports of /ris/ris2.a/product_1. This entry is created by RIS and is a symbolic link from /ris/ris2.a/product_1 to /var/adm/ris/ris2.alpha/product_1. This is done to shorten the path that needs to be sent to the client during the boot process.

Note

When you register the first client on your RIS server for Version 2.0 and prior to Digital UNIX Version 4.0, the ris utility creates the kit/isl directory, which contains tools that clients require to install software subsets.

4.1.1.1 Editing the /etc/exports File

There are certain instances when you must edit the /etc/exports file. When you create a /ris*n*.alpha area, the path to the kit directory is /var/adm/ris/ris0.alpha/kit and the RIS utility places the following line in the /etc/exports file:

```
/var/adm/ris/ris0.alpha/kit -root=0 -ro
```

If you create another directory in this RIS area, for example, dsk1, mount another file system there, move the contents of ris0.alpha to that directory and then link it to ris0.alpha, a listing of the RIS area shows the following entry:

```
ris0.alpha -> ./dsk1/ris0.alpha
```

The path to the kit directory is now effectively /var/adm/ris/dsk1/ris0.alpha/kit. You must edit the corresponding line in the /etc/exports file to read:

```
/var/adm/ris/dsk1/ris0.alpha/kit -root=0 -ro
```

Failure to edit the /etc/exports file in this instance results in a mount failure of the kit directory when attempting a client installation.

4.2 Installing Software into an Existing RIS Area

You can install software subsets that are compatible with the Digital UNIX `setld` utility into an existing RIS environment by entering the following command as superuser and following the procedures as they appear on the screen:

```
# /usr/sbin/ris
```

1. Next the RIS Utility Main Menu is displayed. Choose the option `INSTALL software products` by entering `i` at the prompt:

```
Checking accessibility of RIS areas... done

*** RIS Utility Main Menu ***

Choices without key letters are not available.

    a) ADD a client
    d) DELETE software products
    i) INSTALL software products
     ) LIST registered clients
     ) MODIFY a client
     ) REMOVE a client
    s) SHOW software products in remote installation environments
    x) EXIT

Enter your choice: i
```

2. The RIS Software Installation Menu is displayed. Choose the option to `Add software into an existing area` by entering `2` at the prompt:

```
RIS Software Installation Menu:

    1)  Install software into a new area
    2)  Add software into an existing area
    3)  Return to previous menu

Enter your choice: 2
```

   The utility displays a list of the existing RIS areas:

```
You have chosen to add a product to an existing environment.

Select the remote installation environment:

1) /usr/var/adm/ris/ris0.alpha
      'POLYCENTER advanced File System'
      'DECsafe Available Server Environment  (ASE)'
      'System V Environment'

2) /usr/var/adm/ris/ris1.alpha
      'Sort Runtime Library'
      'Free Software Foundation GNU Source (Rev xxx)'
      'DEC Ada Support Library'

Enter your choice or press RETURN to quit:
```

3. Choose the area that you want to use, and then proceed as before to mount the distribution media and choose subsets. Press the Return key if you want to return to the RIS Utility Main Menu.
4. Repeat this procedure for each additional group of subsets you want to install.

4.3 Installing Kits for Non-Digital Supported Graphics Devices

In Digital UNIX Version 4.0, a RIS server can service a client with graphics hardware which is currently not supported in the Digital UNIX operating system base product installed. This feature is implemented by overlaying an existing operating system base product with the new graphics kit. This section describes how to set up the RIS server to support this feature.

The following is a list of the installation requirements:

1. The installation of graphics kits can be done only on an extracted RIS area. If you attempt to install a graphics device kit into a new RIS area, an error message is displayed.
2. The RIS server must be capable of generating a new generic kernel for the clients. A Digital UNIX Version 4.0 kernel cannot be built on a previous release of the operating system. If you attempt to install a graphics kit on a server, which is not running Digital UNIX Version 4.0, the following message is displayed:

   ```
   The server must be running Digital UNIX Version 4.0 or higher
   to support graphics device kits.
   ```

3. The graphics software kit must be `setld` compatible to be installed into an existing RIS environment.
4. The extracted RIS area should contain all the subsets on the distribution media. If this is not possible due to disk space constraints, the following minimum set of subsets should be extracted:

   ```
   All Mandatory Subsets


   Kernel Build Environment:

   - ATM Kernel Header and Common Files
   - ATM Kernel Modules
   - Logical Storage Manager Kernel Header and Common Files
   - Logical Storage Manager Kernel Modules
   - POLYCTR advfs Kernel Modules
   ```

```
Windowing Environment:

-  Adobe Fonts
-  DECwindows 100dpi Fonts
-  DECwindows 75dpi Fonts
-  LK201 Keyboard Support
-  LK401 Keyboard Support
-  LK411 Keyboard Support
-  LK421 Keyboard Support
-  LK444 Keyboard Support
-  PCXAL Keyboard Support
-  X Customizations for OEM
-  X Fonts
-  X Servers Base
-  X Servers for Open3D
-  X Servers for PCbus
-  X Servers for TurboChannel
-  X/Motif 1.1
```

To create the new product area for the graphics kit, hard links are made between the operating system base product and the new product that will contain the graphics device kit. This permits the operating system base product and graphics device kit to coexist in the same RIS area using minimum additional magnetic disk space.

Execute the following procedures as superuser to install a graphics kit into an existing environment. In the following example, the graphics kit being installed is named ESA100.

Enter the following command to invoke the RIS utility from the `root` system prompt:

```
# /usr/sbin/ris
```

1. The RIS Utility Main Menu is displayed. Chose the option `INSTALL software products` by entering `i` at the prompt:

```
Checking accessibility of RIS areas... done

*** RIS Utility Main Menu ***

Choices without key letters are not available.

    a) ADD a client
    d) DELETE software products
    i) INSTALL software products
     ) LIST registered clients
     ) MODIFY a client
     ) REMOVE a client
    s) SHOW software products in remote installation environments
    x) EXIT
Enter your choice:i
```

2. The RIS Software Installation Menu is displayed. Choose the option `Add software into an existing area` by entering `2` at the prompt:

```
RIS Software Installation Menu:

    1)  Install software into a new area
    2)  Add software into an existing area
    3)  Return to previous menu
Enter your choice:2
```

3. The utility displays a list of the existing RIS areas. Choose the area that you want to base the new graphics kit area against, or the existing graphics kit area where you would like to install the kit. You can install multiple kits in to a single RIS area.

```
Please select one of the following products to base against or
add the kit to.

     1   'Digital UNIX V4.0 Operating System ( Rev xxx )'

Enter your selection or (return) to quit :

You have chosen to add a product to an existing environment.

The existing environment is /usr/var/adm/ris/ris0.alpha.
```

4. Enter the location of the software:

```
Enter the device special file name or the path of the directory where
the software is located (for example, /mnt/ALPHA/BASE):
/mnt/ALPHA/ESA100
```

   The new kit is now added to the area you selected.

During this phase the new product is created and the hard links between the products are made. Messages similar to the following are displayed at your terminal.

```
Preparing new product area...
      Working....Thu Aug 24 13:47:48 EDT 1995
      Working....Thu Aug 24 13:49:49 EDT 1995
      Working....Thu Aug 24 13:51:50 EDT 1995
      Working....Thu Aug 24 13:53:51 EDT 1995
      Working....Thu Aug 24 13:55:52 EDT 1995
      Working....Thu Aug 24 13:57:53 EDT 1995
      Working....Thu Aug 24 13:59:54 EDT 1995
      Working....Thu Aug 24 14:01:55 EDT 1995
      Working....Thu Aug 24 14:03:55 EDT 1995
      Working....Thu Aug 24 14:05:56 EDT 1995
      Working....Thu Aug 24 14:07:57 EDT 1995
      Working....Thu Aug 24 14:09:58 EDT 1995
      Working....Thu Aug 24 14:11:59 EDT 1995
      Working....Thu Aug 24 14:14:00 EDT 1995

The subsets listed below are optional:
```

```
There may be more optional subsets than can be presented on a single
screen. If this is the case, you can choose subsets screen by screen
or all at once on the last screen. All of the choices you make will
be collected for your confirmation before any subsets are extracted.

     1) SVGA Graphics Support Subset

Or you may choose one of the following options:

     2) ALL of the above
     3) CANCEL selections and redisplay menus
     4) EXIT without extracting any subsets

Enter your choices or press RETURN to redisplay menus.
Choices (for example, 1 2 4-6):1

You are installing the following optional subsets:

        SVGA Graphics Support Subset
Is this correct? (y/n):y

Checking file system space required to extract selected subsets:

File system space checked OK.
Extracting ESABASE100...
Media extraction complete.
```

At this point, the new product area has been created and the graphics kit installed into it.

4.4 Using an NFS-Mounted RIS Area

The information in this section can be used only if you are serving a version of Digital UNIX prior to Version 4.0.

You can use an NFS mount point to install software from a RIS area or Digital UNIX distribution CD–ROM that you import from another machine. For example, if a system named `salaam` has a CD–ROM containing the Digital UNIX subsets mounted on `/mnt` and listed in its `/etc/exports` file, the system administrator on `aladdin` can NFS mount that CD–ROM with the following command:

```
aladdin_root# mount salaam:/mnt/ALPHA/BASE /mnt
```

After the CD–ROM is mounted, the system administrator on `aladdin` can use the `ris` utility to install software from it as if it were local to `aladdin`.

If another system has a RIS area with the needed subsets for a RIS area on the local system and exports that area, you can create a RIS area from the remote RIS area.

For example, if a system named `abu` has Digital UNIX subsets in its `ris0.alpha` product environment, the system administrator on `aladdin`

can NFS-mount that product environment with the following command:

```
aladdin_root# mount abu:/var/adm/ris/ris0.alpha  /mnt
```

After the remote product environment is mounted, the system administrator for `aladdin` can use the `ris` utility to install software from it as if it were local to `aladdin`.

Cloned Installations 5

This chapter explains how to use RIS to set up and manage cloned installations. Topics include:

- Installation cloning overview
- Modifying the Configuration Description File (CDF)
- Prerequisites
- Acceptable differences between the CDF and the system to be cloned
- RIS administrator tasks
- Determining CDF registration
- Removing a client from CDF registration
- Deleting CDFs from the RIS server
- Messages displayed during a cloned installation

5.1 Installation Cloning Overview

A cloned installation provides the ability to duplicate the installation configuration from a system that has already been installed with Digital UNIX Version 4.0 or higher on to systems with similar hardware configurations.

Cloning is ideal for environments in which there are many of the same or similarly configured systems. The installation of a model system can be duplicated on other systems using this procedure. The benefits are that the resulting installations are identical and limited user input is required during a cloned installation.

Cloning also provides the ability to easily reinstall a system which is identical to the prior system installation.

When Digital UNIX Version 4.0 is installed on a system, the installation procedure creates a Configuration Description File (CDF). After the installation is complete, the CDF is located on the newly-installed system in `/var/adm/smlogs/install.cdf`. The CDF contains the following information about the installation:

- Software subsets that were installed
- File systems that were created
- Disk types and disk names
- File system layout
- File system type

If you copy the CDF that was created on an already-installed RIS client to the `/var/adm/ris/clients/cdf` area on the RIS server, you can register new RIS clients for cloned installations. You do this by registering new clients to a RIS environment as well as to a CDF. If a RIS client is registered to a CDF and boots across the network to start an installation, the CDF is retrieved and used by the installation procedure to provide the answers to all installation configuration questions.

5.2 Modifying the CDF

Digital does not recommend modifying the CDF in any way. Modifying a CDF may cause the installation to fail and may result in an unusable client system. Therefore, CDF modification is unsupported.

5.3 Prerequisites

The only requirements for a system to use installation cloning are:

- It is installable through RIS. The *Installation Guide* describes the systems that can and cannot boot from RIS.
- It is registered on the RIS server that has the appropriate CDF.
- The disk configuration for `root`, `usr`, `var`, and `swap` areas on the system where the CDF was created and the system to be cloned must be the same.

5.4 Acceptable Differences Between the CDF and the System to Be Cloned

Differences in the disk configuration, graphics adapter, keyboard type, and fonts are acceptable as explained in the following sections.

5.4.1 Acceptable Differences in Disks Configurations

The system to use installation cloning should have the same configuration as the system where the CDF was generated. However, it is possible to support differences in configuration.

The system to use installation cloning must have the same disk configuration for those disks on which /, usr, swap1, var (if not a directory within usr) and swap2 (if allocated) are to be installed as the system on which the CDF was generated. The same disk configuration means that the disk type (for example RZ26) and the device name (for example rz3) must match. If the partition tables on these disks are not the same, the software specified in the CDF may not fit on to the system.

It does not matter if disks other than those referenced previously are different or not on the system to use installation cloning. Consider this scenario: A CDF generated on system SYSA, which has an RZ26 at rz0 and an RZ25 at rz1 and /, usr, and swap1 are placed on rz0. SYSB has an RZ26 at rz0 and an RZ26 at rz1. SYSB can use the CDF from SYSA assuming there are no other differences. The difference in disk type at rz1 is acceptable. If the disks at rz0 were different, an installation cloning could not be performed.

5.4.2 Acceptable Differences in Graphics Adapters

To reduce the disk space required when installing Digital UNIX, the software required to support the different graphics options has been packaged so that the subsets required to support options that are not on your system are not installed. This determination is done automatically by the installation process and guarantees that the appropriate subsets are loaded. However, when a system uses installation cloning, the subsets loaded onto the system are defined by the contents of the CDF. Therefore, if the system to be installed has a different graphics type than the system on which the CDF was created, the appropriate graphics support will not be installed.

When generating the CDF through the full installation of a system, you must consider the graphics options of the systems that will be cloned from the CDF. If any of the systems to be cloned have different graphics options, you must load the subsets required to support the graphics options needed by those systems.

When selecting subsets, look in the Windowing Environment category for subsets of the name X Servers for <xxx>. The <xxx> will be replaced with a name that describes which graphics options the subset supports. In Digital UNIX Version 4.0, the following graphics subsets are available:

`X Servers Base` - device independent X Server support (always loaded)
`X Servers for Open3D` - supports the ZLXp-L graphics adapter
`X Servers for PCbus` - support for EISA and PCI bus graphics adapters
`X Servers for TurboChannel` - support for TurboChannel bus graphics adapters

Note

`X Servers for PCbus` adapters supported by Digital UNIX are specified in the Software Product Description (SPD).

The following example explains an acceptable graphics cloning scenario.

SYSA and SYSB are determined to be similar enough to allow the CDF from SYSA to be used for installation cloning of SYSB. SYSA has an `Open3D` graphics option while SYSB has a QVision graphics option (a `PCbus` based adapter). When installing SYSA, the `X Servers for Open3D` subset will be mandatory while the `X Servers for PCbus` subset will be optional. Installing this optional subset ensures that the appropriate subset is installed when doing the installation cloning of SYSB. If you do not install the optional subset, the graphics capabilities of SYSB are likely to be disabled.

Digital does not recommend using the CDF from a system without graphics support to clone systems with graphics support. There are several subsets that will not be loaded on these systems that are mandatory for systems with graphics support.

If you are unsure of which graphics options are available on the systems you want to clone, install all of the graphics subsets that are available. However, installing all of the subsets requires more disk space than loading only selected graphics subsets.

5.4.3 Acceptable Differences in Font Types

In order to reduce the disk space required when installing Digital UNIX, the software required to support the `75dpi` and `100dpi DECwindows` fonts are contained in individual subsets. By doing this, the installation will load only the fonts required for the system and leave the other as an optional subset. This determination is done automatically by the installation process. When installation cloning occurs, the fonts loaded are defined by the contents of the CDF. If the system to be cloned requires a different size font from those in the CDF, the system to be cloned will not have the appropriate fonts loaded.

When generating the CDF through the full installation of a system, you must consider the font sizes required by the systems that will be cloned from the

CDF. If the systems to be cloned require other font sizes, load the appropriate font subset when installing the system.

The need for `Decwindows 75dpi Fonts` or `DECwindows 100dpi Fonts` depends on the resolution of the graphics adapter being used. On a system already running Digital UNIX, this value can be determined by invoking `sizer -gr`. When the resolution is 1024x768 or less, the `DECwindows 75dpi Fonts` are required. When the resolution is greater, the `DECwindows 100dpi Fonts` are required. If you are unsure of the resolution available on the systems to be cloned, select both font subsets to ensure the correct font is available.

Systems with multiple graphics adapters may require both the `DECwindows 75dpi Fonts` and `DECwindows 100dpi Fonts` if the adapters include those with 1024x768 or less resolution and those with greater resolution.

While there are other subsets that contain fonts, only the DECwindows fonts are packaged separately by size.

The following scenario explains an acceptable font difference.

SYSA is being installed with the intention of using its CDF to perform installation cloning on other systems, including SYSB. The graphics adapter on SYSA provides a resolution of 1024x680 while the adapter on SYSB provides a resolution of 1280x1024. When installing SYSA, the `DECwindows 75dpi Fonts` is mandatory and `DECwindows 100dpi Fonts` is optional. Select the optional subset as well to provide the necessary fonts for the installation cloning on SYSB.

If you are unsure of the fonts available on the systems you want to clone, load all of the font subsets that are available. However, loading all of the font subsets requires more space than loading selected fonts.

5.4.4 Acceptable Differences in Keyboard Type

In order to reduce the disk space required when installing Digital UNIX, the software required to support the different Digital keyboard types is contained in individual subsets. By doing this, the installation will load only the software required. This determination is done automatically by the installation process. However, when an installation cloning occurs, the keyboard support to be loaded is defined by the contents of the CDF. If the system to be installed has a different keyboard type than the system on which the CDF was created, that system will not load the appropriate keyboard support.

When generating the CDF through the installation of a system, you must consider the keyboard type of the systems that will be cloned using the CDF. If the systems that will be cloned have different keyboard types, load the

appropriate keyboard support subset when installing the system. The keyboard type can be determined from information available when the system is in console mode or by simply looking at the model number which can generally be found on the underside of the keyboard itself.

The following scenario explains an acceptable keyboard difference.

SYSA is being installed with the intention of using its CDF to perform installation cloning on other systems, including SYSB. SYSA has a PXCAL keyboard while SYSB has an LK444 keyboard. During the installation of SYSA, the subset `PCXAL Keyboard Support` is mandatory. However, the subset `LK444 Keyboard Support` is optional. Selecting this optional subset results in some unnecessary software being loaded on SYSA, but allows the CDF to be appropriate for use on SYSB.

If you are unsure of the keyboard types available on the systems you want to clone, load all of the keyboard subsets that are available. However, loading all of the keyboard subsets requires more disk space than loading selected keyboard subsets.

5.5 RIS Administrator Tasks

The following steps must be performed prior to attempting to register a client for a cloned installation:

1. Copy the CDF to the RIS server as described in the following section.
2. Add the client on the RIS server as shown in Section 6.2.

5.5.1 Copying the CDF to the RIS Server

Copy the CDF, `/var/adm/smlogs/install.cdf`, from the system where is was created into the following directory on the RIS server: `/var/adm/ris/clients/cdf` using the copy tool you usually use (for example `ftp`, `dcp`, or `rcp`).

Since all CDFs created during an installation will have the file name `install.cdf`, you should establish a naming convention which lets you easily distinguish one CDF from another. For example, the CDF for an AlphaStation 400 system could be called `alphastation400.cdf`. There is no restriction on the file name you use for a CDF.

5.5.2 Adding the Client System to Be Cloned on the RIS Server

Section 6.2 describes the RIS client registration process.

5.6 Determining CDF Registration

To determine if a RIS client is registered to a CDF, examine the RIS database file, `/var/adm/ris/clients/risdb`, on the RIS server. The name of the CDF is specified in the fourth field: fields are separated by a colon. In the following sample entry in the `risdb` file, `dec3000.cdf` is the configuration description file to which the client is registered:

```
coral:08-00-2b-e6-76-77:ris2.alpha,product_1:dec3000.cdf
```

5.7 Removing a Client from CDF Registration

You can remove a client from CDF registration by using the Modify option from the RIS Utility Main Menu. When you are prompted to specify a CDF for the client, enter `n` or press Return to register the client without specifying a CDF.

5.8 Deleting CDFs from the RIS Server

If a CDF is no longer needed, you can delete the CDF by removing the appropriate file from the `/var/adm/ris/clients/cdf` directory.

Before deleting a CDF, you should ensure that no clients are registered for the CDF being deleted by examining the RIS database file, `/var/adm/ris/clients/risdb`, on the RIS server. The name of the CDF is specified in the fourth field: fields are separated by a colon. In the following sample entry in the `risdb` file, `dec3000.cdf` is the CDF to which the client is registered:

```
coral:08-00-2b-e6-76-77:ris2.alpha,product_1:dec3000.cdf
```

5.9 Messages Displayed During a Cloned Installation

The messages displayed during a cloned installation are documented in the *Installation Guide*.

Managing and Maintaining RIS Clients and Environments 6

This chapter describes how to use the `ris` utility to manage Digital UNIX RIS environments and clients. Topics include:

- Preregistration tasks
- Adding a client
- Adding a graphics kit
- Modifying a client
- Removing a client
- Listing registered clients
- Listing products in the server's RIS areas
- Deleting software products from the server's RIS areas

6.1 Preregistration Tasks

Before you register RIS clients, gather the information required for each one. The RIS Client Configuration Worksheet in Appendix A will help you organize your information as you register clients. Fill out a worksheet for each client you want to register.

Perform the following tasks to prepare to register clients:

1. Obtain information about each client and fill out a copy of the RIS Client Configuration Worksheet from Appendix A.
2. Register each client's host name and Internet Protocol (IP) address with the appropriate naming service Berkeley Internet Name Domain(BIND) Service and Network Information Service(NIS).

6.1.1 Obtaining Information About Each Client

You need the following information about each processor you plan to register as a client:

- Host name (see Section 6.2 for restrictions on host names)
- The RIS environments you want to make available to the client

- The hardware platform type of the client (MIPS, Alpha)
- The hardware network address of the client
- The address of the gateway from the client to the server, is required if the server and client are on different networks
- The type of network on which the client resides (Ethernet, FDDI, or Token Ring)

6.1.2 Registering Clients' Host Names and IP Addresses with Servers

If the host system is served by any of the following naming services, check with your site administrator to be sure that your clients are registered with the appropriate naming service servers:

- `/etc/hosts`
- Berkeley Internet Name Domain (BIND)
- Network Information Service (NIS), formerly called Yellow Pages (YP)

See the *Network Administration* guide for information about configuring naming services on a local area network and registering clients with them.

6.2 Adding a Client to RIS

To add a client processor to RIS, follow these procedures:

1. Invoke the `ris` utility by entering the following command at the root system prompt:

   ```
   # /usr/sbin/ris
   ```

   The RIS Utility Main Menu is displayed. Choose the option `ADD a client` by entering `a` at the prompt.

   ```
   Checking accessibility of RIS areas.... done

   *** RIS Utility Main Menu ***

       a) ADD a client
       d) DELETE software products
       i) INSTALL software products
       l) LIST registered clients
       m) MODIFY a client
       r) REMOVE a client
       s) SHOW software products in remote installation environments
       x) EXIT

   Enter your choice: a
   ```

The following message is displayed:

```
You have chosen to add a client for remote installation services.

The following conditions must be met to add a client:

  1. You must know the client processor's hostname.
  2. The client's hostname must be in your system's host
     database(s).
  3. You must know whether the client is on an Ethernet, FDDI,
     or Token Ring network.
  4. You must know the client's hardware Ethernet, FDDI, or
     Token Ring address if the client is registering to install
     operating system software.
  5. If the client and the server reside on different subnets,
     you will need the address of the gateway(s)
     that the client can use to communicate with the server.

Do you want to continue? (y/n) [y]:
```

If you enter n, the utility returns to the RIS Utility Main Menu. If you enter y, a prompt asks for the client's host name.

2. Enter the client's host name at the prompt.

   ```
   Enter the client processor's hostname: client1
   ```

   Only lowercase letters (a-z), numbers and the period (.) and dash (-) are permitted in host names, and a host name must begin with a letter. Invalid host names can corrupt the RIS database. Additionally, the client must not be registered on another RIS or DMS server as a client.

   The client processor must be registered with the appropriate naming service or you cannot register the client with RIS. If the client is not registered with the appropriate naming service, the utility displays an error message and repeats the prompt.

3. Enter the environment to which you want to add the client. The utility displays the available environments (and the products installed in those environments) to which you can add the new client. Your output will be similar to the following example (which shows five environments):

   ```
   Select the remote installation environment:

   1)  /usr/var/adm/ris/ris0.alpha
         'Sort Runtime Library'
         'Free Software Foundation GNU Source (Rev 214)'
         'DEC Pascal RTLB V5.4 for Digital UNIX Systems'
         'DEC C++ Class Libraries Version 4.0 for Digital UNIX'
         'DEC Ada Runtime Library'

   2)  /usr/var/adm/ris/ris1.alpha
         'POLYCENTER advanced File System'
         'DECsafe Available Server Environment (ASE)'
         'System V Environment'

   3)  /usr/var/adm/ris/ris2.alpha
         'Digital UNIX V4.0 Operating System ( Rev xxx)'
         'DEC Runtime Library'
   ```

```
4)  /usr/var/adm/ris/ris3.alpha
      'Digital UNIX V4.0 Operating System (Rev xxx)'

5)  /usr/var/adm/ris/ris5.alpha
      'Sort Runtime Library'
      'Free Software Foundation GNU Source (Rev xxx)'
      'DEC Pascal RTL V5.4 for Digital UNIX Systems'
      'DEC C++ Class Libraries Version 4.0 for Digital UNIX'
      'DEC Ada Runtime Library'

Enter your choice or press RETURN to quit: 4
```

4. Enter the number of the product you want this client to be able to install. When the utility asks you to confirm your choices, you can accept them or respecify the information. In the example shown below, the environment has only one product installed:

```
Select one or more products for the client to install
from /usr/var/adm/ris/ris3.alpha:

Product    Description
  1    'Digital UNIX V4.0 Operating System (Rev xxx)'

Enter one or more choices as a space-separated list
(for example, 1 2 3) or all for all products [all]: 1

You chose the following products:

  1    'Digital UNIX V4.0 Operating System (Rev xxx)'

Is that correct? (y/n) [y]:
```

5. If a Configuration Description File (CDF) exists on the RIS server during the registration of a client, the following message is displayed:

```
Do you want to specify a Configuration Description File (CDF)
for Installation Cloning on this client? [y/n] [n] : y
```

   If you do not want to specify a CDF, for installation cloning chose n.

   If you enter y, RIS displays a list of the CDFs on the RIS server:

```
This RIS server has the following Configuration
Description Files (CDF) available:

alphastation400.cdf alphastation400a rz26.cdf
Enter a CDF name or press <Return> to exit CDF selection:
rz26.cdf
```

   After you enter a CDF, CDF verification is performed. The verification determines if the products in the RIS environment to which the client is registered and the products specified in the CDF are the same. The CDF is also validated as suitable for installation cloning.

If you decide not to register a client for a cloned installation or cannot determine a CDF to use, continue with the client registration by pressing Return.

6. Enter the type of network upon which this client resides:

```
Network type:

     1) Ethernet or FDDI
     2) Token Ring

Enter your choice: 1
```

7. The following message is displayed when the server and client are on different networks. You must provide the gateway information needed for the client to connect to the server. RIS stores this information in the `/var/adm/ris/gateways` file. RIS displays the default network information if the gateway information is known.

```
The following are the known gateway[s] between the client
subnet and server subnet. If these values[s] are not correct,
please enter the proper addresses[s]. If these values are
correct press Return. (For example, 16.69.144.???):
[16.69.144.199]
```

   If the network information is unknown, RIS displays the following message. Enter the client's gateway address as shown in the following example:

```
Enter the IP address of the gateway[s] between the client
subnet and server subnet: (For example, 16.69.144.???):
[16.69.144.199]
```

8. Enter the client's hardware network address as shown in the following example:

```
Enter the client processor's hardware network address. For
example, 08-00-2b-02-67-e1: 08-00-2b-39-96-68
```

   If you do not know the client's hardware network address, you can obtain it in one of the following ways:

   – On a client that is not currently running (you are at the boot prompt), issue the appropriate console command or commands for that type of client. Console commands are processor specific, so you must refer to your hardware documentation for the correct commands. With the correct console commands, you can display the current environment variables or show the client's devices. The hardware address associated with the network interface or interfaces is displayed.

   – On a client running Digital UNIX issue the `uerf –r 300` command as superuser. In the output, find the string `hardware address`. Either the line containing the string or the next one

contains the hardware address. For example:

```
# uerf -r 300 | grep -i "hardware address" | uniq
_hardware address: 08-00-2f-ef-1f-10
```

If the hardware address is on the line following the one that contains the string `hardware address`, you must manually search the output from the `uerf` command to find the correct hardware address.

– From the RIS server, you can determine the hardware address of a running Digital UNIX client by using the `ping` and `arp` commands. To determine the hardware address of the RIS client `spike`, enter a command similar to the following example:

```
# /usr/sbin/ping -q -c1 spike; arp spike
PING spike.cities.dec.com (152.90.224.30): 56 data bytes

----spike.cities.dec.com PING Statistics----
1 packets transmitted, 1 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 0/0/0 ms
spike (152.90.224.30) at 08-00-2B-03-09-BF
```

The hardware address in this case is `08-00-2B-03-09-BF`.

If you do not enter the address in the correct format, the utility displays an error message and repeats the prompt.

Note

Except for checking the format of the number you enter, the `ris` utility does not verify its validity.

When you enter the hardware network address in the correct format, the following message is displayed:

```
Client client1 has been added.
```

6.2.1 Adding a RIS Client from the Command Line

You can add a single RIS client from the command line by invoking the `ris` utility with its `–a` option. Other options supply the network address, path, and product list. The syntax of the command is:

/usr/sbin/ris -a *clientname* **-h** *network-address* **-p** *path,product* [**,***product...*]

For example:

```
# /usr/sbin/ris -a minaret -h 08-00-2B-03-05-8B -p \
   ris0.alpha,product_001
```

6.3 Adding a Client to a RIS Area with Non-Digital Supported Graphics Devices

To add a graphics kit to RIS, follow these procedures:

1. Invoke the `ris` utility by entering the following command at the root system prompt:

   ```
   # /usr/sbin/ris
   ```

   The RIS Utility Main Menu is displayed. Choose the option `ADD a client` by entering `a` at the prompt.

   ```
   Checking accessibility of RIS areas.... done

   *** RIS Utility Main Menu ***

       a) ADD a client
       d) DELETE software products
       i) INSTALL software products
       l) LIST registered clients
       m) MODIFY a client
       r) REMOVE a client
       s) SHOW software products in remote installation environments
       x) EXIT

   Enter your choice: a
   ```

   The following message is displayed:

   ```
   You have chosen to add a client for remote installation services.

   The following conditions must be met to add a client:

     1. You must know the client processor's hostname.
     2. The client's hostname must be in your system's host
        database(s).
     3. You must know whether the client is on an Ethernet, FDDI,
        or Token Ring network.
     4. You must know the client's hardware Ethernet, FDDI, or
        Token Ring address if the client is registering to install
        operating system software.
     5. If the client and the server reside on different subnets, you will
        need the address of the gateway(s) that the client can use to
        communicate with the server.

   Do you want to continue? (y/n) [y]:
   ```

   If you enter `n`, the utility returns to the RIS Utility Main Menu. If you enter `y`, a prompt asks for the client's host name.

2. Enter the client's host name at the prompt:

```
Enter the client processor's hostname: ejfudd
```

   Only lowercase letters (a-z), special characters dash (-), and dot (.), and numbers are permitted in host names, and a host name must begin with a letter, not a number. Invalid host names can corrupt the RIS database. Additionally, the client must not be registered on another RIS or Dataless Management Services (DMS) server for bootp services.

   The client processor must be registered with the appropriate naming service or you cannot register the client with RIS. If the client is not registered with the appropriate naming service, the utility displays an error message and repeats the prompt.

3. Enter the environment to which you want to add the client. The utility displays the available environments (and the products installed in those environments) to which you can add the new client. The output will be similar to the following:

```
The existing environment is /usr/var/adm/ris/ris0.alpha.

Select one or more products for the client to install
from /usr/var/adm/ris/ris0.alpha:

Product   Description
   1'Digital UNIX V4.0 operating System ( Rev xxx  )'
   2'Digital UNIX V4.0 operating System ( Rev xxx  )' w/
        'ESA Kit ESABASE100'
```

   The products displayed are both operating system base products. Select only one of these products.

```
Enter one or more choices as a space-separated list
(for example, 1 2 3) or all for all products [all]: 2
You chose the following products:

  2    'Digital UNIX V4.0 operating System (Rev xxx)' w/
       'ESA Kit ESABASE100'

Is that correct? (y/n) [y]:
```

4. If Configuration Description Files exist on the RIS server during the registration of a client, the following message is displayed:

```
Do you want to specify a Configuration Description File (CDF)
for Installation Cloning on this client? [y/n] [n] : y
```

   If you do not want to specify a CDF, for installation cloning chose n.

If you enter `y`, RIS displays a list of the CDFs on the RIS server:

```
This RIS server has the following Configuration
Description Files (CDF) available:

alphastation400.cdf alphastation400a rz26.cdf
Enter a CDF name or press <Return> to exit CDF selection:
rz26.cdf
```

After you enter a CDF, CDF verification is performed. The verification determines if the products in the RIS environment to which the client is registered and the products specified in the CDF are the same. The CDF is also validated as suitable for installation cloning.

If you decide not to register a client for a cloned installation or cannot determine a CDF to use, continue with the client registration by pressing Return.

5. Enter the type of network to which this client is connected:

```
Network type:

     1) Ethernet or FDDI
     2) Token Ring

Enter your choice: 1
```

6. Enter the client's hardware network address as shown in the following example:

```
Enter the client processor's hardware network address. For
example, 08-00-2b-02-67-e1: 08-00-2b-39-96-68
```

If you do not enter the address in the correct format, the utility displays an error message and repeats the prompt.

Note

Except for checking the format of the address you enter, the `ris` utility does not verify its validity.

If the kernel does not already exist for this combination of the base product and graphics device kit, RIS automatically runs `doconfig` to build a new generic `Install` kernel.

A new generic `Install` kernel for the client systems is built, which includes support for the graphics devices.

The following messages are displayed as the kernel is being built.

```
*** KERNEL CONFIGURATION AND BUILD PROCEDURE ***

Saving /usr/sys/conf/INSTALL as /usr/sys/conf/INSTALL.bck

Do you want to edit the configuration file? (y/n) [n]:


*** PERFORMING KERNEL BUILD ***
      Working....Thu Aug 24 13:18:27 EST 1995
      Working....Thu Aug 24 13:20:29 EST 1995
      Working....Thu Aug 24 13:22:30 EST 1995
      Working....Thu Aug 24 13:24:34 EST 1995
      Working....Thu Aug 24 13:26:35 EST 1995
      Working....Thu Aug 24 13:28:38 EST 1995
      Working....Thu Aug 24 13:30:39 EST 1995
      Working....Thu Aug 24 13:32:42 EST 1995
      Working....Thu Aug 24 13:34:59 EST 1995
Image requires 59600 bytes
Loading /usr/sys/bin/sboot
      text at         20000000     len=cf40
      data at         2000cf40     len=1990
      entry at         20000000
Image requires 6216496 bytes
Loading /usr/sys/INSTALL/vmunix
      text at fffffc0000230000     len=4ac110
      data at fffffc00006dc110     len=141a20
      entry at fffffc000044e180
1+0 records in
1+0 records out

The new kernel is /usr/sys/INSTALL/vmunix

The network kernel is /usr/sys/INSTALL/.vmunix

The new kernel (vmunix) and network kernel (.vmunix) will now be
copied into the required locations in the RIS area.

Client ejfudd has been added.
```

6.4 Modifying Clients

You can modify a RIS client's network type, hardware network address, its RIS environment information, and the list of products it can install. You cannot modify a client's IP or routing information. To modify a client's entry, follow these steps:

1. Invoke the `ris` utility and choose the `m` option to modify a client.
2. Choose the client you want to modify from the list displayed.

The remainder of the modification procedure is similar to the procedure for registering a client, as described in Section 6.1.

6.5 Removing Clients

Follow these steps to remove a client:

1. Invoke the `ris` utility and choose the `r` option to remove a client processor.
2. Enter the name of the client processor to remove when prompted by the utility.
3. Verify that you want to remove the client processor.

After you confirm your choice, the utility deletes the client's registration.

When removal is complete, the utility returns you to its main menu.

You can also use a `ris` command line to remove several clients at once. The following example removes the clients `houri` and `scimitar:`

```
# /usr/sbin/ris -r houri scimitar
```

6.6 Listing Registered Clients

To view the registered clients, invoke the `ris` utility and choose the `List Registered Clients` option. If there are no registered clients, the utility indicates this fact.

6.7 Listing Products in Server Areas

To view the current products in a server's area, invoke the `ris` utility and choose the option to show products.

You can also use a `ris` command line to show the products installed in a server's area. For example:

```
# /usr/sbin/ris -s

Show Products in RIS Server Areas:

     1  /var/adm/ris/ris0.alpha
           Digital UNIX V4.0 Operating System (Rev xxx)
```

6.8 Deleting Products from RIS Server Areas

To delete one or more of the current products in a RIS area, invoke the `ris` utility and choose the option to delete products. The utility asks you to choose a RIS area and then guides you through the procedure to delete products.

Booting a RIS Client 7

This chapter describes the network files and daemons that the RIS utility uses and the sequence of events that occur when a client broadcasts a `bootp` request. If you use RIS to install the operating system on a client, the client must boot across the network.

Note

The client must be registered on the RIS server before you can install the operating system.

7.1 Remote Boot Files and Daemons

Table 7-1 describes the files and daemons used by RIS servers to boot a remote client.

Table 7-1: Remote Boot Files and Daemons

Name	Description
`/etc/bootptab`	Contains information needed to boot remote clients
`/sbin/init.d/dhcp`	Script used to start `joind`
`/etc/inetd.conf`	Contains start-up information for various internet daemons
`/usr/sbin/joind`	`bootp` server daemon (handles `bootp` requests)
`/usr/sbin/tftpd`	`tftpd` server daemon
`/usr/sbin/inetd`	Internet server daemon
`/sbin/init.d/dhcp`	Script used to start `joind`

7.1.1 Internet Daemon and its Configuration File

On a Digital UNIX system, network boots occur using the `bootp` protocol. This protocol is serviced by one of two daemons: `bootpd` and `joind`. For Digital UNIX Version 4.0, Digital recommends the use of the `joind` daemon. The `bootpd` daemon is started using the internet daemon, the `joind` daemon is not. The `inetd` daemon starts networking-related daemons on a Digital UNIX system. Some of these daemons, such as

tftpd, are related to RIS; others, such as fingerd, are not. On request, the inetd daemon starts any of the daemons listed in its configuration file, /etc/inetd.conf.

7.1.2 The bootp Daemon (bootpd/joind)

The bootp daemon handles remote boot requests. It handles any bootp requests received by the RIS server. As it starts up, the bootp daemon reads its /etc/bootptab file to determine the systems from which it will recognize remote boot requests. Whenever the /etc/bootptab file is modified, the bootp daemon rereads it.

Section 7.1.3 describes the content and format of the /etc/bootptab file. See joind(8) or bootpd(8) for more information.

7.1.3 The /etc/bootptab File

The /etc/bootptab file is a text file that contains information that a server needs to boot a remote client. The ris utility adds and removes entries from this file during client management. Other applications may also place entries in the /etc/bootptab file.

The general format for entries in the bootptab file is as follows:

tag: **tg=***value...*: **tg=***value...*: **tg=***value...*

Example 7-1 describes the entries in the /etc/bootptab file for RIS clients.

For additional information about the contents of the bootptab file, see the joind(8) reference page.

Example 7-1: Sample /etc/bootptab File

```
.ris.dec:hn:vm=rfc1048                                          1
.ris0.alpha:tc=.ris.dec:bf=/var/adm/ris/ris0.alpha/vmunix:      2
spike:tc=.ris0.alpha:ht=ethernet:gw=16.69.224.222: \
  ha=08002b309668:ip=16.30.0.143:                               3
.ris93.alpha:tc=.ris.dec:bf=/ris/ris93.a/vmunix: \
  rp="ds9:/ris/ris93.a/product_001":                            4
```

1 The .ris.dec entry defines characteristics common to all clients. The fields specify the following:

- hn: Tells the boot server to send the name of the client system to the client when it makes a boot request.
- vm: Vendor-specific information

2 The `.ris`*`n.arch`* entry, in this example `.ris0.alpha`, defines characteristics common to all clients using this RIS area. The fields specify the following:

- `tc`: Table continuation

  The `tc` field lets you follow pointers back to common entries. For example, the `tc` entry for `.ris0.alpha` in Example 7-1 points to the `.ris.dec` entry. The `.ris.dec` entry contains the common hardware type (ht) and vendor specific (vm) information. The `.ris0.alpha` entry, itself, contains common information about the boot file location.

- `bf`: Name of the boot file

3 The *`hostname`* entry, in this example `spike,` defines characteristics for a specific client. The fields specify the following:

- `tc`: Table continuation

  The following describes the entry for the host `spike`: its `tc` entry points to `ris0.alpha`, which contains its boot file information. The `ris0.alpha`, entry in turn points back to `ris.dec,` which contains relevant hardware type and vendor specific information.

  If you added another host entry to the `/etc/bootptab` file, it would look similar to the following:

  ```
  lee:tc=ris0.alpha:ht=ethernet:ha=08002b390668: \
    ip=16.140.64.249:
  ```

- `ht`: The client's hardware type is either `ethernet`, `fddi`, or `ieee802` (for Token Ring)
- `ha`: Client's network hardware address
- `ip`: Client's IP address

1 The `.ris93.alpha` entry defines characteristics for a Digital UNIX Version 4.0 and later RIS area. The fields specify the following:

- `tc`: Table continuation

  The `tc` field lets you follow pointers back to common entries. For example, the `tc` entry for `.ris93.alpha` in Example 7-1 points to the `.ris.dec` entry. The `.ris.dec` entry contains the common hardware type (ht) and vendor specific (vm) information. The `.ris93.alpha` entry contains common information about the boot file location.

- `bf`: Name of the boot file
- `rp`: The rp parameter points the client to the point where it will mount its root on the server.

7.1.4 The tftpd Daemon

The `tftpd` daemon handles the transfer of the boot file during a remote boot. This daemon starts when there is a file to be transferred. See the `tftpd`(8) reference page for more information.

7.2 Remote Boot Flow

Digital UNIX client systems use the `bootp` protocol to perform the remote bootstrap operation from a Digital UNIX RIS server. The command used to initiate a remote boot is processor specific. For additional information, see the *Installation Guide*. However, once the remote boot operation has started, the underlying process is the same for all Digital UNIX systems that support network booting:

1. The processor-specific remote boot command is issued at the client console prompt.
2. The client processor firmware sends a `bootp` packet over the Ethernet. This packet contains the hardware Ethernet address of the client.
3. The `bootp` server daemon compares the Ethernet hardware address in the packet with the client registration information stored in its `/etc/bootptab` file to determine if the client requesting the remote boot is registered to the server.
4. If the address matches one in its `/etc/bootptab` file, the `bootp` daemon sends to the client a packet of information that includes the server's Internet address, client's Internet address, and the name of the file to be loaded from the server. This information was placed in the `bootptab` file by the `ris` utility when the client was registered on the server.

   Internet addresses are used to set up a network that is used to download to the client processor the file specified in the `bootptab` file. For Digital UNIX RIS clients, this file is `/var/adm/ris`*n*`.alpha/vmunix`, where `ris`*n*`.alpha` corresponds to the RIS area to which the client is registered. This file is the Digital UNIX standalone operating system used to start the installation.
5. The client system requests the file from the server system.
6. The client and server system use the `tftp` protocol to transfer `vmunix` to the client.
7. Once `vmunix` is loaded, the client system begins to execute `vmunix` and the Digital UNIX standalone system messages are displayed on the client console terminal.

After the operating system is installed, the client is a self-supporting system. Follow normal procedures to boot the system from its own local disk.

RIS Troubleshooting 8

This chapter contains information to help you troubleshoot problems with your RIS system. Topics include:

- Problems with the `ris` utility
- Problems with client registration
- Problems with cloned client registration
- Problem with client not in database
- Problems with RIS server response during booting
- Problems mounting the `root` file system
- Problems when clients are registered on multiple RIS servers
- Problems in loading the correct kernel file once booting has commenced

8.1 Problems with the ris Utility Lock Files

To prevent multiple users from performing operations on RIS areas simultaneously, the `ris` utility creates two lock files in the `/tmp` directory, `rislock` and `ris.tty.lock`. when the user is installing or deleting software from a RIS area. If the `ris` utility is run by another user, or the same user on a different terminal, selecting add or delete software generates a message similar to the following:

```
The ris utility is currently locked while j_smith on /dev/ttyp3
is installing software.  Try again later.
```

If the `ris` utility is stopped prematurely, these lock files may not be removed. If the lock files are not removed, the message displays even though no other user is using RIS.

If this occurs, you must delete the lock files from the `/tmp` directory.

Caution

Before deleting the lock files, ensure that no other user is using the `ris` utility.

8.2 Problems with Client Registration

The server requires a client's hardware address in order to boot the client over the network. The `ris` utility prompts you for the client's address during the registration process. If it does not, check the following:

- If the RIS area is linked to a CD–ROM

  Check that the CD–ROM that is the target of the links is mounted.

- If the RIS area is serving a version prior to Version 3.0

  Check that the mandatory update subsets for the release the server is serving are installed in the server's RIS area. Install the mandatory update subsets from the */local_mnt* `/ALPHA/UPDATE` directory on the Digital UNIX distribution CD–ROM. For example, if the CD–ROM is installed on `/mnt`, install the mandatory update subsets from the `/mnt/ALPHA/UPDATE` directory.

- If the RIS area is serving Version 3.0 and later

  Check that the mandatory operating system subsets are installed into the RIS area. Install the mandatory subsets from the */local_mnt* `/ALPHA/BASE` directory on the Digital UNIX distribution CD–ROM. For example, if the CD–ROM is installed on `/mnt`, install the mandatory update subsets from the `/mnt/ALPHA/BASE` directory.

Note

The client can use the `setld` utility to load optional subsets or layered product subsets over the network. See the *System Administration* guide for more information about loading subsets with the `setld` utility.

8.3 Problems with Cloned Client Registration

A CDF is created as a result of a RIS installation. To use the CDF for installation cloning, the hardware configuration, to some degree, and the software subsets to load must be the same. Before allowing a CDF to be specified for installation cloning of a client, RIS attempts to verify that the subsets specified in the CDF exist in the RIS area which the user has selected. If they do not match, the CDF is rejected for use. This error can

occur if the version numbers of the subset do not match(for example OSFBASE350 and OSFBASE400).

It is possible that the CDF will be used for installation cloning of a system that is registered to a different RIS area. In this scenario, it is possible that the subsets contained in these RIS areas are different. It is also possible that the version of Digital UNIX served by the RIS area is different from the version specified in the CDF. In this scenario, there would be many missing subsets because none of the subsets specified in the CDF would be present in the RIS area.

In the event that a CDF is specified that contains the name of a software subset that is not present in the selected RIS area, the following is displayed:

```
Enter a CDF name or press <Return> to exit CDF selection: rz26.cdf

The selected CDF, rz26.cdf, specifies software subsets that are not
present in the selected RIS environment. The missing software subsets are:
OSFSERPC400

Please select a different CDF.
```

If you attempt to use a CDF that was not created as part of a RIS installation, it is not compatible with installation cloning. The following is displayed:

```
Enter a CDF name or press <Return> to exit CDF selection: rz26.cdf

The selected CDF, rz26.cdf, was not created during a RIS installation.
Therefore, it cannot be used for Installation Cloning. Please select a
different CDF.
```

8.4 Problems with Client Not in RIS Database

If a message appears on the client's console while you are performing a RIS installation that states that the client is not in the RIS database, check the following on the server:

- As shown in Section 8.5, check `/var/adm/ris/clients/risdb` to ensure the client's name is properly entered. If it is not, use the `ris` utility to add or modify the client's registration. Do not edit the `risdb` file directly; use the `ris` utility.
- If `/var/adm/ris/clients/risdb` contains the correct client name, you must determine the client's name as recognized by the name servers (for example, BIND or NIS). If no name servers are in use, check the `/etc/hosts` file. The client name must appear in the `/etc/hosts` file exactly as it appears in `/var/adm/ris/clients/risdb`. The `/etc/hosts` file contains the name by which the client is known at the server. The `/var/adm/ris/clients/risdb` database contains the name by which the client is known to RIS. The two names must match. If you are using the BIND or NIS name servers, use the `nslookup`

command to find the name by which the client is known to the server.

If the /etc/hosts file or the name server and /var/adm/ris/clients/risdb both include the client, but one file uses the short client name and the other file uses the fully-qualified domain name, you will have a problem. You may be able to solve the problem by editing the /etc/hosts file to include both the short and fully-qualified domain name.

If you found a discrepancy between the files where /etc/hosts used the short name and /var/adm/ris/clients/risdb used the fully-qualified domain name, you most likely have an error in your network configuration. It is recommended that you review the procedures used to configure your network and name servers and correct them before continuing with RIS installations.

8.5 Problems with RIS Server Response

Booting failures often occur because the information possessed by the server is invalid. The following two server files are involved in handling RIS clients. You should check them in the order listed:

- /var/adm/ris/clients/risdb

  This file is created and managed by the ris utility; it contains the utility's view of the environment. Run the ris utility to show the configuration for the client in question. Verify that the client is registered and that its registration information is correct. If not, use the ris utility to add or modify the client's registration.

- /etc/bootptab (Digital UNIX servers only)

  This file is not exclusively used by RIS which means that it can be edited for other purposes (such as Dataless Management Services), and the entry for your client could have been corrupted. Examine the client's bootptab entry to ensure that the entry agrees with both the risdb entry and the addresses and parameters of the equipment in your environment. The contents of the /etc/bootptab file are described in the joind(8) reference page and in Section 7.1.3.

8.5.1 Diagnosing Response Failures on Servers Using bootp Daemon

Digital UNIX servers respond to bootp requests from Digital UNIX clients. If the Digital UNIX server's information is correct for the client but the server still fails to respond, enable logging of bootp messages on the server by editing the server's /etc/inetd.conf file and by modifying the line

for bootps to include the –d option as a bootpd command argument. For example:

```
bootps  dgram   udp   wait   root   /usr/sbin/bootpd   bootpd -d
```

Then, find the process IDs for the Internet daemons. Send a HUP signal to the inetd daemon so it will reread the /etc/inetd.conf configuration file, and kill the bootpd daemon. For example:

```
# ps x | egrep "inetd|bootpd"
  228 ??  I      0:00.93 /usr/sbin/inetd
  243 ??  I      0:00.91 /usr/sbin/bootpd
 9134 p2  S      0:00.23 egrep inetd|bootpd
# kill -HUP 228
# kill -KILL 243
```

Caution

> You must kill the inetd daemon before killing the bootpd daemon.

It is not necessary to restart the bootpd daemon manually; the inetd daemon starts it automatically.

To track boot requests as they occur, run the tail –f command on the /var/adm/syslog.dated/*today's-date*/daemon.log file and boot the client. Many daemons other than the bootpd daemon log information to the daemon.log file; however, the log file shows a hardware address that matches the address in the /etc/bootptab file for the client.

If the client's boot requests are not logged, you can enable additional logging by editing the /etc/inetd.conf file, and add a second –d option to the bootpd command. Each additional instance of the –d option (up to three) increases reporting; the second instance enables the server to report all boot requests, even for client systems it does not recognize. This level of reporting should help you determine where in the system the request is being lost.

If you modify the /etc/inetd.conf file, restart the inetd daemon by sending it a HUP signal. Example 8-1 shows a section of a daemon.log file. It shows the data logged by various system daemons, including the bootpd daemon when run with two –d flags set.

Example 8-1: Sample daemon.log File

```
Jul 28 14:56:36 ludwig mountd[191]: startup
Jul 28 14:56:38 ludwig xntpd[235]: xntpd version 1.3                    1
Jul 28 14:56:43 ludwig mold[269]: mold (V1.10) initialization complete
Jul 28 14:56:44 ludwig evd[272]: E003-evd (V1.10) initialization complete
Jul 28 14:56:45 ludwig internet_mom[275]: internet_mom - Initialization
                complete...
Jul 28 14:56:45 ludwig snmp_pe[278]: M004 - snmp_pe (V1.10) initialization
                complete
Jul 28 16:34:55 ludwig inetd[282]: /usr/sbin/bootpd: exit status 0x9    2
Jul 28 16:35:47 ludwig bootpd[1228]: bootpd 2.1a #0: \                  3
                Fri Feb 05 00:32:28 EST 1993
Jul 28 16:35:47 ludwig bootpd[1228]: reading "/etc/bootptab"
Jul 28 16:35:47 ludwig bootpd[1228]: read 3 entries from "/etc/bootptab"
Jul 28 16:35:47 ludwig bootpd[1228]: request from hardware address \    4
                08002B2C9C6F
Jul 28 16:36:08 ludwig bootpd[1228]: request from hardware address \    5
                08002B309668
Jul 28 16:36:08 ludwig bootpd[1228]: found: host1.dec.com (08002B309668)
                at (16.69.224.83)
Jul 28 16:36:08 ludwig bootpd[1228]: file /var/adm/ris/ris0.alpha/\
                vmunix.host1.dec.com
Jul 28 16:36:08 ludwig bootpd[1228]: vendor magic field is 0.0.0.0
Jul 28 16:36:08 ludwig bootpd[1228]: sending RFC1048-style reply
```

1 Many daemons log information to this file.

2 Result of sending a HUP signal to the `inetd` daemon and killing the `bootpd` daemon.

3 A new `bootpd` daemon starts up in response to a boot request. The `bootpd` daemon reads the `/etc/bootptab` file as a part of its startup.

4 A `bootpd` request by a system with hardware address 08002B2C9C6F. Because the system is not a client of this RIS server, its hardware address is not in the server's `/etc/bootptab` file.

5 A `bootpd` request by a system with hardware address 08002B309668. The system is a client of this RIS server.

8.5.2 Diagnosing Response Failures on Servers Using the joind Daemon

To serve bootp requests from clients on servers running Digital UNIX Version 4.0, the `joind` daemon, which also services Dynamic Host Configuration Protocol (DHCP) requests, should be running. DCHP enables the automatic assignment of IP address to clients on networks from a pool of addresses. The IP address assignment and configuration occurs automatically whenever appropriate client systems (workstations and portable computers) attach to a network. The Digital UNIX implementation of DHCP is based on the JOIN product by Competitive Automation. Ensure that the server's information on the client is correct, namely information contained in the

bootptab file of the server as shown in Section 7.1.3. If the server still fails to respond, enable logging of bootp messages on the server by using the following procedure:

1. Check that the `joind` daemon is servicing your bootp request. This can be done by issuing the following command:

```
# ps -x | grep -E "joind"
393 ??       I        0:05.82 /usr/sbin/joind
26446 ttyp0     S +     0:00.01 grep -e joind
```

2. Determine the current setting of JOIND_FLAGS by issuing the following:

```
# rcmgr get JOIND.FLAGS
```

3. Stop the `joind` daemon by issuing the following command:

```
# /sbin/init.d/dhcp stop
```

4. Restart the daemon with debugging turned on by doing the following. Set the JOIND_FLAGS to indicate debugging is turned on.

```
# rcmgr set JOIND_FLAGS y -dx
   Where x is the level of debugging. A value from 0 to 9 is valid.
   Where y is the previously determined setting of the JOIND_FLAGS.
# /sbin/init.d dhcp start -dx
```

   Example 8-1 shows a section of a `daemon.log` file. It shows the data logged by various system daemons, including the `joind` daemon.

5. To turn off debugging, do the following:

```
# /sbin/init.d/dhcp stop
# rcmgr set JOIND_FLAGS y
    Where y is the previous determined setting of the JOIND_FLAGS.
    determined.
# /sbin/init.d dhcp start
```

8.5.3 Restrictions on Running bootpd and joind

A RIS server should run the `bootpd` or `joind` daemon. A RIS server running both of these daemons is not supported. The results will be unpredictable when running both daemons.

8.5.4 Problems with booting the RIS client

If you encounter a situation where the system will not boot or where the system will boot but then not be able to mount the root file system, you should check to ensure that the RIS client is not registered for bootp service on multiple RIS or Dataless servers. In order for the bootp protocol to work properly, it is important that the client be registered for bootp service on only

one server. The client is registered for bootp service when they are registered for a Digital UNIX operating system base product or when the client is registered as a Dataless client.

It is possible for a RIS client to be registered to two RIS servers at the same time, given they are not both registered for the Digital UNIX operating system base product on both servers and attempt to boot their systems using bootp.

8.6 Problems with System Panics on Boot Due to the Inability to Mount the Root File System

Starting with Digital UNIX version 4.0, the installation media is mounted as the `root` file system for installation. This occurs in both the case of CD-ROM installation and RIS installations. As a result, it is important that the installation media be mounted on the server locally. Due to limitations imposed by NFS, RIS cannot provide client access to files which it has remotely mounted from another system. The distribution media or extracted RIS area must be available through a local mount point on the RIS server.

8.7 Problems with Loading the Correct Kernel File

If the Digital UNIX server responds but an incorrect kernel (`vmunix`) is loaded, it is possible that the server's RIS area is configured incorrectly. You can observe the loading process by editing the `/etc/inetd.conf` file and restarting the Internet daemon as described in the previous section. In this case you add the `-d` option to the line containing the `tftpd` command, as follows:

```
tftp    dgram   udp   wait   root   /usr/sbin/tftpd    \
                                tftpd -d /tmp /var/adm/ris
```

Logging the server's `tftp` traffic shows you what file is being transferred and what time the transfer is started and finished. Ensure that the proper `vmunix` file is being loaded and that the loading operations are completed correctly.

8.8 Problems with Getname Failing on Client

If the RIS server is using C2 security and the RIS password has not been set to not expire, it is possible for the RIS clients to be denied service. If the RIS

client receives a message similar to the following:

```
Cannot find the name for client using bin/getname. Check with the system
manager of you RIS server
```

The RIS password on the server has probably expired. To fix this problem, refer to Section 3.2.

Dataless Management Services 9

This chapter describes Dataless Management Services (DMS), the dataless management utility (`dmu`), the requirements for setting up a DMS environment, and the relationship between DMS servers and clients.

9.1 What is Dataless Management Services?

In a dataless management services (DMS) environment, a server system maintains the `root`, `/usr`, and `/var` file systems for all client systems. The server maintains one copy of `root` for each client. The `/usr` file system is exported read only and is shared by all clients registered to the environment. Client systems have their own `/var` file system. All swapping and dumping is done on the client's local disk.

The dataless management utility (dmu) creates a `root` file system based on the software subsets installed in the DMS environment area on the server. This `root` file system is accessed by client systems over a Local Area Network (LAN). DMS lets system administrators customize the `root` and `/usr` file systems before client systems access them.

You must have superuser privileges to perform many of the `dmu` functions.

9.2 Advantages of Using Dataless Management Services

The advantages of installing DMS are:

- Less disk space is required on client systems. By sharing the `/usr` area, you eliminate the need for disk space to hold a separate `/usr` area for each client. For Alpha systems, you can save more than 200 megabytes (MB) for each client.
- Installation and setup of servers and clients are done by automated scripts, thereby simplifying the task of the server system administrator. Maintenance of the DMS areas is similarly straightforward.
- Because the DMS files reside on the server, the server's system administrator can perform most system management tasks. The involvement of individual users with the complexities of system management is reduced.

9.3 Relationship Between DMS Servers and Clients

The DMS utility, `dmu`, manages the sharing of installed operating system software between servers and clients in a LAN. In addition to the server's normal disk area, one or more disk partitions are reserved as the DMS area. The DMS area is made up of one or more product environments and client areas.

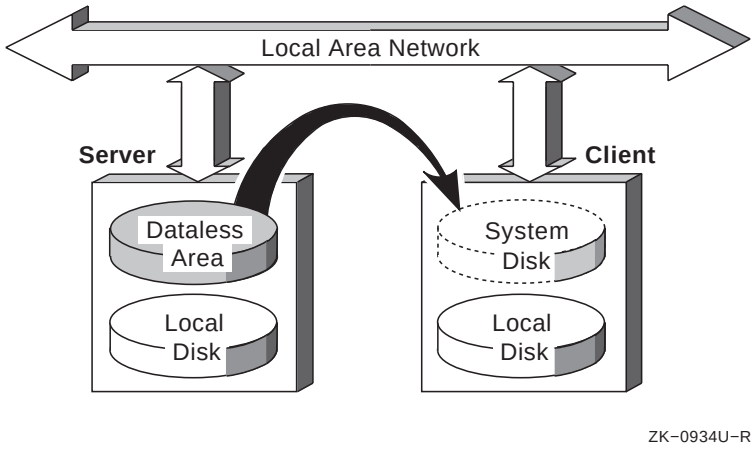
9.3.1 DMS Server

In the DMS area, the server maintains multiple copies of the `root` area, one for each client. Each copy is in a client `root` directory in the DMS area and is customized for the client in order to provide for differences between hardware platforms or environmental requirements. Each of the client `root` directories is private; this means that there is a directory for each client so that no conflict or confusion exists between clients. The server's DMS `root` and `/usr` areas are made available to clients by means of the Network File System (NFS). For more information about the NFS used by Digital UNIX systems, refer to the *Network Administration* guide.

Beyond verifying clients' identities, vectoring their boot requests, and providing their system disk space, the server does not interact directly with the clients. The server can, if desired, support local timesharing users and need not be dedicated to DMS.

A DMS client's system disk space (`root` and `/usr` areas) is physically connected to the server instead of to the client. The client accesses that disk area through a LAN connection with the server. Each DMS client is booted across the network from its private `root` area on the server. Once booted, the client continues to use its `root` files and `/usr` files from the server's DMS area. These files appear to the client as if they were on local disks, as shown in Figure 9-1.

Figure 9-1: File Sharing Between the DMS Server and Client



As indicated in Figure 9-1, clients must have local disks. In addition to local disks, clients can import file systems from any other computer to which they have network access. Clients use swap and dump space on their local disks.

9.3.2 Environment Portion of DMS Area

One or more **DMS environments** can reside in a partition. If you want to prevent the `dmu` utility from putting all DMS environments in the same disk partition, indicate a unique mount point for each DMS environment. The DMS environment disk space requirements should be calculated using the worksheets in appendix B. Then the mount point of `./dmsn.alpha` should be added to `/etc/fstab`.

Each DMS environment contains a customized Digital UNIX file system consisting of `root`, `/usr`, and `/var`. The `dmu` utility copies the `root` area to the client area when a client is added to the dataless environment.

Figure 9-2: Environment Portion of DMS Area

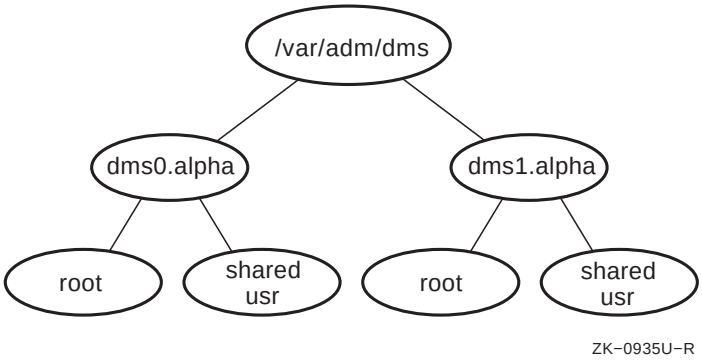


Figure 9-2 shows the `/var/adm/dms` portion of a DMS area, it contains two DMS environments, `dms0.alpha` and `dms1.alpha`. Each DMS environment contains a `root` and `/usr` file system. The `root` file system is copied to each client system. The `/usr` file system is read only and is shared among all client systems registered to the environment.

The `root` file system contains copies of the kernel, `.vmunix`, `vmunix` and other primary system files. These primary files can be in either **new** form (files supplied in the Digital UNIX distribution kit and prefixed with `.new..`) or in **prototype** form (files prefixed with `.proto..`).

The `.new..` version of a file should never be customized.

The `.proto..` files have special significance for DMS environments. By modifying the `.proto..` files, the DMS server system administrators can customize the system to meet their specific needs. These customized `.proto..` files are used during the configuration of the server's DMS client environments. Standard files (such as `/etc/hosts` and `/etc/fstab` for example) can be modified so that clients do not have to modify them.

The `/usr` file system contains common files that can be used without being tailored by clients registered to the DMS environment.

DMS environments can be created with many different combinations of products to allow servers to provide diversified service based on client's software product needs. For example, you could have a DMS environment with only the base Digital UNIX Version 4.0 operating system and another DMS environment with the Digital UNIX Version 4.0 operating system plus any number of additional products installed (such as System V, DECLadebug, DEC Fortran, and so on). Multiple environment areas can be established in separate partitions to support a greater variety of different

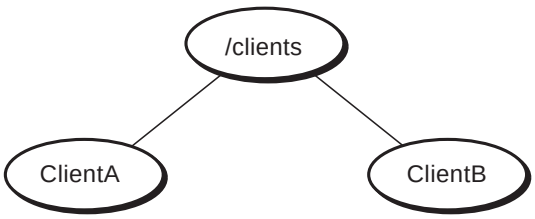
environments, improve performance, or support more clients than allowed by the disk space available in `/var/adm/dms`.

The server does not use any of the DMS area. System administrators can access the DMS area as required for maintenance and for installation or removal of layered products, but the area is not used by the server itself.

9.3.3 Client Portion of DMS Area

A DMS **client area** for individual client systems also resides in a DMS area. Figure 9-3 shows a DMS client area, named `/clients`. The `/clients` area should most likely be located on its own partition after the size of the area is calculated using the worksheets in Appendix B. Then, the mount point of `/clients` should be added to the `/etc/fstab` file.

Figure 9-3: DMS Client Area



Multiple copies of the `root` file system reside in the client area, one for each client, tailored from the appropriate generic `root` file system. Each client builds a customized kernel, which resides in the client's `root` area if the client has a Partial or Full build environment. This customized kernel supports the client's actual system configuration, including central processor, system memory, and peripheral devices. Figure 9-3 shows two client `root` areas, named `ClientA` and `ClientB`. Each client sees its private `root` area and the shared `/usr` area from the appropriate `/var/adm/dms` environment as local, although these areas are actually on the server and are accessed through NFS. Figure 9-4 shows how clients share `/usr` and have their own `root` file system.

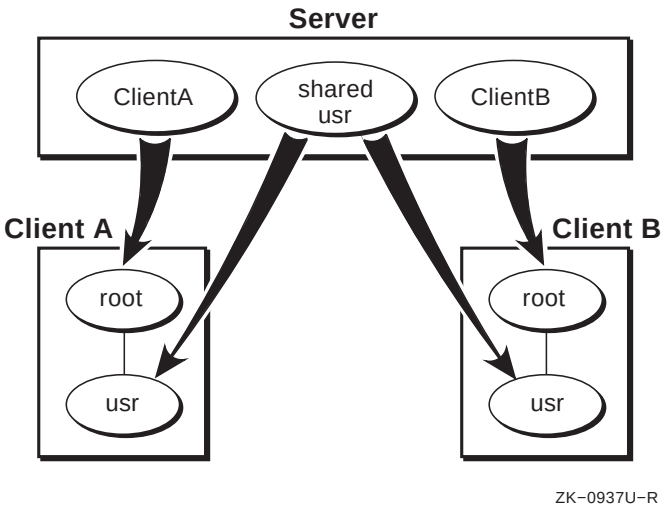
Multiple client areas can be established but must reside in different partitions.

9.3.4 Characteristics of DMS Clients

Clients do not have access to the entire DMS area. Each DMS client has access to the `root` area assigned to it on the server.

Common system files residing in the `/usr` area are shared among all the clients registered to that particular `/var/adm/dms` environment. Mounted with read-only access for the clients, this shared area is protected from erroneous client activity. Figure 9-4 illustrates this concept.

Figure 9-4: Client Views of the DMS Area



In Figure 9-4, the small boxes represent what the clients think they see; the arrows show how the real disk areas on the server are mounted by the client to produce this view.

Clients can be timesharing systems or workstations. Because each client's `root` area is tailored specifically to the client's needs and would contain the software the client can run, there is no interference between clients attempting to use identical resources that could, for example, have licensing restrictions based on the number of concurrent users.

Preparing DMS Servers and Clients 10

This chapter describes the tasks that you must perform to set up a DMS server. Information includes:

- Requirements for DMS servers and clients
- Allocating disk partitions for DMS
- Planning and calculating disk space requirements for DMS
- Installing Digital UNIX software on the DMS server
- Information required for DMS clients
- Registering DMS clients with network naming services

10.1 Requirements for DMS Servers

Setting up a dataless environment requires that the following conditions be met for DMS servers:

- The server must have Version 3.0 or later installed. The server can be any Alpha processor. A single server can serve both DMS and RIS clients, however, a client cannot be registered to both. DMS servers can only serve Version 3.0 or later clients.
- The DMS server must have the following software subsets installed:
  - Additional Networking Services (OSFINET)
  - Dataless Management Services (OSFDMS)
- The DMS server must have the OSF-SVR or UNIX-SERVER Product Authorization Key (PAK) loaded and registered. The OSF-SVR or UNIX-SERVER license allows an Alpha system to be a server.

Note

Software licensing lets you run software in a shared environment. As a minimum, the OSF-SVR or UNIX-SERVER software license must be installed for a system to be a server. See *Software License Management* for more information about software licensing.

- The DMS server must be able to install software into the DMS area:
  - The DMS server can have a CD–ROM optical disk drive to install software subsets for one or more specific products from the CD–ROM to the DMS area on the server.
  - The DMS server can use a Network File System (NFS) mount point to install software from a Remote Installation Services (RIS) area or Digital UNIX distribution CD–ROM from another processor. See Section 4.4 for more information about using an NFS-mounted RIS area.
- The DMS server must have at *least* one separate disk partition where the DMS environment and client areas reside because the `root` would not be large enough for many `client` areas and `var` would likely fill up after one environment was added. Smaller disks may not hold an entire DMS area.
- The DMS server must have NFS set up.
- The DMS server and all DMS clients must be connected to an Ethernet or FDDI Local Area Network (LAN).

10.2 Requirements for DMS Clients

Setting up a dataless environment requires that the following conditions be met for DMS clients:

1. DMS clients must have a disk drive large enough to accommodate dump and swap file systems (approximately 200 MB).
2. DMS clients must be registered with the server either via the NIS or BIND naming services, using the `Network Information Service (NIS)` or `BIND Configuration Application` or the client must have an entry in the server's `/etc/hosts` file (by using the `Network Configuration Application` utility or by manual entry using a text editor).
3. DMS clients must be capable of booting over Ethernet or FDDI using the `bootp` and `tftp` protocols. This is the same requirement to be able to install Digital UNIX from a RIS server. Most Alpha workstations and deskside servers have this capability, but most data center servers would not be configured as DMS clients. Consult your system's hardware documentation to determine whether it supports `bootp` and `tftp` over Ethernet or FDDI.
4. The client must not be registered on another RIS or DMS server.

10.3 Allocating Disk Partitions on the Server

The DMS server must have at least one separate disk partition to contain the DMS environment and client areas because the `root` would not be large enough for many `client` areas and `var` would likely fill up after one environment was added. Deciding how to allocate disk partitions is critical to the performance of dataless management. Consider the following factors when allocating disk partitions for the DMS environment (`/var/adm/dms/dms`*n*`.alpha`) and client (`/clients`) area:

- The number of physical blocks available compared to the number of blocks required by the environments you expect to create on the disk.
- Spreading environments with large numbers of registered clients among different disks to reduce disk contention.
- Protecting against disk failures by using the Logical Storage Manager (LSM).
- Using the Advanced File System (AdvFS) on certain disks for faster system recovery. Refer to the *POLYCENTER Advanced File System Utilities Technical Summary* and the *System Administration* guide for more information about AdvFS.

Refer to the *System Administration* guide for more information about disk partitioning.

10.4 Setting Up a Local Area Network (LAN)

You must connect the DMS server and all of the client processors to an Ethernet or FDDI LAN. For instructions on setting up a LAN, refer to the *Network Administration* guide.

10.5 Setting Up a Network File System

The Network File System (NFS) must be set up before you install DMS. For instructions on setting up NFS, refer to the *Network Administration* guide. After you install NFS, ensure the `portmap`, `mountd`, `nfsd`, and `nfsiod` daemons are running by entering the following command:

```
# ps ax | grep -E "portmap|mountd|nfsd|nfsiod"
```

If these daemons are not all running, start the inoperative ones. Refer to the appropriate reference pages for information about starting these daemons. Enter the following command to display reference pages (this example shows

how to display the reference page for the portmap daemon):

```
# man portmap
```

10.6 Planning Disk Space for DMS

You must calculate the amount of disk space required to ensure that you have enough space in the DMS areas in which the dmu utility will be created. DMS clients' system disk space is located on the server in a DMS area. See Section 9.3.2 for a description of the DMS area's contents. A server can have multiple DMS areas in which some of the files (for example the contents of the /usr area) are duplicated. This necessary duplication imposes additional space requirements on the server.

Throughout this guide, the server's environment file systems are designated as /var/adm/dms/dms*n*.alpha and /clients/*hostname* where *hostname* is the name of the client. The root areas are designated dms*n*.alpha where the letter *n* represents the number assigned to the specific file system or common root area when it is installed. The client's private portion of the common root area is designated /clients/*hostname*.

Disk space is required on the server for each DMS server area file system. The following sections provide guidelines for estimating the disk space required by the DMS area.

Appendix B contains worksheets to help you calculate your space requirements.

10.6.1 Disk Space Required for DMS Environments

Each dms*n*.alpha environment must have the following software subsets installed:

- Additional Networking Services (OSFINET)
- Dataless Management Services (OSFDMS)

Each dms*n*.alpha environment can also contain additional software for the clients registered to access that environment. Section 11.2 describes how to install software in DMS environments.

In addition to space needed for the mandatory subsets and the subsets required by DMS reserve the following space:

- Enough space for any layered products, such as DECnet/OSI that you plan to install at any time in the future
- An additional 10% of the required disk space to allow for file system administration tasks and file system information

Appendix B contains worksheets for calculating the amount of space you need for a single DMS environment. Refer to the first worksheet as you read the following example calculation.

Caution

Subset sizes in this example are for illustration only. The actual sizes for standard Digital UNIX subsets are listed in the *Installation Guide*. To determine the names of the subsets you want to install, refer to the descriptions in the *Installation Guide*. Subset size information for layered products is included in the products' installation documentation.

Assume that you want to install all of the mandatory and optional subsets plus one layered product. You need at least one DMS environment, `/var/adm/dms/dms`*n*`.alpha`. You refer to the appropriate documentation and find that you want the following subsets:

Subsets	Size in MB
Mandatory Digital UNIX subsets	200
All optional Digital UNIX subsets	270
One layered product subset	50
SUBTOTAL	520
10% additional space for overhead	52
TOTAL	572

The subset sizes add up to 520 MB. Allowing another 10% of this space (52 MB) for file system administration and information, you arrive at a total size of 572 MB for the `/var/adm/dms/dms`*n*`.alpha` environment. Reserve additional space for any other software products you plan to install later. These products' space requirements must be factored into the 10% overhead allocation.

10.6.2 Estimating Disk Space for Clients

You must reserve disk space in the `/clients` file system on the server for clients' `root` areas. The amount of disk space required depends upon the type of kernel build you choose for the client.

Refer to the second DMS worksheet in Appendix B to calculate the amount of space needed for a `/clients` area.

10.6.2.1 Types of Kernel Builds

When you are adding clients to a DMS environment, you have the option to choose: no build, full build, or partial build kernel support. When determining the amount of space required by a client, you must keep in mind the type of build support you choose for the client.

Clients' volatile files, such as those in the `/tmp`, `/var/spool`, `/var/sys`, and `/var/adm` directories are located in the individual client's `root` area. The client's `root` area requires a minimum of 40 MB of disk space. Use the following guidelines for estimating disk space requirements, in addition to the 30 MB minimum required by the client:

- No build support - Not recommended for clients on Digital UNIX Version 3.2C or higher

  Providing no build area means that the clients cannot build kernels and must run the Generic `DATALESS` kernel supplied by the system administrator. No build support is available only when the server and client are on the same version of the operating system. Additionally, no build support kernel build type does not allow the client to build a customized kernel. If you choose no build support, you do not need to allow for extra disk space other than the required minimum 30 MB.

- Full build support

  A full build area creates an entire `/sys` area for the client and consumes the most disk space. You should select this option if the client modifies kernel objects and performs kernel builds. If you choose a full build, allow an additional 100 MB for each client's `root` area.

- Partial build support - Default for clients on Digital UNIX Version 3.2C or higher

  A partial build area creates a build area that contains only configuration data. All kernel objects are obtained from the server. You should select this type of build if the client performs kernel builds but does not modify kernel objects. If you choose a partial build, allow an additional 15 MB for each client's `root` area.

The space required by individual clients will not be the same, but you can add all the needed spaces together to arrive at the total requirement for the `/clients` area. You must also remember to reserve additional space for clients that add files to their `root` areas.

10.7 Installing the Digital UNIX Operating System on the Server

The *Installation Guide* describes how to install the Digital UNIX operating system on the server. It is recommended that you perform a custom

installation when installing software on the server because during a custom installation you have the opportunity to choose the disks and partitions on which to install the software. The *Installation Guide* also contains lists of all the standard Digital UNIX supported and unsupported software sets with subset names, sizes, and descriptions of subset contents. You need this information to install the operating system itself as well as for installing DMS.

10.7.1 Required Software Subsets on the DMS Server

The following optional Digital UNIX software subsets must be installed on the server to successfully use the DMS utilities to set up a DMS environment:

- Additional Networking Services (OSFINET)
- Dataless Management Services (OSFDMS)

To install these software subsets, you can follow either one of these steps:

- Perform a custom installation and choose the subsets listed previously along with the other subsets you choose to install.
- Perform a default installation and then, after the installation is complete, use the `setld` utility to install the subsets listed above and any additional software subsets.

For information about using the `setld` utility to load software subsets, refer to the *Installation Guide* or `setld`(8).

10.8 Client Registration

Before you can use DMS to serve a client, you must register the client with a network naming service and with the DMS server. You must perform the following tasks to prepare to register clients:

1. Obtain information about each client.
2. Fill out a copy of the DMS Client Setup Worksheet in Appendix B for each client.
3. Register each client's host name and IP (Internet Protocol) address with the appropriate naming service, using the `NIS` or `BIND Configuration Application` or by placing an entry for the client in the server's `/etc/hosts` file.

10.8.1 Obtaining Information About Each Client

You need to know the following information about each processor you plan to add as a client to a `/var/adm/dms/dms`*n*`.alpha` environment and to register the client with the appropriate naming service:

- The host name

  Only lowercase letters (`a-z`) and numbers are permitted in host names. The host name must begin with a letter.

- The DMS environment and client areas to which you want to register the client
- The client's network interface type, subnet mask and gateway address for this network interface

  The gateway address is required when the server and client are on different networks.

  See the *Network Administration* guide for information about network interfaces, subnet masks and route for network.

- The client's Ethernet or FDDI hardware address

  See the *Network Programmer's Guide* or Section 6.2 for information about how to obtain hardware addresses.

- The swap device and partition and swap device drive type (swapping is done on the client's local disk)

  Refer to the *Installation Guide* for guidelines on planning swap space on the client's local disk. However, keep in mind that because the `/usr` file system is not on the client's local disk, you have much more space on the client to allocate for swap space.

- The type of kernel build to be supported (full, partial, or none). Refer to Section 10.6.2.1 for a description of the types of kernel build support for the client.

10.8.2 Registering Clients' Host Names and IP Addresses with Servers

If the host system is served by any of the following naming services, check with your site administrator to be sure that your clients are registered with the appropriate naming service servers:

- The server's `/etc/hosts` file
- Berkeley Internet Name Domain (BIND)
- Network Information Services (NIS)

By using the `Network Configuration Application`, you can place each client processor's host name and IP (Internet Protocol) address in the `/etc/hosts` file when you initially set up your LAN. The `Network Configuration Application` is described in the *Network Administration* guide.

You can also place the host name and IP address in the `/etc/hosts` file by using a text editor such as `vi`. The host name and IP address for each client processor must be unique.

See the *Network Administration* guide for information about setting up NIS and the `BIND Configuration Application`.

10.9 Security Considerations

C2-Security may be installed on the server and the clients. However, Dataless Management Services uses the `bootp` protocol, which is not a secure protocol. Therefore, your dataless environments may not be secure.

Creating DMS Environments on the DMS Server 11

This chapter describes how to use the `dmu` utility to add software to a DMS environment and how to configure the environment. The information in this chapter describes how to:

- Install software into a new DMS environment
- Add software into an existing DMS environment
- Customize and configure a DMS environment
- Install a hardware update release
- Set up a worldwide DMS server

11.1 Compatibility Between the DMS Server and the DMS Client

When installing Digital UNIX Version 4.0 or higher into a DMS environment and the DMS server is running a previous version, you must perform the following procedure as superuser on the server:

1. If your distribution media is CD–ROM, enter a `mount` command similar to the following:

   ```
   # mount -rd /dev/rz4c /mnt
   ```

   This example uses a CD–ROM drive that is unit 4 and specifies `/mnt` as the mount point; if your drive is a different unit, substitute the device special file name for that unit.

   If you are uncertain of your CD–ROM's unit number, enter the `file` command, specifying the raw device, as follows:

   ```
   # file /dev/rrz*c

   /dev/rrz1c: char special (8/1026) SCSI #0 RZ25 disk #8 (SCSI ID #1)
   /dev/rrz2c: char special (8/2050) SCSI #0 RZ25 disk #16 (SCSI ID #2)
   /dev/rrz3c: char special (8/3074) SCSI #0 RZ25 disk #24 (SCSI ID #3)
   /dev/rrz4c: char special (8/4098) SCSI #0 RRD43 disk #32 (SCSI ID #4)
   ```

   The CD–ROM device corresponds to an RRD device, in this example RRD43.

2. To update DMS on the server, assuming the distribution media is mounted at `/mnt`, enter the following:

   ```
   # /mnt/isl/utilupdate -d -m /mnt
   ```

   In the previous example, `-d` copies the new DMS utility from the distribution CD-ROM to the server in `/usr/sbin`.

   The `-m /mnt` is the mount point of the distribution media. This is a required parameter.

   The command copies the existing files in `/usr/sbin` to files with a `*.pre-V4.0` suffix, for example: `/usr/sbin/setld` is copied to `/usr/sbin/setld.pre-V4.0`.

When the script has finished, the server can serve a Digital UNIX Version 4.0 DMS client.

If the utility finds that there are already `*.pre-V4.0` files on your system, no copies are made. If the server is already running Digital UNIX Version 4.0, a confirmation message is displayed and no copies are made.

11.2 Installing Software in a New DMS Environment

You must install and configure all the software you plan to use in a DMS environment before you can add clients to share the environment.

Perform the procedures described in this section to install the software into a new `dms`*n*`.alpha` environment. Repeat the installation procedures for each `dms`*n*`.alpha` environment you plan to set up.

1. Before starting the `dmu` utility, insert the Digital UNIX distribution CD–ROM into the drive, then execute a command similar to the following to mount the CD–ROM:

   ```
   # mount -rd /dev/rz4c /mnt
   ```

   This example mounts a CD–ROM drive that is device 4 on the mount point `/mnt.` If your drive is a different device, substitute the correct device name. The mount point does not have to be `/mnt`.

   If you are not sure of your CD–ROM's unit number, enter the `file` command specifying the raw device as shown in this example

   ```
   # file /dev/rrz*c
   /dev/rrz1c:char special (8/1026) SCSI #0 RZ25 disk #8 (SCSI ID #1)
   /dev/rrz2c:char special (8/2050) SCSI #0 RZ25 disk #16 (SCSI ID #2)
   /dev/rrz3c:char special (8/3074) SCSI #0 RZ25 disk #24 (SCSI ID #3)
   /dev/rrz4c:char special (8/4098) SCSI #0 RRD43 disk #32 (SCSI ID #4)
   /dev/rrz9c:char special (8/17410) SCSI #1 RZ57 disk #72 (SCSI ID #1)
   ```

The CD–ROM device corresponds to an RRD device, in this example RRD43.

Note

Additionally, you can use a Network File System (NFS) mount point to install software from a Remote Installation Services (RIS) area or Digital UNIX distribution CD–ROM from another processor. See Section 4.4 for more information about using an NFS-mounted RIS area.

2. Invoke the `dmu` utility by entering the following command at the root system prompt:

```
# /usr/sbin/dmu
```

The DMU Main Menu is displayed:

```
*** DMU Main Menu ***

Choices without key letters are not available.

     ) ADD a client
     ) CONFIGURE software environments
     ) DELETE software environments
    i) INSTALL software environments
     ) LIST registered clients
     ) MODIFY a client
     ) REMOVE a client
     ) SHOW software environments
    x) EXIT
```

If this is the first time you have accessed `dmu`, there are no DMS software environments installed. The only option you have is to install software into an environment or to exit from the utility.

3. Choose the `INSTALL software environments` option by entering `i` at the prompt.

```
Enter your choice: i
```

4. The `INSTALL software environments` option displays an installation menu which lists the installation options that are available. Choose option 1, `Install software into a new area`:

```
DMU Software Installation Menu:

        1) Install software into a new area
        2) Add software to an existing area
        3) Perform configuration phase on an existing area
        4) Return to previous menu

Enter your choice: 1

You have chosen to establish a new remote dataless environment.
```

5. A prompt asks for the full pathname of the device special file name or the path of the directory where the software is located.

```
Enter the device special file name or the path of the directory where
the software is located (for example, /mnt/ALPHA/BASE):
/mnt/ALPHA/BASE
```

6. The dmu utility lists the mandatory software subsets that are installed automatically (the mandatory subsets displayed vary depending upon the type of hardware you are using):

```
*** Enter subset selections ***

The following subsets are mandatory and are installed
automatically unless you choose to exit without installing
any subsets:


      * Adobe Fonts
      * Base System
      * Base System - Hardware Support
      * Base System Management Applications and Utilities
      * Basic Networking Configuration Applications
      * Basic Networking Services
      * Basic X Environment
      * CDE Desktop Environment
      * CDE Mail Interface
      * CDE Minimum Runtime Environment
      * Compiler Back End
      * DECwindows 100dps Fonts
      * Graphical Base System Management Utilities
      * Graphical Print Configuration Application
      * Graphical System Administration Utilities
      * Hardware Kernel Header and Common Files
      * Hardware Kernel Modules
      * Kernel Header and Common Files
      * Keyboard Support
      * Local Printer Support
      * NFS(tm) Configuration Application
      * NFS(tm) Utilities
      * Netscape Navigator V1.12I
      * Old X Environment
      * Standard Kernel Modules
      * Tcl Commands
      * Tk Toolkit Commands
      * X Fonts
      * X Servers Base
      * X Servers for TurboChannel, PCI, or QVision
```

7. The system then displays the first screen of optional software subsets. The optional subsets displayed vary depending upon the type of hardware you are using. At each screen of subsets you can enter the number that corresponds to the subset you want or you can press the Return key to display the next screen of subsets. At the bottom of each subset screen,

you will see the following prompt:

```
---MORE TO FOLLOW---
Enter your choices or press RETURN to display the next screen.
```

The utility is flexible; it lets you enter your subset selections at the bottom of each screen or all at once at the end of the subset list (which may be several screens later).

You can enter subset numbers separately (separated by a space) or in ranges (with a hyphen between the first number in the range and the last number in the range).

The following subsets must be installed in the DMS environment:

– Additional Networking Services

– Dataless Management Services

The first screen of optional subsets is displayed along with the following instructions:

```
The subsets listed below are optional:

There may be more optional subsets than can be presented on a
single screen.  If this is the case, you can choose subsets
screen by screen or all at once on the last screen.
All of the choices you make will be collected for your
confirmation before any subsets are installed.


Free space remaining after mandatory subsets (root/usr/var):
30.4 MB/1.7 GB/12MB

Optional subsets are listed below.  There may be more optional
subsets than can be presented on a single screen.  If this is
the case, you can choose subsets screen by screen, or all at
once on the last screen.  All of the choices you make will be
collected for your confirmation before any subsets are installed.

 - General Applications:
 1) Additional Terminfo databases
 2) Computer Aided System Tutor
 3) DOS tools
 4) GNU Emacs
 5) Local Area Transport (LAT)
 6) UNIX(tm) SVID2 Compatibility
 7) UNIX(tm) to UNIX(tm) Copy Facility

 - Kernel Build Environment:
 8) ATM Kernel Header and Common Files
 9) ATM Kernel Modules
10) Logical Storage Manager Kernel Header and Common Files
11) Logical Storage Manager Kernel Modules
12) POLYCTR advfs Kernel Modules

 - Mail Applications:
13) DECwindows Mail Interface
14) RAND Corp. Mail Handler (MH)
```

```
Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Network-Server/Communications:
15) ATM Commands
16) Additional Networking Services
17) Dataless Management Services
18) Remote Installation Service

 - Printing Environment:
19) Adobe Font Metric Files

 - Reference Pages:
20) Ref Pages: Admin/User
21) Ref Pages: CDE Admin/User
22) Ref Pages: CDE Development
23) Ref Pages: Programming
24) Ref Pages: Realtime
25) Ref Pages: Windows Admin/User
26) Ref Pages: Windows Programming


Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Software Development:
27) CDA(tm) Software Development
28) CDA(tm) for X/Motif Development
29) CDE Software Development
30) GNU Revision Control System
31) Ladebug Debugger Version 4.0-11
32) Ladebug Debugger Version 4.0-11 Release Notes
33) Ladebug Debugger Window Interface
34) Ladebug Debugger remote server
35) Programming Examples
36) Realtime Software Development
37) Software Development Desktop Environment
38) Software Development Tools and Utilities
39) Source Code Control System
40) Standard Header Files
41) Standard Programmer Commands
42) Static Libraries
43) X Window and X/Motif Header Files
44) X Window and X/Motif Programming Examples
45) X Window and X/Motif Software Development
46) X Window and X/Motif Static Libraries


Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Supplemental Documentation:
47) XIE Version 5 Online Documentation

 - System Administration:
48) C2-Security
49) C2-Security GUI
```

```
50) Kernel Debugging Tools
51) Logical Storage Manager
52) Logical Storage Manager GUI
53) Logical Volume Manager
54) Obsolete Commands and Utilities
55) Obsolete Locale databases
56) POLYCTR advfs
57) Single-Byte European Locales
58) System Accounting Utilities
59) System Exercisers

 - Text Processing:
60) Doc. Preparation Tools
61) Doc. Preparation Tools Extensions

Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):

 - Windowing Environment:
62) DECwindows 75dpi Fonts
63) LK201 Keyboard Support
64) LK411 Keyboard Support
65) LK421 Keyboard Support
66) LK444 Keyboard Support
67) PCXAL Keyboard Support
68) X Customizations for OEM
69) X Servers for Open3D
70) X Servers for PCbus
71) X/Motif 1.1

 - Windows Applications:
72) Additional DECwindows Applications
73) Additional X Applications
74) CDE Additional Applications
75) Demo X Applications
76) Nested X Server
77) Old Additional DECwindows Applications
78) Virtual X Frame Buffer

Add to your choices, or press RETURN for next page.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):


The following choices override your previous selections:
79) ALL mandatory and all optional subsets
80) MANDATORY subsets only
81) CANCEL selections and redisplay menus

Add to your choices, or press RETURN to confirm previous choices.
Free space remaining (root/usr/var): 30.4 MB/1.7 GB/127 MB
Choices (for example, 1 2 4-6):  60

Choices (for example, 1 2 4-6):  11-12 16-17 79
```

If you choose the option `ALL mandatory and all optional subsets`, all available software are installed.

If you choose the option `MANDATORY subsets only`, only the

mandatory software subsets are installed in the environment even if you have entered optional subset numbers on previous screens. If you choose this option, you must go back and install the subsets required for DMS from the optional subset list. Use the instructions in Section 11.3 of this manual to install the subsets required for DMS.

If you choose the option `CANCEL selections and redisplay menus`, the utility returns to the first screen of software subsets and you are able to start your subset selection process again.

If you choose the option `EXIT without installing any subsets`, the utility prompts you to confirm your choice. If you enter `y`, the utility returns to the DMU Main Menu. If you enter `n`, the utility returns to the first screen of software subsets to let you begin your subset selection again.

8. Once you have entered your subset selections, the screen displays the subsets you have chosen to install and then asks you to confirm your choice:

```
Choices (for example, 1 2 4-6):  11-12 16-17 62

You are installing the following mandatory subsets:


      * Adobe Fonts
      * Base System
      * Base System - Hardware Support
      * Base System Management Applications and Utilities
      * Basic Networking Configuration Applications
      * Basic Networking Services
      * Basic X Environment
      * CDE Desktop Environment
      * CDE Mail Interface
      * CDE Minimum Runtime Environment
      * Compiler Back End
      * DECwindows 100dps Fonts
      * Graphical Base System Management Utilities
      * Graphical Print Configuration Application
      * Graphical System Administration Utilities
      * Hardware Kernel Header and Common Files
      * Hardware Kernel Modules
      * Kernel Header and Common Files
      * Keyboard Support
      * Local Printer Support
      * NFS(tm) Configuration Application
      * NFS(tm) Utilities
      * Netscape Navigator V1.2I
      * Old X Environment
      * Standard Kernel Modules
      * Tcl Commands
      * Tk Toolkit Commands
      * X Fonts
      * X Servers Base
      * X Servers for TurboChannel, PCI, or QVision
You are installing the following optional subsets:
```

```
 - Kernel Build Environment:
   Logical Storage Manager Kernel Modules
   POLYCTR advfs Kernel Objects

 - Network-Server/Communications:
   Additional Networking Services
   Dataless Management Services

 - Windowing Environment:
   DECwindows 75dpi Fonts

Is this correct? (y/n):
```

If the subsets listed are the subsets that you want to install into the environment, enter `y`. If you type `n`, the list of optional software subsets is displayed again, and you can restart your subset selection process.

9. Before software installation begins, the `dmu` utility checks to make sure there is enough disk space to accommodate the software subsets you have chosen to install in the environment. The following message appears if there is sufficient disk space available:

```
Checking file system space required to install selected
subsets:

File system space checked OK.
```

If there is not enough disk space to perform the installation, the following message is displayed:

```
fitset:
file system /var needs 65006 Kbytes more to install the
software specified.

setld:
There is not enough file system space to install the
mandatory subsets.
```

The `dmu` utility will not continue with the installation and returns to the DMU Main Menu. At this point, you have to resize your disk partitions or choose fewer optional software subsets.

10. If there was enough disk space to install the subsets, messages will appear as each subset is selected, installed, and verified. Depending on the number of and size of the subsets you have chosen, this process can take an hour or more.

    The new environment is located in `/var/adm/dms/dms0.alpha`.

After the installation of software subsets is complete, the utility displays the name of the new DMS environment. If this is the first DMS environment, it is automatically named `dms0.alpha`. Subsequent DMS environments are numbered sequentially. That is, the next environment is named `dms1.alpha`, the one after that is named `dms2.alpha`, and so on.

If you delete an environment, for example `dms4.alpha`, the next time you

install a DMS environment, the dmu utility reuses the number 4 to name the environment. The utility fills the holes left in the numbering sequence by environments that have been deleted.

After you install software into the DMS environments, you must configure and build the kernel for that environment. Refer to Section 11.5 for instructions on how to begin the kernel configuration phase. However, if you want to add additional software to the environment before configuring the kernel, refer to Section 11.3.

11.3 Adding Software to an Existing DMS Environment

Use the setld utility to install Digital UNIX additional software subsets and Digital layered products that are compatible with the Digital UNIX setld utility into the DMS client area on the server. To install additional software into an existing environment, invoke the dmu utility and choose the INSTALL software environments option from the DMU Main Menu.

Caution

Ensure that DMS clients that mount the usr area of the target /var/adm/dms/dms*n*.alpha area are not running when you install an additional software product, or their usr area may change unpredictably and cause destruction of software or data or both.

Digital recommends that you shut down the clients registered to the environment (using the shutdown command) before adding new software. To provide clients access to the new software subsets you install, delete the clients from the environment and then add them to the environment after it is reconfigured.

When clients are removed and then added to the reconfigured environment, customized information in the root directory is lost.

The following sample session illustrates the installation of optional Digital UNIX subsets into /var/adm/dms/dms0.alpha.

1. Mount the CD–ROM that contains the software you want to install as shown in Section 11.2, or mount the file system area that contains the software kits.

2. Invoke the `dmu` utility from the root system prompt by entering:

```
# /usr/sbin/dmu
```

   Choose the `INSTALL software environments` option from the DMU Main Menu by entering `i` at the prompt.

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
     ) LIST registered clients
     ) MODIFY a client
     ) REMOVE a client
    s) SHOW software environments
    x) EXIT

Enter your choice: i
```

3. The DMU Software Installation Menu is displayed. Choose the option, `Add software into an existing area`. A message confirms that you have chosen to add a product to an existing area.

```
DMU Software Installation Menu:

    1)  Install software into a new area
    2)  Add software into an existing area
    3)  Perform configuration phase on an existing area
    4)  Return to previous menu

Enter your choice: 2

You have chosen to add a product to an existing environment.

The existing environment is /var/adm/dms/dms0.alpha.
```

   In the previous example, only one environment, `dms0.alpha,` exists. If you have more than one DMS environment, a list of the environments is displayed and a prompt asks you to select the environment to which you want to add software:

```
Select the remote dataless environment:

1) /var/adm/dms/dms0.alpha
   'Digital UNIX Operating System (Rev 106)'

2) /var/adm/dms/dms1.alpha
   'Digital UNIX Operating System (Rev 106)'
   'Sort Runtime Library'

Enter your choice: 1
```

4. Next, a prompt asks for the full pathname of the device special file name

or the path of the directory where the software is located:

```
Enter the device special file name or the path of the directory where
the software is located (for example, /mnt/ALPHA/BASE):
/mnt/ALPHA/COMPILERS
```

5. As shown in Section 11.2 the utility lists the subsets that are available. Select the optional subsets that you want from the list. Subsets that are already installed will not display on the list.
6. The utility lists the subsets that you have chosen to install and asks you to confirm your choice. If the subsets listed are the ones that you want, enter `y`. If you enter `n`, the list of optional software subsets is displayed again, and you can reselect the subsets that you want.

Messages appear as each subset that you selected is installed and verified. Depending on the number and size of subsets you have chosen, this process can take an hour or more.

11.4 Installing a Hardware Update Release into a DMS Environment

The procedures in this section assume that the client is running Digital UNIX Version 3.2C or higher.

You can install the new release from a locally mounted CD-ROM, a CD-ROM mounted using NFS from a remote server, or from a RIS area exported using NFS from a RIS server where the new release has been installed. See Section 4.4 for additional information on using this procedure.

If you install from a RIS area, you must know which product areas in your `/usr/var/adm/ris/ ris`*n*`.alpha` contain each of the product kits you need to install. On the RIS server, as superuser, enter the following command to identify the RIS area that contains the release subsets:

```
# /usr/sbin/ris -s
```

If you install from an NFS mounted RIS area or from a locally installed RIS area, examine the `/usr/var/adm/ris/ris`*n*`.alpha/ProdNames` file to determine which directory in the RIS area contains the Digital UNIX operating system software and enter the path of the directory when requested by the system.

If you install from a CD-ROM mounted on the mount point `/mnt,` the directory that contains the Digital UNIX operating system hardware update is `/mnt/ALPHA/hUPDATE.`

To install the Digital UNIX hardware update release, perform the following procedures:

1. Install the Digital UNIX operating system into a new DMS environment using the steps in Section 11.2. Do not configure the DMS environment.
2. Install the Digital UNIX operating system hardware update release into the same environment following the steps in Section 11.3.

After you install the Digital UNIX operating system and add the operating system hardware update, you can configure your DMS environment.

Follow the steps in Section 11.5 to configure your DMS environment.

11.5 Configuring DMS Environments

After you install software into a new or existing DMS environment, you must configure the environment. Configuring the environment entails:

1. Customizing system files (the `.proto..` files). This step is optional; you do not have to customize these files for the environment. This step is performed outside of the `dmu` utility.
2. Building the environment's kernel. This step is mandatory and is performed through the `CONFIGURE software environments` option of the DMU Main Menu.

11.5.1 Customizing .proto.. Files

If you have already configured the DMS environment and later decide to modify `.proto..` files, you must delete the files created by the configuration process. In the following example the `fstab` is modified to include a server name:

```
1. delete the $DMS_ROOT/hosts file
2. modify the $DMS_ROOT/.proto..hosts file
3. configure the DMS area
```

Customize each environment to suit the clients that will be added to a DMS environment by modifying the `.proto..` files. Performing this customization before you add clients to the environment reduces the amount of customization required at each client. You perform the customization before configuring and building the kernel.

There are many `.proto..` files located in the DMS environment `/var/adm/dms/dms`*n*`.alpha` in the `/etc`, `/bin`, `/var/adm/X11`, and `root` directories that you may want to modify. As an example, the `/etc/.proto..hosts` file is a file that you might want to modify in advance. Table 11-1 lists the `.proto..` files found in the `/etc` directory that are available for you to customize.

Table 11-1: .proto.. Files in /etc

.proto..TIMEZONE	.proto..acucap	.proto..autopush.conf
.proto..binlog.conf	.proto..ddr.db	.proto.ddr.dbase
.proto..dhcptab	.proto..disktab	.proto.dvrdevtab
.proto..exports	.proto..fstab	.proto..ftpusers
.proto..gen_databases	.proto..gettydefs	.proto..group
.proto..hosts	.proto..hosts.equiv	.proto..ifaccess.conf
.proto..inet.local	.proto..inetd.conf	.proto..inittab
.proto..lprsetup.dat	.proto..magic	.proto..motd
.proto..networks	.proto..ntp.conf	.proto..passwd
.proto..phones	.proto..profile	.proto..protocols
.proto..rc.config	.proto..remote	.proto..rpc
.proto..securettys	.proto..services	.proto..shells
.proto..slhosts	.proto..stresetup.conf	.proto..svc.conf
.proto..sysconfigtab	.proto..syslog.conf	.proto..ultrix_login
.proto..ultrix_path	.proto..ultrix_profile	

For example, the `/etc/.proto..hosts` file contains no host names. At a minimum, edit this file to include the network addresses, names, and aliases of well-known systems in your environment. Server information should be listed, so that you do not have to enter this information for each client when setting up the network services. Entries in this file look similar to the following:

```
127.0.0.1 localhost
61.96.112.102 dmsserver.myorg.com dmsserver
61.96.112.157 nfsserver.myorg.com nfsserver
```

You should list commonly mounted NFS file systems, as well as the `/proc` file system if the clients will be using it. When you add NFS file systems to the `etc/.proto..fstab` file you should also add the hosts to the `etc/.proto..hosts` file. If the NFS mount points are in the client `root` partition, make the directory mount points in the DMS `root` area as well. If they are in the shared `usr` directory structure, make the directory mount points in the DMS `usr` directory area.

After you have made changes to the `.proto..` files in the DMS environment, perform the configuration phase following the steps in Section 11.5.2.

11.5.2 Performing the Configuration Phase

After you have modified the `.proto..` use the following procedures to configure the environment:

1. Invoke the dmu utility by entering the following command at the root system prompt:

```
# /usr/sbin/dmu
```

   Choose the option CONFIGURE software environments by entering c at the DMU Main Menu prompt.

   If you want to customize the environment, you should have already modified the .proto.. files.

```
*** DMU Main Menu ***

     ) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
     ) LIST registered clients
     ) MODIFY a client
     ) REMOVE a client
    s) SHOW software environments
    x) EXIT

Enter your choice: c
You have chosen to configure an existing dataless
environment.
```

Note

You can also perform the configuration phase from the INSTALL software environments option from the DMU Main Menu (by entering i at the Main Menu prompt). When you enter i, the DMU Software Installation Menu is displayed. As shown in this example, the configuration phase is performed by choosing option 3.

```
DMU Software Installation Menu:

        1) Install software into a new area
        2) Add software to an existing area
        3) Perform configuration phase on an existing area
        4) Return to previous menu
Enter your choice: 3
```

The configuration phase proceeds as shown in the following steps.

2. You are prompted to select the dataless environment that you want to configure:

```
Select the remote dataless environment:

1)  /var/adm/dms/dms0.alpha
    'Digital UNIX V.4.0 Operating System (Rev xxx)'

2)  /var/adm/dms/dms1.alpha
    'Digital UNIX V.4.0 Operating System (Rev xxx)'
    'DEC Pascal for DEC OSF/1 AXP Runtime Support'
    'DEC Fortran for OSF/1 AXP Runtime Support'
    'DEC Cobol RTL V2.2 for DEC OSF/1 Systems'
    'DEC C++ RTL Version 3.0 for DEC OSF/1 SYSTEMS'

Enter your choice: 1
```

   If there is only one environment with software installed, you will not be prompted to enter the environment to configure. The utility proceeds to the next step automatically.

3. The utility displays a message that informs you that if you want to customize the environment, you must have already modified the `.proto..` files within the DMS environment. If you have not already modified these files, you have a chance to stop the process now and modify the `.proto..` files.

```
There are several files prefixed by .proto.. within the
environment area that should be modified before performing
a configuration of the area.  Performing this customization
of the environment before you register clients will reduce the
amount of customization required at each client.

You may now choose to continue with the configuration or return
to the main menu and exit to perform customization of the
environment.
Do you want to (c)ontinue or (r)eturn to the main menu? (c/r)
[c]: c
```

   If you enter `r`, the utility returns to the DMU Main Menu to give you the opportunity to exit the `dmu` utility and modify the `/etc/.proto..` files if desired.

   If you enter `c` to continue with the configuration, the utility displays messages as it configures each software subset. Your output will be similar to the following:

```
Configuring "Base System " (OSFBASE400)

Configuring "Base System - Hardware Support " (OSFHWBASE400)

Configuring "Compiler Back End " (OSFCMPLRS400)

Configuring "Kernel Header and Common Files " (OSFBINCOM400)

Configuring "Standard Kernel Objects " (OSFBIN400)
```

```
Configuring "Hardware Kernel Objects " (OSFHWBIN400)

Configuring "Hardware Kernel Header and Common Files"
(OSFHWBINCOM400)

Configuring "Logical Storage Manager Kernel Header and Common
Files" (OSFLSMBINCOM400)

Configuring "Basic Networking Services " (OSFCLINET400)

Configuring "X Servers " (OSFSER400)

Configuring "Basic X Environment " (OSFX11400)

Configuring "X Fonts " (OSFMITFONT400)

Configuring "DECwindows 75dpi Fonts " (OSFFONT400)

Configuring "DECwindows 100dpi Fonts " (OSFFONT15400)

Configuring "Adobe Fonts " (OSFDPSFONT400)

Configuring "Additional Networking Services " (OSFINET400)

Configuring "NFS(tm) Utilities " (OSFNFS400)

Configuring "POLYCTR advfs Kernel Objects " (OSFADVFSBIN400)

Configuring "Logical Storage Manager Kernel Objects"
(OSFLSMBIN400)

Configuring "Remote Installation Service " (OSFRIS400)

Configuring "Dataless Management Services " (OSFDMS400)
```

After you have created and installed software in at least one DMS environment, performed customization of the `.proto..` files, and performed the configuration phase on the DMS environment, you can add clients to the environment. Adding clients to DMS environments is discussed in Chapter 12.

11.6 Setting Up A Worldwide DMS Server

The following sections provide information for setting up a worldwide Digital UNIX DMS server.

11.6.1 DMS Server Setup

Use the following procedures to create a new `dms`*n*`.alpha` environment and install Digital UNIX worldwide software into it:

1. Install the Digital UNIX operating system into a DMS area before installing the Digital UNIX worldwide support software.
2. If you are using the Digital UNIX CD-ROM as the distribution media, enter a `mount` command similar to the following before starting the utility:

   ```
   # mount -dr /dev/rz4c /mnt
   ```

   This example uses a CD-ROM drive that is unit 4 on the mount point `/mnt`. If your drive is a different unit, substitute the correct unit number.
3. Enter the following command to invoke the dmu utility:

   ```
   # /usr/sbin/dmu
   ```

4. Choose the option `INSTALL software environments` by entering `i` at the DMS Main Menu prompt.
5. The DMU Software Installation Menu is displayed. Choose the option, `Add software to an existing area.` If you have more than one DMS environment, a list of the environments is displayed and a prompt asks you to select the environment to which you want to add software. Select the DMS area on which Digital UNIX is installed.
6. At the prompt enter the full pathnames of the device special file or mount points for the distribution media. Enter `/mnt/ALPHA/WORLDWIDE` to install worldwide support subsets.

The installation procedure then displays:

```
*****************************************************************
*                                                               *
* Digital UNIX WORLDWIDE LANGUAGE SUPPORT INSTALLATION PROCEDURE *
*                                                               *
*****************************************************************

Please select the countries for which you want to install
support subsets:

   1) Czech Republic           2) France
   3) Germany                  4) Greece
   5) Hong Kong                6) Hungary
   7) Israel                   8) Italy
   9) Japan                   10) Korea
  11) Lithuania               12) Poland
  13) Russia                  14) Slovakia
  15) Slovenia                16) Spain
  17) Sweden                  18) Taiwan
  19) Thailand                20) The People's Republic of China
  21) Turkey

  22) All of the above
  23) None of the above

Choices (for example, 1 2 3) :
```

7. Select the countries for which you want to install worldwide software. A list of subsets is displayed. Worldwide subsets are described in the *Installation Guide*. The steps for installing subsets are the same as installing subsets from a RIS server. See Section 4.1 for detailed instructions. After installing the subsets, the DMU Main Menu is displayed.
8. Choose the option `CONFIGURE software environments` by entering `c` at the DMU Main Menu prompt, to configure newly installed subsets into the DMS environment. Questions about configuring `Wnn` appear during the configuration phase.

11.6.2 Worldwide Client Setup

Once you have set up the DMS areas and registered the clients, they can access the configured areas. See Section 10.8 on how to register the client with a network naming service. You must register the client with the full or partial(default) kernel option for them to use the Asian kernel functionality.

11.6.3 Building an Asian Kernel for DMS Clients

When the DMS client boots for the first time from a newly configured DMS area, an Asian kernel is built. Reboot the system if you want to use the Asian terminal driver functions. You can also reconfigure the Asian kernel on the

client machine by using the `wwconfig` command as follows:

```
# wwconfig -a
```

Refer to the *Installation Guide* for a description of the `wwconfig` command.

Managing DMS Clients and Environments 12

This chapter describes how to use the `dmu` utility to manage Dataless Management Services (DMS) environments and clients. The information in this chapter describes how to:

- Add a client to a DMS environment
- Boot a DMS client
- Delete a DMS environment
- Modify a DMS client
- Remove a DMS client
- List registered DMS clients
- Show software environments in the server's DMS area
- Maintain the server's DMS areas
- Apply binary patches to the kernel

12.1 Adding a DMS Client

The information you need to add a DMS client is shown in the Client Setup Worksheet in Appendix B. You should fill out a worksheet for each client you want to add before you use `dmu` to add clients to a DMS environment.

Before you can add a client, you must have already followed the procedures in Chapter 11 to install software in at least one DMS environment, and customize the `.proto..` files (if desired).

The client system must be connected to a Local Area Network (LAN) and must be registered with the server through one of the network naming services (see Section 10.8) or must have an entry in the server's `/etc/hosts` file.

When a client is added to a DMS environment, the `root` directory from the server's DMS environment gets copied to the client area.

Use the following procedure to add a client to a DMS environment:

1. Invoke the dmu utility by entering the following command at the root system prompt:

```
# /usr/sbin/dmu
```

2. Choose the ADD a client option by entering a at the DMU Main Menu prompt:

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
    l) LIST registered clients
    m) MODIFY a client
    r) REMOVE a client
    s) SHOW software environments
    x) EXIT
Enter your choice: a
```

3. The following confirmation message is displayed along with the information you are asked to provide about the client:

```
You have chosen to add a client for dataless service.

The following conditions must be met to add a client:

   1. You must know the client processor's hostname.
   2. The client's hostname must be in your system's host
      database(s).
   3. You must know the client's interface type, subnet
      mask.
   4. You must know the type of kernel build area.
   5. You must know the swap device and partition on the
      client.
   6. You must know the client's hardware Ethernet or FDDI
      address.
   7. If the client and the server reside on different subnets,
      you will need the address of the gateway(s) that the
      client can sue to communicate with the server.

Do you want to continue? (y/n) [y]:
```

   If you enter n, the dmu utility returns to the DMU Main Menu. If you enter y or press the Return key (to accept the default), the utility prompts you to enter the client's host name.

4. The following message is displayed when the server and client are on different networks. You must provide the gateway information needed for the client to connect to the server. RIS stores this information in the /var/adm/ris/gateways file. RIS displays the default network

information if the gateway information is known.

```
The following are the known gateway[s] between the client subnet and
server subnet. If these values[s] are not correct, please enter the
proper addresses[s]. If these values are correct press Return. ( For
example, 16.69.144.???): [16.69.144.199]
```

Enter the client's route for network address as shown in the following example:

```
Enter the IP address of the gateway[s] between the client subnet and
server subnet: ( For example, 16.69.144:???): [16.69.144.199]
```

5. Enter a host name that has an entry in the server system's host database by using the Network Information Service (NIS) or Berkeley Internet Name Domain (BIND) naming services or by making an entry in the server's `/etc/hosts` file.

   ```
   Enter the client processor's hostname or press RETURN to quit:
   client1
   ```

   If you press the Return key, the utility returns to the DMU Main Menu. If you enter a host name that is not in the server's host database, the following message is displayed:

   ```
   arp failed on hostname "client_name"
   ```

   In the above message, `arp` is the address resolution protocol. If you receive this message, check the server's host database, the `/etc/hosts` file, to determine the correct client name. If the client was never registered with a network naming service (such as BIND or NIS) or was never entered in the `/etc/hosts` file, exit the utility by pressing `Ctrl/c` and add the client to the `/etc/hosts` file.

   Note

   For the remaining examples, assume the Return key is pressed to accept the default response.

6. After you enter the client name, you are prompted to enter the location of the client's root directory. If you specify a path other than the default, which is `/clients/`*`hostname`*, you must have already created the directories in that path. The path you specify must begin with `/clients`. If for example, you wanted to differentiate between client systems in different departments at your site, you could specify `/clients/`*`department_name/hostname`* as the location of `root`. The *`department_name`* directory must have already been created under the `/clients` directory for you to do this. Digital suggests a maximum of 25 characters in the total path name for the client's `root` directory.

Enter the path to the client's root file system at the prompt:

```
Enter the path to contain the root file system.
[/clients/client1]:
```

7. Next, the utility prompts you to enter the swap information for the client.

```
Enter the swap device and partition on client1. [rz0b]:
Enter the swap device drive type for rz0b. [RZ26]:
```

8. The utility prompts you to enter some basic network information about the client. The `dmu` utility enters this information into the client's `rc.config` file to allow the client to boot over the network. You will be asked to enter the default route for network information if the server and client are on different networks. Refer to the *Network Administration* guide if you need more information about obtaining the client's network information:

```
Enter the network interface for client1 (16.69.199.157) [ln0]:
Enter the subnet mask for ln0. [255.255.255.0]:
Enter the default route for network 16.69.224 [16.69.144.199]:
```

   If no entry for the client's subnet is found in the `/var/adm/dms/gateways` file on the server the following message is displayed:

```
Enter the IP address of the gateway[s] between the client subnet and
server subnet. (For example, 16.69.144.???). :
```

   If an entry for the client's subnet is found in the `/var/adm/dms/gateways` file on the server the following message is displayed:

```
The following are the known gateway[s] between the client subnet and
server subnet. If these value[s] are not correct, please enter the
proper address[s]. If these value[s] are correct, press Return. (For
example, 16.69.144.???)[16.69.144.199]:
```

Note

> The default is `ln0,` which is appropriate for the DEC 3000 series and other systems that use the Lance Ethernet module. Some systems such as the EB64+ use the Tulip Ethernet module, which is identified as, for example, `tu0.` Be sure to enter the correct network device identifier for the Ethernet or FDDI interface on the client system.

9. The utility prompts you to enter the type of kernel build support you want to provide for the client. Refer to Section 10.6.2.1 for more information about kernel build support. If you are not sure what type of

kernel build support you want, enter H for help.

```
Enter the type of kernel build area for client1.
You may select one of [F]ull, [P]artial, [N]one or
[H]elp for more information. [P]:
```

10. The following message confirms the choices you made:

```
You have specified the following configuration for client1:

        ROOT:  /clients/client1
 SWAP_DEVICE:  /dev/rz0b
   SWAP_TYPE:  RZ26
  BUILD_TYPE:  Partial
   INTERFACE:  ln0 (16.69.244.32)
 SUBNET_MASK:  255.255.255.0
       ROUTE:  network: 16.69.224 gateway: 16.69.144.199
Is this correct (y/n) [y]:
```

    If you enter n, the utility returns to the DMU Main Menu and you will have to add your client information again. If you enter y, you are prompted to select the dataless environment to which you want to add the client. The directory /clients/client1 is overwritten if it currently exists.

11. If there is only one /var/adm/dms/dms*n*.alpha area, the following message is displayed:

```
The existing environment is /var/adm/dms/dms0.alpha.

The following environment will be installed from
/var/adm/dms/dms0.alpha:

Description
   1    'Digital UNIX 4.0 Operating System (Rev xxx)'

Is that correct? (y/n) [y]:
```

    If there are multiple /var/adm/dms/dms*n*.alpha areas, or if more than one dms*n*.alpha environment is installed in this DMS server area, a list of the environments into which you can add the new client is displayed. As shown in the following example, each environment may contain different software subsets or may have been customized which may influence the environment you choose.

```
Select the remote dataless environment:

 1)  /var/adm/dms/dms0.alpha
     'Digital UNIX 4.0 Operating System (Rev xxx)'

 2)  /var/adm/dms/dms1.alpha
     'Digital UNIX 4.0 Operating System (Rev xxx)'
     'DEC Pascal for DEC OSF/1 AXP Runtime Support'
     'DEC Fortran for OSF/1 AXP Runtime Support'
     'DEC Cobol RTL V2.2 for DEC OSF/1 Systems'
     'DEC C++ RTL Version 3.0 for DEC OSF/1 SYSTEMS'

Enter your choice: 2
```

```
The following environment will be installed for the client
from /var/adm/dms/dms1.alpha:

Description
        'Digital UNIX 4.0 Operating System (Rev xxx)'
        'DEC Pascal for DEC OSF/1 AXP Runtime Support'
        'DEC Fortran for OSF/1 AXP Runtime Support'
        'DEC Cobol RTL V2.2 for DEC OSF/1 Systems'
        'DEC C++ RTL Version 3.0 for DEC OSF/1 SYSTEMS'

Is that correct? (y/n) [y]:
```

12. If you enter `n`, the utility returns to the DMU Main Menu and the client is not added to any DMS environment. If you enter `y`, you are prompted to enter the client's Ethernet or FDDI address:

    ```
    Enter the client processor's hardware network
    address. For example, 08-00-2b-02-67-e1: 08-00-2b-30-68-96
    ```

    Refer to the *Network Programmer's Guide* or Section 6.2 for information about how to obtain a network hardware address. If you do not enter the hardware address in the correct format (for example, too many numbers), the utility displays an error message and repeats the prompt as shown in the following example:

    ```
    08-2b-30-68-9696 is an invalid Ethernet or FDDI address.
    Enter the client processor's hardware network address.
    For example, 08-00-2b-02-67-e1:
    ```

    Note

    The utility does not check the validity of the address you enter; however, the utility does check to make sure the address you enter is in the correct format.

13. After you enter a valid hardware network address, the utility checks to see is there is enough free space in `/clients` to create the `root` and `var` file systems for the client. The following message is displayed:

    ```
    Checking file system space required for client
    root and var file systems.
    ```

14. If there is not enough free space available to create the file system the following message is displayed:

    ```
    There is not enough free space in /clients
    to create the root and var file systems
    for client1. client1 has not been added.
    ```

    The DMU Main Menu is displayed.

15. If there is enough space to create the `root` and `var` file systems, the `dmu` utility copies the DMS environment `root` area to the `/clients/<clientname>` area, creates the `/var` file system for the

client, and displays the following message:

```
Creating the root and var file systems for client1
Client client1 has been added.
```

Notify the client's system administrator when client registration is complete, and inform them that they can now boot the client across the network. See Section 12.2 for basic information about booting a client. Detailed booting information is in the *Installation Guide*.

12.2 Booting a DMS Client

After a DMS client is added to the appropriate environment, the client's system administrator can boot the client over the network. When the client starts to boot, the kernel that boots over the network is: `/clients/`*`hostname`*`/.vmunix`

The following occurs when the client boots:

- `/clients/`*`hostname`* is NFS-mounted as `/`
- `/var/adm/dms/dms`*`n`*`.alpha/root/usr` is NFS-mounted as `/usr`

The network information you entered about the client when the client was added to the environment is sufficient to boot successfully across the LAN.

DMS clients must be able to boot over Ethernet or FDDI LAN. The basic procedure for booting a processor over the network from a Digital UNIX server is to shut down the client system to console mode and then issue a boot command from the client.

Refer to the *Installation Guide* for information about booting specific processors.

When the client boots, the client system administrator is prompted to enter a superuser password. The superuser password must contain between 6 and 16 characters and should use a combination of upper and lower case letters. Digital also suggests using special characters such as the dollar sign ($), percent sign (%), asterisk (*), and numbers in the password. The password is not displayed on the screen for security reasons. A second prompt asks for the new password again as validation. The screen display is similar to the following:

```
*** SUPERUSER PASSWORD SPECIFICATION **

Changing password for root.

Enter root password:
Retype root password:
```

System information is displayed while the client system is coming up. When the Common Desktop Environment (CDE) login window or the `login`

prompt appears, enter `root` as the login name. At the prompt for a password, enter the superuser password that was previously specified.

12.2.1 DMS Client Database File

The DMS client database file is located in `/var/adm/dms/clients/dmsdb`. An entry in this file is similar to the following:

```
client1:08-00-2b-30-96-68:/var/adm/dms/dms0.alpha:/clients/client1:
rz0b:RZ26:None:ln0:255.255.255.0
```

In the previous example:

- `client1` is the client's hostname
- `08-00-2b-30-96-68` is the client's hardware network address
- `/var/adm/dms/dms0.alpha` is the DMS environment being served to the client
- `/clients/client1` is the location of the client's root area
- `rz0b` is the client's swap device and partition
- `RZ26` is the swap disk
- `None` specifies the client has no kernel build area
- `ln0` is the network interface type
- `255.255.255.0` is the subnet mask

When you remove a client through the `REMOVE a client` option from the DMU Main Menu, the client's entry in the `dmsdb` file is erased.

12.3 Deleting a Software Environment

When you delete a software environment, the environment itself and all clients registered to that environment are deleted in a destructive manner. That is, once you confirm your choice, there is no opportunity to undo the deletion.

Caution

Make sure that the clients registered to the environment have been notified and shut down before you delete the environment. Failure to do so will cause a running client to lose its operating system.

To delete a software environment, use the following steps:

1. Invoke the dmu utility by entering /usr/sbin/dmu at the root system prompt, and choose the DELETE software environments option by entering d at the prompt:

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
    l) LIST registered clients
    m) MODIFY a client
    r) REMOVE a client
    s) SHOW software environments
    x) EXIT
Enter your choice: d
```

2. The utility displays a list of the existing dataless environments and prompts you to choose the environment you want to delete:

```
Select the remote dataless environment:

 1)  /var/adm/dms/dms0.alpha
       'Digital UNIX V4.0 Operating System (Rev xxx)'

 2)  /var/adm/dms/dms1.alpha
       'Digital UNIX V4.0 Operating System (Rev xxx)'
       'Sort Runtime Library'

 3)  /var/adm/dms/dms2.alpha
       'Digital UNIX V4.0 Operating System (Rev xxx)'
       'System V Environment'
Enter your choice: 1
```

3. After you select the dataless environment to delete, a confirmation displays your choice:

```
The following environment will be deleted from
/var/adm/dms/dms0.alpha:

Description
   'Digital UNIX 4.0 Operating System (Rev xxx)'

Is that correct? (y/n) [y]:
```

   If you enter n, the utility returns to the DMU Main Menu. If you enter y, the following message displays:

```
After this deletion, the area /var/adm/dms/dms0.alpha will
be empty.  The following clients are registered for
/var/adm/dms/dms0.alpha:
client1 client2 client3
This procedure will completely remove /var/adm/dms/dms0.alpha.
Do you want to continue? (y/n) [n]:
```

   If you enter n or press the Return key (to accept the default), the utility returns to the DMU Main Menu and does not delete the environment or

the clients registered to it. If you enter y, the utility deletes the DMS environment and all the clients registered to that environment and displays the following message:

```
Do you want to remove the client's root file system
[/clients/client1]? (y/n) [n]:
```

The utility prompts you to answer whether or not you want to remove the root and var file systems for each client registered to the environment. This is your opportunity to save customized data in the root directory. If you enter n, all customized data in root will be lost.

After the deletion is complete, the utility returns to the DMU Main Menu.

12.4 Modifying Client Information

The dmu utility lets you modify the network hardware address of a client. Refer to the *Network Programmer's Guide* or Section 6.2 in this manual for instructions about how to obtain the hardware address of a client.

To modify a client's information perform the following procedure:

1. To modify a client's hardware address, invoke the dmu utility (by entering /usr/sbin/dmu at the root system prompt), and choose the MODIFY a client option by entering m at the prompt:

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
    l) LIST registered clients
    m) MODIFY a client
    r) REMOVE a client
    s) SHOW software environments
    x) EXIT

Enter your choice: m
```

2. The dmu utility displays a list of the registered clients. It does not display the DMS environment to which the client is registered.

```
The following clients are available to modify:

client4 client5 client6

Enter the client processor's hostname or press RETURN to quit:
client4
```

If you do not enter a client name and press the Return key, the utility returns to the DMU Main Menu.

3. If you enter a valid client name, you are prompted to enter the client's new Ethernet or FDDI address. The client's current hardware address is the default response.

Note

The utility does not check the validity of the address you enter; however, the utility does check to make sure the address you enter is in the correct format.

```
Enter the client processor's hardware network address. For example,
08-00-2b-02-67-e1 [08-00-2b-30-68-96]:
08-03-3c-01-55-44
Client client4 has been modified.
```

If you press the Return key instead of entering a new Ethernet or FDDI address, the address will not change. When the modification is complete, the utility returns to the DMU Main Menu.

Caution

If you want to change the client's IP address or the environment to which the client is registered, you must first shut down the client, (by using the `shutdown` command) and then remove the client from the current environment (by choosing `REMOVE a client` from the DMU Main Menu). Then, add the client to another environment (by choosing `ADD a client` from the DMU Main Menu).

12.5 Removing a Client

You must make sure the client has been shut down (using the `shutdown` command) before it is removed from an environment. A client will lose its operating system if it is removed while it is up and running. Follow these steps to remove (delete) a client from a DMS environment:

1. Invoke `dmu` by entering `/usr/sbin/dmu` at the `root` system prompt and choose the `REMOVE a client` option by entering `r` at the prompt. You may want to execute the `LIST registered clients` option first to determine the exact client processor host name.

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
    l) LIST registered clients
    m) MODIFY a client
    r) REMOVE a client
    s) SHOW software environments
    x) EXIT

Enter your choice: r
```

2. A message appears that confirms that you have chosen to remove a client processor. You are prompted to enter the client processor's host name and then to confirm the removal of the client (the default confirmation is no).

```
You have chosen to remove a client from the remote
dataless service.
Enter the client processor's hostname or press RETURN to quit:
client5
```

If you press the Return key, the utility returns to the DMU Main Menu. If you enter a client name that is not in the DMS client database, /var/adm/dms/clients/dmsdb, the following message is displayed:

```
There is no entry for client_name in the dmsdb file.
```

If you enter a valid client name, the following prompt displays:

```
Remove client5? (y/n) [n]:
```

– If you press the Return key, the utility returns to the DMU Main Menu.

– If you enter n, the utility displays the following message and returns to the DMU Main Menu:

```
client5 was not removed.
```

– If you enter y, the utility displays a message similar to the following:

```
Working....Mon Jul 10 15:20:34
```

The client's registration to the DMS environment along with the following additional items is deleted:

- The client's root directory (including any customized files that may have been added to that directory)
- The entries from /etc/exports (described in Section 13.1)
- The entries from /etc/bootptab

Note

If you remove a client but choose to save the root file system, you cannot reuse that root file system if you subsequently add a client with the same client name.

When client removal is complete, the utility returns to the DMU Main Menu.

12.6 Listing DMS Clients

Choose the `List Registered Clients` option on the DMU Main Menu to see a list of the clients registered in all dataless environments:

1. Invoke the `dmu` utility by entering `/usr/sbin/dmu` at the `root` system prompt and choose the `LIST registered clients` option from the menu by entering `l` at the prompt:

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
    l) LIST registered clients
    m) MODIFY a client
    r) REMOVE a client
    s) SHOW software environments
    x) EXIT


Enter your choice: l
The following clients are registered for /var/adm/dms/dms0.alpha:
client1 client2 client3

The following clients are registered for /var/adm/dms/dms1.alpha:
client4 client5 client6

The following clients are registered for /var/adm/dms/dms2.alpha:
client7 client8 client9
```

12.7 Showing Software Environments

The `dmu` utility lets you display a list of the current DMS environments:

1. Invoke the `dmu` utility by entering `/usr/sbin/dmu` at the `root` system prompt and choose the `SHOW software environments` option from the menu by entering `s` at the prompt:

```
*** DMU Main Menu ***

    a) ADD a client
    c) CONFIGURE software environments
    d) DELETE software environments
    i) INSTALL software environments
    l) LIST registered clients
    m) MODIFY a client
    r) REMOVE a client
    s) SHOW software environments
    x) EXIT

Enter your choice: s
```

2. Your screen display will look similar to the following (depending upon

the software subsets installed in each DMS environment):

```
1)  /var/adm/dms/dms0.alpha
    'Digital UNIX 4.0 Operating System (Rev xxx)'

2)  /var/adm/dms/dms1.alpha
    'Digital UNIX 4.0 Operating System (Rev xxx)'
    'System V Environment '

3)  /var/adm/dms/dms2.alpha
    'Digital UNIX 4.0 Operating System (Rev xxx)'
    'Sort Runtime Support'
```

After displaying the list of DMS environments, the utility returns to the DMU Main Menu.

Note

Only the Digital UNIX product name is displayed by the `Show` command of the `/usr/sbin/dmu` utility. To determine if a hardware release is installed in a DMS environment, use the `setld` command. For example, the following command produces a list of the subsets installed into the client `root` area of `/var/adm/dms/dms0.alpha`:

```
# setld -D /var/adm/dms/dms0.alpha/root -i
```

Refer to `setld`(8) for more information or enter the following command to display the reference page on your screen (if the Digital UNIX reference page software subsets have been installed on your system):

```
# man setld
```

12.8 Maintaining the DMS Environment

This section contains information about maintaining the DMU server area.

12.8.1 Controlling Root File System Growth

The `du` command displays a summary of disk usage for file systems. Use this command to monitor the file growth in each client's `root` directory. If clients use too much space, performance is adversely affected. Users must then be told to delete all unnecessary files from their file systems. Monitor disk usage periodically depending upon the systems' use. Refer to `du`(1) for more information about monitoring file system growth.

The `df` command displays statistics about the amount of free space on a specified file system or on a file system that contains a specified file. Refer to `df`(1) for more information about monitoring file system growth.

12.8.2 Listing Installed Software Subsets

Use the `setld` utility to determine which software subsets are installed into a particular `dms`*n*`.alpha` area. For example, the following command produces a list of the subsets installed into the client `root` area of `/var/adm/dms/dms0.alpha`:

```
# setld -D /var/adm/dms/dms0.alpha/root -i
```

Refer to `setld`(8) for more information or enter the following command to display the reference page on your screen (if the Digital UNIX reference page software subsets are installed on your system):

```
# man setld
```

12.8.3 Removing Subsets

Use the `setld` utility to remove software subsets from a `dms`*n*`.alpha` area. For example, if you installed the Online Reference Pages subset, OSFMAN400, and now want to remove it, use a command similar to the following:

```
# setld -D /var/adm/dms/dms0.alpha/root -d OSFMAN400
```

This command removes the subset from `/var/adm/dms/dms0.alpha`. The *Installation Guide* contains a list of all software subsets.

Caution

During the installation if `setld` placed files in `root`, the product may not be fully removed from the client's `root` file system. Additionally, you should be careful about removing any subset that might be in use by client systems. For example, if you remove a subset that contains kernel build files, the clients may not be able to build new kernels. If you remove a subset that contains NFS components, the clients may not be able to reboot. It is important to understand exactly what dependencies clients have on a software component before you remove it. You may not be able to reload a subset to resolve client operational problems without first removing all of the clients and then reregistering them.

12.9 Applying Binary Patches to the Kernel in a DMS Environment

This section describes how to apply binary patches to the kernel in a DMS environment without deregistering and reregistering all of the client systems or reinstalling the DMS environment.

Binary patches to the Digital UNIX operating system are often issued to address problems in the kernel or layered products.

When a binary patch affects only files in the `/usr` file system or other file systems that are mounted read-only by the DMS clients, simply copy the files into the shared `/usr` file system on the server. The usual cautions that apply to changing the `/usr` file system in a multi-user environment apply to the DMS environment for instance, replacing a shared library has the same potential impact.

When the binary patch changes object modules (or source files) in the `/sys` area in `/usr/sys` on a stand-alone system, the situation is more complicated in the DMS environment. This is due to the way the client's `/sys` area is set up, which differs depending on how the client builds kernels.

The following sections assume that all the client `root` file systems are NFS mounted from the server.

12.9.1 Installing a Binary Patch

Ensure that you have the appropriate binary patch for the version of Digital UNIX that is installed in the DMS area. If you install an incorrect version of the patch, you may create a kernel that will not work on the client systems, or you may create a kernel that causes data corruption. To obtain the exact version names, use the following command:

```
# grep -h "^NAME=" /usr/var/adm/dms/dms0.alpha/root/usr/.smdb./OSFBASE*

     NAME='Digital UNIX Operating System 4.0 ( Rev xxx)'
     NAME='Digital UNIX Operating System Hardware Update Release'
```

In this example, the `dms0.alpha` area contains both the Digital UNIX Operating System Version 4.0 (Rev xxx) base release and the hardware update release. Repeat the previous step for each area until you find the one which has the correct version of the hardware update release installed.

Follow the instructions in the patch kit to install the patch in the server's DMS area.

To install the patch into the `dms0.alpha` area in the `BINARY` directory where most kernel `.o` object files are located, enter the following command:

```
# cd /usr/var/adm/dms/dms0.alpha/root/usr/sys/BINARY
```

Use the `ls` command to verify that the object file present in the `sys/BINARY` directory is the one you want to replace. Make a copy of the file under another name. If you are going to replace the file `if_tu.o`, copy it to `if_tu.o-bak` or `if_tu.o-old`. Later, if there is a problem with the patch, you can restore the original file.

After you verify the files to replace and make backup copies, put the replacement files into the directory. You are ready to build a new DATALESS kernel.

To assure that your new DATALESS kernel picks up the patched modules, remove the old DATALESS kernel build area from your server by entering the following commands:

```
# cd /usr/var/adm/dms/dms0.alpha/root/usr/sys
# rm -rf DATALESS
```

You do not need to keep the old DATALESS directory because its contents will be completely replaced when you run doconfig to build a new kernel. Use the -n flag or doconfig will not create a .vmunix, which is used to boot the client using the bootp protocol. However, removing the directory assures that you will get the correct files for building the new kernel.

12.9.2 Configuring the Clients

The following sections describe how to update the client area based on the client's build type.

12.9.2.1 Updating a Client Whose BUILD_TYPE Is None:

If the client's kernel build type is NONE you must copy the DATALESS kernel to the client's root area. To copy the new vmunix and the network-bootable .vmunix to the client's root, enter the following commands:

```
# cd $DMSROOT/root
# ROOT_PATH=/clients/client_name
# export ROOT_PATH
# cp usr/sys/DATALESS/vmunix $ROOT_PATH
# cp usr/sys/DATALESS/.vmunix $ROOT_PATH
```

When you reboot the client, the client will use the new generic .vmunix with the binary patch installed.

12.9.2.2 Updating a Client Whose BUILD_TYPE Is Partial

When a client is configured to do Partial kernel builds, the client receives a copy of the DMS area's root/usr/sys directory with the exception of the /usr/sys/BINARY and /usr/sys/include directories. The client's /sys has a symbolic link to the read-only /usr/sys/BINARY and /usr/sys/include in the server's DMS area.

If the replacement file or files from the patch kit all reside in either the /usr/sys/BINARY or /usr/sys/include directories in the server's DMS area, rebuild the kernel on the client system and reboot.

If the replacement file or files reside in another part of the /usr/sys directory, copy them to the corresponding place in the client's sys directory hierarchy.

Next, the doconfig command must be run on the client. Use the -n flag or doconfig will not create a .vmunix, which is used to boot the client using the bootp protocol.

12.9.2.3 Updating a Client Whose BUILD_TYPE Is Full

When a client is configured to do full kernel builds, it receives a full copy of the /root/usr/sys directory hierarchy.

In this case, you must first install all the patch files that you have put in the server's DMS area in the /usr/sys hierarchy into the corresponding places in the client's sys area. For instance, if you installed the module if_tu.o into /usr/sys/BINARY in the server's DMS area, you need to also install it in /clients/ *client_name* /sys/BINARY.

Because clients that are configured to do full kernel builds may have already modified some kernel objects, be sure to verify that the module you are replacing is the same module you replaced in the DMS area on the server.

Next, run the doconfig command on the client. Be sure to use the -n flag or doconfig will not create a .vmunix, which is used to boot the client via bootp protocol.

Be sure that the client's build area does not contain files that are customized for the client's particular environment.

12.9.3 Booting Client Systems with the New Kernel

After you have installed the new kernel in the client's root area, reboot the client system for the kernel changes to take effect.

12.9.3.1 Recovering from Failures During the Boot

If the client system cannot reboot, you can usually recover by copying the generic network-bootable .vmunix from the DMS area's root area to the client's private root area.

Doing this should let the client boot. You still need to determine why the new kernel was not bootable.

DMS Troubleshooting 13

This chapter contains information to assist you in troubleshooting problems with your DMS server and lists the server files and processes to check if a client is having trouble booting.

13.1 Server Areas to Check for Client Booting Problems

If a DMS client has trouble booting, you can check several aspects of server operation to ensure that the server's end of the network connection is functioning properly:

- The server may not be a Network File System (NFS) server. To check whether or not a server is an NFS server, enter the following command on the server:

  ```
  # rcmgr get NFSSERVING
  ```

  If the response is a `1`, the system is an NFS server. If the response is a `0`, the system is not an NFS server. Run `nfssetup` to configure the server to be an NFS server.

- The network daemons may not be running on the server. This condition is reported by the client with a message like the following:

  ```
  panic: vfs_mountroot: cannot mount root
  ```

  If this message appears on the client, check to make sure that the following daemons are running on the server:

  - `portmap`
  - `mountd`
  - `nfsd`
  - `nfsiod`

Enter the following command on the server to see if the daemons are running:

```
# ps ax | grep -E "portmap|mountd|nfsd|nfsiod"
```

Process status will appear for any of those daemons that are running. (A line will also appear showing your `egrep` command.)

If the daemons are not all running, you must start the inoperative ones.

- The client's directories may be exported improperly. You can determine if this is the case by examining entries in the server's `/etc/exports` file:
  - If the client boots to single-user mode but will not boot to multiuser mode, make sure that the appropriate `/usr` file system and `dms`*n* root area have entries in `/etc/exports`.

    Proper `/etc/exports` entries should look similar to the entry shown below. In this example, the client name is `client1`.

    ```
    /clients/client1 -r=0 client1
    /var/adm/dms/dms0.alpha/root/usr -r=0 -ro
    ```

    The contents of these entries are described in the `exports`(5) reference page.
- If you are installing a hardware update release and you configure the DMS environment before you add the operating system hardware update, you must connect to the `root` directory in the DMS environment and issue the following two commands to undo the configuration:

  ```
  # rm -rf usr/sys/conf/DATALESS
  # rm -rf usr/sys/DATALESS
  ```

- If you cannot execute commands on the client and the server and client are on different versions of the software, check to see if you copied the `dmu` version on the client on to the server. Refer to Section 11.1 for more information.

RIS Worksheet A

This appendix contains a worksheet for recording setup information for the RIS client. Make as many copies of this worksheet as you need.

RIS Client Configuration Worksheet

Network

System name: _____

Network hardware address: ☐☐-☐☐-☐☐-☐☐-☐☐-☐☐

IP network address: _____

Internet domain: _____

Route address: _____

The route address is only required if the server and client are on different networks.

RIS Info

Client operating system: _____

Processor architecture: _____

Server system name: _____

RIS environment name: _____

Products: _____

_____

_____

_____

_____

_____

_____

_____

_____

Duplication

Duplicate another client? No ☐ Yes ☐

Name of client to copy: → _____

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DMS Worksheets B

This appendix contains three DMS worksheets. Two of the worksheets are used to calculate the amount of disk space required for the DMS environments and `/clients` area. The third worksheet is used to record individual DMS client information. Make as many copies of these worksheets as you need. The worksheets are printed on only one side of the page so you can easily photocopy them. To keep all your calculations together, use the back side of each worksheet for additional notes or for calculating the numbers you insert into fields on the worksheet.

The following worksheets are included:

- Disk space allocation for the `/var/adm/dms/dms`*n* `.alpha` environments
- Disk space allocation for the `/clients` area
- Individual DMS client information

Disk Space Required for Dataless Environments

Use this worksheet to calculate the amount of space required for a single `/var/adm/dms` file system. If you want multiple `/var/adm/dms` environments, you must prepare a separate sheet for each environment. Each environment has a number: the first is `/var/adm/dms/dms0.alpha`, the second is `/var/adm/dms/dms1.alpha`, and so on. Fill in the number of this `/var/adm/dms/dms`*n*`.alpha` environment on the top line.

Disk Space for the `/var/adm/dms/dms`_____`.alpha` File System

Using the appropriate subset size information, follow these steps to find how much space you need for a `/var/adm/dms/dms`*n*`.alpha` environment:

Step 1

Decide which subsets and layered products you want to install, add up their total sizes in megabytes, and enter the sums here. Subset names and descriptions are located in the *Installation Guide*. Layered product information is located in the products' Software Product Descriptions (SPDs).

MANDATORY subset space: _____ MB

OPTIONAL subset space: _____ MB

Layered product space: _____ MB

Step 2

Add up the sizes from step 1 to arrive at the amount of space your dataless environment will require.

Subtotal: _____ MB

Step 3

Allocate an additional 10% of the space from step 2 for file system administration and other information. Enter that number here:

10% overhead space: _____ MB

Step 4

Add together the amounts of space from steps 2 and 3. The total is the amount of space you should allocate for this environment.

Total space for `/var/adm/dms/dms`___`.alpha`: _____ MB

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Disk Space for the /clients File System

Using the appropriate memory size information for your clients, follow these steps to find how much space you need for the `/clients` area.

Step 1

To allow at least 30 megabytes(MB) for an individual client's root area, multiply the number of clients in the `/clients` area by 30.

Number of clients ( ) x 30 = _____ MB

Step 2

Allocate an additional 15 MB per client for files added by users. Multiply the number of clients by 15 and enter that value here.

Number of clients ( ) x 15 = _____ MB

Step 3

Allocate an additional 15 MB for clients that have partial kernel build areas. Multiply the number of clients with partial kernel build areas by 15 and enter that value here.

Number of clients ( ) x 15 = _____ MB

Step 4

Allocate an additional 100 MB for clients that have full kernel build areas. Multiply the number of clients with full kernel build areas by 100 and enter that value here.

Number of clients ( ) x 100 = _____ MB

Step 5

Add the above figures. The total is the amount of space you should allocate for the `/clients` area.

Total space for `/clients` file system: _____ MB

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DMS Client Setup Worksheet

This worksheet is used for recording the information you need to know when adding a client to a DMS environment using the `ADD a client` menu option. If you are adding multiple clients, you must prepare a separate sheet for each client. Fill in the client's system name (host name) on the next line.

Registration Information for DMS Client _____

Network

The client's Ethernet or FDDI hardware address in the form of six two−character groups separated by minus signs.

For example, 08−00−2f−03−f5−08 ☐☐-☐☐-☐☐-☐☐-☐☐-☐☐

The client's network interface type. _____
For example, ln0 or tu0, etc.

The client's subnet mask. _____
For example, 255.255.255.0

The client's route address. _____
For example, 255.255.255.0
The route address is only required if the server and client are on different networks.

DMS Information

The name of the dataless environment to which this client will be added. For example, `/var/adm/dms/dms`*n*`.alpha` _____

The name of the `/clients` area.
For example, `/clients/`*`hostname`* _____

The client's swap device and partition.
For example, rz0b _____

The client's swap device type.
For example, RZ26 _____

The kernel build type (Full, Partial, or None) _____

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Glossary

This glossary defines terms and concepts related to software sharing.

BIND
: The Berkeley Internet Name Domain (BIND) service is a distributed database lookup service that allows you to distribute the `hosts` database network-wide.

client
: A computer system that uses resources provided by another computer, called a server.

client area
: In DMS, an area containing a single client's custom-tailored root files including the operating system kernel.

Dataless Management Services (DMS)
: Dataless Management Services is a service provided by Digital whereby a server computer system maintains the `root`, `/usr`, and `/var` file systems for client computer systems connected to the server via a Local Area Network (LAN).

DHCP (Dynamic Host Configuration Protocol)
: DCHP enables the automatic assignment of an IP address to clients on networks from a pool of addresses. The IP address assignment and configuration occurs automatically whenever appropriate client systems (workstations and portable computers) attach to a network. The Digital UNIX implementation of DHCP is based on the JOIN product by Competitive Automation.

DMS area
: A reserved disk area physically connected to a DMS server which contains multiple copies of the root area, one for each DMS client.

DMS client
: A computer system whose system disk area is physically connected to a DMS server rather than to the client itself and is accessed across the network by the client.

DMS client area
: A DMS client area resides in each DMS area and is called `/clients`. Mulitple copies of the root area reside in the client area, each tailored

from the appropriate generic root for an individual client.

DMS environment
: A portion of a DMS area, containing software to support one or more clients. A DMS environment contains one or more DMS root areas. DMS environments are located in `/var/adm/dms`.

DMS root area
: One root area is required for each client that is to be supported in the DMS environment. DMS root areas are located in `/var/adm/dms/dms`*n*`.alpha`. Each root area contains a generic root directory and a shared `/usr` filesystem.

DMS server
: A computer system that maintains the `root` `/usr` and `/var` file systems for DMS client systems. The DMS servers can contain multiple DMS environments to which clients are added. DMS clients are booted over a Local Area Network. Swapping and dumping is not supported over the network and must be done on client's local disks.

dmu (dataless management utility)
: The DMS utility, called `dmu`, provides the ability to manage the sharing of installed operating software between DMS servers and clients. The utility allows users to install, configure, show, and delete DMS environments and add, list, modify, and remove DMS clients.

generic root
: In DMS, a portion of the DMS environment that contains system software in a generic form, ready to be copied for tailoring to fit an individual client's requirements.

NIS
: The Network Information Service (NIS) is a distributed data lookup service for sharing information on a local area network (LAN). NIS allows you to coordinate the distribution of database information throughout your networked environment.

new files
: In DMS, refers to files that are exactly as supplied in the software distribution kit and have not been customized. These files are used by the update installation process and allow the files to be delivered onto the system without overwriting the existing, and possibly customized version of the file. New files are prefixed with `.new..` These files should never be modified. See **prototype files**.

private area
: In DMS, a portion of the DMS area that is reserved for the exclusive use of a single client. The private area contains the client's custom-tailored copy of certain operating system software files, including the kernel.

product environment
: In RIS, a portion of the RIS area containing a set of software kits that are intended for installation on a particular client type, such as RISC processors.

prototype files
: In DMS, refers to files that can be modified by the server's system administrator so that they can be customized for a particular client site, such as `/etc/hosts` entries. Prototype files are prefixed with `.proto..` and can be customized before the DMS environment is configured. See **new files**.

RIS area
: A reserved disk area physically connected to a RISC server, containing one or more product environments in which are stored installable software kits.

RIS client
: A computer system that has permission to install software across the network by accessing kits stored in the server's RIS area.

RIS server
: A computer system that serves other computers by providing operating system software for them to install; the software is stored on disks belonging to the server and is accessed across the network by the clients.

server
: A computer system that serves one or more other computers, called clients, by providing a resource to them.

subset
: An installable software kit module that is compatible with the Digital UNIX `setld` software installation utility.

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