NetWorker
for DIGITAL UNIX
Version 5.2
AA-RDHHA-TE

Release Supplement and Installation Guide

Digital Equipment Corporation

Maynard, Massachusetts

Operating System: DIGITAL UNIX
Software: NetWorker for DIGITAL UNIX Version 5.2
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Chapter 1: Release Supplement

Please review the following important notes for relevant information before you install the NetWorker software.

What Is New in Release 5.2 for DIGITAL UNIX

NetWorker Release 5.2 for DIGITAL™ UNIX® contains new features and improvements including:

- Cluster server failover
- Cluster client support
- Save set consolidation
- Save set cloning size increased
- Storage node support
- Storage node save mount timeout
- Override of a daily forced incremental backup
- Pre- and post-processing for client backup improvement
- File device update
- Save set staging
- Enabler and authorization codes for license management
- NetWorker documentation provided in PDF format

Cluster Server Failover

This release includes failover (relocate) capability with the cluster server. Cluster servers allow NetWorker to migrate or employ failover between other nodes in the same cluster. Failover allows another node in the cluster to take over the operations from the first node. Failover continues with the last interrupted save set. See “Chapter 3: Installing a NetWorker Cluster Server” on page 61 for more information.

Cluster Client Support

Cluster client support is included in this release. A cluster client shares resources mapped to another node in the cluster. Resources are shared among the cluster client members or nodes. A cluster client does not have the failover capabilities of a cluster server. See "Chapter 3: Installing a NetWorker Cluster Server" on page 61 for more information.

Save Set Consolidation

Save set consolidation is a new backup type. This backup type merges the incremental backups with the last full backup of a save set to create a new backup. This new backup is the same as a full backup. Therefore you will not need to perform a full backup over the network on a regular basis. You will only need to perform a full backup over the network the first time. See "Chapter 4: Save Set Consolidation" on page 89 for more information.

Save Set Cloning Size Increased

This release of NetWorker supports cloning larger save sets, up to 5 GB.

Storage Node Support

NetWorker supports the ability to designate another system on the network that has a storage device attached to act as a storage node of the NetWorker server. You can designate, in order of priority, the storage node that a client's data should be directed to by entering the hostname in the Storage Nodes attribute of the Clients resource. If the first storage node listed for the client is not available, the next storage node on the list is contacted to receive the backup data.

In order to use the support for storage nodes, you must purchase an enabler for each storage node that you want to add. If you want to use an autochanger for backups to a storage node, you must obtain an autochanger enabler code for each autochanger you want to use with NetWorker. You enter all enabler codes on the NetWorker server, regardless of where the software is installed. Then you install the client and storage node software and the NetWorker device drivers on each system that you want to designate as a storage node.

If the backup devices reside in an autochanger, first use the administration program (**nwadmin** or **nsradmin**) on the NetWorker server to manually add *root@<storagenode-hostname>* to the NetWorker server's Administrator list; then run the **jb_config** program on the storage node system to configure the remote autochanger for use with NetWorker.

During a backup, the storage node software invokes the NetWorker media daemons that are responsible for sending backup data received from each client to the mounted backup media. The storage node software also invokes the daemon responsible for sending entries to the media database on the NetWorker server. Each client's local **save** program relays information for entries in the client index back to the NetWorker server. The NetWorker server keeps track of which set of backup media a client's save set data was sent to, for potential recovery later.

You do not have to keep *root@storagenodehost* on the Administrator list for storage node backups. You need to have the entry there when you run the **jb_config** program, but can remove it as soon as the program is completed.

Refer to the *Administrator's Guide* Chapters 3, 4, and 5, for information on how to configure support for storage nodes and remote devices, and Appendix A for a description of how storage nodes function.

Note that you cannot convert an existing NetWorker server to a storage node, as stated in the note on page 53 of the *Administrator's Guide*.

Storage Node Save Mount Timeout

This release includes a timeout mechanism for save mount requests on storage nodes. This allows a **save** to be redirected to another storage node, if an appropriate volume is not mounted within the timeout period.

Override of a Daily Forced Incremental Backup

A new attribute in the Groups resource, named Force Incremental, provides the ability to perform more than one full backup per 24-hour period. Use the Details > View option (**nwadmin**) or Options > Display Options > Hidden to view and change the setting for Force Incremental.

The default setting for the Force Incremental attribute is Yes. This means an incremental backup will occur if the group is run more than once a day. Set this attribute to No to do more than one full backup per day.

64-Bit Filesystem Support

This release includes support for 64-bit filesystems for clients of Solaris 2.6, AIX 4.2, AIX 4.3, HP-UX 10.20, and HP-UX 11.0. You can archive, back up, browse, and recover files larger than two gigabytes. If your clients are not 64-bit capable, you can browse files larger than 2 gigabytes, but you cannot recover them.

Pre- and Post-Processing for Client Backup Improvement

A new pre- and post-processing command, **savepnpc**, allows you to invoke a set of pre-processing commands once before the first save set on the client begins its backup, and a set of post-processing commands that run only after the last save set on the client completes its backup. Previously the pre- and post-processing commands were run on each save set specified for the client. You use the **savepnpc** command in place of **save** in your customized backup script. The **savepnpc** command uses the same syntax as the **save** command. See Appendix B in the *Administrator's Guide* and the man pages for more detailed information about **savepnpc**.

File Device Update

If you use a file device, you must enter it as a directory path (the same as other device types) rather than as just a filename. The *path/tmpfs* is not allowed on Solaris servers.

Clone Storage Node Affinity

This release includes *clone storage node affinity*. Clone storage node affinity is the link between a client's resource of a storage node and a list of available storage nodes to receive cloned save sets from the storage node client. Data is cloned from media that contain the original save sets to media on the specified clone storage node.

NetWorker Portmapper Name Change

The term *NetWorker Portmapper* has been changed to *Storage Management Portmapper* with this release.

NetWorker Resource and Attribute Changes

This release includes several NetWorker resource and attribute changes. The Name attribute of the NSR device resource has been changed to have a two-part value. The first part is an optional hostname. The hostname is prefixed with **RD=** for a remote device. If the hostname is not specified, it assumes the device resides on the local server. The second part is the device name, separated from the hostname by a colon.

A new hidden attribute has been added to the NSR device resource. It is called *Recover Only*. The default for this attribute is No. It can be set to Yes when you define the device or update its definition. A Yes indicates the device can be used for recovery operations only.

Another attribute has been added to the NSR device resource. It is called *Target Sessions*. The default value for Target Sessions is 4. You can change the value from 1 to 512 when a device is configured on the NetWorker server, depending on base enabler and other enablers loaded. This attribute replaces the *sessions per device* defined in the NSR resource in pre-5.0 releases.

A Storage Nodes attribute has been added to the NSR Client resource. This new field contains a list that contains the storage nodes for the client. This list directs the server to store data for the client to either local devices or a particular storage node's remote devices.

A Clone Storage Nodes attribute has also been added. This attribute allows you to specify a different network interface for storage nodes that perform cloning operations than the network interface you specify for the storage node's remote device.

Two new attributes have been added to the NSR resource. One is *nsrmmd polling interval*, which controls the time interval between polls of remote **nsrmmd**s. The second is *nsrmmd restart interval* which sets the time interval that **nsrd** waits before restarting a **nsrmmd**. The restart interval begins when **nsrd** first detects a **nsrmmd** has terminated. For local **nsrmmd**s, this detection is immediate. For remote **nsrmmd**s, the detection will usually start when the **nsrmmd** is missing from a polling reply, or the polling event timed out without a reply.

The default value for both of these intervals is 2 minutes. The polling interval can range from 1 to 60 minutes, while the restart interval can have a value from 0 to 60 minutes. A value of 0 for the restart interval means an immediate restart is desired. Changing the value of these attributes resets the currently running **nsrmmd**s. For example, setting the pooling interval from 2 minutes to 10 minutes resets the next polling interval for all currently running **nsrmmd**s to 10 minutes from now. Similarly, changing the restart interval from 2 minutes to 0 will causes any **nsrmmd**s waiting to restart immediately.

Save Set Staging Support

This release of NetWorker supports the ability to copy entire save sets from their original backup media to a different set of media, which can be any of the media types supported by NetWorker. In the version 5.0 release, save set staging was manually invoked with the **nsrstage** command. With this release, you now have the ability to configure automatic staging, based on defined policies. This is accessed through a new NetWorker resource, named Staging. The automatic staging feature only works with file devices. You must have a file device defined before it is available as a selection in the Staging resource. Refer to the *Administrator's Guide* or the **nsrstage** man page for further details on how to use this feature.

Enabler and Authorization Codes for License Management

This release of NetWorker for DIGITAL UNIX uses a new license management method. This release now uses Legato's Enabler technology for consistent license management with other NetWorker products in multiplatform environments. Previous versions used the DIGITAL License Management Facility (LMF). See "Registering NetWorker Products" on page 36 and "How to Enable and Register NetWorker" on page 54 for information on contacting DIGITAL to register NetWorker products and enabling NetWorker.

Conventions

This manual uses the following typographic conventions and symbols to make information easier to access and understand.

- **boldface** – Indicates DOS or UNIX line commands. For example:

  The **nsradmin** command starts the command line version of NetWorker.

- *italic* – Used for directory pathnames, files, machine names, and new terms defined in the Glossary or within the chapter, and to emphasize words or ideas. For example:

  Messages displayed within the NetWorker message display are also written to */nsr/logs/daemon.log*.

- `fixed-width` – Used for examples and information displayed on the screen. For example:

  ```
  media waiting: recover waiting for 8mm 5GB tape volume name
  ```

- Pull-down_menu>Command>Command – Depicts a path or an order to follow for making selections in the GUI. For example:

  Volume>Change Mode>Appendable

- **`fixed-width, boldface`** – Used for commands and text you type exactly as shown. For example:

  `nwadmin`

- ***`fixed-width, boldface italic`*** – Used for commands and text you type for which you need to substitute a variable. For example:

  `nwadmin -s server_name`

Important: Indicates important information and cautionary notes that prevent you from making a mistake.

Important Notes and Tips

This section provides important notes and tips about your NetWorker software and provides recommendations, where appropriate.

Patch Needed for NetWorker on DIGITAL UNIX 4.0.C or Earlier

If you are installing NetWorker on a system with DIGITAL UNIX 4.0C or earlier installed, you must first install the DIGITAL patch QAR 36779 before installing NetWorker. To download the patch:

1. Go to the DIGITAL service patch search utility at the URL

   http://www.service.digital.com:8031//public/

2. Enter **QAR 36779** in the query field and press the Submit Query button. A list of relevant hits appears.
3. Select the hit for your DIGITAL UNIX Aggregate Summary.
4. Download the *.tar* and *.ps* files. The *.tar* file contains the patch and the *.ps* file contains the release notes. Install this patch before you install NetWorker.

Parallelism and Devices

The maximum value for parallelism and devices depends on the NetWorker product purchased and the number of enabled storage nodes, as shown in Table 1. Regardless of the number of enabled storage nodes, the maximum limit for parallelism is 512 savestreams and the maximum limit for devices is 256.

Table 1. Maximum Parallelism and Device Values

NetWorker Product	With Each Enabled Storage Node	Without Storage Nodes
Workgroup Edition	Feature is not available	Parallelism: 8
	Feature is not available	Devices: 2
NetWork Edition	Parallelism: 32 Maximum = (32 x #nodes) + 32	Parallelism: 32
	Devices: 16 Maximum = (16 x #nodes) + 16	Devices: 16
Power Edition	Parallelism: 32 Maximum = (32 x #nodes) + 64	Parallelism: 64
	Devices: 16 Maximum = (16 x #nodes) + 32	Devices: 32

Unsynchronized Client Clock Errors

If the setting for the system clock on a NetWorker client that has NetWorker 5.1 client software installed differs from the NetWorker server's setting by more than one minute, you might receive the following message during a scheduled backup that invokes the **savegrp** program:

```
Warning: unsynchronized client clock detected
```

This situation does not occur on machines with prior releases of the NetWorker client software installed.

Unsynchronized clocks can cause a scheduled backup to occur at a level other than expected; for example, a scheduled incremental backup can run as a level full. The backup is still completed successfully, but more data than needed is backed up.

To avoid the problem, keep the server and client clocks synchronized to within a minute of each other.

How to Back Up a ClearCase VOB

Technical Bulletin 306, which is found in the *bulletins.pdf* file included with your NetWorker software, provides a sample script that you can customize in order to back up a ClearCase® VOB (version object base). Your customized script file must reside in the same directory where the NetWorker **save** program is installed. Enter the name of the script into the Backup Command attribute of the Client resource configured for the ClearCase VOB. During a scheduled backup, the Backup Command is invoked instead of the usual **save** program.

Important: You must include the **save** command within your script in order for the backup to occur. If the script file is not in the same directory as the **save** program, the backup will fail.

Running nwadmin on a Non-DIGITAL Display

If you run the command **nwadmin** with your display set to a non-DIGITAL platform, the following error message appears:

```
Warning: Cannot convert string "-*-Menu-Medium-R-Normal--
*-120-*-*-P-*-ISO8859-1" to type Fontstruct
```

This font conversion error does not affect the functionality of **nwadmin** in any way. You can prevent the error message from appearing by downloading the missing fonts to your server. You can obtain the missing fonts from *ftp.x.org* at *R5contrib/DECwindows_on_X11R4_font.aliases*.

Advanced Filesystem (AdvFS) Quota Files

NetWorker is able to back up and restore AdvFS quota files and AdvFS fileset quotas from a client running DIGITAL UNIX 4.0 and later.

Device Information

You must use a non-rewind-on close device for NetWorker backups. NetWorker writes a file mark on a volume at the end of each backup. When the next backup occurs, NetWorker appends data to the volume based on the position of the file mark. If the device automatically rewinds the volume, the file mark position is lost and the data is overwritten by the next backup; *you will be unable to recover the previous backup data at a later date*.

Licensing for Users of Informix and SAP R/3 Modules

The NetWorker product suite includes optional modules for backing up a variety of database systems. Users of NetWorker backup modules for Informix or SAP R/3 databases on DIGITAL UNIX need to be aware of the following licensing information.

If your NetWorker server uses DIGITAL LMF PAKs for license management, then you need to install a LMF PAK on the client system running the Informix or SAP R/3 database backup module for DIGITAL UNIX.

If your NetWorker server uses enablers for license management, install a LMF PAK on the client system running the Informix or SAP R/3 database backup module for DIGITAL UNIX, and also install a module enabler on the NetWorker server system.

NetWorker Documentation

Troubleshooting, command reference, and maintenance information is included in the *NetWorker for DIGITAL UNIX Administrator's Guide*. The installation information is provided in Chapter 2 of this document, which contains information on how to evaluate, enable, authorize, and run a test of the NetWorker software for DIGITAL UNIX.

The instructions that explain how to use the graphical user interfaces provided with the **nwadmin**, **nwbackup**, **nwrecover**, **nwarchive**, and **nwretrieve** programs are included in the online help.

The *NetWorker Disaster Recovery Guide* provides instructions to recover your server in the event of a disaster. There are separate chapters provided for each of the server platforms that NetWorker supports. Chapter 1 of the *Disaster Recovery Guide* contains important information to review in order to plan and implement your disaster recovery strategy, so you can be prepared for quick recovery when a disaster occurs.

All of the NetWorker manuals (*Administrator's Guide*, *Disaster Recovery Guide*, *Power Edition Performance Tuning Guide*, and this *Release Supplement and Installation Guide*) are provided as PDF (portable document format) files with the NetWorker software. You can use Adobe® Acrobat Reader® to view and print the PDF files. See "How to View and Print Electronic Documentation" on page 58 for more information.

Important: We *strongly* recommend that you keep a printed copy of both the *Disaster Recovery Guide* and the *Installation Guide* on hand so that they are readily available for reference in the event that your system is not available.

Bug Fixes

This section lists the bugs that have been fixed in this release.

Sparse Files with Holes Greater Than 4 GB

In version 4.4 of NetWorker for DIGITAL UNIX, the client did not correctly save sparse files with holes greater than 4 GB. This has been fixed in this release.

Multiple Withdrawals on ATL 2640 or DEC TL810/820 Series

Prior to this release you could not do multiple slot withdrawals on the ATL 2640 or DEC TL810/820 series. If you attempted to do so, you would receive the following error message:

```
all output ports are full
```

This problem is fixed in this release. You can now do multiple slot withdrawals on the ATL 2640 and DEC TL810/820 series.

Deposit Error on DEC TL810/820

Previously, if you attempted to do multiple slot deposits into the DEC TL 810/820, and possibly the ATL 2640, you would receive the following error message:

```
Jukebox error, Illegal Request, Invalid Element access
```

This has been fixed. You can now do multiple slot deposits on the DEC TL 810/820 and the ATL 2640.

mmrecov Bug

The **mmrecov** program had been failing and giving a message indicating the volume was not in the media pool. This has been resolved in this release.

nsrindexd Bug

The **nsrindexd** program had been consistently core dumping after upgrading from NetWorker 4.2.5 to NetWorker 5.0. This has been resolved in this release.

Recovery Error

In the previous release, customers had problems restoring files to the original client and to other clients. Recovery failed a few hours into the recovery of large amounts of data. (There were no recovery problems with small amounts of data.) This has been resolved in this release.

Non-privileged Users Able to Gain Privileged Access

The 5.0 release allowed local non-privileged users to create and truncate the root privileges of arbitrary files and to obtain UID 0 (root) privileges. This has been resolved in this release.

Known Problems and Restrictions in this Release

The following sections contain information about known problems and restrictions in this release. Workarounds are provided where available.

Cluster Server

The following are known problems and restrictions with the cluster server.

Restarting the NetWorker Cluster Server Unassigned Tape Service

If a NetWorker tape service status is reported as unassigned, do not place the service offline until you determine which error caused the service to be unassigned. Under some circumstances (specifically, if the shared disk could not be unmounted), changing a service status from unassigned to offline can result in a system panic. Refer to the *TruCluster Software Products Administration Guide* for more information.

If the NetWorker tape service is unassigned when the service attempts to relocate, it is usually because the shared disk is being accessed. This can happen if someone accesses (using **cd**) a directory in the filesystem. If this happens, the disk cannot be unmounted and the relocation / failover fails with a “disk busy” message.

To correct this, do the following:

1. Identify and remove the program(s) accessing the shared disk.
2. Manually unmount the disk.
3. Use the **asemgr** command to put the service offline and then back online.
4. Use the **asemgr** command again to relocate if it is still necessary to do so.

Important: If you fail to manually unmount the shared disk after all references to it are removed, a system panic of one or more of the cluster nodes could result. Consequently, some data in the */nsr* directory may be lost when the service is placed back online. See the *NetWorker Disaster Recovery Guide* for instructions to recover the lost data.

Cluster Server Relocation Restarts syslogd

When the NetWorker tape service is relocated, NetWorker action scripts restart **syslogd**. This is done to allow **syslogd** to change from pointing to the local */nsr* directory log files to pointing to the NetWorker server log files located on the storage disk. Each time **syslogd** is restarted a new subdirectory is created in */var/adm/syslog.dated*. Therefore you might need to check several directories for system log information.

To prevent NetWorker from restarting **syslogd**, do the following:

1. Make sure the local */nsr* directory for each cluster node follows the same path.
2. Make a copy of the following files on each cluster node:
   - */etc/syslog.conf*
   - */bin/networker.start*
   - */bin/networker.stop*
3. Take the NetWorker tape service offline using **asemgr**.
4. On each cluster node, edit the entry that was written by NetWorker during installation in */etc/syslog.conf* to force the **syslogd** daemon to point to the log files.

   For example, if the path to the local */nsr* directory on each cluster is */var/nsr*, edit the */etc/syslog.conf* file to replace the following lines:

   ```
   daemon.notice        /nsr/logs/message
   local10.notice       /nsr/logs/summary
   ```

   with these lines:

   ```
   daemon.notice        /var/nsr/logs/message
   local10.notice       /var/nsr/logs/summary
   ```

5. On each cluster node, edit the NetWorker action scripts, */bin/networker.start* and */bin/networker.stop*, to remove references to **syslogd**. Do this by commenting out the following:

   a. In */bin/networker.start*, comment out both commands to `restart_syslog`:

   ```
   # restart_syslog
   ```

   b. In */bin/networker.stop*, comment out the following lines:

   ```
   # echo "Sending a HUP to syslogd daemon"
   # if [-f /var/run/syslog.pid]
   # then
   #   echo "Restarting syslog daemon.."
   #   pid=' cat /var/run/syslog.pid'
   #   kill -1 ${pid}
   # else
   #   echo "Can't restart syslog daemon"
   #   echo "Restart syslog manually"
   #   exit 1
   # fi
   ```

6. On one of the cluster nodes do the following:

   a. Manually mount the NetWorker storage disk and create softlinks from the NetWorker server */nsr* directory (located on the shared disk) to the local */nsr* directory. In the following example, *goofy* is the name of the NetWorker service:

   ```
   # ln -s /var/nsr/logs/messages
   /goofy/nsr/logs/messages
   # ln -s /var/nsr/logs summary /goofy/nsr/logs/summary
   ```

   b. Manually unmount the NetWorker storage disk.

7. On each cluster node restart the **syslogd** daemon.

8. Run **asemgr** and replace each action script so ASE recognizes the modified files.

9. Run **asemgr** to put the NetWorker tape service back online.

Important: With these changes, the messages sent by NetWorker to these log files will be written to the local */nsr* directory of the cluster node currently running the NetWorker tape service. When the NetWorker tape service relocates, only partial log files are accessible on the server's */nsr* directory. To see the other log file information, see the local log files on the other nodes running NetWorker.

Savegroup with Cloning Error

If a savegroup with cloning process is running and the NetWorker server is relocated while NetWorker is writing to the clone tape, the savegroup is restarted and the backup of the savegroup is completed successfully. However, sometimes the cloning might not be completed successfully, but the savegroup completion message still reports full success.

You should periodically search the operating system log files to identify when the NetWorker tape service might have been relocated. If a savegroup with cloning was scheduled to run close to any of those times, use **nsrclone** to manually clone the save sets involved or rerun the savegroup.

Migration Savegroup Error

If the NetWorker server is relocated during migration or premigration, the server might not complete the original premigration or migration step successfully.

You should periodically search the operating system log files to identify when the NetWorker tape service might have been relocated. If a migration savegroup was scheduled to execute close to any of those times, do the following to manually recover any files that were only partially migrated:

1. Mount the corresponding migration tape on a NetWorker device. In this example, the device is */dev/nrmt0h*.
2. Use the **scanner *device_name*** command to determine the correct save set ID for the latest migration save set. In the following example, the migration save set, */the_migfs*, is save set ID (ssid) 27245:

   ```
   # scanner /dev/nrmt0h

   scanner: scanning tz88 tape TESTHSM:000 on /dev/nrmt0h

   client name   save set   save time    level     size
   files   ssid
   ```

```
mudbone.zso /the_migfs  11/21/97 11:31mi   345273816
337   27245
```

3. Run the **scanner** command with **uasm** to recover the files in a temporary area. For example:

   ```
   # scanner -s 27245 /dev/nrmt0h | uasm -rv -m
   /the_migfs=/mnt
   ```

4. Copy the files scanned in the temporary area to their original location.
5. Rerun the migration savegroup, if necessary.

Upgrade Shared Device Firmware

If NetWorker 5.2 is configured as a cluster server, backup devices must be located on a shared bus. The following supported shared devices must be upgraded with the corresponding firmware:

- TZ88 drive with V90 firmware
- TZ89 drive with V55 firmware

Contact technical support to get the correct firmware version.

Scanner Interrupted by Bus Reset

Sometimes **scanner** is interrupted when a bus reset occurs. If this happens, **scanner** needs to be rerun.

Reset during Volume Saving

When doing a save the volume might be marked full. The server will then request another volume to continue the save.

Devices and Media

The following are known problems and restrictions with devices and media.

Rewind-on-Close Devices Prior to NetWorker 4.4

Rewind-on-close devices defined and mounted with a NetWorker version prior to 4.4 must be removed from the NetWorker database and redefined as no-rewind-on-close devices. Failure to redefine the device will result in lost data if NetWorker uses the tape mounted on that device. See the *Administrator's Guide* for additional information on setting devices as no-rewind.

Tape Block Size Incompatibility

To improve performance, NetWorker for DIGITAL UNIX, Versions 4.3 and later, use a 256 KB data block size for TZ89 tapes. This size is used to improve performance. However, NetWorker tapes written using the TZ89 device definition might not be readable by earlier versions and other types of NetWorker servers.

To ensure tape portability, define the tape drives on DIGITAL UNIX as TZ88. This will ensure the use of the more portable 32 KB blocks. Note that there might be some performance cost when using the 32 KB block size.

Labeling Two Volumes Concurrently

If you try to label two volumes concurrently, while using the same label template, the first label operation will be completed successfully but the second label attempt will generate an error message. The message will state that there are duplicate labels. Cancel the failing label operation, and choose another label.

Jukeboxes

The following are known problems and restrictions with jukeboxes.

Library Firmware Updates

To work correctly with NetWorker, firmware for TL820 series tape libraries must identify the library as a TL820. Firmware for TL810 series libraries must identify the library as a TL810. The following libraries are affected:

- TL820 series: TL820, TL822, TL829, TL893, TL896
- TL810 series: TL810, TL812, TL894

Use the **inquire** command to determine the library identity. If your library firmware is not set as required, contact technical support for assistance.

Canceling a Jukebox Label Operation

If you start a label operation using **nwadmin** and then cancel the operation, NetWorker might not move the volume from the jukebox tape drive back into the volume's original slot. Attempts to label another volume will result in the following message:

```
The drive is loaded with a volume from a different slot
```

If this occurs, reset the jukebox or run **nsrjb -u** to unload the tape drive.

Installing TL893, TL896, TL820, TL891, TL892, TL894 Jukeboxes

When you run **jb_config** to configure a TL893 or TL896 jukebox and choose not to use the autoconfigure option, select 29) DIGITAL TL820 Series from the Install an SJI Jukebox menu. To configure a TL894 jukebox, select 28) DIGITAL TL810 Series from the Install an SJI Jukebox menu. To configure a TL891 or TL892, select 27) DIGITAL TL800 Series from the Install an SJI Jukebox menu.

Jukebox Configuration on a Cluster Member

When configuring a jukebox on a cluster member, where the device is not shared among the members, the jukebox must be defined as a remote device. This can be done using **jb_config** on the member where the jukebox is attached. However, the defaults **jb_config** generates for the device will not include the physical hostname of the cluster member, as needed. Therefore when you answer the **jb_config** prompts for name, control port, and devices, you need to prefix answers with the correct information such as: **rd=*hostname:***, where *hostname* is the physical hostname of the cluster member.

Graphical User Interface (GUI)

The following are known problems and restrictions with the GUI.

Archive Retrieve Window Problem

In the Archive Retrieve window, the Change Server dialog is a modal dialog. No access to the main Retrieve window screen or help window is allowed until the dialog is dismissed. The Detail dialog can be accessed independently of the Change Server dialog.

Blank Lines in the Indexes Display

Occasionally a blank line will be displayed in the Clients section of the Indexes display. This is an aesthetic effect of the GUI arranging the information for display. None of the save sets are lost. If a blank line is selected, no client information is displayed.

Cloning

The following are known problems and restrictions with cloning.

Automatic Savegroup Cloning with 4 mm Devices

In some circumstances, a 4 mm device can hang at the start of an automatic clone operation. If this problem occurs, see the comments in the */sbin/init.d/NSRstartstop* file. Follow the instructions for a workaround and

then restart NetWorker using the */sbin/init.d/NSRstartstop* start command. Do not make this change unless there is a known problem with this type of device. Firmware version 4BQH prevents this problem with the TLZ7L device.

Cloning Save Sets Using Jukeboxes

For a server with two jukeboxes that each have only one device, NetWorker might hang while attempting to clone save sets that cross volumes from one jukebox to another. To avoid this situation, do not attempt to clone these save sets. Another way to avoid this situation is to label all of the volumes in one of the jukeboxes for cloning pools only. If you want to clone some of the save sets on a volume, use the following command to determine which save sets are completely contained on that volume:

```
# mminfo -avo t vol_name
```

The output from this command provides the save set ID number for each save set. In addition, the *fl* (flag) column indicates whether all or only part of the save set is contained on the volume. (The *c*, *h*, *m*, or *t* characters of the flag column designate respectively whether all, head, middle, or tail of the save set is contained on the volume.)

Once you decide which save sets to clone, create a file containing the save set IDs of the save sets you want to clone, excluding the save sets that cross to a volume in the other jukebox. In the file, list one save set ID per line, leaving no blank lines. Make sure there is a carriage return after the last entry.

Then, issue the following command to clone the save sets (*clone_pool* is the name of an existing clone pool and *ids_file* is the name of the file you created containing the save set IDs):

```
# nsrclone -b clone_pool -V -f ids_file
```

HSM

The following are known problems and restrictions with HSM.

NFS Timeout Error

During the demigration of very large files, the operation that started the demigration of the file can terminate with an NFS timeout error such as the following:

```
#./openfile file_name
Reading 1 byte from file file_name
NFS2 read failed for server pidxxx : RPC : Timed out
Error reading file file_name
```

Disregard the timeout error. The demigration of the file will continue to a normal, successful completion. After completion, the file may be accessed normally. You can verify whether a file demigration is in progress by monitoring NetWorker activity with the administrator tools.

Superfull Backups

It is recommended that you not run the superfull backup function at this time. At this release, the following problems exist with this feature:

- The superfull backup will successfully build a clone tape containing the last backup and migration save set. However, migrated files cannot be successfully recalled from the clone. Files can be restored from the backup clone normally.
- The superfull backup does not identify or clone manual creations of migration save sets.

Immediate Technology

Power Edition NetWorker contains a feature called “Immediate Technology” that is designed to use shared memory to communicate between a **save** or **recover** process and a **nsrmmd** process controlling the backup media. This mechanism uses less of the system resources. You will notice that the system can do more work, though the improvement may not be obvious in terms of decreased time.

Without NetWorker Immediate Technology, NetWorker sends data from the **save** process to the **nsrmmd** process using an Open Network Computing (ONC) RPC network connection. (The same type of connection is used between **nsrmmd** and the **recover** process when retrieving data.) This communication is ideal when the **nsrmmd** and the client process are on separate machines. But when the processes are local to the same machine, better performance can be achieved by using shared memory instead. Therefore, NetWorker Immediate technology is defined as “the use of shared memory for local connections between **nsrmmd** and the client processes **save** and **recover** on NetWorker server machines or storage nodes.”

Performance Factors

This section provides suggestions to improve performance using a simple system example. The suggestions are for your hardware configuration. If a change is made from regular NetWorker to NetWorker with Immediate Technology and is not accompanied by an increase in performance, the problem is likely to be within hardware configuration.

For example, using a small single CPU workstation with a single SCSI controller and an older DLT tape drive and a single disk drive, you notice a backup speed of 2.5 MB using regular NetWorker. You want faster backups so you upgrade to a newer faster DLT and to NetWorker with Immediate Technology. However, backup sessions still have performance of 2.5 MB. Because the disk and tape drive still use the same SCSI bus, competition for that bus slows down the rates to a maximum of around 3 MB. Unless Immediate Technology has the correct hardware support, faster throughput is not possible.

Consider the following when attempting to maximize system throughput rates:

- System Utilization

  The more processes and I/O activity, the more backup performance will be degraded. Backups during low use time (such as night-time and week ends) provide more resources for non-backup activities and allow for faster backups.

- Tape Drives

  If the data is being backed up to an older 4 mm DDS2 device, NetWorker might reach the maximum performance of the tape drive without using Immediate Technology. Faster drives should be obtained in order to take advantage of the Immediate Technology. Without faster tape drives, Immediate Technology is not useful.

- SCSI buses

  SCSI performance includes:

  – Basic SCSI: 5 MB
  – Fast or Wide SCSI: 10 MB
  – Fast and Wide SCSI: 20 MB

  A high-speed device connected to a Basic SCSI bus will not have very good performance. For high end tape drives, a Fast and Wide SCSI bus is required to take advantage of the tape drive's maximum performance.

- Disk Drives

  Disk drives can vary greatly in performance but usually range somewhere between 3 to 5 MB. To get the maximum performance from a high-speed tape drive, the data from several disk drives must be backed up to the tape device simultaneously.

- SCSI Geometry

  A common bottleneck that can occur is SCSI bus contention. If the hard drive being backed up shares the same SCSI bus as the tape drive, there will be a drop in performance because the two share the bandwidth.

  Ideally a high performance tape drive that runs at 12 to 15 MB should have a dedicated Fast and Wide SCSI bus. There should be another Fast and Wide SCSI bus with three or four disk drives attached. Each disk drive should have its own filesystem that can be read independently of the others.

  When a NetWorker backup starts, a single **save** should be run on each of the filesystems on the disk drives. This causes data to be read off each of the disks at approximately 3 to 4 MB. The **save** should then drive the tape device at maximum speed. Also, there should be very little activity on the system at the time of the backup and the system should have enough CPU to manage this amount of I/O in order to attain this performance level.

Licensing Errors

The following are known licensing errors.

LMF and nsrlmc Command

There may be instances with NetWorker for DIGITAL UNIX Version 5.2 when legal and appropriate DIGITAL License Management Facility (LMF) licenses are ignored at the time of NetWorker server startup or new device definition.

For example, assume that a NetWorker server is correctly licensed for a TLZ7L autochanger with LMF, but the following error message appears:

```
nsrjb: error, The jukebox 'TLZ7L' is not properly
licensed.  Make sure the jukebox is properly enabled and
authorized.
```

The workaround is to run the **nsrlmc** command manually. Immediately after running the command, the license problem should disappear. If the problem persists or the instances increase, please contact your local Customer Support Center.

SQL Server Savegroup Completion Error

If the NetWorker Version 5.2 server license for the Windows NT Microsoft SQL Server has not been installed and a client has been set up to save using the NetWorker Module for Microsoft SQL Server, execution of a savegroup that includes that client will result in a savegroup completion error message similar to the following:

```
* montlake:MSSQL:master 1 retry attempted

* montlake:MSSQL:master nsrsqlsv: Internal system error,
please see nsr\applogs\xbsa.messages on the client system
for reason.

* montlake:MSSQL:master nsrsqlsv: MS SQL error:
severity=5, errno=10007, oserr=-1

* montlake:MSSQL:master nsrsqlsv: dberrstr=General SQL
Server error: Check messages from the SQL Server.

* montlake:MSSQL:master nsrsqlsv: oserrstr=(null)

* montlake:MSSQL:master nsrsqlsv: previous DB-MSG=Write on
dump device '\\.\pipe\sql\nsrdump4210' failed, vsn=884
return=-2 status=-2. Please consult the SQL Server error
log for more details.

* montlake:index aborted
```

Exchange Server Savegroup Completion Error

If the NetWorker Version 5.2 server license for Windows NT Microsoft Exchange Server has not been installed and a client has been set up to save using the NetWorker Module for Microsoft Exchange Server, execution of a savegroup that includes that client will result in a savegroup completion error message similar to the following:

```
* montlake:MSEXCH:IS 1 retry attempted

* montlake:MSEXCH:IS nsrxchsv: Internal system error,
please see nsr\applogs\xbsa.messages on the client system
for reason.

* montlake:MSEXCH:DS 1 retry attempted

* montlake:MSEXCH:DS nsrxchsv: Internal system error,
please see nsr\applogs\xbsa.messages on the client system
for reason.
```

Miscellaneous

The following are miscellaneous problems and restrictions with this release.

Sparse Files

NetWorker determines that files are sparse (or "holey") by comparing the allocated blocks with the byte size (this can be seen using the **ls -ls** command). If the allocated blocks do not account for the size of the file, the file is considered to be sparse and saved using an algorithm that replaces long strings of zeroes with "holes" in the recovered file.

When AdvFS clone filesets are used, AdvFS reports the number of blocks allocated to the clone (which is zero, or the number of blocks on the real file that have been modified since the clone creation). Thus, files in a cloned fileset always look sparse to NetWorker.

The problem that may occur is that some files that were not sparse when saved may be sparse when recovered. Note that Oracle databases are zero-filled, fully allocated files and, as such, are not "holey." They are particularly susceptible to this problem.

At this time, the workaround for this is to use the **cp** command to copy the file after recovery. This will cause a sparse file to be converted to a fully-allocated file. A more permanent solution is being implemented by AdvFS in a future release of DIGITAL UNIX.

Storage Nodes and Alternative Network Connections

A NetWorker client system that is defined as a Storage Node cannot be configured with alternative network connections.

Although there is special handling of a server's resource to find the possible Server aliases and thereby support multiple network interfaces for a server, this same feature is not supported for Storage Node client resources.

There is no workaround for this release.

Recovering Files Saved with NetWorker Version 3.2A

If you use NetWorker 5.2 to recover a file saved under NetWorker Version 3.2A, the recover operation might generate a message such as the following:

```
Unaligned access pid=22822 <recover> va=0x11fffe00c
pc=0x120086760 ra=0x120086754 inst=0xb40a0000
```

Disregard this error message. The recover operation will be completed successfully.

Save Set Retrieve Failure

Attempting to retrieve a save set might fail if a client has never had an incremental, level, or full backup and has only saved its data through archiving. For example, you might get an error message with this command:

```
# nsrretrieve -s sinclair -S 23653
nsrretrieve: SYSTEM error, No such file or directory
```

To work around this problem, perform a single backup of the client of any amount of data.

Retention Policies Greater Than 28 Years

Retention policies greater than 28 years do not work correctly. If the duration of the retention policy goes back prior to January 1, 1970, the volumes will be incorrectly marked recyclable.

Head and Middle Volumes Not Marked Recyclable

If multiple volumes are used for a single save set and one of those volumes is deleted, all the other volumes should be marked recyclable. The volumes are not currently being marked recyclable by NetWorker. Therefore you must manually mark the volumes recyclable.

Multiple Concurrent Savegroups

NetWorker is designed to run one savegroup at a time. Running multiple concurrent savegroups will result in unpredictable behavior. If overlapping savegroups cause system problems, reschedule the groups or combine them into a single group.

BMO Version Compatibility

If you are running the NetWorker BusinesSuite Module for Oracle (BMO) version 1.0x, 2.0x, or 2.1, you must upgrade to BMO version 2.1B (DIGITAL) or 2.1.2 (Legato) to be compatible with NetWorker version 5.2.

Each version of the BusinesSuite Module for Oracle (BMO) requires specific versions of other software for compatibility. Refer to the following table:

BMO Version	DIGITAL UNIX	NetWorker	Oracle	EBU/RMAN
V1.0 / V1.0A	V3.2C	V3.2x	V7.1.6	V2.0.10
V2.0	V4.0A	V4.x	V7.3.2.1	V2.0.12.4
V2.1B (DIGITAL) or 2.1.2	V4.0A or later	V5.2	V7.3.3 V8.0.3 or later	V2.0.12.4 / V8.0.3 or later

Using the nsrinfo Command

The **nsrinfo -N** command works only for paths that are either root or a fully specified file (for example, */var/tmp/foo.txt*). The following error message is displayed when this command is used on any non-root directory:

```
WISS error, cannot find the key
```

Recovering UFS Files with Inode 4 or 5 into an AdvFS Filesystem

Do not attempt to recover a UFS file assigned an inode number of 4 or 5 into an AdvFS filesystem. Such an operation will fail. AdvFS user quota files are assigned inode number 4 and group quotas are assigned inode number 5. These AdvFS quota files cannot be overwritten (NetWorker follows a special algorithm to save and recover AdvFS quota files).

To recover a UFS file with inode 4 or 5 into an AdvFS filesystem, recover it first into a UFS filesystem and then use the **cp** command to copy it to the desired location in the AdvFs filesystem.

Recovering Large Numbers of Files

When attempting to recover more than 300,000 files at a time, use the save set recover command: **`recover -S`** ***`ssid`***

If you attempt to recover more than 300,000 files using the **nwrecover** or **recover** commands, you will receive the following error message:

```
recover: Not enough space

recover: <path>: Permission denied

Nothing to recover
```

Label Command Failing on Write-Protected Tapes

If you attempt to write to a write-protected tape, the write will fail with an I/O error rather than the message: `this tape is write protected`

Sony AIT/ DEC TZS20 Device Type

There is no device type that matches the Sony AIT (or DEC TZS20) tape drive. The workaround is to select *8mm 5G* as the device type. However, there is a possibility of a loss of data when spanning tapes.

ATL 4/52 with Inventory and Barcoded Tapes

If you attempt to inventory a non-barcoded tape using an ATL4/52 jukebox and answering **yes** to the inventory command query `match barcodes`, the jukebox will reset. The inventory will continue until another non-labelled tape

is found. The workaround is to use only barcoded tapes when "match barcodes" is set to **yes**. Turn off "match barcodes" if non-labelled tapes are used.

Inquire Command Does Not Display Device Pathnames

When you use **inquire** to find device pathnames to use in **jb_config, inquire** does not display the pathnames required. The workaround is to use OS tools to find the pathnames for the devices in question.

Migration Control GUI Does Not Display Information

With NetWorker 5.2 running on DIGITAL UNIX 4.0D or earlier, the nwadmin>Server>Migration Control GUI does not display any information about the migration process when you are migrating data to other media.

This limitation of functionality should be addressed in a future release of NetWorker.

Installing NetWorker Man Pages

Before you can successfully install the NetWorker man pages on your DIGITAL UNIX system, you must have the OSFMAN* subsets and corresponding files installed. If these are not installed, you cannot install the NetWorker man pages. See "Man Page Installation Requirements" on page 49 for more information.

jbconfig Man Page

In NetWorker 5.2, the jbconfig man page follows the 8.3 file naming convention. To access the jbconfig man page, use the following command format:

```
man jbconfig
```

The **jb_config** command itself, however, appears with an underscore. Use the format **jb_config** when you are using the **jb_config** program to configure a silo or jukebox.

Recovering Resource Files with mmrecov

With NetWorker 5.2, the mmrecov command does not perform the recovery correctly. The resource database contents are not recovered correctly to the */nsr/res.R* directory. This should be addressed in a future release of NetWorker.

You can work around this now by recovering the resource database from the volume containing the bootstrap. When the **mmrecov** process is completed, enter the following command:

scanner -v -S *ssidnumber devicename* | uasm -r -v /nsr/res

This command recovers */nsr/res* to its original location. The **uasm** detects that the *nsr.res, nsrla.res, nsrjb.res*, and other files are present. It then prompts you to overwrite and rename the file. Choose either r or R to rename the files.

After the files have been renamed, complete the following steps:

1. Run **nsr_shutdown** to shut down NetWorker.
2. Preserve the current resource file; for example:

   ```
   # mv nsr.res nsr.res.save
   ```

3. Rename the the recovered (.R) resource file; for example:

   ```
   # mv nsr.res.R nsr.res
   ```

4. Start NetWorker by running **nsrd** and **nsrexecd** from the command line.

Index Conversion

If you upgrade from a pre-5.0 NetWorker release, the client's index database will not be created if the defined client was not saved before the upgrade. To fix this, run **nsrck** after the upgrade to create the null index database for non-saved clients. See the **nsrck**(8) man pages for more information.

Contacting DIGITAL

This section describes how to contact DIGITAL for authorization codes or technical support for your NetWorker products.

Registering NetWorker Products

For instructions on how to enable, register, and authorize your NetWorker product, see your Enabler Certificate. To register your NetWorker products and obtain authorization codes, email, fax, or mail your registration form to DIGITAL.

Email: *networker@mail.dec.com*

Fax: (603) 884-3920

Mail: Digital Equipment Corporation
8 Cotton Rd.
Nashua, NH 03063
Attn: Obligation Management

Technical Support

For technical support on NetWorker products, contact your local DIGITAL Customer Support Center. Information about DIGITAL support options and contacts can be found on the web at *www.digital.com/services/mcs/index.htm*.

Chapter 2: Installation Guide

This chapter provides instructions to install NetWorker on a system running DIGITAL UNIX 4.0A or later.

After you install NetWorker, refer to the *Administrator's Guide*, the program's online help, and the manual (man) or reference pages for detailed instructions to configure, administer, and use NetWorker.

If you are upgrading your installation, see "Upgrading Your Installation" on page 40.

What Is Included with NetWorker?

The distribution media contains all the NetWorker software and the online documentation as follows:

- The NetWorker server administration program and the programs used by NetWorker clients for the manual backup and recovery of files.
- Support for additional client connections to clients of the same hardware platform as the NetWorker server.
- Electronic versions of the NetWorker documentation set for UNIX in portable document format (PDF) and the NetWorker man or reference pages. Use Adobe Acrobat Reader to view the NetWorker documentation set online.

The following are optional modules and applications:

- NetWorker Storage Node Module
- NetWorker Autochanger Software Module
- NetWorker Silo Management Module
- NetWorker High Speed Device Support Module (NetWorker, Power Edition only)
- NetWorker Archive Application
- Hierarchical Storage Management (HSM) Application
- NetWorker Cluster Support (NetWorker, Power Edition only)

Your NetWorker software includes all the software you need to install the NetWorker features you purchased, as well as the software required to add new features or upgrade the functionality of NetWorker at a later date.

Your distribution files contain the NetWorker software for a server, storage nodes, and clients of the same hardware platform. If you want to back up data from clients on other operating systems and hardware platforms, contact DIGITAL or your Authorized Reseller to purchase the appropriate version of NetWorker ClientPak™.

Subset Naming Conventions for NetWorker 5.1 and Later Releases

The NetWorker 5.1 release used the following naming conventions for its subsets:

- LGTOCLNT for the client subset
- LGTONODE for the storage node subset
- LGTOSERV for the server subset
- LGTOMAN for the manual pages subset

This release and all future releases include the version number in the subset names. The subset names in this release are:

- BRXCLNT520 for the client subset
- BRXNODE520 for the storage node subset
- BRXSERV520 for the server subset
- BRXMAN520 for the manual pages subset

Upgrading Your Installation

This section includes information required to upgrade an existing NetWorker installation to NetWorker version 5.2

Important: Before you update your NetWorker software to the current release, it is recommended that you complete a successful, full, scheduled backup (not a manual backup) of your server. Updating to the current release is not reversible.

Delete Old NetWorker Subsets

Before you install a new version of NetWorker, you must delete all of your old NetWorker subsets. Use the **setld -d** command to do this. For example:

```
# setld -d subset_name
```

Important: The subsets have dependencies and must be deleted and installed in the correct order. The correct order for deletion is: server, storage node, and then client. The correct order for installation is the reverse of the deletion order. The installation order is: client, storage node, and server. (You can also select All, which deletes and installs the subsets in the correct order.) The manual pages subset has no dependencies. It can be deleted and installed in any order.

If you don't know whether a subset is installed, you can use the **setld -i** command with the **grep** command to find out. For example:

```
# setld -i | grep LGTO
```

If all the subsets from the 5.1 version are installed, you will see a display similar to the following:

```
LGTOCLNT        installed       Legato Networker Client
LGTONODE        installed       Legato Networker Storage Node
LGTOSERV        installed       Legato NetWorker Server
LGTOMAN         installed       Legato Networker Manpages
```

If you want to search for a 4.*x* version, do the following:

```
# setld -i | grep BRX
```

For example, if all the subsets from any of the 4.*x* versions are installed, you will see a display similar to the following:

```
BRXCKIT4XX      installed       NetWorker DIGITAL UNIX Client
BRXRNOTES4XX    installed       NetWorker Release Notes and
                                Documentation
BRXSMAN4XX      installed       NetWorker Server Reference
                                Pages
BRXSOAKIT4XX    installed       NetWorker Server for DIGITAL
UNIX
```

If you attempt to install NetWorker and any previous version is already installed, you will receive an error message. For example, if an earlier client subset from Legato is already installed, you will see a display similar to the following:

```
A version of Legato's NetWorker Client subset is already
installed on the machine hostname. Please use "setld -d"
to delete it before installing this product subset.
```

Likewise if you have a previous DIGITAL version of the client subset installed, you will see a display similar to the following:

```
A version of Digital's Networker Client subset (BRXCKIT*)
is already installed on the client hostname. Please use
"setld -d" to delete it before installing this product
subset.
```

Updating From Versions Prior to Version 4.4

Updates from prior versions of NetWorker for DIGITAL UNIX to NetWorker version 5.2 may require temporary installation of an intermediate version. This is necessary to accomodate changes in the format of NetWorker indexes. Contact your local DIGITAL Customer Support Center (CSC) for more information.

If you are updating from version 3.2 of NetWorker, you must first update to version 4.2b, then update to version 4.4, and finally update to version 5.2.

If you are updating from version 4.2*x* of NetWorker, you must first update to version 4.4, then update to version 5.2.

After you install version 5.2, you must enable NetWorker. See "How to Enable and Register NetWorker" on page 54 for more information.

Install New Subsets

After all earlier subset versions have been deleted, use the **setld -l** option to install new subsets as described in the following sections.

Important: If any earlier NetWorker subsets are installed prior to the 5.2 NetWorker installation, the installation process will not complete successfully.

Existing Indexes Converted to Version 5 Format

If you are upgrading from a previous version of NetWorker for DIGITAL UNIX, the online indexes will be converted to NetWorker version 5 format. The index conversion will take some time; use the messages panel of the main NetWorker administration window to monitor the status of the conversion. To ensure successful conversion, note the following recommendations:

- Back up your indexes before conversion using a full, scheduled backup, not a manual backup. Index conversion is not reversible.
- The conversion process temporarily requires additional free disk space on the drive containing the indexes. Provide about three times the size of your existing indexes.
- Run the **nsrck -X** command to check the consistency of the indexes before the conversion.
- Run the command line utility **nsrls -f** *filename* on the indexes before and after conversion and compare the number of logical records in the index file; the count for the upgraded indexes will be off by one.

Software Installation Roadmap

To install all the NetWorker software subsets during a single session use the All option. Read the sections referenced for each procedure before you install the software:

1. Read the requirements for installation:
   - "Server Installation Requirements" on page 44
   - "Client Installation Requirements" on page 47
   - "Storage Node Installation Requirements" on page 48
2. Install the NetWorker software on the system you want to designate as the server. Check the contents of your distribution CD-ROM. You will find a NetWorker software directory and a documentation directory, which contains all your online documentation files in PDF format.
3. See the following for information to install NetWorker from your CD:
   - "How to Install NetWorker from a Local CD-ROM" on page 51
   - "How to Install NetWorker from a Remote CD-ROM" on page 52

   You must install the subsets in the following order:
   a. The client software subset (*BRXCLNT520*)
   b. The storage node software subset (*BRXNODE520*)
   c. The server software subset (*BRXSERV520)*

You can also install the optional man or reference pages (*BRXMAN520*). The man pages are independent of the other subsets and can be installed or removed at any time.

4. Install the NetWorker *BRXCLNT520* software on the client systems. Unless you purchased a ClientPak enabler, you can only save from clients with the same operating system and hardware platform.
5. If you purchased an enabler for storage node support, install the NetWorker client (*BRXCLNT520*) and storage node (*BRXNODE520*) subsets on the systems that you want to designate as storage nodes.
6. If you are using an autochanger for storage, configure autochanger support and test the autochanger connection. See:
   - "How to Configure Autochanger Support" on page 53.
   - "How to Test the Autochanger Connection" on page 53.

   For more detailed information, refer to the autochanger and silo chapters in the *Administrator's Guide*.
7. Enable and register all of your NetWorker products. See "How to Enable and Register NetWorker" on page 54.

Installation of the PDF files and NetWorker man pages is optional. The man pages can be installed on any DIGITAL UNIX system on your network. The PDF files can be copied to any system on your network where Adobe Acrobat Reader is installed; you can also read them from the CD-ROM.

After NetWorker is installed on the server, storage nodes, and clients, refer to the *Administrator's Guide* for information on how to configure NetWorker for scheduled backups. To use the NetWorker GUI, refer to the online help. Refer to the *NetWorker Disaster Recovery Guide* to learn how to use NetWorker to recover data lost in a system disaster.

Server Installation Requirements

To install NetWorker on a DIGITAL UNIX server, your system must meet the following requirements:

- DIGITAL UNIX version 4.0A or higher must be installed.
- If DIGITAL UNIX 4.0A, 4.0B, or 4.0C is installed, you must also have the DIGITAL patch QAR 36779 for NetWorker installed. See "Patch Needed for NetWorker on DIGITAL UNIX 4.0.C or Earlier" on page 15 for information on downloading this patch.
- The minimum software subsets listed in Table 2 must be installed.

Table 2. Required Server Software

Subset Identifier	Subset Name	Description
OSFBASE405	DIGITAL UNIX Base System	Base operating system software
OSFCLIENT405	Basic Networking Services	Network server communications
OSFNFS405	NFS Utilities	Network server communications
OSFPRINT405	Local Printer Support (Printing Environment)	Support needed to print the bootstrap file and to print information from NetWorker windows that appear in tabular format

Table 3 displays optional software you can also install.

Table 3. Optional Server Software

Subset Identifier	Subset Name	Description
OSFMANOS405	Ref Pages (Admin / User Reference pages)	Reference pages for the base operating system; needed to view the NetWorker reference pages.
CLCMC313	SCSI CAM Media Changer Driver	Device driver required if you have a jukebox.
CLCOP313	SCSI CAM Optical Driver	Device driver required if you have an optical jukebox with a SCSI interface control port. Check the SCSI CAM Layered Components Software Product Description for information on which version of the software to install.

Perform the following steps to determine whether the required subsets are loaded:

1. Log in to the system where you will install NetWorker.
2. Enter the following command:

```
# /usr/sbin/setld -i | grep subset-identifier
```

Check the displayed rows for the name of the relevant subset and any patches. Note that ***subset-identifier*** is the subset name listed in Table 2 or Table 3. The word "installed" appears in a row after the subset identifier when a subset is installed. If the word "installed" does not appear (the second column in a row is blank), the subset or patch is not installed.

In this case, you must load the missing subsets before installing NetWorker. The NetWorker 5.2 subsets on DIGITAL UNIX consist of the client (BRXCLNT520), storage node software (BRXNODE520), server (BRXSERV520), and man or reference pages (BRXMAN520).

You must have the following disk space available, in addition to the software requirements, shown in Table 2 on page 45:

Table 4. Required Server Space

Software/Documentation Files	Directories and Space Requirements (MB)
NetWorker for DIGITAL UNIX Client, Storage Node and Server	*/usr/opt/networker/bin* 73 MB
NetWorker for DIGITAL UNIX Client and Storage Node	*/usr/opt/networker/bin* 60 MB
NetWorker for DIGITAL UNIX Client	*/usr/opt/networker/bin* 45 MB
Man or Reference Pages	*/usr/opt/networker/man* 1 MB
Adobe Acrobat Reader (if required)	(see Adobe installation requirements)
NetWorker Documentation PDF files	4 MB

- A directory on the server large enough for the NetWorker client file indexes, server indexes, and media database (usually */nsr*) must be available. The installation script checks for space and suggests one or more locations for the indexes and media database.
- Enough file space for the client, server, and storage node executables (they are installed in */usr/opt/networker/bin).*
- The system pathname of at least one storage device for use by the NetWorker server to back up and recover files. If the device uses tape, it must be a non-rewind-on-close device.

- A directory with enough space to receive the online NetWorker man pages (installed in */usr/opt/networker/man*), if you elect to install them.
- A directory with enough space to receive the PDF documentation files, if you elect to copy them. If you do not already have Acrobat Reader installed, you need a directory with enough space to install the Acrobat Reader software. You can download the free Acrobat Reader from the Adobe web site at *www.adobe.com*.

The NetWorker software installation script modifies the following system files during the installation process:

- */etc/rpc*
- */etc/syslog.conf*

Client Installation Requirements

To install NetWorker on a DIGITAL UNIX client, the client system must meet the following requirements:

- DIGITAL UNIX version 4.0A or higher must be installed.
- If DIGITAL UNIX version 4.0A, 4.0B, or 4.0C is installed, you must also install the DIGITAL patch QAR 36779 for NetWorker. See "Patch Needed for NetWorker on DIGITAL UNIX 4.0.C or Earlier" on page 15 for information on downloading this patch.
- The minimum software subsets listed in Table 5 must be installed.

Table 5. Required Client Software

Subset Identifier	Subset Name	Description
OSFBASE405	DIGITAL UNIX Base System	Base operating system software
OSFCLINET405	Basic Networking Services	Network server communications
OSFNFS405	NFS Utilities	Network server communications

- You must have 45 MB of disk space in */usr/opt/networker/bin* to successfully install the client.
- To request backup and recovery services from the NetWorker server, NetWorker clients must be able to access the NetWorker software. There are two ways clients can access the NetWorker software:

- Clients can NFS-mount a directory to the remote system where the NetWorker programs are located.
- Clients can have the NetWorker programs installed directly on their local disks.

Important: The PATH environment variable for the user *root* on the NetWorker server and the user on each NetWorker client *must* contain the directory where the NetWorker executables reside (*/usr/opt/networker/bin*).

- If you have clients of the same hardware platform as the NetWorker server, use the same software to install NetWorker on the clients. For clients with different hardware platforms, you need to purchase and install the required client software for that platform separately. Contact DIGITAL or your Authorized Reseller for more information.
- To back up a NetWorker client over the network, the **nsrexecd** daemon must be active on the client.

To add a client to the NetWorker server's list of systems to back up, first install the NetWorker client software appropriate for the client's operating system on the client system. Then, configure a client resource for that system on the NetWorker server. The NetWorker server only provides backup and recovery services to clients with a configured resource on the server. Refer to the **nsr** man page for a comprehensive description of the access control policies employed by the NetWorker server.

Storage Node Installation Requirements

A storage node is a system with a storage device or autochanger attached. The term "autochanger" refers to a device, such as an autoloader, carousel, library, near-line storage, datawheel, or jukebox.

To install NetWorker on a DIGITAL UNIX system designated as a storage node, the system must meet the following requirements:

- DIGITAL UNIX version 4.0A or higher must be installed. You must also install the CLC subsets if a jukebox or optical drive is used.
- If DIGITAL UNIX version 4.0A, 4.0B, or 4.0C is installed, you must also have the DIGITAL patch QAR 36779 for NetWorker installed. See "Patch Needed for NetWorker on DIGITAL UNIX 4.0.C or Earlier" on page 15 for information on downloading this patch.
- At least one storage device must be attached and installed according to the manufacturer's instructions.

- Storage devices must be supported by NetWorker.

  NetWorker supports a variety of media types, including 4 mm, 8 mm, optical disk, digital linear tape (DLT), and disk file. NetWorker also supports a wide variety of devices attached to a NetWorker server or a designated storage node, either as a stand-alone device or in an autochanger or silo tape library.

- To successfully install the storage node, you must first install the NetWorker client. Make sure there is enough free space to install these subsets. The storage node also contains the device driver files, installed in */usr/opt/networker/bin*.

Man Page Installation Requirements

To successfully install the NetWorker man pages you must ensure that the requisite DIGITAL UNIX man page subsets are already installed on the system. The following are the four man page subsets:

OSFMANOS*xxx*

OSFMANOP*xxx*

OSFMANWOS*xxx*

OSFMANWOP*xxx*

Each of the four subsets must be installed on the system. To verify that they are installed, enter the following:

```
setld -i | grep subset
```

If any of the four DIGITAL UNIX man page subsets are not installed on the system, you cannot install the NetWorker man pages.

The man pages are installed in */usr/opt/networker/man* under the directories *man3*, *man5*, and *man8*. Man pages do not have any specific dependency requirements and you can install or remove them independently of the other subsets.

When you install the man pages, the following message is displayed:

```
Please update the MANPATH Environment Variable to include
the path /usr/opt/networker/man
```

You must update the variable to successfully access the man pages.

HSM Filesystem Considerations

HSM for DIGITAL UNIX is an optional module that has a set of polices and functions that move data between different media types and locations, trading storage cost for access time. Information about HSM is included the *Administrator's Guide*.

The following are filesystem considerations for DIGITAL UNIX systems. When using HSM the following filesystems are automatically excluded from migration:

- All files in */user*, */var*, */opt*, and */proc*
- All files that end with *.so*
- All executable files and data files used by NetWorker

You can choose to exclude certain files or groups of files from migration. Consider excluding files based on group ID or user ID. For example:

- Exclude the groups *system, backup, administrator*
- Exclude user root

If you choose to use migration for the *ftp* directory, note the following:

- The client is not required to have HSM capability.
- The user will see symbolic links.

Do not migrate the */var/spool* directory because mail and news are updated too frequently to benefit from migration.

NFS clients cannot migrate files on an NFS-mounted directory. The NetWorker philosophy is that the NFS server should manage file migration on exported storage.

The NFS server is expected to be a NetWorker HSM client and migrates data according to its policies. Therefore an NFS client that is also a NetWorker HSM client cannot migrate files from an NFS-mounted directory.

However, an NFS client may need to recall previously migrated files from an NFS-mounted directory. This is allowed by NetWorker with the following configuration:

- The NFS server must be utilizing a NetWorker HSM server.
- The NFS client must be running the NetWorker HSM client software and be configured as a client to the same NetWorker HSM server as the NFS server.
- The NFS client must have the correct user / group available and have write privileges on the NFS-mounted directory.

- The NetWorker HSM server must list the NFS / NetWorker HSM client as a remote access user.

How to Install NetWorker from a Local CD-ROM

To install NetWorker on a system with a CD-ROM drive attached, follow these steps:

1. Become root on the system where you want to install the NetWorker software.
2. Insert the NetWorker distribution CD-ROM into the drive.
3. Mount the CD-ROM, for example:

   # **mount -r -t cdfs -o rrip /dev/rz4c /mnt**

   where */mnt* is the mount point and */dev/rz4c* is the block device.
4. Check the contents of your distribution CD-ROM. You will find a NetWorker software directory and a documentation directory, which contains all the online documentation files in PDF format.
5. Change directory to the NetWorker software directory, for example:

   # **cd /mnt/kit**
6. Enter the following command to begin the installation:

   # **setld -l .**
7. Select the subsets you want to install, then follow the instructions on the screen to complete the installation.
   - If you are installing the subsets on a server, select BRXCLNT520, BRXNODE520, and BRXSERV520 (in that order). Or select the All option to install all subsets.
   - If you are installing the subsets on a client, select BRXCLNT520.
   - If you are installing the subsets on a storage node, select BRXCLNT520 and BRXNODE520 (in that order).
8. Change directory:

   # **cd /**
9. Enter **umount /mnt** to unmount the CD-ROM.

How to Install NetWorker from a Remote CD-ROM

To install the NetWorker software from a remote CD-ROM drive:

1. Insert the CD-ROM into the drive on the remote system.
2. Mount the CD-ROM:

   # **mount -r -t cdfs -o rrip /dev/rz4c /mnt**

   where */mnt* is the mount point and */dev/rz4c* is the block device.
3. Become root on the system where you want to install the NetWorker software.
4. Mount the remote CD-ROM:

   # **mount -r -t cdfs -o rrip *remote-host*:/dev/rz4c /mnt**
5. Check the contents of your distribution CD-ROM. You will find a NetWorker software directory and a documentation directory, which contains all the online documentation files in PDF format.
6. Change directory to the NetWorker software directory, for example:

   # **cd /mnt/kit**
7. Enter the following command to begin the installation:

   # **setld -l .**
8. Select the subsets you want to install, then follow the instructions on the screen to complete the installation.
   - If you are installing the subsets on a server, select BRXCLNT520, BRXNODE520, and BRXSERV520 (in that order). Or select the All option to install all subsets.
   - If you are installing the subsets on a client, select BRXCLNT520.
   - If you are installing the subsets on a storage node, select BRXCLNT520 and BRXNODE520 (in that order).
9. Change directory:

   # **cd /**
10. Enter **umount /mnt** to unmount the CD-ROM.

How to Configure Autochanger Support

To use an autochanger for NetWorker storage management, you must first use the **jb_config** program to configure the autochanger and test the device driver software you installed. Follow the instructions in this section to configure and test the device driver software on a NetWorker server or storage node with an attached autochanger. For more detailed information, refer to the autochanger chapter in the *Administrator's Guide*.

To configure the autochanger:

1. Become root on the NetWorker server or storage node. If you are working from a storage node, add **root@storage.node** to the administrator's list.
2. Enter the **jb_config** command. If you are working from a storage node, use the **jb_config -s *servername*** command, where ***servername*** is the name of the NetWorker server system.
3. NetWorker displays a list of jukeboxes. When prompted, indicate which jukebox is to be installed.
4. Continue to provide the appropriate responses when prompted by NetWorker. For step-by-step examples of how to configure a SCSI or SJI autochanger, refer to the *Administrator's Guide*.
5. When the configuration is completed, NetWorker displays the message

   ```
   Jukebox has been added successfully.
   ```

When you use the **jb_config** program to configure an autochanger, NetWorker creates a new resource with the name you specified. You can view the new Jukeboxes resource in the NetWorker administration program. Refer to the online help or the **nsr_jukebox**(5) man page for details on the attributes of the Jukeboxes resource.

How to Test the Autochanger Connection

To test the autochanger connection:

1. Become root on the NetWorker server or storage node.
2. Insert two volumes, one each into the first and last slots of the autochanger. Make sure that the drives are empty and that all drive doors are open.
3. Enter the **jbexercise** command at the prompt; specify the control port and the device type.

4. The control port for SCSI autochanger models is typically expressed in the format */dev/scsidev@n.n.n*. You can obtain the exact control port pathname from the response displayed by the **jb_config** command:

   ```
   These are the SCSI Jukeboxes currently attached to your system:

   1) scsidev@1.2.0: DLI Libra Series

   2) scsidev@0.2.1: Quantum DLT/Digital DLT
   ```

   For example, the following command runs the **jbexercise** program on the Quantum DLT/DIGITAL DLT autochanger detected by the **jb_config** command:

   ```
   # jbexercise -c /dev/scsidev@0.2.1 -m "Quantum DLT/Digital DLT"
   ```

See the *Administrator's Guide* or refer to the **jbexercise**(1m) man page for additional information on the command options available for the **jbexercise** command.

Important: After you install, configure, and test the autochanger, enter the enabler code for the NetWorker Autochanger Software Module according to the instructions on your enabler certificate. Be sure to register and authorize the Autochanger Software Module, or the software will disable itself 45 days after you enter the enabler. See "How to Enable and Register NetWorker" on page 54 for instructions.

How to Enable and Register NetWorker

To enable and register NetWorker:

1. Become root on your NetWorker server. Start the GUI version of the NetWorker administration program.

   ```
   # nwadmin &
   ```

2. Open the Server Setup window. Fill in the name, address, phone, and e-mail information requested.
3. Open the Registration window.
4. Select the Create button.
5. Enter your enabler code in the Enabler Code field.

6. Select the Tabular option from the View menu, then select Print from the File menu.
7. Fax or e-mail the output to DIGITAL. The fax number is (603) 884-3920. The e-mail address is **networker@mail.dec.com**.

After you enable NetWorker, you have 45 days to register the software. DIGITAL returns a unique authorization code to you after receipt of your completed registration form. To enable NetWorker permanently, enter the authorization code in the Registration window.

To enable NetWorker, the specific process you must follow depends on whether the NetWorker software you installed is for a new, updated, or evaluation version of the software.

- If you have purchased your *first* NetWorker product, find your Enabler Certificate. You need the enabler code on the certificate to enable and register NetWorker products.
- If you are updating NetWorker and have purchased an update contract, you receive a license that uses enabler and authorization codes with your update. Find the Enabler Certificate; you need the enabler code on the certificate to enable and register NetWorker products.
- If you install version 5.2 and have an existing NetWorker LMF PAK installed, NetWorker will temporarily recognize your existing LMF license. You have until December 31, 1998 to register with DIGITAL and obtain the permanent enabler and authorization codes required to license and use NetWorker beyond that date.
- If you already have the NetWorker server software enabled and want to *evaluate* any of the optional modules included with this software distribution, enter the evaluation enabler code shown in Table 6 for the

product you want to evaluate. After you enter the evaluation enabler, you can evaluate the product with your existing NetWorker server software for 45 days.

Table 6. Evaluation Enabler Codes

NetWorker Product	45-Day Evaluation Enabler Code
Unlimited Slot Jukebox Module	131eea-298758-cb9f4a
Storage Node 1	f57277-ad693a-2917ac
Storage Node 2	75f2f7-2de9ba-a9902c
Storage Node 3	f67378-ac6a3b-2e10af
100 Client Connections	8c8e0e-2b00d1-4023c5
Archive	e76c69-a87b2c-3f8fbe
HSM	d75c59-9e4b1c-0fbf8e

- If you installed the NetWorker server software for *evaluation* purposes, you have 30 days to use the software before you must purchase and enter an enabler code. You do not need to enter enabler codes to evaluate any of the optional NetWorker software products within the 30-day period. To use the NetWorker software beyond the 30-day trial evaluation, you must purchase an enabler code for the software you want to use.
- If you are purchasing a NetWorker cluster server, see “Chapter 3: Installing a NetWorker Cluster Server” on page 61 for cluster server licensing information. See “Registering NetWorker Licenses for Cluster Server Failover” on page 65 for cluster server licensing instructions.

Important: If you move the NetWorker software from one machine to another or change the network address of a machine after the software is installed, you receive a message warning that the software will expire in 15 days. If you need to move your software or reconfigure your network, first contact Customer Support to obtain a *Host Transfer Affidavit* to avoid an interruption in your scheduled backups.

Quick Tour and Test of NetWorker

The NetWorker software includes both a command line interface and a GUI. To learn more about the command line interface, refer to the **nsradmin**(8) man page. Use the GUI for this Quick Tour.

To start the GUI of the NetWorker administration program, enter the **nwadmin** command at the shell prompt:

```
# nwadmin &
```

If NetWorker does not start successfully:

- The required NetWorker daemons, **nsrd** and **nsrexecd**, might not be present. To determine whether the NetWorker daemons are currently present, run the **ps** command at the shell prompt. If the output does not list **nsrd** and **nsrexecd** as current processes, enter **nsrd** and **nsrexecd** at the shell prompt to start the daemons.
- The DISPLAY environment variable might not be set correctly.
- The PATH environment variable might not contain the correct path to the NetWorker programs. The correct path is */usr/opt/networker/bin*. If the PATH environment variable does not contain this path, correct it to this path.

The speedbar buttons displayed in the main window of the GUI provide quick access to the most frequently performed NetWorker administration tasks.

The program's online help is available through the Help menu. You can view a topic that is specific to the window or scroll to another topic of your choice.

The *BRXCLNT520 and BRXNODE520* subsets need to be installed before the server is installed. When *BRXSERV520* is installed the server automatically adds its hostname to the list of NetWorker clients. The program then specifies the save set value All which means all the files are backed up to the server.

To test the software and device connections, you can use the default setup provided by the installation or you can modify the options before you perform the test.

To perform a quick test of the NetWorker software:

1. Insert a volume into the device you configured for NetWorker backups.

   Instructions for using a stand-alone device are provided here. To use a device in an autochanger or silo, use the configuration instructions provided in the *Administrator's Guide*.

2. Select the Label speedbar button to label the volume. NetWorker displays the preconfigured label templates provided for you to use.

3. Click OK to label the volume with the Default label template, which is already selected for you.
4. Select the Mount speedbar button to mount the volume in the drive. Highlight the volume you labeled in step 3 and click OK to mount the volume. If you are working on a stand-alone device, the volume is mounted after you select the Mount speedbar button.
5. Select the Groups option from the Customize menu. The Default group is already configured and highlighted.

   All you need to do to test the group backup is to select the Enabled radio button and then return to the main window.
6. Select the Group Control speedbar button in the main window. The Group Control window appears with the Default group already highlighted. To start the test backup, simply click the Start button.
7. Click the Details button in the Group Control window to view the progress of your test backup. At the same time, messages appear in the panels of the main window as the backup progresses.
8. After the backup is completed, click the Indexes button in the main window to view the client file index entries made for the server during the test backup.

If the test backup was not run successfully, refer to the troubleshooting information in the *Administrator's Guide* to determine the cause.

How to View and Print Electronic Documentation

The NetWorker documentation set includes the *Administrator's Guide*, *Disaster Recovery Guide*, *Power Edition Performance Tuning Guide*, and *Release Supplement and Installation Guide*. The documentation files are in PDF format and are located in the NetWorker documentation directory on the CD-ROM. You can view the documentation directly from the CD-ROM or copy the files onto your system.

Use Adobe Acrobat Reader to view or print PDF versions of NetWorker documentation.

If you do not already have Acrobat Reader installed on your system, it is available for free download at *http://www.adobe.com*.

To print documentation from either the CD-ROM or the installed files, follow these steps:

1. Change directories to the location of the document you would like to print and start Acrobat Reader (UNIX):

   # acroread *file-name*.pdf

2. Select the Print option from the file menu to print all or part of the document.

For a list of Acrobat Reader command line options, enter the following command at the shell prompt:

 # acroread -help

Chapter 3: Installing a NetWorker Cluster Server

NetWorker can be used for backup in a DIGITAL TruCluster™ Available Server Environment (ASE). By installing NetWorker as a highly available application on each node in an ASE, NetWorker will have failover (relocate) capability with the cluster server.

In ASE, NetWorker recognizes a cluster environment during installation and allows you to install NetWorker as either a cluster server or as a non-cluster server. If NetWorker is to run as a cluster server, you must install NetWorker as a cluster server on each cluster member in the ASE.

For this release there are two types of cluster support, *cluster servers* and *cluster clients*. *Clustering* means that two or more nodes share one or more resources. The shared resource is a *virtual machine* with its own IP address. The virtual machine is an ASE Service. A cluster server is a shared resource or virtual machine containing the NetWorker server resources (indexes, */nsr* directories, and tape devices). A cluster client is a shared resource or virtual machine containing a NetWorker client. Nodes on a cluster are physical machines with their own IP addresses.

Cluster servers allow NetWorker to migrate or employ failover between other nodes in the same cluster. Failover allows another node in the cluster to take over the operations from the first node. Failover continues with the last interrupted save set.

A cluster client shares resources mapped to another node in the cluster. Resources are shared among the cluster client members or nodes. A cluster client does not have the failover capabilities of a cluster server.

Support for the cluster server and cluster client is enabled as a Power Edition feature or in evaluation mode. A separate license is required for NetWorker cluster capability. You need to purchase cluster client licenses based on the total number of nodes (physical machines) and shared resources (virtual machines). Cluster client licensing is only available if Power Edition licensing

is enabled. (Power Edition includes three cluster client licenses.) See “Registering NetWorker Licenses for Cluster Server Failover” on page 65 for licensing information.

Installation Requirements

Chapter 2 describes the software and hardware requirements for installing NetWorker. This chapter discusses the additional software and hardware requirements for setting up NetWorker as a highly available application in an ASE.

Software Requirements

In addition to the software requirements (listed in “Chapter 2: Installation Guide”), you must have all of the following software on each cluster member to install NetWorker as a cluster server:

- DIGITAL UNIX Version 4.0D
- DIGITAL TruCluster Version 1.5
- NetWorker Version 5.2
- ASE lib patch from DIGITAL

Hardware Requirements

In addition to the hardware requirements (listed in “Chapter 2: Installation Guide”), you must have the following hardware configuration to install NetWorker on a cluster member server:

- Cluster system running DIGITAL UNIX Version 4.0D and TruCluster Version 1.5 on each cluster member.
- Dedicated disk to be used as the NetWorker storage disk (for the */nsr* directory) connected to a cluster shared bus.

System Information Required

The following table lists the information you will need to set up NetWorker.

Table 7. Required Information

Information Required	Example
Tape service name with IP address in the same subnet as the cluster members.	*goofy, 16.64.96.31*
Tape service mount point.	*/goofy*
Tape service media changer (if required). (See *Important* section below.)	*/dec/mc131*
Tape service one or more devices.	*/dev/nrmt1h, /dev/nrmt2h*
Tape service storage disk.	*/dev/rz130c*
Tape service start action script. (See *Important* section below.)	*/bin/networker.start*
Tape service stop action script. (See *Important* section below.)	*/bin/networker.stop*

Important: The tape service media changer requires the installation of CLC313. The action scripts are installed on */bin* by NetWorker during the installation configuration.

Installation Procedures

This section lists the procedures for setting up and installing NetWorker as a highly available application in an ASE. The steps required include the following:

- Check for factory installed system (FIS) installation.
- Register server and client licenses.
- Install NetWorker.
- Connect the storage devices to the cluster.
- Define NetWorker as a highly available application.
- Configure the NetWorker cluster server.

Installation Examples

In the sections that follow, examples of commands and input are provided. To clarify the procedures, the following sample configuration is used throughout the examples:

- Two cluster nodes:
  - *pluto*: IP address 16.64.96.28
  - *donald*: IP address: 16.64.96.30
- NetWorker tape service: *goofy*: IP address 16.64.96.31
- Share bus: 16
- Shared tape device: TL810 connected to the shared bus
- Media changer: SCSI ID #3
- Four devices on SCSI ID: numbers: 0,1,4,5
- Storage disk on shared bus: SCSI ID #2

Checking for FIS Installation

NetWorker might have been installed on your system at the factory. If so, a FIS would not have been configured for a cluster environment. To determine if you have a NetWorker 4.4 FIS installation, check for the */usr/opt/BRX440/BRXSOAKIT440/fis.file*. If this file exists on any of the cluster members, then NetWorker 4.4 was installed on that system by using the FIS installation process.

If the *fis.file* file exists, use the **setld -d** command to delete the NetWorker 4.4 server subset as follows:

```
# setld -d BRXSOAKIT440
```

Then install the NetWorker 5.2 server subset from your media distribution.

To determine if you have a NetWorker 5.2 FIS installation, check for the */usr/opt/networker/bin/fis.file*. If this file exists on any of the cluster members, then NetWorker 5.2 was installed on that system by using the FIS installation process.

If the *fis.file* file exists, use the **setld -d** command to delete the NetWorker 5.2 server, storage node, and client subsets (in that order) as follows:

```
# setld -d BRXSERV520 BRXNODE520 BRXCLNT520
```

Then reinstall the NetWorker 5.2 subsets from your media distribution.

Registering NetWorker Licenses for Cluster Server Failover

To register in a cluster environment:

1. Be sure you have already defined NetWorker as an ASE tape service (using **asemgr**) and that your NetWorker service is online.
2. Log onto the system running your NetWorker service.
3. Create a file in */nsr/res/hostids* that contains the hostids of all the cluster members, using this syntax: ***hostid1:hostid2:hostid3:...*** For example:

   ```
   20202c9:2020214
   ```

   (To find the hostid values, run the **hostid** command on each cluster member.)
4. Restart the server by taking the tape service offline and then putting it back online, using **asemgr**.
5. Complete the Registration window in **nwadmin** as follows:
   a. Open the main NetWorker administration window using the **nwadmin** command.
   b. Open the Server Setup window and enter the information requested to complete the form. The Name, Address, Phone, and E-mail fields are re quired to successfully register NetWorker.
   c. Open Registration window and select the Create button.
   d. Enter your enabler code in the Enabler Code field.
   e. Select Tabular under the View menu.
   f. Select Print under the File menu and print the registration form.
6. Send the registration form to DIGITAL by fax or e-mail. The fax number is (603) 884-3920. The e-mail address is **networker@mail.dec.com**.

DIGITAL will then send you your authorization codes using your *composite hostid*. (Your composite hostid was created after step 4. It is the hostid that appears in the Registration window in step 5.)

Installing NetWorker in a Cluster

Installing NetWorker in a cluster environment is similar to installing NetWorker in a non-cluster environment, except that when you install NetWorker on a cluster server, NetWorker gives you the option to install NetWorker 5.2 as a NetWorker cluster server if it detects that your system is running the proper software.

If you want to install the NetWorker server as a cluster server, you must install the NetWorker 5.2 software on each cluster member in the same ASE_ID number where the NetWorker server runs. Follow these steps to install NetWorker:

1. Make sure the local */nsr* directory is created on a local disk.
2. Refer to "Chapter 2: Installation Guide" for information about the **setld** command and about mounting media.
3. Refer to "Server Installation Requirements" on page 44 for information on choosing and loading the subsets.
4. During the installation, the following additional message is displayed in an ASE:

```
********* File Configuration on NetWorker Server *******

*********************************************************

This system has the cluster software installed. If this system
is to run as a member of a NetWorker cluster server, make sure
that ase is running. The installation will create this member
local home directory.

*********************************************************

Is this system a member of a NetWorker cluster server? <?
help> [y]:

/nsr not found!

Enter the location for this cluster member NetWorker home
directory (it must sit on a local disk!) [/var/nsr]:
```

5. If you want NetWorker to run as a cluster server, respond **y** to the first query and provide a location for the NetWorker home directory.

   The following is an example of the installation script. Note that except for the **nsrexecd** daemon, the NetWorker server daemons will not start at the conclusion of the installation procedure.

```
# setld -l .

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.
```

```
    1) Digital Networker Basic Client
    2) Digital Networker Driver & Storage Node
    3) Digital Networker Manpages
    4) Digital Networker Server
Or you may choose one of the following options:
    5) ALL of the above
    6) CANCEL selections and redisplay menus
    7) EXIT without installing any subsets
Enter your choices or press RETURN to redisplay menus.
Choices (for example, 1 2 4-6): 5
You are installing the following optional subsets:
     Digital Networker Basic Client
     Digital Networker Driver & Storage Node
     Digital Networker Manpages
        Digital Networker Server
Is this correct? (y/n): y
Checking file system space required to install selected subsets:
File system space checked OK.
4 subset(s) will be installed.
Loading 1 of 4 subset(s)....
This subset may take some time to complete.
Digital Networker Basic Client
   Copying from . (disk)
   Verifying
Loading 2 of 4 subset(s)....
This subset may take some time to complete.
Digital Networker Driver & Storage Node
   Copying from . (disk)
   Verifying
```

```
Loading 3 of 4 subset(s)....
This subset may take some time to complete.
Digital Networker Manpages
   Copying from . (disk)
   Verifying
Loading 4 of 4 subset(s)....
This subset will take some time to complete.
Digital Networker Server
   Copying from . (disk)
        Working....Fri Apr 3 15:12:25 PST 1998
   Verifying
4 of 4 subset(s) installed successfully.
Configuring "Digital Networker Basic Client" (BRXCLNT520)
Digital Networker Basic Client
Licensed to Digital Equipment Corporation, Maynard,
Massachusetts
Copyright (c) 1990 -1998, Legato Systems, Inc. All Rights
Reserved
************ File Configuration on NetWorker Client ***********
/nsr not found!
Enter the location for this Client's NetWorker home directory
(it must sit on a local disk!) [ /var/nsr ]:
The installation procedure adds entries to the /etc/rpc and
/etc/syslog.conf files on the NetWorker server; the original
files are renamed and saved. The installation also creates
the /sbin/init.d/NSRstartstop file.
Do you wish to continue? (y/n) [ y ]:
Modifying /etc/rpc
Modifying /etc/syslog.conf
* * * Restarting syslog daemon * * *
```

```
Do you wish to remove the saved files? (y/n) [ n ]:
The modified files were saved and renamed as follows:
File                 Location of saved file
----                 ----------------------
/etc/rpc            /etc/rpc_nsrsave
/etc/syslog.conf   /etc/syslog.conf_nsrsave
Creating /sbin/init.d/NSRstartstop
Starting nsrexecd...
 The nsr/res/servers file will need to be updated with
 the list of servers that will back up this system as
 as a client.
 This is also needed if this machine is to be used
 as an HSM client.
 /nsr/res/servers file does not exist..
 Do you wish to create the file? (y/n):n
*****************************************
Please create the /nsr/res/servers file
and manually edit it with the list of
remote backup servers
*****************************************
BRXCLNT520 software installed successfully
The Digital NetWorker Client version 520 binaries have been
installed in /usr/opt/networker/bin. Please update the PATH
environment variable to include /usr/opt/networker/bin.
************************************************************
Configuring "Digital Networker Driver & Storage Node"
(BRXNODE520)
Digital Networker Driver & Storage Node
Licensed to Digital Equipment Corporation, Maynard,
Massachusetts
```

```
Copyright (c) 1990 -1998, Legato Systems, Inc. All Rights
Reserved

Starting nsrexecd...

BRXNODE520 software installed successfully

The Digital NetWorker Storage Node version 520 binaries have been
installed in /usr/opt/networker/bin. Please update the PATH
environment variable to include /usr/opt/networker/bin.
************************************************************

Configuring "Digital Networker Manpages" (BRXMAN520)

Digital Networker Manpages

Licensed to Digital Equipment Corporation, Maynard,
Massachusetts

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Reserved

BRXMAN520 software installed successfully

The Manpages are installed in the following locations:

 /usr/opt/networker/man/man3

 /usr/opt/networker/man/man5

 /usr/opt/networker/man/man8

Please update the MANPATH environment variable to include the
path

/usr/opt/networker/man.
************************************************************

Configuring "Digital Networker Server" (BRXSERV520)

Digital Networker Server

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Massachusetts

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Reserved

************ File Configuration on NetWorker Server ***********

************************************************************
```

```
This system has the cluster software installed. If this system
is to run as a member of a NetWorker cluster server, make sure
that ase is running. The installation will create this member
local home directory.
************************************************************

Is this system a member of a NetWorker cluster server? <?
help>[y]: y

Starting nsrexecd...

************************************************************

Please refer to the TruCluster Production Server Software
Documentation Version 1.5 for information on

        - how to define a highly available application

        - how to install and setup shared tapes hardware

        - how to define a cluster tape service

Please refer to the 'Digital NetWorker for DIGITAL UNIX Version
5.2 Release Supplement and Installation Guide' for instructions
on: Setting up NetWorker 5.2 as a NetWorker Cluster Server.
************************************************************

BRXSERV520 software installed successfully

The Digital NetWorker Server version 520 binaries have been
installed in /usr/opt/networker/bin. Please update the PATH
environment variable to include /usr/opt/networker/bin.
************************************************************

# exit
```

6. On each node, modify the */nsr/res/servers* file by adding each cluster member and NetWorker tape service name.
7. Restart **nsrexecd** on each node.

Connecting Storage Devices to the Cluster

Refer to the TruCluster, DIGITAL UNIX, and device documentation for instructions on connecting the NetWorker storage disk and tape devices to the cluster shared bus.

If you are using a jukebox, you must install the CLC313 kit and create the media changer special device on each cluster member. Also, make sure that the special device files created in the */dev* directory for each device have the same name on each cluster member.

If you configure a jukebox on a cluster member and the device is not shared among the members, the jukebox must be defined as a remote device. To do this, use **jb_config** on the member where the jukebox is attached. Use the prefix **rd=*hostname*:** to respond to the **jb_config** prompts for name, control port, and devices. (The hostname is the physical hostname of the cluster member.)

In the following example, the **scu** command reports the shared disk, media changer, and four tape devices in the TL810 connected to the example cluster shared bus (16):

```
root@pluto[1]> scu show edt lun 0
CAM Equipment Device Table (EDT) Information:
Device: RZ28 Bus: 0, Target: 0, Type: Direct Access
Device: RZ28 Bus: 0, Target: 1, Type: Direct Access
Device: RZ28 Bus: 0, Target: 2, Type: Direct Access
Device: RZ28 Bus: 0, Target: 4, Type: Direct Access
Device: RZ28 Bus: 0, Target: 5, Lun: 0, Type: Sequential Access
Device: RRD43 Bus: 0, Target: 6, Lun: 0, Type: Read-Only Direct
Access
Device: TZ88 Bus: 16, Target: 0, Lun: 0, Type: Sequential Access
Device: TZ88 Bus: 16, Target: 1, Lun: 0, Type Sequential Access
Device: RZ28 Bus: 16, Target: 2, Lun: 0, Type Direct Access
Device: TL810 Bus: 16, Target: 3, Lun: 0, Type: Medium Changer
Device: TZ88 Bus: 16, Target: 4, Lun: 0, Type: Sequential Access
Device: TZ88 Bus: 16, Target: 5, Lun: 0, Type Sequential Access
Device:  Bus: 16, Target: 7, Lun: 0, type Processor
```

The corresponding special file names for each device on the example cluster node, *pluto*, were created with the following names:

```
root@pluto{2}> file /dev/nrmt*h
/dev/nrmt1h: character special (9/262147) SCSI #16 TZ88 tape #7
(SCSI ID #0)
   (SCSI LUN #0) errors = 0/81 62500_bpi
/dev/nrmt2h: character special (9/263171) SCSI #16 TZ88 tape #8
(SCSI ID #1)
   (SCSI LUN #0) errors = 0/17 offline
/dev/nrmt3h: character special (9/266243) SCSI #16 TZ88 tape #11
(SCSI ID #4)
   (SCSI LUN #0) errors = 0/10 offline
/dev/nrmt4h: character special (9/267267) SCSI #16 TZ88 tape #12
(SCSI ID #5)
   (SCSI LUN #0) errors = 0/10 offline
```

On the Example cluster node, *donald*, the names are the same, as follows:

```
root@donald[2]> file /dev/nrmt*h
/dev/nrmt1h: character special (9/262147) SCSI #16 TZ88 tape #7
(SCSI ID #0)
   (SCSI LUN #0) errors = 0/81 62500_bpi
/dev/nrmt2h: character special (9/263171) SCSI #16 TZ88 tape #8
(SCSI ID #1)
   (SCSI LUN #0) errors = 0/17 offline
/dev/nrmt3h: character special (9/266243) SCSI #16 TZ88 tape #11
(SCSI ID #4)
   (SCSI LUN #0) errors = 0/10 offline
/dev/nrmt4h: character special (9/267267) SCSI #16 TZ88 tape #12
(SCSI ID #5)
   (SCSI LUN #0) errors = 0/10 offline
```

After you have created the NetWorker tape service, the **file** command will display the previous output only on the node currently running the tape service. This is because the devices are then reserved for that node and the **file** command is not allowed to get information from any other node.

Defining NetWorker as a Highly Available Application

The TruCluster Available Server administration document includes detailed information about how to define a highly available application and set up a shared tape service for general applications. Refer to that document for general information.

This section includes specific instructions for defining NetWorker as a highly available application and setting up a NetWorker shared tape service. The steps in this section instruct you how to create the NetWorker tape service and verify the shared device and tape services.

To define NetWorker as a highly available application in an ASE, complete each of the following steps:

1. On each cluster member, add the NetWorker tape service name to the */etc/hosts* file.
2. Create the NetWorker tape service by running the ASE **asemgr** utility and doing the following:
    a. Select Managing ASE Services from the ASE Main Menu. Then select Service Configuration followed by Add a New Service.
    b. Add a Tape service from the Adding a Service menu. Assign a name to the tape service and an IP address. The name assigned to the tape service must also be used to identify the mount point in step f below.
    c. Specify tape information to define the tape storage for the tape service.
    d. Enter a special file name for the media changer (if applicable).
    e. Specify disk information to define the disk storage for the tape service.
    f. Identify the mount point of the directory on which the NetWorker tape service will be mounted. The mount point name must be the same as the name assigned to the tape service in Step b above.
    g. Enter read / write and quota management information.
    h. Define the Start Action user-defined script for the tape service. From the menu, select Add a Start Action script. Enter the full pathname of the start action script: */bin/networker.start*. The start action script argument must have the same name as the tape service specified in Step b.

i. Define the Stop Action user-defined script for the tape service. Select Add a Stop Action script from the menu. Enter the full pathname of the stop action script: */bin/networker.stop*. The stop action script argument must have the same name as the tape service specified in step b.

j. Select the preferred policy under the menu for Selecting an Automatic Service Placement Policy.

k. Select Quit when all choices are complete.

The following script example shows how to create the NetWorker tape service:

```
root@pluto[1]> asemgr
TruCluster Production Server (ASE)
     ASE Main Menu
a) Managing the ASE          -->
m) Managing ASE Services    -->
s) Obtaining ASE Status      -->
x) Exit                              ?) Help
Enter your choice: m
   Managing ASE Services
c) Service Configuration    -->
r) Relocate a service
on) Set a service on line
off) Set a service off line
res) Restart a service
s) Display the status of a service
a) Advanced Utilities      -->
q) Quit (back to the Main Menu)
x) Exit                              ?) Help
Enter your choice [q]: c
   Service Configuration
a) Add a new service
m) Modify a service
```

```
o) Modify a service online
d) Delete a service
s) Display the status of a service
c) Display the configuration of a service
q) Quit (back to Managing ASE Services)
x) Exit                                 ?) Help
Enter your choice [q]: a

    Adding a service

Select the type of service:
1) NFS service
2) Disk service
3) User-defined service
4) Tape service
q) Quit without adding a service
x) Exit                                 ?) Help
Enter your choice [1]: 4

You are now adding a new tape service to your ASE.

A tape service consists of one or more tape devices, zero
or more media changer devices, and an optional disk
configuration that are failed over together. The disk
configuration can include UFS filesystems, AdvFS filesets,
LSM volumes, or raw disk information.

    Tape Service Name

The name of a tape service must be a unique service name
within this ASE. Optionally, an IP address may be assigned
to a tape service. In this case, the name must be a unique
IP host name set up for this service and present in the
local hosts database on all ASE members.

Enter the tape service name (‘q’ to quit): goofy

Assign an IP address to this service? (y/n): y

Checking to see if goofy is a valid host...

    Specifying Tape Information
```

Enter one or more character device special files to define the tape storage for this service.

For example:

Rewind on close, high density: /dev/rmt0h

No rewind on close, medium density: /dev/nrmt1m

To end the list, press the Return key at the prompt. To quit, enter ‘q’.

Enter a tape special file name (press ‘Return’ to end):
/dev/nrmt1h

Enter a tape special file name (press ‘Return’ to end):
/dev/nrmt2h

Enter a tape special file name (press ‘Return’ to end):
/dev/nrmt3h

Enter a tape special file name (press ‘Return’ to end):
/dev/nrmt4h

Enter a tape special file name (press ‘Return’ to end):

Specifying Media Changer Information

Enter zero or more character device special files to define the media changers for this service.

For example: /dev/mc16

To end the list, press the Return key at the prompt. To quit, enter ‘q’.

Enter a media changer special file name (press ‘Return’ to end):

/dev/mc131

Enter a media changer special file name (press ‘Return’ to end):

Specifying Disk Information

Enter one or more device special files, AdvFS filesets, or LSM volumes to define the disk storage for this service.

For example: Device special file: /dev/rz3c

AdvFS fileset: domain1#set1

LSM volume: /dev/vol/dg1/vol01

To end the list, press the Return key at the prompt.

Enter a device special file, and AdvFS fileset, or an LSM volume as storage for this service (press ‘Return’ to end): **/dev/rz130c**

Mount Point

The mount point is the directory on which to mount ‘/dev/rz130c’.

If you do not want it mounted, enter “NONE”.

Enter the mount point or NONE: **/goofy**

UFS File System Read-Write Access and Quota Management

Mount ‘/dev/rz130c’ file system with read-write or read-only access?

1) Read-write

2) Read-only

Enter your choice [1]: **1**

You may enable user and group quotas on this file system by specifying full path names for the quota files. If you place the files within the service’s file systems, the quota assignments you make with edquota will relocate with the service. Enter “none” to disable quotas.

User quota file [/goofy/quota.user]:

Group quota file [/goofy/quota.group]:

UFS Mount Options Modification

Enter a comma-separated list of any mount options you want to use for ‘/dev/rz130c’ (in addition to the UFS-specific defaults listed in the mount.8 reference page). If none are specified, only the default mount options are used.

Enter options (Return for none):

Specifying Disk Information

Enter one or more device special files, AdvFS filesets, or LSM volumes to define the disk storage for this service.

For example: Device special file: /dev/rz3c

AdvFS fileset: domain1#set1

```
            LSM volume:          /dev/vol/dg1/vol01
To end the list, press the Return key at the prompt.
Enter a device special file, an AdvFS fileset, or an LSM
volume as storage for this service (press ‘Return” to end):
Modifying user-defined scripts for ’goofy’:
   1) Start action
   2) Stop action
   3) Add action
   4) Delete action
   x) Exit - done with changes
Enter your choice [x]: 1
Modifying the start action script for ‘goofy’:
   a) Add a start action scrip
    ) Edit the start action script
    ) Modify the start action script arguments []
    ) Modify the start action script timeout [60]
    ) Remove the start action script
   x) Exit - done with changes
Enter your choice [x]: a
Enter the full pathname of your start action script or
“default” for the default script (x to exit):
/bin/networker.start
Enter the argument list for the start action script
(x to exit): goofy
Enter the timeout in seconds for the start action script
[60]: 300
Modifying the start action script for ‘goofy’:
   f) Replace the start action script
   e) Edit the start action script
   g) Modify the start action script arguments [goofy]
```

```
   t) Modify the start action script timeout [300]
   r) Remove the start action script
   x) Exit - done with changes
Enter your choice [x]:
Modifying use-defined scripts for ‘goofy’:
   1) Start action
   2) Stop action
   3) Add action
   4) Delete action
   x) Exit - done with changes
Enter your choice [x]: 2
Modifying the start action script for ‘goofy’:
   a) Add a start action scrip
    ) Edit the start action script
    ) Modify the start action script arguments []
    ) Modify the start action script timeout [60]
    ) Remove the start action script
   x) Exit - done with changes
Enter your choice [x]: a
Enter the full pathname of your stop action script or
“default” for the default script (x to exit):
/bin/networker.stop
Enter the argument list for the stop action script (x to
exit): goofy
Enter the timeout in seconds for the stop action script
[60]: 300
Modifying the stop action script for ‘goofy’:
   f) Replace the stop action script
   e) Edit the stop action script
   g) Modify the stop action script arguments [goofy]
```

```
   t) Modify the stop action script timeout [300]
   r) Remove the stop action script
   x) Exit - done with changes
Enter your choice [x]:
Modifying user-defined scripts for ‘goofy’:
   1) Start action
   2) Stop action
   3) Add action
   4) Delete action
   x) Exit - done with changes
Enter your choice [x]:
   Selecting an Automatic Service Placement (ASP) Policy
Select the policy you want ASE to use when choosing a
member to run this service:
   b) Balanced Service Distribution
   f) Favor Members
   r) Restrict to Favored Members
                                        ?) Help
Enter your choice [b]:
   Selecting an Automatic Service Placement (ASP) Policy
Do you want ASE to consider relocating this service to
another member if one becomes available while this service
is running (y/n/?): y
Enter ‘y’ to add Service ‘goofy’ (y/n): y
Adding service...
Starting service...
Service goofy successfully added...
      Service Configuration
   a) Add a new service
   m) Modify a service
```

```
   o) Modify a service online
   d) Delete a service
   s) Display the status of a service
   c) Display the configuration of a service
   q) Quit (back to Managing ASE Services)
   x) Exit                                ?) Help
Enter your choice [q]: x
```

To verify that the NetWorker service can successfully relocate from one cluster to another, you can attempt a manual relocation. Refer to the TruCluster documentation for information on how to do this.

3. To determine the name of the cluster member that is currently running the NetWorker service, use the **asemgr -d** command. The following example indicates that the tape service, goofy, is running on *pluto*:

```
root@pluto asemgr -d
   Level of ASE logging:
Informational (log everything)
   Location of Logger(s)
The following member(s) are logging ASE information:
mcpluto
mcdonald
   Member Status
Member:      Host Status:     Agent Status:
mcpluto      UP               RUNNING
mcdonald     UP               RUNNING
   Service Status
goofy on mcpluto
```

4. Run the **asemgr -d -v** command to verify that the NetWorker tape service definition completed successfully. The following is an example of the verification command output:

```
root@pluto asemgr -d -v service_name
   Status for TAPE service 'goofy'
```

```
Status:      Relocate:     Placement Policy:  Favored
Member(s):
on mcpluto     yes         Balance Services   None
   Storage configuration for TAPE service 'goofy'
Tape devices
/dev/nrmt1h
/dev/nrmt2h
/dev/nrmt3h
/dev/nrmt4h
Media changer devices
/dev/md131
Mount Table (device, mount point, type, options)
/dev/rz130c /goofy advfs rw,groupquota,userquota
```

5. Use the **scu** command to verify the share devices reservations. In the following example, the NetWorker tape service, goofy, is running on the cluster node, *pluto*. The **scu** command is used to verify device reservation for */dev/nrmt1h*. The **scu** and **tur** commands return the following error for cluster node *donald* because this device is reserved by cluster node *pluto*:

```
root@pluto[1]> scu
scu> set nexus b 16 t 0 1 0
Device: TZ88, Bus: 16, Target: 0, Lun: 0, Type:
Sequential Access
scu> tur
root@donald[14]> scu
scu> set nexus b 16 t 0 1 0
Device: TZ88, Bus: 16, Target: 0, Lun: 0, Type:
Sequential Access
scu> tur
scu: 'test unit ready' failed, EIO (5) - I/O error
scu>
Note: Media changer devices are not reserved
```

Configuring the NetWorker Cluster Server

After NetWorker is installed on the cluster servers, you must complete the installation by running the Installation Verification Procedure (IVP) and configuring the servers. To do so, do the following:

1. Log in to the cluster member that is running the NetWorker tape service.
2. Run the IVP to verify that the software is available on your NetWorker server as follows:

   # setld -v *subsetname*

   Then you can modify the */etc/hosts* file to add the name *nsrhost* as an alias to the official host name of the NetWorker server. This ensures that NetWorker will attempt to connect to the designated NetWorker server.
3. From the NetWorker **nwadmin** GUI Server window, go to Server Setup and add any cluster member not already listed in the server administrator attribute.
4. Edit or create the */nsr/res/servers* file to add the NetWorker tape service and each cluster member to the list of servers allowed to back it up.
5. Go to the Savegroup window on the NetWorker **nwadmin** GUI to define a savegroup. Under Details, enable the autorestart attribute. You will see the following differences in the NetWorker cluster server setup:
   a. The NetWorker cluster server will take the identity of the NetWorker tape service regardless of which cluster member is currently running the NetWorker service.
   b. The first time NetWorker runs, it creates the client resource for the NetWorker tape service. Client resources need to be created manually for any cluster member to be backed up by the NetWorker tape service.
   c. If you are using an enabler code, enter it in the Registration window. If an authorization code is being used, you need to define the hostids in */nsr/res/hostids*. Follow the steps in “Registering NetWorker Licenses for Cluster Server Failover” on page 65 to define your hostids and to complete your registration.
   d. Add all cluster member hostnames to the server’s remote access list.

Important: Only save sets that are part of a savegroup with the Autorestart attribute enabled will be restarted after the NetWorker tape is relocated.

e. The server's save set value **All** *must* be changed to the NetWorker tape service mountpoint. For the example configuration listed on page 64, the server save set attribute should be changed to */goofy*.

Migrating a NetWorker Server to a Cluster Server

When a system that is already running NetWorker is a member of a cluster and is to be upgraded to NetWorker 5.2 so that it can run as a cluster server, you must install NetWorker 5.2 as a *cluster server*. To migrate the existing server indexes, media database, and resource file, follow the installation steps in this section.

Important: You can migrate a non-cluster NetWorker server to a NetWorker cluster server only if the NetWorker storage device used on the existing server is one of the devices supported for cluster server failover.

Follow these steps to migrate the non-cluster NetWorker server to a NetWorker cluster server:

1. Remove the old NetWorker server using the **setld -d** command. Do not remove the old *nsr* directory.
2. Preserve the link to the old *nsr* directory (located on the old server local disk) by entering the following:

   # **mv /nsr /nsr.old**

3. Follow the instructions at the beginning of this chapter to install and configure NetWorker 5.2 as a cluster server. This includes connecting the NetWorker shared storage and the shared dedicated disk to a shared bus in the cluster.
4. Make sure NetWorker is running on the cluster node where the old *nsr* directory is located. If not, relocate the tape service to accomplish this.

5. On the cluster node running the NetWorker tape service as root, do the following:
   a. Stop all NetWorker activity using the **nsr_shutdown** command.
   b. Remove the default resources that were created when the NetWorker tape service was defined. Enter the following:
      # **rm -rf /nsr/***
6. Migrate the indexes, media database, and resource files from the old server to the NetWorker cluster server *nsr* directory, now located on a shared disk, by following these steps:
   a. Create a NetWorker directive file (for example, */tmp/directive*) on your source system. Enter these lines in the file:

```
<</>>
forget
ignore
+skip: core
+skip: db. *
```

   b. Change to your */nsr* directory and use the **uasm** command to move the files from one directory to the other.
      # **cd /nsr.old**
      # **uasm -s -f /tmp/directive . | (cd /nsr; uasm -rv)**

   After migrating your indexes and editing the resource files, start NetWorker on the new server. Also, you must configure all the devices, including any jukeboxes, for the new server.
7. Take the NetWorker tape server offline and then put it back online. NetWorker takes the identity of the NetWorker tape service.
8. Remove any old device and jukebox resources and reconfigure them to reflect their new location on the shared bus.

Relocating the NetWorker Service

Each time the NetWorker tape service is relocated, whether manually due to a system crash or automatically due to ASE placement policy enforcement, the ASE software will shut down all the NetWorker daemons on the cluster member running the NetWorker tape service. It will then restart **nsrexecd** on that system.

Then it will relocate the NetWorker service to the assigned cluster member. The */nsr* link will be redefined to point to the NetWorker tape service shared disk: */nsr -> /tape_service_name/nsr*. Using the previous cluster example, the link to the */nsr* directory is as follows:

- On the cluster member running the NetWorker service:

  /nsr->/goofy/nsr

  /nsr.NetWorker.local->/var/nsr

- On each cluster member not running the NetWorker service:

  /nsr->/nsr.NetWorker.local

  /nsr.NetWorker.local->/var/nsr

ASE will not relocate the NetWorker service if it cannot access any of the NetWorker tape service devices or if the storage disk is busy (which could happen if a user has changed to a directory on that filesystem).

Shutting Down/Restarting the Cluster Server

To shut down the NetWorker daemon on the cluster server, you must take the NetWorker tape service offline by running the ASE **asemgr** command. This cleanly stops all NetWorker activity.

To manually restart the NetWorker daemons on a cluster server, set the NetWorker tape service online by running the ASE **asemgr** command.

Deinstalling the Cluster Server Subset

Before deinstalling the cluster server subset, take the NetWorker tape service offline to stop the NetWorker daemons and any NetWorker activity. If the NetWorker daemons are running, the NetWorker server subset will not be deinstalled.

To deinstall the server subset on a cluster member, follow these steps:

1. Take the NetWorker service offline using the **asemgr** command.
2. Remove the subsets for the server, storage node, and client (in that order) with the **setld -d** command.

If you do not stop the NetWorker daemons before attempting to deinstall the software, you will receive an error message.

Reinstalling the Cluster Server Subset

To reinstall the server subset on a cluster member, follow these steps:

1. Take the NetWorker service offline using the **asemgr** command.
2. Remove the NetWorker server subset using the **setld -d** command
3. Reinstall the NetWorker server subset.
4. Define the current NetWorker start and stop scripts to ASE using the **asemgr** command.
5. Put the NetWorker service back online using the **setld -l** command.
6. Put the NetWorker tape service back online using the **asemgr** command.

Making a Cluster Member a Client of the NetWorker Cluster Server

When you install the NetWorker 5.2 software on a cluster member, the installation creates the */nsr* link to point to a local disk. It also creates a second link to the local NetWorker directory named *nsr.NetWorker.local*. For example, if the local NetWorker directory was created in */var/nsr*, after the installation, each client member will have the following links:

- */nsr->/nsr.NetWorker.local*
- */nsr.NetWorker.local->/var/nsr*

To make a cluster member a NetWorker client of the NetWorker cluster server, follow these steps:

1. Using the **nwadmin** GUI, use the Client Setup under Clients to add the cluster member as a client of the NetWorker server.
2. Add the IP name for this cluster member's cluster interconnect to its remote access attribute list. For example, add **root@mcdonald.com** to *donald's* client resource.
3. Add each cluster member to the server resource remote access list.

Chapter 4: Save Set Consolidation

This chapter describes the save set consolidation feature of NetWorker. Consolidation is a new backup type. This backup type merges the incremental backups with the last full backup of a save set to create a new backup. This new backup is the same as a full backup. Therefore you will not need to perform a full backup over the network on a regular basis. You will only need to perform a full backup over the network the first time. The DIGITAL server supports save set consolidation for any client regardless of platform type.

The save set consolidation is time-driven as opposed to event-driven. To use save set consolidation, select the consolidated backup option from the Schedules menu. The letter “c” denotes this newly created consolidated type.

You can indirectly invoke a consolidated backup immediately by changing the scheduled backup today to be consolidated and starting a save group backup. New schedule templates, such as *Consolidate on 1st of month*, *Consolidate Every Friday*, and *Consolidate on First Friday of Month*, are created.

If a save set consolidation operation fails, NetWorker will resort to a full backup. There are some limitations to the consolidation process:

- Raw disk file partitions are not eligible for consolidation because incremental backups are not possible on these filesystems.
- Database systems cannot be consolidated.
- Renamed directories cannot be consolidated.
- Deleted directories are not supported for any non-UNIX client.
- You can only administer the save set consolidation server with an **nwadmin** release that includes the save set consolidation feature.

Hardware Requirements

Save set consolidation requires at least two attached tape drives. For better performance, it is recommended that you have three or more tape drives available for consolidated backups.

When to Use Save Set Consolidation

Save set consolidation gives servers the ability to leverage off previously backed-up data to create new full backups. The main benefit is a reduction of network traffic because clients do not send the entire full backup over the network. Rather, they send a small level 1 backup. The server then consolidates the most recent full backup with the new level 1 backup.

You should use save set consolidation if you have the following conditions:

1. A client is at a remote location and data transfer over the network to the server is a performance issue for either the network or the client.
2. Network bandwidth is small or large backups over the network are cost-prohibitive.
3. You need large filesystems backed up and the incremental data is small.
4. The server has the necessary resources (a minimum of two tape drives and preferably three tape drives) and the cycles to consolidate full backups locally.

Do not use save set consolidation if you have any of the following conditions:

1. The client is connected to the server over a fast network or is a local client, and the network data traffic generated by full backups is not a problem.
2. The filesystems being backed up are not very large or contain a large number of small files that are modified often.
3. The incremental data usually contains a large amount of data, and the number of files changed since the last full backup is large compared to the total number of files in the filesystem.
4. It is cost-prohibitive to allocate three (or the minimum of two) tape drives for the exclusive use of the server while it consolidates the full backup.

Important: Save set consolidation should not be regarded as a performance improvement without considering the above conditions. If used inappropriately, save set consolidation could lower performance since it uses tape-to-tape transfer, which might be slower than the disk-to-tape data transfer used by backups. However, in the appropriate circumstances, save set consolidation can be used to free network bandwidth and client resources if these are performance issues.

Consolidated Backup

The following example and steps show how consolidated backup works:

1. The administrator sets the schedule for consolidated backup. For example, to establish a weekly schedule starting with a consolidated full, and the other six days having incrementals, you would use cIIIIII.
2. The first backup of the new save set is a regular full backup, not a consolidated full. Following the example in Step 1, the first day of the week would be a regular full backup.
3. In this example the second week's backup would be a consolidated full schedule. The NetWorker server gives priority to any regular backup and restore jobs. Once they are complete, NetWorker begins a consolidated backup and runs it to completion.
4. For the consolidated backup process, the NetWorker server initially requests the client to perform an incremental backup. This incremental backup encompasses the file changes between the current time and the last incremental save time.
5. When the incremental backup is completed, the consolidated backup process browses the index entries for changed files in the incremental sessions. A list of changed files (new, modified, or deleted) and their corresponding save set / volume information is built. This list is used to find which files to extract and volumes to mount for consolidation. (A consolidation occurs once a week. You can only recover files from the most recent save after a consolidation happens.)
6. The consolidated full backup removes deleted files and directories (rather than generating a full save set that contains deleted files and directories).
7. After the list is built, the NetWorker server allocates three tape drives for the consolidated backup operation. The server then mounts the tape with the last full backup and the destination tape. The server processes all the

files on the list. If a file has not changed since the last full backup, the file will be extracted from the last full tape and stored on the destination tape. If the file has been changed since the last full backup, the appropriate volume containing the file will be mounted and the file will be extracted and stored on the destination tape.

Important: Even if a consolidated backup cannot be completed because of a system crash, tape drive errors, or other problem, data integrity is ensured. The consolidated backup will be aborted. The transactional log assists save set consolidation in putting back changes made to the catalog. In most instances, NetWorker only makes catalog changes when data has been written to tape.