Legato NetWorker®

Disaster Recovery Guide

Release 6.1

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Preface

The *Legato NetWorker Disaster Recovery Guide, Release 6.1* contains information on how to prepare for a disaster before one strikes and how to recover from a disaster.

Using the NetWorker software to back up your data is the first step in a disaster recovery program. The next step is deciding how to recover your data after a disaster.

Audience

The information in this guide is intended for the following audiences:

- System administrators who perform backup and recovery procedures, and maintain the safety of the data located over a network
- Managers who want to learn how to implement a disaster recovery program
- Users who are responsible for implementing disaster recovery plans and procedures

Product Documentation

Legato offers an extensive archive of product documentation at its web site *www.legato.com*. Most of the documents are in Adobe® Acrobat® Portable Document Format (PDF), and can be viewed by downloading and installing the Adobe Acrobat Reader. The Reader is available in the */viewers/acroread* directory on the Legato Documentation Suite CD-ROM, or directly from Adobe at *www.adobe.com*. To install and use the Reader on the platform of your choice, refer to the instructions in the CD-ROM's */viewers/acroread/readme.txt* file or at the Adobe web site.

Conventions

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

Convention	Indicates	Example
boldface	Names of DOS or UNIX line commands, daemons, options, programs, or scripts	The **nsradmin** command starts the command line version of the administration program.
italic in text	Pathnames, filenames, computer names, new terms defined in the Glossary or within the chapter, or emphasized words	Displayed messages are also written to */nsr/logs/daemon.log*.
italic in command line	A variable that you need to provide in the command line	`nwadmin -s` *server-name*
`fixed-width`	Examples and information displayed on the screen	`media waiting: recover waiting for 8mm 5GB tape volume name`
`fixed-width, boldface`	Commands and options that you must type exactly as shown	**`nsr_shutdown -a`**
Menu_Name> Command	A path or an order to follow for making selections in the GUI	Volume>Change Mode>Appendable
Important:	Information that you must read and follow to ensure successful backup and recovery of your data	⚠ **Important:** You must install the NetWorker Module software in the same directory where you installed the NetWorker client binaries.

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Chapter 1: Introduction

The *Legato NetWorker Disaster Recovery Guide, Release 6.1* provides step-by-step instructions for recovering from a disaster on supported NetWorker 6.1 client and server platforms.

Note: The term "autochanger" refers to a variety of backup devices: autoloader, carousel, datawheel, jukebox, library, and near-line storage.

What Is a Disaster?

For the purpose of this guide, a *disaster* is any situation in which the day-to-day access to data (for example, working files, software programs, or system files) is disrupted. A disaster can also damage network components, such as data, devices, hardware, media, and software.

A disaster can be the result of any one or a combination of the following:

*   Computer viruses that can corrupt data
*   Hardware and software failures
*   Infrastructure interruptions, inconsistencies, or loss of services such as communication or network connections

The degree of loss during a disaster can range from one or more files lost when a disk crashes to an entire computer system. The degree of severity of the disaster determines the procedures you might need to perform to recover your data.

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Disaster Recovery Guide Overview

The guide includes the following chapters that will help you prepare for and perform a recovery of your NetWorker servers, clients, and storage nodes:

Chapter 2: Preparing for a Disaster

This chapter contains concepts, information, and links to procedures on preparing for a disaster.

If you are viewing the online version of this guide, print out a hard copy and store it in a safe location.

Preparing for Disaster

You should back up important data on a scheduled basis. The more time and effort you invest in incorporating, maintaining, and testing a backup solution, the better prepared you will be in the event of a disaster.

Ensure that your servers are backed up regularly using a backup group. Otherwise, a bootstrap will not be saved (because backups performed using the command line or the NetWorker User program do not save the NetWorker server bootstrap). You should also ensure that a local backup device on the server is used to back up the server's bootstrap.

In the case of a NetWorker version upgrade, always perform a scheduled backup of the NetWorker server right after the upgrade. This ensures that a new version (upgraded version) bootstrap is saved.

The bootstrap can be printed from the *savegrp.log* file, which is located in the *nsr* directory. Refer to the appropriate *Administrator's Guide* for instructions on how to configure the NetWorker software to send bootstrap information directly to a printer or to a specified e-mail address. If the bootstrap is backed up to a pool other than the preconfigured pools, save the name of the pool along with the bootstrap.

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To ensure that you can recover from network-related disasters, you must have access to the key information related to each computer within your organization that needs protection. Maintain a copy of this key information on site, so that it can be easily accessed by those assigned to perform disaster recovery.

> ⚠️ ─────────────────────────────────────
>
> **Important:** Having the correct information on hand in case a disaster occurs is a key element in recovering from a disaster as quickly as possible.
> ───

Enact strict guidelines regarding the access, maintenance, and usage of this key information, and maintain the information in an onsite locale that is the most resistant to disaster.

Gathering the Key Information

Maintain accurate records for each hardware, software, network, device, and media component within your organization.

Computer Hardware Information

The following information regarding computer hardware must be maintained and kept up-to-date:

- Filesystem configuration
- Fully Qualified Domain Names, IP addresses, and hostnames
- For Domain Name Service (DNS) clients, maintain the DNS host's internet address and its hostname
- Hard drive configuration information
- Media device names
- Hardware vendor contact information and contract number
- Configuration information for each piece of hardware, both active and inactive, within the organization or organizational site

To obtain hardware information for a specific operating system, see:

- NetApp®: "Replacing a Hard Drive" on page 122
- NetWare®: "Obtaining the Hard Drive Information" on page 92
- Windows® 95/98: "Obtaining the Hard Drive Information" on page 114
- Windows NT® 4.0/UNIX®: "Obtaining the Hard Drive Information" on page 29
- Windows® 2000: "Obtaining the Hard Drive Information" on page 63

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Computer Software Information

The following information regarding computer software must be maintained and kept up-to-date:

- Copies of the original operating system and software media and patches (and where they are located)
- Software enabler and authorization codes
- Software vendor contact information and contract number
- The operating system version and patches installed
- Operating system configuration information
- Emergency media that can be used to restore a computer in the event of a disaster
- NetWorker bootstrap information for each NetWorker server
- Kernel configuration and location information
- Device drivers

To obtain software information for a specific operating system, see:

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Platform	Recovery/Repair	Prerequisite Information
Windows NT 4.0/UNIX	Recovering the UNIX Operating System	page 31
	Repairing the Windows NT 4.0 Operating System	page 35
	Recovering the Windows NT 4.0 Operating System	page 40
	Recovering a Windows NT 4.0/ UNIX NetWorker Server	page 44
	Recovering NetWorker Client or NetWorker Storage Node Data	page 56
Windows 2000	Recovering the Windows 2000 Operating System	page 64
	Recovering a Windows 2000 NetWorker Server	page 69
	Recovering NetWorker Client or NetWorker Storage Node Data	page 85
	Recovering Microsoft Cluster Server Host Systems	page 145
NetWare	Recovering the NetWare Operating System	page 94
	Recovering a NetWare NetWorker Server	page 97

Platform	Recovery/Repair	Prerequisite Information
Windows 95/98	Recovering the Windows 95/98 Operating System	page 115
	Recovering a Windows 95/98 NetWorker Client	page 118
NetApp	Recovering the Data ONTAP™ Operating System	page 122
	Recovering a NetApp NetWorker Client	page 125

2

2

Chapter 3: Windows NT 4.0/UNIX Disaster Recovery

This chapter describes how to perform a disaster recovery on a Windows NT 4.0 or UNIX system using NetWorker 6.1 software.

Disaster Recovery Procedures Overview

Following is a brief overview of disaster recovery procedures. These procedures are explained in detail in subsequent sections in this chapter.

1. Reinstall the operating system, if necessary.

2. Reinstall the NetWorker software, if necessary.

3. If you are using a stand-alone device, configure the device and load the volume containing the latest bootstrap.

4. If you are using an autochanger:

   a. Run the **jbconfig** command to install the autochanger.

   b. Run the **nsrjb -HE** command to reset the autochanger.

   c. Run the **nsrjb -Iv -S**# command to inventory the backup tape in slot # containing the latest bootstrap.

   d. Run the **nsrjb -lnv -S**# **-f** *device-name* command to load the backup tape in slot # into the device.

5. If you know the bootstrap save set ID, run the **mmrecov** command to recover the media database and resource configuration files.

   If you do not know the bootstrap save set ID, run the **scanner -B** *device-name* command to locate the bootstrap save set ID; then run the **mmrecov** command to recover the media database and resource configuration files.

6. Stop the NetWorker services (Windows NT)/daemons (UNIX).

7. Copy the contents of the *res.R* directory to the *res* directory.

8. Restart the NetWorker services (Windows NT)/daemons (UNIX).

9. Run the **nsrjb -HE** command to reset the autochanger.

10. If you are using an autochanger, run the **nsrjb -Iv** command to re-inventory the autochanger; or run the **nsrjb -Iv -S** command to re-inventory only the affected slots.

11. Run the **nsrck -L7** command to recover the indexes.

12. Start NetWorker User (Windows NT)/nwrecover (UNIX).

13. Recover the client data.

Entries in the following table point to sections in this chapter that describe disaster recovery procedures you might need to follow, depending on the situation.

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To recover...	See...
Hard drive	• "Replacing a Hard Drive" on page 29
Operating system	• "Recovering the UNIX Operating System" on page 31 • "Repairing the Windows NT 4.0 Operating System" on page 35 • "Recovering the Windows NT 4.0 Operating System" on page 40
NetWorker server	• "Recovering a Windows NT 4.0/UNIX NetWorker Server" on page 44
Any client or storage node data	• "Recovering Client or Storage Node Data" on page 56
Data	• Refer to the appropriate Legato backup utility *Administrator's Guide*
Legato Celestra Power/NDMP data	• Refer to the appropriate Legato Celestra® *Administrator's Guide*

Important: (Windows NT) You must recover disk data or application data prior to recovering the registry or system state.

Replacing a Hard Drive

To replace a hard drive:

- Obtain the hard drive information.
- Replace the hard drive.

Obtaining the Hard Drive Information

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The following information is required to replace a hard drive. Obtain the information using the commands appropriate for your operating system.

- Size of the drive
- Volume size, filesystem type (Windows NT)
- Filesystem volume information (UNIX)
- Volume label assigned to each disk partition

This information includes details about:

- How the disk is partitioned
- How the disk is loaded
- The size of the disk
- Each logical volume (size and label)
- Each filesystem

Note: Though it will not affect NetWorker operation, you may also note any use of mirroring, RAID/striping, compression, or volume sets.

How to Replace a Hard Drive

If you are experiencing the failure of one or more hard drives, refer to the appropriate documentation for your operating system and the appropriate hard drive vendor documentation for detailed instructions on how to replace your hard drive(s).

Important: Install a new drive that is the same size or larger than the original drive. This will ensure that you can recover all of the drive's data.

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To begin the recovery process, recover:

- The UNIX operating system, if necessary. For details, see "Recovering the UNIX Operating System" on page 31.
- The Windows NT operating system, if necessary. For details, see "Recovering the Windows NT 4.0 Operating System" on page 40.
- The NetWorker server, if necessary. For details, see "Recovering a Windows NT 4.0/UNIX NetWorker Server" on page 44.
- Any client or storage node data, if necessary. For details, see "Recovering Client or Storage Node Data" on page 56.
- All other data not listed above (for example, application data and user data) using the Legato backup utility you used to back up the data. For details, refer to the appropriate Legato *Administrator's Guide*.

Recovering the UNIX Operating System

To recover the UNIX operating system:

- Meet the operating system recovery prerequisites.
- Recover the operating system.

Prerequisites

To recover the operating system, you need the following information:

- Version and patch level of the operating system
- TCP/IP properties:
  - Adapter type
  - IP address
  - Default gateway
  - Subnet mask
  - DNS server
- Computer properties:
  - Hostname
  - DNS domain name
  - Superuser password
- Device and SCSI drivers
- Boot files required for booting the kernel. For example:
  - */unix*
  - */boot*
  - */etc/default/boot*
  - */stand/vmunix*

Note: Refer to the appropriate documentation for your operating system to determine which boot files should not be overwritten during a recovery.

How to Recover the UNIX Operating System

This section describes how to recover the UNIX operating system. Use this process to recover the operating system back to the original computer or to a different computer.

You can recover the operating system by performing either a:

- Complete installation. In this instance you perform a complete installation and configuration of the operating system.

  — or —

- Partial installation. In this instance you install and configure only those files that enable the computer to communicate over the network. Then, recover the remaining operating system and configuration files using NetWorker.

Important: Do not recover the operating system from an X session. Rather, recover the operating system in single-user mode from the system console.

To recover the operating system, follow these procedures, explained in detail in the following sections:

1. Install the operating system.

2. Configure the operating system.

3. Test the operating system and configure the devices.

Task 1: Install the Operating System

To install the operating system:

1. Install the same version and patch level of the UNIX operating system into its original location. Refer to the UNIX documentation accompanying the operating system for details.

   If you want to upgrade the operating system, first recover the operating system as it was previous to the disaster, and then perform the upgrade.

2. Recreate all of the filesystems that were previously on the computer.

   The filesystems must be:
   • The same filesystem type.
   • At least the same size as before to hold all of the backed-up data.

   At a minimum, configure the root volume group and kernel parameters, such as asynchronous I/O. If the resources are available, reconstruct non-root volume group filesystems and logical volumes.

3

Task 2: Configure the Operating System

To configure the operating system:

1. Configure the network exactly as it was configured before the disaster. If you do not, the NetWorker software will treat the computer as a *new* computer. If the computer has a different host ID you must reregister the NetWorker software. Refer to the appropriate *NetWorker 6.1 Installation Guide* for details.

2. If you are recovering the operating system to a different computer, assign the same *hostname* for the new computer. If you do not use the same *hostname*, you will not be able to recover the NetWorker indexes associated with the original computer.

3. Configure the date and time as they were configured before, including the time zone.

4. Install any additional UNIX components or services before recovering the computer's data.

5. Reboot the computer.

Task 3: Test the Operating System and Configure the Devices

To test the operating system and configure the devices:

1. Configure any devices required by the NetWorker software, for example SCSI passthru devices for autochangers.

2. Perform a test to verify that the:

   - Name to Address resolution and TCP/IP are functioning properly. This test is performed by running **ping** to communicate with a client or storage node, and then running **ping** on the client to reach the server.
   - Operating system is functioning properly.
   - Tape drive is functioning properly. This test can be performed using the **mt** commands.
   - Devices are recognized by the operating system. If the devices are not recognized by the operating system, you might need to:
     - Load the SCSI driver.
     - Install the device driver software.
     - Modify the device configuration files to enable the computer to communicate with the device during recovery. Refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version* for details.

To complete the recovery process, recover:

1. The NetWorker server, if necessary. For details, see "Recovering a Windows NT 4.0/UNIX NetWorker Server" on page 44.

2. Any client or storage node data, if necessary. For details, see "Recovering Client or Storage Node Data" on page 56.

3. The computer's data using the Legato backup utility you used to back up the data. Refer to the appropriate *Administrator's Guide* for details.

Repairing the Windows NT 4.0 Operating System

To repair the Windows NT 4.0 operating system:

- Meet the Windows NT operating system repair prerequisites.
- Repair the operating system.

Prerequisites

To repair the Windows NT 4.0 operating system, you need the following:

- Original Windows NT operating system setup diskettes.
- Windows NT CD-ROM and service pack (same version/level as was previously installed).
- Backup or clone volume containing the most recent Emergency Repair Disk data (REPAIRDISK: save set) or a current Emergency Repair Disk.
- Administrator account password. This is only required if you are repairing the registry, if available, or system state.

3

How to Repair the Windows NT 4.0 Operating System

To repair the Windows NT 4.0 operating system, follow these procedures, explained in detail in the following sections:

1. Use NetWorker software on a different machine to create an Emergency Repair Disk (if you do not have a *current* Emergency Repair Disk for the target machine).

2. Use the Emergency Repair Disk to repair the operating system.

Task 1: Use NetWorker to Create an Emergency Repair Disk (if required)

This section describes how to create an Emergency Repair Disk using NetWorker.

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Important: Since the operating system of the target machine needs repair, you must use another Windows NT machine with a NetWorker client to create the Emergency Repair Disk (this is referred to as a *Directed Recover*).

Prior to creating the Emergency Repair Disk, ensure that the following prerequisites are true:

- Ensure that the computer you wish to use to create the Emergency Repair Disk is a functional NetWorker client.

- Ensure that the computer you wish to use to create the Emergency Repair Disk is connected to the NetWorker server that backed up the failed computer's REPAIRDISK.

- Ensure that the computer you wish to use to create the Emergency Repair Disk is included in the Remote Access List of the computer you are recovering. The Remote Access List is contained in the computer's associated client resource on the NetWorker server. For instructions, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*.

- If the earlier prerequisites are not true, you must update your server. Before updating your server, ensure that the account creating the Emergency Repair Disk (*<username>@<computer>*) is on the Administrator's list (this will provide you with the proper permissions to update the server). For instructions, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*.

There are two ways to recover the Emergency Repair Disk data:

- Using the NetWorker User program. See "Using NetWorker User" on page 37.

  — or —

- Using the **recover** command. See "Using the recover Command" on page 37.

Using NetWorker User

To recover the Emergency Repair Disk data using the NetWorker User program:

1. Insert a formatted diskette (1.44 MB) into drive A.

2. From the Operation menu, select Directed Recover. The Source Client window appears.

3. Select the computer you want to recover the data *from* (the computer on which the disaster occurred) and click OK. The Destination Client window appears.

4. Select the computer you want to recover the data *to*, and click OK. This is the Windows NT computer on which you are creating the Emergency Repair Disk.

5. Select and mark the *REPAIRDISK* directory.

6. From the Options menu, select Recover Options.

7. Enter `a:\` in the Relocate Recovered Data To box.

8. Click Start to recover the Emergency Repair Disk data.

   NetWorker creates the Emergency Repair Disk by recovering the source client's repair disk data to the diskette in drive A.

⚠ ──────────

Important: If the repair disk file is larger than 1.44 MB, it will not fit onto a diskette. This is a known limitation in the Windows NT operating system; a workaround is not yet available.

──────────

Using the recover Command

To recover the Emergency Repair Disk data using the **recover** command, follow these steps on the Windows NT server where the data for the failed computer was saved:

1. Insert a formatted diskette (1.44 MB) into drive A.

2. Change to the directory containing the NetWorker binaries. By default the binaries are located in the *%SystemDrive%\Program Files\nsr\bin* directory.

3. Recover the Emergency Repair Disk data using the **recover** command as follows:

   recover -c *failed-hostname*

   recover> **cd /**

   recover> **add REPAIRDISK**

   recover> **relocate a:**

   recover> **recover**

   This procedure initiates the recovery of the failed computer's REPAIRDISK data to the server's drive A.

Task 2: Use the Emergency Repair Disk to Repair the Windows NT 4.0 Operating System

To use the Emergency Repair Disk to repair the Windows NT 4.0 operating system:

1. Insert Windows NT Setup Disk 1 into drive A and reboot the computer.

2. When prompted, insert Windows NT Setup Disk 2 into drive A and press [Enter].

3. Press [R] to select the Repair option from the Windows NT Setup Welcome Screen.

4. Select the emergency repair options for your situation.

5. Select Continue and press [Enter].

6. When prompted, insert Windows NT Setup Disk 3 into drive A, press [Enter], and follow the instructions.

7. Insert the Emergency Repair Disk into drive A and press [Enter]. When prompted:

   • Press [Enter] to repair the specified file.

   • Press [Esc] if you do not want to repair the specified file.

   If the operating system is damaged beyond repair, you must recover it. See for details.

8. Reboot the computer.

   The operating system should now be repaired.

9. Verify that:

- The operating system is functioning properly.
- The network protocols are functioning properly. Test by running **ping**.
- The devices are recognized by the operating system.
- The Name to Address resolution is correct. Run **nslookup** using the Fully Qualified Domain Name of the Windows NT NetWorker backup server, client, or storage node.

10. If you are using a device with a default configuration that is not directly supported by Windows NT, you might need to reinstall the device driver software.

To complete the recovery process, recover:

- The NetWorker server, if necessary. See "Recovering a Windows NT 4.0/UNIX NetWorker Server" on page 44 for details.
- Any client or storage node data, if necessary. See "Recovering Client or Storage Node Data" on page 56 for details.
- The computer's data using the Legato backup utility you used to back up the data. Refer to the appropriate *Administrator's Guide* for details.

3

Recovering the Windows NT 4.0 Operating System

To recover the Windows NT 4.0 operating system:

- Meet the operating system recovery prerequisites.
- Recover the operating system.

Prerequisites

To recover the operating system, you need the following:

- Windows NT CD-ROM and service pack (same version/level as was previously installed).
- Location of the operating system.
- TCP/IP properties:
    - Adapter type
    - IP address
    - Default gateway
    - Subnet mask
    - DNS server
- Windows NT Server/workstation properties:
    - Computer name
    - Domain name
    - Administrator name and password
- Date/time properties.
- Virtual memory settings.
- Protocols installed.
- Localization Properties information for Windows NT.
- See "Dynamic Host Configuration Protocol (DHCP) and Windows Internet Naming Service (WINS) Databases" on page 55 for more information about requirements.

3

How to Recover the Windows NT 4.0 Operating System

This section describes how to recover the Windows NT 4.0 operating system. You can use this process to recover the operating system back to the original computer or to a different computer.

You can recover the operating system by performing a:

- Complete installation. In this instance you perform a complete installation and configuration of the operating system.

  — or —

- Partial installation. In this instance, you install and configure only those files that enable the computer to communicate over the network. Then, recover the remaining operating system and configuration files using NetWorker.

To recover the operating system, follow these procedures, explained in detail in the following sections:

1. Install the Windows NT 4.0 operating system.

2. Test the operating system and configure the devices.

Task 1: Install the Windows NT 4.0 Operating System

To install the operating system:

1. Install the same version, service pack, and patch level of the Windows NT operating system into its original location. Refer to the documentation accompanying the operating system for details.

   If you want to upgrade the operating system, first recover the operating system as it was previous to the disaster, then perform the upgrade.

2. Install the computer as a Workstation or Server, not as a BDC (Backup Domain Controller) or PDC (Primary Domain Controller).

3. Install the computer into a Workgroup, not into a Domain.

4. Configure the TCP/IP properties as they were configured before, with the same hostname, IP address, default gateway, subnet mask, and DNS server.

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![warning icon] **Important:** If you are recovering the operating system to a different computer, you must:

— Use the same *hostname* for the new computer. If you do not use the same *hostname* you will not be able to recover the NetWorker indexes associated with the original computer.

— Assign the same TCP/IP address for the new computer, otherwise it will be assigned a new host ID by NetWorker. If this computer does not have the same TCP/IP address as the original computer, you must reregister the NetWorker software. Refer to the *NetWorker 6.1 Installation Guide, Windows Version* for details.

5. Configure the Windows NT server/workstation properties as they were configured before the disaster. Make sure that you use the same computer name, administrator name, and password.

6. Configure the Localization Properties as they were configured before the disaster.

7. Restart the computer after installing the Windows NT operating system.

8. Reset the Virtual Memory Settings as they were configured before by selecting System>Performance>Change in Control Panel.

![warning icon] **Important:** Do not upgrade OEM drivers for network interface cards (NIC) with the OEM Service Pack version of the NIC.

9. To apply the new settings, restart the computer after the service pack is installed.

Task 2: Test the Operating System and Configure the Devices

To test the operating system and configure the devices:

1. Configure any devices required by NetWorker, for example, SCSI passthru devices for autochangers.

2. Verify that the:

   - Operating system is functioning properly.
   - Network protocols are functioning properly. Test by running **ping**.
   - The Name to Address resolution is correct. Test by running **nslookup** using the Fully Qualified Domain Name of the Windows NT NetWorker backup server, client, or storage node.
   - Devices are recognized by the operating system. If the devices are not recognized by the operating system, you might need to:
     – Load the SCSI driver.
     – Install the device driver software.

To complete the recovery process, recover:

- The NetWorker server, if necessary. For details, see "Recovering a Windows NT 4.0/UNIX NetWorker Server" on page 44.
- Any client or storage node data, if necessary. For details, see "Recovering Client or Storage Node Data" on page 56.
- The computer's data using the Legato backup utility you used to back up the data. Refer to the appropriate *Administrator's Guide* for details.

Once you have recovered the computer's data and rebooted the computer:

- If you want to use Active Desktop, install it.
- If the computer is a Backup Domain Controller, synchronize it with the Primary Domain Controller.
- If the computer is a Primary Domain Controller, synchronize it with the domain.

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Recovering a Windows NT 4.0/UNIX NetWorker Server

To recover a NetWorker server:

- Meet the NetWorker server recovery prerequisites.
- Recover the NetWorker server.

Prerequisites

To recover the NetWorker server, you need the following:

- Version and patch level of NetWorker.
- Location of NetWorker.
- NetWorker server installation media.
- Backup or clone volumes containing the server bootstrap and indexes.
- For UNIX systems, any links to the NetWorker directories (for example, */nsr -> /usr/nsr*).

![warning icon]

Important: If you are trying to recover the NetWorker server on a Windows NT computer, follow the instructions in the following section: "Dynamic Host Configuration Protocol (DHCP) and Windows Internet Naming Service (WINS) Databases" on page 55 before recovering the NetWorker server. This will ensure that the Windows NT DHCP databases and WINS databases are properly restored.

3

How to Recover a Windows NT 4.0/UNIX NetWorker Server

This section describes how to recover a NetWorker server. You can use the following process to recover the NetWorker server back to the original computer or to a different computer.

Note: If you want to recover the NetWorker server to a different computer, refer to *Technical Bulletin 364: How to Rename a NetWorker Server (NT)* or *Technical Bulletin 365: How to Rename a NetWorker Server (UNIX)* for important information (refer to the Legato web site *www.legato.com* under Support/Documentation/Technical Bulletins).

![warning icon]

Important: If your Windows NT 4.0/UNIX NetWorker server was also being used as a Legato License Manager server (not recommended) and a disaster recovery is required on the NetWorker server, the *lictype.res* file of the Legato License Manager is not restored. This is because the Legato License Manager files and directories are not considered part of NetWorker. After completing the disaster recovery on the NetWorker server, you must explicitly recover the Legato License Manager as a client of the NetWorker server.

To recover a NetWorker server, follow these procedures, explained in detail in the following sections:

1. Install NetWorker.

2. Configure NetWorker.

3. Locate the server's bootstrap save set ID.

4. Recover the NetWorker server bootstrap.

5. Rename the NetWorker server configuration files.

6. Recover all indexes for clients on the NetWorker server. (Because a NetWorker server is always a client of itself, this step includes recovering the client indexes that are associated with the server.)

7. Recover the NetWorker server's client data.

8. Complete the server recovery.

Note: If you are using Windows NT 4.0 and you are using DHCP or WINS, see .

Task 1: Install NetWorker

Important: If you upgraded directly from Windows NT NetWorker 4.3 or Windows NT NetWorker 5.7 to Windows NT NetWorker 6.0 and later *and* you have not yet performed a scheduled backup of the NetWorker server since the upgrade, you must reinstall the previously installed version of NetWorker (Windows NT NetWorker 4.3 or Windows NT NetWorker 5.7) and use it to recover the bootstrap before proceeding. Once you have recovered the bootstrap using the previously installed version of NetWorker, reinstall NetWorker 6.x and proceed as normal. This additional step applies only to Windows NT NetWorker 4.3 and Windows NT NetWorker 5.7 bootstraps.

3

To install NetWorker:

1. Install the same version of NetWorker into its original location. Refer to the appropriate *NetWorker 6.1 Installation Guide* for installation instructions.

Note: If you want to upgrade the NetWorker server, first recover the server to its original state, then perform the upgrade.

2. Install any NetWorker patches that were installed prior to the disaster.

3. If you are using UNIX, recreate any links that you had to the NetWorker directories (such as the NetWorker indexes and configuration files).

Task 2: Configure NetWorker

To configure NetWorker:

1. Configure the Device resource(s).

   If you want to recover your data using a stand alone device, ensure that the stand alone device resource exists (this is defined in your */nsr/res* directory). If you want to use a stand alone device and the stand alone resource does not exist, create the stand alone device.

   If you want to recover your data using an autochanger, ensure that the autochanger resource exists (this is defined in your */nsr/res* directory). Otherwise, add and configure the autochanger using the **jbconfig** command. Refer to the appropriate *NetWorker 6.1 Administrator's Guide* for details on how to use the **jbconfig** command.

If you are using an autochanger, reset the autochanger using the **nsrjb -vHE** command. This command resets the autochanger, ejects backup volumes, reinitializes the element status, and checks each slot for a volume.

If your autochanger does not support the **-E** option, initialize the element status using **sjiielm** (on Linux, use **ielem**).

If you are using an autochanger, inventory the autochanger using the **nsrjb -I** command. This will help you determine whether the volumes required to recover the bootstrap are located inside the autochanger.

2. If you are recovering a relocated server's file index from a NetWorker 6.0 or later version backup, this step is no longer necessary.

If you are recovering the server's file index from a NetWorker pre-6.x version backup and you relocated the server's file index path to a new location:

a. Edit the Index Path attribute in the server's associated Client resource to the original path.

b. Shut down and restart the NetWorker services (Windows NT) or daemons (UNIX). This will enable NetWorker to recognize that the index path has changed.

For instructions on how to shutdown and restart the NetWorker services (Windows NT) or daemons (UNIX), refer to "Task 5: Rename the NetWorker Server Configuration Files" on page 51 before proceeding to "Task 3: Locate the Server's Bootstrap Save Set ID".

Task 3: Locate the Server's Bootstrap Save Set ID

This section describes how to locate the save set ID for the NetWorker server's latest bootstrap. The bootstrap contains the media database and resource configuration files.

Important: If you routinely move your NetWorker backup media to an offsite location for safekeeping and a subsequent file recover operation generates a mount request, the recover will wait until an operator satisfies the mount request. To avoid delays when recovering files, use the **mminfo -mv** command to list the media that is associated with the file you want to recover and to retrieve the media from the offsite storage before starting the recover.

To locate the save set ID of the most recent bootstrap (if you do not already have this information):

1. Insert the most recent media or clone volume(s) used for scheduled backups into the appropriate device.

2. At the system console/command prompt, switch to the directory where the NetWorker binaries and executables are located.

3. If you are using an autochanger, insert the first volume of the bootstrap save set into the first drive of the autochanger using the following command:

   nsrjb -lnv -S slot -f *device-name*

   where *slot* is the slot where the first volume is located and *device-name* is the pathname for the first drive. You can obtain this *device-name* using the **inquire** command.

4. Use the **scanner -B** command to determine the save set ID of the most recent bootstrap on the media: **scanner -B** *device-name*. For example:

   Windows NT:

   scanner -B \\.*Tape0*

   Solaris:

   scanner -B */dev/rmt/0hbn*

   Linux:

   scanner -B */dev/nst0*

   If you do not locate the save set ID of the most recent bootstrap on the most recent media, run the **scanner -B** command on preceding media to locate the save set ID of the most recent bootstrap.

5. When you see the output, record both the bootstrap save set ID and the volume label.

3

Task 4: Recover the NetWorker Server Bootstrap

This section describes how to recover the NetWorker server bootstrap using the **mmrecov** command.

Note: In NetWorker 6.0 and later, the **mmrecov** command is only used to recover the NetWorker server's media database and resource configuration files; the **nsrck** command is used to recover the server's client indexes.

To recover the NetWorker server bootstrap:

1. Use the **mmrecov** command to recover the NetWorker server's bootstrap (media database and resource configuration files). For example:

   Windows NT:

   ```
   D:\Program Files\nsr\bin>mmrecov
   ```

   The following output appears:

   ```
   mmrecov: Using madrid.spain.com as server
   ```

   UNIX:

   mmrecov

   The following output appears:

   ```
   mmrecov: Using madrid.spain.com as server
   ```

   Important: The **mmrecov** command overwrites the server's media database. It does not overwrite the resource configuration files, as **mmrecov** recovers them to the resource directory: *res.R*. For more information, refer to **mmrecov** reference pages in the *Legato Command Reference Guide* for the syntax and options for this program (refer to your Documentation Suite CD or the Legato web site *www.legato.com* under Support/Documentation/Manuals).

2. If the following message appears, enter the name of the device you are using for the recovery (this message only appears if the server has multiple devices configured and enabled).

   Windows NT:

   ```
   What is the name of the device you plan on using
   [\\.\Tape1]? \\.\Tape0
   ```

   UNIX:

   ```
   What is the name of the device you plan on using
   [/dev/rmt/0hbn]? /dev/rmt/0hbn
   ```

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3. When the following message appears, enter the save set ID for the latest bootstrap. If you are recovering a cloned version of the bootstrap, specify the save set ID associated with the clone.

   ```
   Enter the latest bootstrap save set ID []: 20076
   ```

4. When the following message appears, enter the file number to begin the recovery. If unknown, press [Enter].

   ```
   Enter starting file number (if known) [0]: 130
   ```

5. When the following message appears, enter the first record number to begin the recovery. If unknown, press [Enter].

   ```
   Enter starting record number (if known) [0]: 0
   ```

6. When the following message appears, follow the prompt:

   Windows NT:

   ```
   Please insert the volume on which save set ID 20076 started
   into \\.\Tape0. When you have done this, press <RETURN>:
   ```

   Note: If you ran **scanner -B** in the previous task, the volume should already be loaded and you can just press <RETURN>. If the volume is not loaded, insert it now, then press <RETURN>. The following message appears:

   ```
   Scanning \\.\Tape0 for save set 20076; this may take a
   while...
   ```

   UNIX:

   ```
   Please insert the volume on which save set id 20076 started
   into /dev/rmt/0hbn.
   ```

   Once you have loaded the appropriate volume, the following message appears:

   ```
   Scanning /dev/rmt/0hbn for save set 20076; this might take
   a while...
   ```

   NetWorker then scans the volume for the appropriate save set and recovers it.

Note: You can use the **nwadmin** program (click the Monitor tab in Windows NT) to monitor the recovery of the media database and resource configuration files.

The NetWorker media database and resource configuration files are recovered when the following message appears:

```
If your resource files were lost, they are now recovered
in the 'res.R' directory. Copy or move them to the 'res'
directory, after you have shut down the service. Then
restart the service.

Otherwise, just restart the service.

If the on-line index for the server-name was lost, it can
be recovered using the nsrck command.
```

Task 5: Rename the NetWorker Server Configuration Files

Because the configuration files cannot be reliably overwritten while NetWorker is running, **mmrecov** recovered the *res* directory as *res.R* by default. In addition, **mmrecov** might have recovered another server's configuration file in this directory; stopping and restarting both the NetWorker Remote Exec and NetWorker Backup and Recover Server services/daemons is recommended.

To rename the configuration files in Windows NT:

1. Shut down the NetWorker Backup and Recover Server and NetWorker Remote Exec services:

    a. From the Windows NT Control Panel, select Services and select the NetWorker Backup and Recover Server service.

    b. Click Stop.

    c. Select the NetWorker Remote Exec service.

    d. Click Stop.

    e. Click Close.

2. Rename the existing *res* directory to *res.orig*.

3. Rename the recovered *res* directory (*res.R*) to *res*.

4. From the Windows NT Control Panel, select Services, restart the NetWorker Remote Exec service, and then restart the NetWorker Backup and Recover Server service.

5. After you verify that the NetWorker configurations are correct, remove the *res.orig* directory.

To rename the configuration files in UNIX:

1. Shut down (stop) the daemons by entering the **nsr_shutdown** command at the UNIX command prompt:

   nsr_shutdown

2. Rename the existing */nsr/res* directory to */nsr/res.orig*:

   mv res res.orig

3. Rename the recovered */nsr/res.R* directory to */nsr/res*:

   mv res.R res

4. Restart NetWorker by first entering the **nsrexecd** command; then enter the **nsrd** command to complete the NetWorker restart:

   nsrexecd
   nsrd

Note: You can also restart NetWorker by running the NetWorker startup script for the appropriate platform.

5. After verifying that the NetWorker configurations are correct, remove the */nsr/res.orig* directory.

6. Run the **nsrjb -HE** command to reset the autochanger.

7. If you are using an autochanger, run the **nsrjb -Iv** command to re-inventory the autochanger; or run the **nsrjb -Iv -S** command to re-inventory only the affected slots.

Task 6: Recover All Indexes for Clients on the NetWorker Server

Once you recover the server's media database and resource configuration files, recover all indexes for clients on the NetWorker server.

To recover all indexes for clients on the NetWorker server:

1. Enter the **nsrck -L7** command:

   nsrck -L7 *client-name*

Note: If you do not supply a client name, the indexes of all clients will be recovered.

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2. If you are using a cloned version of the index, NetWorker may prompt you to load an original volume (not the clone volume).

To use the clone:

a. Enter a [Ctrl]+[c] to exit out of **nsrck** and verify that the pending original volume message has terminated.

b. Delete the records of the original volume(s) using the **nsrmm -d** *volume-name* command. For example:

NetWorker requests the original volume *mars.1*. Because this volume is not available, delete the *mars.1* volume from the media database using the following command:

```
nsrmm -d mars.1
```

c. Enter the **nsrck -L7** command:

```
nsrck -L7 client-name
```

3

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Important: Once the media database and server resource configuration files have been recovered, you may recover the client indexes in any order. It is not necessary to recover the server's own client index before recovering the index of any other client.

If your clients have the NetWorker client installed, you may run on-demand and scheduled saves once the media database and server resource configuration files are recovered; however, you will not be able to browse the saves for a client until you recover the client's file index. You may use save set recover to recover files before a client's file index is recovered.

Task 7: Recover the NetWorker Server's Client Data

This procedure describes how to recover the remainder of the NetWorker server's data, including the registry, using the NetWorker User program (Windows NT) or the nwrecover program (UNIX).

To recover the NetWorker server data:

1. Log on as Administrator (Windows NT) or as root (UNIX).

2. Load and inventory the devices. This ensures that NetWorker can recognize the location of each volume.

If you load a clone volume, NetWorker uses the clone volume for the remainder of the recovery process.

3. Run the NetWorker User program (Windows NT) or the **nwrecover** program (UNIX).

4. Mark all the drives or filesystems, including *%SystemDrive%* (for example *C:/*). Also, mark any operating system specific special backups, such as the registry (5.5.1 clients) or SYSTEM STATE save set (5.7/6.0 and later clients).

Important: To avoid having to reboot twice, make sure the SYSTEM STATE save set is restored last. If you recover all save sets in a single operation, NetWorker User will restore them in the correct order. If you recover save sets in multiple NetWorker User operations, recover the SYSTEM STATE save set last.

The bootstrap and indexes are browsable for NetWorker releases earlier than 6.0. If you are recovering a save set from a NetWorker release earlier than 6.0 and you select for recovery the drive where the NetWorker server nsr directory is located (by default, *%SystemDrive%\Program Files\nsr)*, be sure to unselect the following subdirectories of the *nsr* directory: *index, mm, res, bin.*

5. Click Start to begin the recovery.

Task 8: Complete the Server Recovery

To complete the server recovery process:

1. Perform a test backup or recover to make sure the server is fully recovered.

2. Verify that the server and its associated clients are included in a scheduled backup.

Dynamic Host Configuration Protocol (DHCP) and Windows Internet Naming Service (WINS) Databases

If you are using Windows NT 4.0 and you are using DHCP or WINS, it is recommended that you regularly dump these databases and back up the dumps with the NetWorker software.

Windows NT does not provide a programming interface for backup and restore of the DHCP database or the WINS database, but you can configure DHCP and WINS database dumps using DHCP Manager and WINS Manager. You can back up these database dumps as part of your routine NetWorker filesystem operations and then restore the dumps with the NetWorker software if it ever becomes necessary. After restoring the dumps you can import them, again using DHCP Manager or WINS Manager.

How to Dump, Back Up, Restore, and Import the WINS and DHCP Databases

3

To dump, back up, restore, and import the WINS and DHCP databases:

1. To open the DHCP administrative interface, go to Start>Programs>Administrative Tools>DHCP Manager.

2. To run DHCP dumps as necessary, configure the dumps from DHCP Manager. A default dump location is provided, but you can specify a different location. Make a note of the database dump location you choose.

3. To open the WINS administrative interface, go to Start>Programs>Administrative Tools>WINS Manager.

4. To run WINS dumps as necessary, configure the dumps from WINS Manager. A default dump location is provided, but you can specify a different location. Make a note of the database dump location you choose.

5. As part of your routine NetWorker filesystem backups, specify the save set(s) that include(s) the filesystem locations you specified for the DHCP and WINS databases dumps. You can then restore a dump whenever it becomes necessary.

6. To recover a DHCP or WINS database, open DHCP Manager or WINS Manager and import the database that NetWorker backed up and restored.

Recovering Client or Storage Node Data

To recover client or storage node data:

- Meet the client or storage node data recovery prerequisites.
- Recover the client or storage node data.

Prerequisites

To recover the client or storage node data, you need the following:

- Version and patch level of NetWorker.
- Location of NetWorker.
- NetWorker ClientPak for your operating system.
- Backup or clone volumes containing the NetWorker client data you wish to recover.

3

How to Recover Windows NT 4.0/UNIX Client or Storage Node Data

This section describes how to recover client or storage node data. You can use this process to recover the client or storage node data either back to the original computer or to a different computer.

Important: If the NetWorker server has failed, it should be fully recovered and functional before attempting to recover client or storage node data.

To recover client or storage node data, follow these procedures, explained in detail in the following sections:

1. Install NetWorker, if necessary.

2. Recover the client or storage node data.

3. Complete the client or storage node data recovery.

Task 1: Install NetWorker

This section describes how to install NetWorker on a client or storage node.

Before starting this procedure:

- Determine what Legato backup utility software was installed on the computer prior to the disaster (for example, SmartMedia®, ClientPak®, NetWorker Module).
- Determine what Legato backup utility patches were installed prior to the disaster.
- Determine whether the Legato backup utility software or patches are actually damaged to the point where they need to be reinstalled.

If the client's or storage node's NetWorker software is not properly installed and running:

1. Install the same version of NetWorker, which had been installed on the computer prior to the disaster, into its original location.

   If you want to upgrade the client or storage node software, first recover the client or storage node to its original state, and then perform the upgrade.

2. Install any NetWorker backup utility patches that were installed prior to the disaster.

3. From the NetWorker User program (Windows NT) or the **nwrecover** program (UNIX), perform a test recovery to ensure that the NetWorker recovery process is functioning properly.

Task 2: Recover the Client or Storage Node Data

This section describes how to recover the client or storage node data, including the registry or system state.

Important: (Windows NT) If you receive a message instructing you to reboot the computer, you must reboot prior to recovering the registry (5.5.1 clients) or system state (5.7/6.0 and later clients).

To recover the client or storage node data:

1. To determine the volumes required to recover the client or storage node data, use the **mminfo -avot** command on the server.

2. Start the NetWorker User program (Windows NT) or the **nwrecover** program (UNIX).

3. Mark all the drives or filesystems and any operating system specific special backups, such as the registry (5.5.1 clients) or SYSTEM STATE (5.7/6.0 and later clients).

Note: To avoid having to reboot twice, make sure the SYSTEM STATE save set is restored last. If you recover all save sets in a single operation, NetWorker User will restore them in the correct order. If you recover save sets in multiple NetWorker User operations, recover the SYSTEM STATE save set last.

Note: If you are recovering a NetWorker server, unmark any boot files required for UNIX operating system recovery that you determined should not be overwritten. See the "Prerequisites" section for "Recovering the UNIX Operating System" on page 31 for more information.

4. For Windows NT only, recover the RepairDisk, if required.

![warning triangle icon]

Important: In version 5.5.x, NetWorker does not back up user profiles as part of the *%SystemRoot%\profiles* directory; rather, it saves this data with the REGISTRY: saveset. Therefore, the registry must be recovered in its entirety to recover a user profile.

In NetWorker versions 5.7 and 6.0 and later, the user profile folders are stored in the save set corresponding to the disk drive on which they are located (for example, the C:\ save set). Therefore, this save set must be recovered to restore a user profile.

The top level of user profiles folders is located at
%SystemDrive%\winnt\profiles (Windows NT 4.0).

5. Set the recover options by selecting the Overwrite Existing File from the Options>Recover Options menu.

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Important: If you did not set the recover options, you must select the Overwrite Existing File option when the Naming Conflict dialog box appears during the recovery process. To enable automatic overwriting of files with the same name, select the Suppress Further Prompting option in the Naming Conflict dialog box.

6. Select Start.

   For Windows NT, files in the Recycle Bin are not password-protected. When the Password Protection window appears, select Recover>OK to recover these files.

   NetWorker logs the output of the recovery process to the NetWorker logs directory (*networkr.log*), which is overwritten each time a recovery is performed.

7. Reboot the computer. The computer should now be restored to the state prior to the disaster.

3

Task 3: Complete the Client or Storage Node Data Recovery

To complete the client or storage node data recovery process:

1. Perform a test recovery using each of the Legato backup utilities incorporated into your backup solution.

2. Recover your data using the Legato backup utility you used to back up the data. Refer to the appropriate *Administrator's Guide* for details.

For Windows NT only, once you have completed the recovery process:

- If you want to use Active Desktop, install it after you have recovered all of the computer's data.

- If the computer is a Backup Domain Controller (BDC), synchronize it with the Primary Domain Controller (PDC).

- If the computer is a Primary Domain Controller (PDC), synchronize it with the domain.

3

Chapter 4: Windows 2000 Disaster Recovery

This chapter explains how to recover from a disaster on a NetWorker 6.0 and later client or server host running Windows 2000.

Disaster Recovery Procedures Overview

Following is a brief overview of disaster recovery procedures. These procedures are explained in detail in subsequent sections in this chapter.

1. Reinstall the operating system, if necessary.

2. Reinstall the NetWorker software, if necessary.

3. If you are using a stand-alone device, configure the device and load the volume containing the latest bootstrap.

4. If you are using an autochanger, run each of the following commands from a Windows command prompt:

   a. Run the **jbconfig** command to install the autochanger.
   b. Run the **nsrjb -HE** command to reset the autochanger.
   c. Run the **nsrjb -Iv -S**# command to inventory the backup tape in slot # containing the latest bootstrap.
   d. Run the **nsrjb -lnv -S**# **-f** *device-name* command to load the backup tape in slot # into the device.

5. If you know the bootstrap save set ID, run the **mmrecov** command from a command prompt to recover the media database and resource configuration files.

   If you do not know the bootstrap save set ID, run the **scanner -B** *device-name* command to locate the bootstrap save set ID; then run the **mmrecov** command to recover the media database and resource configuration files.

6. Stop the NetWorker services.

7. Copy the contents of the *res.R* directory to the *res* directory.

8. Restart the NetWorker services.

9. Reset the autochanger.

10. If you are using an autochanger, run the **nsrjb -Iv** command to re-inventory the autochanger; or run the **nsrjb -Iv -S** command to re-inventory only the affected slots.

11. Run the **nsrck -L7** command to recover the indexes.

12. Start NetWorker User.

13. Recover the client data and the client's SYSTEM save sets.

Entries in the following table point to sections in this chapter that describe disaster recovery procedures you might need to follow, depending on the situation.

4

To recover...	See...
Hard drive	• "Replacing a Hard Drive" on page 63
Operating system	• "Recovering the Windows 2000 Operating System" on page 64
NetWorker server	• "Recovering a Windows 2000 NetWorker Server" on page 69
NetWorker client data or NetWorker storage node data	• "Recovering NetWorker Client Data or Storage Node Data" on page 85
Filesystem data	• *NetWorker 6.1 Administrator's Guide, Windows Version*

Replacing a Hard Drive

To replace a hard drive:

- Obtain the hard drive information.
- Replace the hard drive.

Obtaining the Hard Drive Information

Go to Start>Programs>Administrative Tools>Computer Management>Storage>Disk Management to obtain the following information about the damaged drive:

- Size of the drive
- Size, format, and volume label assigned to each disk partition

After you obtain this information, you can replace the hard drive.

How to Replace a Hard Drive

If a hard drive fails, refer to the hard drive vendor documentation and the appropriate Microsoft Windows 2000 documentation for instructions on replacing the drive.

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Important: Install a new drive that is the same size as, or larger than, the original drive. This will ensure that you have enough space to recover all of the failed drive's data. A recovery of the SYSTEM save sets (SYSTEM FILES, SYSTEM DB, and SYSTEM STATE) requires extra disk space for temporary files that are created during the operation. The operation might require as much extra space as the total size of the SYSTEM save sets. Before a disaster recovery, for an estimate of the amount of extra temporary disk space required, run the **mminfo** command from a command prompt to check the size of the SYSTEM save sets that are to be restored. (In many situations, about 500 MB of extra disk space should be sufficient to restore the SYSTEM save sets.) After the restore is complete and the computer is rebooted, the space used by the temporary files is reclaimed by the operating system.

To begin the recovery process, recover:

- The operating system, if necessary. See "Recovering the Windows 2000 Operating System" on page 64 for details.
- The NetWorker server, if necessary. See "Recovering a Windows 2000 NetWorker Server" on page 69 for details.
- Any client or storage node data, if necessary. See "Recovering NetWorker Client Data or Storage Node Data" on page 85 for details.
- The data on the hard drive. For details, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*.

Recovering the Windows 2000 Operating System

Before you recover the operating system, satisfy the prerequisites described in the following section.

Prerequisites

4

To recover the operating system, you need the following information about the state of the computer immediately prior to the disaster:

- Operating system version and all previously applied patches, service packs, and option packs
- TCP/IP properties:
  - IP address
  - Default gateway
  - Subnet mask
  - DNS server
- Host properties
  - Computer name (also called the *hostname*)
  - Full domain name
  - Administrator name and password
- Date/time properties
- Virtual memory settings
- Protocols installed

How to Perform Multiple Disaster Recoveries

If you are performing multiple disaster recoveries (more than one computer), you must recover each computer in the following order:

1. The NetWorker server component. See "Recover a Windows 2000 NetWorker Server" on page 70 for instructions.

2. The NetWorker storage node component.

   If the backup device used by the NetWorker server is a storage node, you might have to restore the storage node partially before attempting to recover the NetWorker server.

   For information about storage node recovery, see "How to Recover a Windows 2000 NetWorker Client or Storage Node" on page 85.

3. The NetWorker client component. See"How to Recover a Windows 2000 NetWorker Client or Storage Node" on page 85 for instructions.

   If you are performing a disaster recovery for a NetWorker 5.7 (or later) client host running Windows 2000 in an MSCS environment, see "Chapter 10: Sun Cluster Disaster Recovery" on page 153 for more information.

4

How to Recover the Windows 2000 Operating System

You can recover the Windows 2000 operating system to the original computer or to a different computer.

You can recover the operating system by performing either:

- A complete installation and configuration.

  — or —

- A partial installation and configuration. In this case, you install and configure only those files that enable the computer to communicate over the network. Then you recover the remaining operating system and configuration files using NetWorker.

Performing a Partial Installation

To recover the operating system by performing a partial installation:

1. Install and configure the operating system.

2. Test the operating system and configure the devices.

These procedures are explained in detail in the following sections.

Task 1: Install the Operating System

To install the operating system:

1. Install the same Windows 2000 version, service pack, and patches that were in use immediately prior to the disaster. Install these to the same path location that was used before. Refer to the operating system documentation for details.

2. Install the computer into a workgroup, not into a domain. If the computer being recovered was previously a domain controller or a member of a domain, it will be restored to the correct domain when the recovery is complete.

3. Configure the computer host properties as they were configured before, with the same computer name, fully qualified domain name, administrator name, and password. (The fully qualified domain name for a computer named *kingdome*, for example, might be *kingdome.seattle.washington.com*.)

   a. On the Desktop, right-click My Computer and select Properties on the context menu.The System Properties dialog box appears. (Another way to reach the System Properties dialog box is to select Start>Settings>Control Panel and click on the System icon.)

   b. In the System Properties dialog box, select the Network Identification tab.

   c. In the Network Identification dialog box, click the Properties button.

   d. In the Identification Changes dialog box, click the More button.

   e. In the DNS Suffix and NetBIOS Computer Name dialog box, ensure that the field labeled "Primary DNS suffix of this computer" contains your domain name. If not, enter your domain name in this field.

4. Configure the TCP/IP properties as they were configured before, with the same hostname (domain name), IP address, default gateway, subnet mask, and DNS server.

   To see the TCP/IP property values, enter **ipconfig /all** at the command line.

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5. Ensure that the *hosts* file (*%SystemRoot%\system32\drivers\etc\hosts*) includes an entry with the IP address and computer name of the NetWorker server to be used in the recovery. NetWorker requires this entry when:

- DNS is not in use or no DNS server is available
- The NetWorker server host in a recovery operation is also a DNS server

In either case, the entry in the *hosts* file should include the IP address, then the fully qualified domain name, and then the computer name, all on the same line, as in the following example:

```
123.56.890.474 charon.pluto.legato.com charon
```

⚠

Important: If you are recovering the operating system to a different computer, you must:

— Use the same hostname for the new computer. If you do not use the same hostname, you will not be able to recover the data saved by the NetWorker server under the original hostname.

— Assign the same TCP/IP address for the new computer; otherwise the computer will be assigned a new host ID by NetWorker. If this computer does not have the same TCP/IP address as the original computer, you must re-register the NetWorker software. Refer to the *Legato NetWorker 6.1 Installation Guide, Windows Version* for details.

4

6. Configure the Date/Time Properties as they were configured before.

7. Restart the computer after installing the operating system.

8. Reset the Virtual Memory Settings as they were configured before by selecting Control Panel>System>Advanced>Performance options>Virtual Memory>Change.

9. If you had any additional Windows 2000 components installed through Windows 2000 Setup, such as Gateway Services for NetWare, install them before recovering the computer data.

Task 2: Test the Operating System and Configure the Devices

To test the operating system and configure the devices:

1. Configure any devices required by NetWorker, for example SCSI passthru devices for autochangers.

2. Disable RSM on *any* removable storage library (robotic changer or stand-alone drive) connected to the computer you are recovering.

   a. On the Windows desktop, right click My Computer and select Manage from the pop-up menu.

   b. On the Computer Management navigation pane (left side of the dialog box), expand *Storage\Removable Storage\Physical Locations*.

   c. Right-click the library name and select Properties from the pop-up menu.

   d. On the General tab of the Properties dialog box, ensure that the Enable Library check box is *cleared*.

   e. Click OK to apply any changes and close the Computer Management dialog box.

   f. Repeat step b through step e for each removable storage library connected to your NetWorker server.

3. Verify that:

   - Operating system is functioning properly.
   - Network protocols are functioning properly. Test by running **ping**.
   - Name to Address resolution is correct. Test by running **nslookup** using the fully qualified domain name of the Windows 2000 NetWorker backup server, client, or storage node.
   - Necessary devices are recognized by the operating system. If the devices are not recognized, you might need to:
     - Load the SCSI driver.
     - Install the device driver software.

To complete the recovery process, recover:

- The NetWorker server (if the host being recovered was acting as a NetWorker server). See "Recovering a Windows 2000 NetWorker Server" on page 69 for details.
- Any clients or storage nodes, if necessary. See "Recovering NetWorker Client Data or Storage Node Data" on page 85 for details.
- The data.

After you recover the host's data, install Active Directory if you want to use it.

Recovering a Windows 2000 NetWorker Server

![warning icon]

Important: If the computer that failed was a NetWorker server host, you will need to recover the state of the server prior to the failure.

To recover a NetWorker server:

1. Satisfy the NetWorker server recovery prerequisites.

2. Recover the NetWorker server.

These procedures are explained in detail in the following sections.

Prerequisites

To recover a NetWorker server, you need the following information:

- Version and patch level of NetWorker that was in use when the node failed.

- Backup or clone volumes containing the NetWorker server bootstrap, which contains the following three items:

    – NetWorker server media database

    – NetWorker server configuration files

    – Backup or clone volumes containing the NetWorker server and client indexes

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![warning icon]

Important: Before you continue with the following procedure to recover a NetWorker server, ensure that you understand the instructions in the *NetWorker 6.1 Administrator's Guide, Windows Version* regarding the proper way to restore the NetWorker SYSTEM save sets.

How to Recover a Windows 2000 NetWorker Server

You can recover the NetWorker server to the original computer or to a different computer.

Important: If your Windows 2000 NetWorker server was also being used as a Legato License Manager server (not recommended) and a disaster recovery is required on the NetWorker server, the *lictype.res* file of the Legato License Manager is not restored. This is because the Legato License Manager files and directories are not considered part of NetWorker. After completing the disaster recovery on the NetWorker server, you must explicitly recover the Legato License Manager as a client of the NetWorker server.

To recover a NetWorker server, follow these main procedures, explained in detail in the following sections:

1. Install NetWorker.

2. Configure NetWorker.

3. Locate the server's bootstrap save set ID.

4. Recover the NetWorker bootstrap. Use clone volumes to recover the server bootstrap, if necessary.

5. Rename the NetWorker server configuration files.

6. Recover all indexes for the clients of the NetWorker server. (Because a NetWorker server is always a client of itself, this includes recovering the client indexes that are associated with the server.)

7. Recover the NetWorker server data.

8. Complete the server recovery.

9. Verify the NetWorker server recovery.

4

Task 1: Install NetWorker

Important: If you upgraded directly from Windows NT NetWorker 5.7 to Windows NT NetWorker 6.0 and later *and* you have not yet performed a scheduled backup of the NetWorker server since the upgrade, you must reinstall Windows NT NetWorker 5.7 and use it to recover the bootstrap before proceeding. Once you have recovered the bootstrap using the previously installed version of NetWorker, reinstall NetWorker 6.x and proceed as normal. This additional step applies only to Windows NT NetWorker 5.7 bootstraps.

To install NetWorker:

1. Install the same release of NetWorker that was used previously to its original location. Refer to the *NetWorker 6.1 Installation Guide, Windows Version* for instructions.

   • If the NetWorker installation kit is available on a shared drive on the network, you can install NetWorker over the network.

   • If you want to upgrade the NetWorker server, first recover the server to its original state, and then perform the upgrade.

   • You do not need to reload the license enablers if the NetWorker configuration files still exist. By default the configuration files are located in the *%SystemDrive%\Program Files\nsr\res* directory.

2. Install any NetWorker patches that were in use prior to the disaster.

Task 2: Configure NetWorker

To configure NetWorker:

1. From NetWorker Administrator, check the settings in the Preferences tab of the NetWorker server's client resource. Verify that the computer's aliases are entered correctly. The settings might look something like the following:

```
aliases:kingdome
        kingdome.seattle.washington.com
```

2. Configure the Device resources to have the same settings as those being recovered. Do not mount or relabel the volumes loaded on the new devices.

If you want to recover your data using an autochanger:

a. Add and configure the autochanger using the **jbconfig** command or the auto-detection feature in NetWorker Administrator. Refer to the *Legato Command Reference Guide* for information about using **jbconfig**; refer to the *NetWorker 6.1 Administrator's Guide, Windows Version* and *NetWorker Administrator Online Help* for details on using auto-detection.

b. Run the command **nsrjb -vHE** from a Windows command prompt. This command resets the autochanger, ejects backup volumes, re-initializes the element status, and checks each slot for a volume.

If your autochanger does not support the **-E** option to the **nsrjb** command (to re-initialize the element status), initialize the element status using **sjiielm**. For information about the **nsrjb -E** option and the **sjiielm** command, refer to the *Legato Command Reference Guide*.

c. If you need to determine which volume contains the bootstrap, inventory the autochanger using the **nsrjb -Iv** command. If you know the slot number where the bootstrap is located, use the **nsrjb -Iv -S** *slot-number* command to inventory that particular slot.

d. If the device to be used by the NetWorker server is a storage node, refer to the *NetWorker 6.1 Installation Guide, Windows Version* for details on configuring a storage node device.

3. Configure the Client resource associated with the server.

Set the browse and retention policies to a time value that covers the oldest backup from which you are recovering. The browse policy is set to one month by default. This will enable you to recover all of the server's records using **mmrecov**.

![warning icon]

Important: If you do not reset the browse and retention policies, all of the server's records will be recovered. However, any records that are more than one month old will be discarded because the browse policy is one month by default.

4. If you are recovering a relocated server's file index from a NetWorker 6.0 or later version backup, this step is no longer necessary.

If you are recovering the server's file index from a NetWorker pre-6.x version backup and you moved the server's file index path to a new location:

a. Edit the Index Path attribute in the server's associated Client resource to the original path.

b. Restart the NetWorker services. This will enable NetWorker to recognize that the index path has changed.

Task 3: Locate the Server's Bootstrap Save Set ID

If you already know the bootstrap save set ID, skip this task and go to "Task 4: Recover the NetWorker Server Bootstrap" on page 74.

The bootstrap contains the server's media index and resource configuration files. This data is needed to re-create your NetWorker server in the event of a disaster. For more information about the bootstrap, see "Preparing for Disaster" on page 21.

There are two ways to locate the save set ID of the most recent bootstrap:

1. The fastest way to determine the bootstrap save set ID is to find it in the *savegrp.log* file (printed or e-mailed) for the group that includes the NetWorker server.

   By default, NetWorker automatically creates a bootstrap save set after each scheduled backup and sends a copy to the default printer. You can also configure NetWorker to e-mail a copy of the bootstrap after a scheduled backup. If the bootstrap is neither printed nor e-mailed, NetWorker also writes the bootstrap information to the end of the *savegrp.log* file that is created for that particular backup.

   The following example lines from a *savegrp.log* file show a bootstrap save set ID of **565435905**:

```
May 16 13:47:52 wayout.legato.com: * wayout.legato.com:bootstrap
May 16 13:47 2000 wayout.legato.com bootstrap information Page 1

May 16 13:47:52 wayout.legato.com: * wayout.legato.com:bootstrap
date time level ssid file record volume

May 16 13:47:52 wayout.legato.com: * wayout.legato.com:bootstrap
05/16/00 13:47:26 full 565435905 4 0 wayout.legato.com.001
```

4

2. If the bootstrap information is not available from any of these sources, you can use NetWorker's **scanner** command (which might be somewhat time-consuming) to locate the bootstrap save set ID, as follows:

   a. Insert the media or clone volumes from the most recent scheduled backups into the appropriate device. (Do not use NetWorker to insert the media; NetWorker does not currently have the necessary information to recognize the media).

      Do not mount the new devices created in "Task 2: Configure NetWorker" on page 71.

   b. Restart the NetWorker server services.

   c. If you are using an autochanger, insert the first volume of the bootstrap save set into the first drive of the autochanger using the following command:

      nsrjb -lnv -S slot -f *device-name*

      where *slot* is the slot where the first volume is located and *device-name* is the pathname for the first drive. You can obtain this *device-name* using the **inquire** command.

   d. Run the **scanner -B** command to determine the save set ID of the most recent bootstrap on the media volume. For example:

      scanner -B \\.*Tape0*

      If you do not locate the save set ID of the most recent bootstrap on the media volumes used for the most recent scheduled backup, run the **scanner -B** command on the media volumes from the next most recent scheduled backup to locate the save set ID of the most recent bootstrap.

Task 4: Recover the NetWorker Server Bootstrap

This section describes how to recover the NetWorker server bootstrap using the **mmrecov** command. By default, the NetWorker server bootstrap files reside in the *mm* and *res* subdirectories of the *nsr* directory, which by default is installed at *%SystemDrive%\Program Files\nsr.*

In NetWorker 6.x, the **mmrecov** command is used only to recover the NetWorker server's media database and resource configuration files; the **nsrck** command is used to recover the server's client indexes (including those of the server). The **mmrecov** command will overwrite the server's existing online media indices. Refer to the **mmrecov** and **nsrck** reference pages in the *Legato Command Reference Guide* for details.

⚠

Important: If you upgraded directly from Windows NT NetWorker 5.7 to Windows NT NetWorker 6.0 and later *and* you have not yet performed a scheduled backup of the NetWorker server since the upgrade, you must reinstall Windows NT NetWorker 5.7 and use it to recover the bootstrap before proceeding. Once you have recovered the bootstrap using the previously installed version of NetWorker, reinstall NetWorker 6.x and proceed as normal. This additional step applies only to Windows NT NetWorker 5.7 bootstraps.

To recover the NetWorker server bootstrap:

1. If you ran the **scanner** command in the previous task, skip this step and go to step 2. If you did not run **scanner**, insert the backup media or clone volumes that contain the most recent backup named "bootstrap" into the storage device. Do not mount the new devices created in "Task 2: Configure NetWorker" on page 71.

   If you are using an autochanger, insert the first volume of the bootstrap save set into the first drive of the autochanger, using the following command:

   nsrjb -nlv -S slot -f *device-name*

   where *slot* is the slot where the first volume is located and *device-name* is the pathname for the first drive. (Another way to do this is to use the NetWorker Administrator Autochanger option. From NetWorker Administrator, select Configure>Autochanger>Operations.)

⚠

Important: If you are using clone volumes and do not have all of these volumes loaded, **mmrecov** will request the original volumes. You will need to remove the original volumes from the database because the original volumes are not available.

2. Use the **mmrecov** command to recover the NetWorker server's bootstrap.

   The following output appears:

   ```
   mmrecov: Using madrid.spain.com as server
   ```

> ⚠
>
> **Important:** The **mmrecov** command will overwrite the server's existing online file and media indexes. The **mmrecov** command does not recover the NetWorker clients' online indexes. These indexes are recovered through regular recovery procedures. Refer to the **mmrecov** and **nsr_crash** reference pages in the *Legato Command Reference Guide* for details.

3. When the following message appears, enter the name of the device you are using for the recovery (this message only appears if the server has multiple devices configured and enabled):

   ```
   What is the name of the device you plan on using
   [\\.\Tape1]? \\.\Tape0
   ```

4. When the following message appears, enter the save set ID for the latest bootstrap. If you are recovering a cloned version of the bootstrap, specify the save set ID associated with the clone.

   ```
   Enter the latest bootstrap save set ID: 20076
   ```

5. When the following message appears, enter the file number to begin the recovery. If unknown, enter zero.

   ```
   Enter starting file number (if known) [0]: 130
   ```

6. When the following message appears, enter the first record number to begin the recovery. If unknown, enter zero.

   ```
   Enter starting record number (if known) [0]: 0
   ```

7. When the following message appears, ensure that the volume containing the associated save set ID has been inserted into the backup device, for example:

   ```
   Please insert the volume on which save set ID 20076 started
   into \\.\Tape0. When you have done this, press <RETURN>:
   ```

8. Once you have loaded the appropriate volume, the following message appears:

   ```
   Scanning \\.\Tape0 for save set 20076; this may take a
   while...
   ```

   The NetWorker software then scans the volume for the appropriate save set. Once the save set has been located, the NetWorker software recovers it. The NetWorker software uses **nsrmmdbasm** to recover the media

database and **uasm** to recover the NetWorker resource configuration files. You can use NetWorker Administrator to monitor the recovery of the server's media database and resource configuration files.

Important: The server media database might not be on the same volume as the resource configuration files. If this is the case, the NetWorker software will prompt you if additional media is required.

Task 5: Rename the NetWorker Server Configuration Files

Because the configuration files cannot be reliably overwritten while NetWorker is running, **mmrecov** recovered the *%SystemDrive%\Program Files\nsr\res* directory as *%SystemDrive%\Program Files\nsr\res.R* by default. In addition, **mmrecov** may have recovered another server's configuration file in this directory; stopping and restarting the NetWorker Power Monitor, NetWorker Backup and Recover, and NetWorker Remote Exec services is recommended.

Before renaming the NetWorker server configuration files, you must shut down the three NetWorker services in the following order:

- NetWorker Power Monitor
- NetWorker Backup and Recover
- NetWorker Remote Exec

To shut down the three NetWorker services, follow this procedure for each of the services (in the order listed above):

1. Select the NetWorker service from the Windows 2000 menu by selecting Start>Programs>Administrative Tools>Services.

2. Right-click the service.

3. Select Stop from the menu.

4. Before proceeding, wait for the service to shut down completely.

4

Once you have shut down all three NetWorker services in the proper order, rename the NetWorker server configuration files. To rename the NetWorker server configuration files:

1. Rename the existing *%SystemDrive%\Program Files\nsr\res* directory to *%SystemDrive%\Program Files\nsr\Res.orig*.

2. Rename the recovered *%SystemDrive%\Program Files\res.R* directory to *%SystemDrive%\Program Files\nsr\res*.

After you rename the NetWorker server configuration files, you must start the three NetWorker services in the following order:

- NetWorker Remote Exec
- NetWorker Backup and Recover
- NetWorker Power Monitor

To start the three NetWorker services, follow this procedure for each of the services (in the order listed above):

1. Select the NetWorker service from the Windows 2000 menu by selecting Start>Programs>Administrative Tools>Services.

2. Right-click the service.

3. Select Start from the menu.

4. Before proceeding, wait for the service to start completely.

Once you have started all three NetWorker services in the proper order, verify that the NetWorker configurations are correct and then remove the *res.orig* directory.

4

Task 6: Reset and Inventory Your Autochanger

If you are using an Autochanger, perform you need to perform a reset and inventory the contents.

1. Run the command **nsrjb -vHE** from a Windows command prompt. This command resets the autochanger, ejects backup volumes, re-initializes the element status, and checks each slot for a volume.

   If your autochanger does not support the **-E** option to the **nsrjb** command (to re-initialize the element status), initialize the element status using **sjiielm**. For information about the **nsrjb -E** option and the **sjiielm** command, refer to the *Legato Command Reference Guide*.

2. Run the **nsrjb -Iv** command from a Windows command prompt to inventory the autochanger; or run the **nsrjb -Iv -S** command to inventory only the affected slots.

Task 7: Recover All Indexes for Clients on the NetWorker Server

After you recover the server's media database and resource configuration files, you may recover the client indexes in any order. It is not necessary to recover the server's own client index before recovering the index of any other client.

4

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Important: If your clients have the NetWorker client installed, you may run manual and scheduled backups after the media database and server resource configuration files are recovered; however, you will not be able to browse the backups for a client until you recover the client's file index. You may use save set recover to recover files before a client's file index is recovered.

To recover all indexes for clients on the NetWorker server:

1. At a Windows command prompt, enter the **nsrck -L7** command:

   nsrck -L7 *client-name*

Note: If you do not supply a client name, the indexes of all clients will be recovered.

2. If you are using a cloned version of the index, the NetWorker software may prompt you to load an original volume (not the clone volume).

   a. Enter [Ctrl]+[c] to exit **nsrck** and verify that the pending original volume message has terminated.

   b. Delete the records of the original volume(s) using the **nsrmm -d** *volume-name* command. For example:

      The NetWorker software requests the original volume *mars.1*. Because this volume is not available, delete the *mars.1* volume from the media database using the following command:

      nsrmm -d mars.1

   c. Restart the NetWorker server services.

   d. At a Windows command prompt, enter the **nsrck -L7** command:

      nsrck -L7 *client-name*

Task 8: Recover the NetWorker Server Data

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Important: If you routinely move your NetWorker backup media to an off-site location for safekeeping and a subsequent file recover operation generates a mount request, the recover will wait until an operator satisfies the mount request. To avoid delays when recovering files, use the **mminfo -mv** command to list the media volume that is associated with the file you want to recover and retrieve the media from the off-site storage before starting the recover.

To recover the remainder of the NetWorker server data, including the client indexes, follow these steps:

1. Log on to Windows 2000 with local administrator privileges. To recover the SYSTEM save sets, *you must be logged on to the computer being restored* with local administrator privileges. Directed recovery of the SYSTEM save sets is not supported in this release.

2. If you are using an autochanger, inventory it. This will ensure that NetWorker can recognize the location of each volume.

⚠

Important: After the media database and server resource configuration files have been recovered, you may recover the client indexes in any order. It is not necessary to recover the server's own client index before recovering the index of any other client.

If your clients have the NetWorker client installed, you may run on-demand and scheduled saves once the media database and server resource configuration files are recovered; however, you will not be able to browse the saves for a client until you recover the client's file index. You may use save set recover to recover files before a client's file index is recovered.

3. If you load a clone volume, the NetWorker software will use the clone volume for the remainder of the recovery process if either of the following is true:

   • The original volume was not added back into the media database.
   • The original volume was added back into the media database, but it was not placed in an autochanger and inventoried.

   However, if the original volume was added back into the media database, placed in an autochanger and inventoried, the NetWorker software will prompt you to mount the original volume.

4. Ensure that all drive letters that contained system information prior to the node failure are accessible. The system information includes the boot partition, system partition, and the partition that contains the databases and database logs for the system state components.

5. Start NetWorker User.

6. Click the Recover speedbar button to open the Recover window. NetWorker displays the associated computer's directory structure in the Recover window.

7. Select and mark all applicable drives for recovery (for example, *C:*). Make sure the NetWorker directory is included (the default path is *%SystemDrive%\Program Files\nsr*). Also mark the SYSTEM save sets (SYSTEM FILES, SYSTEM DB, and SYSTEM STATE) for recovery. For details regarding these save sets, refer to the section on using NetWorker with Windows 2000 in the *NetWorker 6.1 Administrator's Guide, Windows Version*.

4

Important: To avoid having to reboot twice, make sure the SYSTEM STATE save set is restored last. If you recover all save sets in a single operation, NetWorker User will restore them in the correct order. If you recover save sets in multiple NetWorker User operations, recover the SYSTEM STATE save set last.

The bootstrap and indexes are browsable for NetWorker releases earlier than 6.0. If you are recovering a save set from a NetWorker release earlier than 6.0 and you select for recovery the drive where the NetWorker server nsr directory is located (by default, *%SystemDrive%\Program Files\nsr)*, be sure to unselect the following subdirectories of the *nsr* directory: *index, mm, res, bin.*

8. Set the recover options by selecting the Overwrite Existing File radio button from the Options>Recover Options menu.

Important: If you did not set the recover options, you will need to select the Overwrite Existing File option when the Naming Conflict dialog box appears during the recovery process. To enable automatic overwriting of files with the same name, select the Suppress Further Prompting option in the Naming Conflict dialog box.

9. Click the Start speedbar button to begin the recovery.

Task 9: Complete the NetWorker Server Recovery

After the recovery operation is complete, follow these steps to finish the process:

1. Check the *%SystemDrive%\Program Files\nsr\logs\networker.log* file to verify that no errors were generated during the recover sessions. If errors are found, you may need to rerun the recover once the cause of the errors has been addressed.

2. Restart the computer and verify that the NetWorker Backup and Recover Server, NetWorker Power Monitor, and NetWorker Remote Exec services have started.

⚠

Important: After recovery of the NetWorker server, the operating system must be rebooted. The reboot operation provides for the complete restoration of the system protected files and restarting of services which were automatically stopped prior to recovery.

Task 10: Verify the NetWorker Server Recovery

To verify the NetWorker server recovery:

1. Verify that all services related to the Windows 2000 system state that were previously installed have been restarted. You can use Event Log Viewer to check for service-startup errors. Refer to the sections on preparing to recover the SYSTEM save sets in the *NetWorker 6.1 Administrator's Guide, Windows Version* for a list of these services.

2. Use the Event Viewer to examine the event log for the Windows protected files to verify that there are no errors regarding replacing files.

3. If the NetWorker server was previously configured as a domain controller, verify that the drives configured to store the Active Directory database and log files have been recovered.

4. Verify that any applications which were running prior to the disaster, such as Microsoft Office, have been properly restored by restarting the applications and viewing previously saved documents.

5. Perform a test backup or restore to ensure that the server is fully recovered.

6. Verify that the server and its associated clients are included in a scheduled backup.

4

Dynamic Host Configuration Protocol (DHCP) and Windows Internet Naming Service (WINS) Databases

Windows 2000 does not provide a programming interface for backup and restore of the DHCP database or the WINS database. However, you can configure and automate DHCP and WINS database dumps using Windows 2000 administrative tools, back up and restore the database dumps as part of your routine NetWorker filesystem operations, and finally import the databases using the same Windows 2000 administrative tools you used to configure the dumps.

If you are using DHCP or WINS, you can dump, back up, restore, and import these databases as follows:

1. To open the DHCP administrative console, go to Start>Programs>Administrative Tools>DHCP.

2. Configure and automate DHCP database dumps from the DHCP administrative console. A default dump location is provided, but you can specify a different location. Make a note of the database dump location you choose.

3. To open the WINS administrative console, go to Start>Programs>Administrative Tools>WINS.

4. Configure and automate WINS database dumps from the WINS administrative console. A default dump location is provided, but you can specify a different location. Make a note of the database dump location you choose.

5. As part of your routine NetWorker filesystem backups, specify the save set(s) that include(s) the filesystem locations you specified for the DHCP and WINS databases dumps.

6. To recover a DHCP or WINS database, open the corresponding administrative console and import the database that NetWorker backed up and restored.

Recovering NetWorker Client Data or Storage Node Data

You can recover the NetWorker client or NetWorker storage node data to the original computer or to a different computer. Recovering client data or storage node data involves the following main procedures:

1. Satisfy the NetWorker client or storage node data recovery prerequisites.

2. Reinstall NetWorker, if necessary.

3. Recover the NetWorker client or storage node data.

4. Complete the NetWorker client or storage node recovery.

These procedures are explained in detail in the following sections.

Prerequisites

To recover the client or storage node software, you need:

- The same release and patch level of the NetWorker software that was in use before the disaster.
- The location where the NetWorker software was originally installed. By default, NetWorker is installed in the *%SystemDrive%\Program Files\nsr* directory.

4

How to Recover a Windows 2000 NetWorker Client or Storage Node

To recover a Windows 2000 NetWorker client or NetWorker storage node, perform the following tasks:

Task 1: Install NetWorker

If the NetWorker software on the NetWorker client host or NetWorker storage node is not properly installed and running, you must reinstall NetWorker. Before reinstalling the NetWorker software on a NetWorker client or NetWorker storage node, identify the Legato products (and associated patches, if applicable) that were installed before the disaster (such as SmartMedia, ClientPak, and NetWorker Modules).

Reinstall any Legato backup software and patches that are unusable or appear to be damaged, as follows, and by referring to the product *Installation Guide* as necessary:

1. Install the same version of the NetWorker software to the same location it occupied before the disaster.

   - If the NetWorker installation kit is available on a shared drive on the network, you can install the NetWorker software over the network.

   - If you want to upgrade the NetWorker client or NetWorker storage node software, first recover the NetWorker client or NetWorker storage node to its original state, and then perform the upgrade.

2. Install any NetWorker patches that had been installed prior to the disaster.

3. Install the temporary enabler code for each Legato backup product. You can find the temporary enabler code in the *Installation Guide* for each product.

4. If you are restoring a NetWorker storage node, make sure that the storage node system can see the local devices that the NetWorker server will use the storage node devices.

   Refer to the *NetWorker 6.1 Administrator's Guide, Windows Version* for instructions on configuring a stand-alone or autochanger storage node.

5. From NetWorker User, perform a test recovery to ensure the NetWorker recovery process is functioning properly.

Task 2: Recover the NetWorker Client or NetWorker Storage Node Data

Before continuing with the following procedure, be sure you understand the information in the *NetWorker 6.1 Administrator's Guide, Windows Version* about the proper way to restore the NetWorker SYSTEM save sets.

If the NetWorker server has failed, it should be fully recovered and functional before you attempt to recover associated NetWorker client data or NetWorker storage node data. If the backup device used by the NetWorker server is a storage node, you might have to restore the storage node partially before attempting to recover the NetWorker server.

To recover NetWorker client or NetWorker storage node data:

1. Open NetWorker User. Click the Recover button on the toolbar.

2. In the NetWorker User Recover window, mark each of the following for recovery:

   • All local physical drives
   • The SYSTEM save sets: SYSTEM STATE, SYSTEM FILES, and SYSTEM DB

   Note: To avoid having to reboot twice, make sure the SYSTEM STATE save set is restored last. If you recover all save sets in a single operation, NetWorker User will restore them in the correct order. If you recover save sets in multiple NetWorker User operations, recover the SYSTEM STATE save set last.

   ⚠

   Important: The NetWorker software stores the user profiles folders in the save set corresponding to the disk drive on which they are located (for example, the C:\ save set). Therefore, this save set must be recovered to restore a user profile.

   The top level of user profiles folders is located at *%SystemDrive%\Documents and Settings*.

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3. In the Options>Recover Options dialog box, select Overwrite Existing File. (If you do not set the recover options, you will need to select the Overwrite Existing File option when the Naming Conflict dialog box appears during the recovery process. To enable automatic overwriting of files with the same name, select the Suppress Further Prompting option in the Naming Conflict dialog box.)

4. Click Start.

5. When the Password Protection window appears, you can select Recover>OK to recover these files. Files in the Recycle Bin are not password-protected.

6. The NetWorker software logs information about the recovery process to *%SystemDrive%\networkr.log*. This log is overwritten each time a recovery is performed. Check the log file to verify that no errors messages were generated during the recover sessions. If there are error messages in the log file, you might need to run the recovery again after addressing the source of the errors.

7. Reboot the computer. The computer should now be recovered to the state prior to the disaster.

8. After the data is recovered, you might have extra files that were recovered from open files. You can locate these files by searching for *.*.*a* (for example, *nsrexecd.exe.a1001789*) and then delete them.

> ⚠️
>
> **Important:** For information about backup and recovery procedures for terminal services licensing, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*.

Task 3: Complete the NetWorker Client or Storage Node Recovery

To complete the NetWorker client or NetWorker storage node recovery:

1. Perform a test recovery using each of the Legato backup products you are using.

2. Recover your data using the Legato product you used to back up the data. Refer to the appropriate *Administrator's Guide* for details.

3. Verify that all services related to the Windows 2000 system state that were previously installed have been restarted. You can use Event Log Viewer to check for service-startup errors. Refer to the sections on preparing to recover the SYSTEM save sets in the *NetWorker 6.1 Administrator's Guide, Windows Version* for a list of these services.

4. Verify that all devices previously managed by the Removable Storage Manager are visible to the operating system.

5. Ensure that the storage devices to be used by the NetWorker server can be detected by the storage node.

6. Use the Event Viewer to examine the event log for the Windows-protected files to verify that there are no errors regarding replacing files.

7. If either the NetWorker client or NetWorker storage node was previously configured as a domain controller, verify that the drives configured to store the Active Directory database and log files have been recovered.

8. Verify that any applications which were running prior to the disaster, such as Microsoft Office, have been properly restored. You can verify this by restarting the applications and viewing previously saved documents.

9. Perform a test backup or restore to the NetWorker server to ensure that the connection between the NetWorker client or NetWorker storage node and the NetWorker server is working properly.

After you complete the entire recovery, install Active Directory if you want to use it.

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Chapter 5: NetWare Disaster Recovery

This chapter provides instructions on how to perform a disaster recovery on a NetWare system using the NetWorker software. It also describes the prerequisites for recovering the hardware, operating system, and software.

All of the utilities referenced in this chapter are NetWare console utilities.

The set of instructions you need to follow depends upon the extent of the damage caused by the disaster. Refer to the following list of disaster recovery scenarios to determine which set of instructions apply to your situation.

To recover...	See...
Hard drive	• "Replacing a Hard Drive" on page 92
Operating system, single-server, with or without NDS	• "Recovering the NetWare Operating System" on page 94
NetWorker server	• "Recovering a NetWare NetWorker Server" on page 97
Operating system, replicated NDS partition, multiserver NDS	• "Recovering a Replicated NDS Partition" on page 105

Replacing a Hard Drive

To replace a hard drive:

- Obtain the hard drive information.
- Replace the hard drive.

Obtaining the Hard Drive Information

Obtain the following information about each drive:

- Size of the drive
- Size, format, and volume label assigned to each drive partition
- NetWare Directory Services (NDS), the NDS tree topology, and the location of server objects, partitions and replicas, and bindery context settings

You can obtain information about each drive using:

- **install** (or **nwconfig** on NetWare 5.0). This server utility provides information about each hard drive including each volume segment on the drive.
- **netadmin** (DOS) or **nwadmn** (Windows). These NetWorker server utilities provide information about each server object, such as name and location.
- **dsrepair**. This server utility enables you to perform a check on each partition and replica.
- *autoexec.ncf*. This file contains the bindery context settings.
- **ndir**. This workstation utility provides information about each volume, directory, and file on the disk.

After you obtain this information, you can replace the hard drive.

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How to Replace a Hard Drive

If you are experiencing the failure of one or more hard drives, refer to the appropriate NetWare documentation and the appropriate hard drive vendor documentation for detailed instructions on how to replace your hard drives.

Important: Install a new drive that is the same size or larger than the original drive. This will ensure that you can recover all of the drive's data.

Important: Do not delete any volume objects from the NDS tree. This would eliminate any references that other objects might have to a particular volume.

To begin the recovery process, recover:

- The operating system. See "Recovering the NetWare Operating System" on page 94 for details.
- The NetWorker server, if necessary. See "Recovering a NetWare NetWorker Server" on page 97 for details.
- The computer's data using NetWorker. Refer to the *NetWorker Administrator's Guide, NetWare Version* or details.

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Recovering the NetWare Operating System

To recover the operating system:

- Meet the operating system recovery prerequisites.
- Recover the operating system.

Prerequisites

To recover the operating system, you need the following:

- NetWare operating system, license software, patch level, and version
- Version and patch level of the MS-DOS software
- IPX/SPX and/or TCP/IP properties:
    - Adapter type
    - IPX network number or IP address
    - Default gateway
    - Subnet mask
    - DNS server
- Computer properties:
    - Computer name
    - DNS domain name
    - Administrator name and password
- Device and SCSI drivers
- Startup files, including *autoexec.bat*, *config.sys*, *autoexec.ncf*, and *startup.ncf*

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How to Recover the NetWare Operating System

This section describes how to recover the NetWare operating system using the NetWorker software. You can use this process to recover the NetWare operating system back to the original computer, or to a different computer.

You can recover the operating system by performing either:

- A complete **install** or **nwconfig**. In this instance, you perform a complete reinstallation and configuration of the operating system.

    — or —

- A partial **install** or **nwconfig**. In this instance, you install and configure only those files that enable the computer to communicate over the network. Then, you recover the remaining operating system and configuration files using the NetWorker software.

To recover the operating system, follow these procedures, explained in detail in the following sections:

1. Install the operating system.

2. Configure the operating system.

3. Test the operating system and configure the devices.

Task 1: Install the Operating System

To install the operating system:

1. Install MS-DOS, including the *AUTOEXEC.BAT* and *CONFIG.SYS* files, into its original location. Refer to the MS-DOS documentation for details.

2. Install the same version and patch level of NetWare using the **install** or **nwconfig** utility into its original location with the same:

   • Version
   • Patch level
   • Computer name
   • IPX network number and/or IP address

   Refer to the NetWare documentation for details.

   If you want to upgrade NetWare, first restore the operating system to its original state, and then perform the upgrade.

3. Install NDS into its original location using the **install** or **nwconfig** utility:

   • Use the same name as the original tree.
   • Use the same server name.
   • Use the same container and Administrator name.
   • Ensure the Administrator object resides at the same level, in the same container, as it did in the original tree.

   Refer to the NetWare documentation for details.

!

Important: If this server will become the master of the NDS Root partition, during installation, make sure you re-create the Organization object using the same name. If the Organization object does not have the same name, the sub-tree will contain new empty containers.

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Task 2: Configure the Operating System

To configure the operating system:

1. Configure the IPX/SPX and TCP/IP properties exactly as they were configured before. If you do not, the NetWorker software will assign the computer a new host ID. If the computer has a different host ID, you must reregister the NetWorker software. Refer to the *NetWorker Installation Guide, NetWare Version* for details.

2. If you are recovering to a new computer, assign the same *hostname* for the new computer. If you do not use the same *hostname,* you will not be able to recover the NetWorker indexes associated with the original computer.

3. Configure the date and time properties as they were configured before.

4. If you had any additional NetWare components or services, reinstall them before recovering the computer's data.

5. Restart the computer after installing the NetWare operating system.

Task 3: Test the Operating System and Configure the Devices

To test the operating system and configure the devices:

1. Configure any devices required by NetWorker. For example, SCSI passthru devices for autochangers.

2. Perform a test to verify that the:

   - Name to Address resolution is correct. Test by running **nslookup** using the Fully Qualified Domain Name of the NetWare NetWorker backup server, client, or storage node.
   - Network protocols are functioning properly.
   - Operating system is functioning properly.
   - Time synchronization is functioning properly.
   - Devices are recognized by the operating system. If the devices are not recognized by the operating system, you might need to:
     - Modify the device configuration files to enable the computer to communicate with the device during recovery.
     - Load the SCSI driver and its associated ASPI driver.
     - Install the device driver.

To complete the recovery process, recover:

- The NetWorker server, if necessary. See "Recovering a NetWare NetWorker Server" on page 97 for details.
- The NetWorker client, if necessary.
- The computer's data using NetWorker. Refer to the *NetWorker Administrator's Guide, NetWare Version* for details.

Recovering a NetWare NetWorker Server

To recover a NetWorker server:

- Meet the NetWorker server prerequisites.
- Recover the NetWorker server.

Prerequisites

To recover the NetWorker server, you need the following:

- Version and patch level of NetWorker
- Location of NetWorker
- Backup or clone volumes containing the:
  - NetWorker server media manager. By default, this directory is located in the *SYS:NSR\MM* directory.

![warning icon]

Important: Do not attempt to recover the *legatomm* file manually. Recover this file using the NetWorker Utilities Recover from a Disaster option.

5

  - NetWorker server indexes. By default, this directory is located in the *SYS:NSR\INDEX\<SERVER-NAME>* directory.
  - NetWorker server configuration files. By default, this directory is located in the *SYS:NSR\RES* directory.

How to Recover a NetWare NetWorker Server

This section describes how to recover a NetWorker server. You can use this process to recover the NetWorker server back to the same computer, or to a different one.

To recover a NetWorker server, follow these procedures, explained in detail in the following sections:

1. Install NetWorker.

2. Configure NetWorker so that it can perform the remainder of the recovery processes.

3. Locate the latest bootstrap save set ID.

4. Recover the NetWorker bootstrap.

5. Rename the NetWorker server configuration files.

6. Recover the NetWorker server data.

Task 1: Install NetWorker

To install NetWorker:

1. Install the same version of NetWorker into its original location. Refer to the *NetWorker Installation Guide, NetWare Version* for installation instructions.

   • If you wish to upgrade the NetWorker server, first recover the server to its original state, and then perform the upgrade.

   • You do not need to reload the license enablers if the NetWorker configuration files still exist. By default, the configuration files are located in the *SYS:NSR\RES* directory.

2. Install any NetWorker patches you had installed prior to the disaster.

5

Task 2: Configure NetWorker

To configure NetWorker:

1. Configure the Device resource, if:

   - You want to recover your data using multiple devices.
   - You are not using a 4-mm device. The default device created by NetWorker is a 4-mm device.
   - You want to recover your data using an autochanger. Use [F4] to verify that the autochanger correctly appears in the Autochanger window.

2. Configure the Client resource associated with the server.

   Set the browse and retention policies to a decade. The browse policy is one quarter (four months) by default. This enables you to recover all of the server's records.

> ⚠️
>
> **Important:** If you do not reset the browse and retention policies, all of the server's records will be recovered. However, any records that are more than one quarter (four months) old will be discarded, because the browse policy is one quarter by default.

Task 3: Locate the Server's Bootstrap Save Set ID

This section describes how to locate the save set ID for the NetWorker server's latest bootstrap. The NetWorker server's bootstrap contains the server's online file index, media index, and resource configuration files.

Use the following steps to locate the save set ID of the most recent bootstrap if you do not have this information:

1. Insert the most recent media or clone volumes used for scheduled backups into the appropriate device.

2. At the NetWare system console, switch to the directory where the NetWorker NLMs are located. By default, these files are located in the *SYS:NSR\BIN* directory.

3. Use the **scanner -B** command to locate the most recent bootstrap on the media.

5

Task 4: Recover the NetWorker Server Bootstrap

This section describes how to recover the NetWorker server's bootstrap. By default, these files reside in the *SYS:NSR* and *SYS:NSR\RES* directories, and can be recovered using the NetWorker Utilities program.

To recover the NetWorker bootstrap:

1. Load and inventory the devices. This ensures that the NetWorker software can recognize which slots contain which volumes.

   If you load a clone volume into a device, the NetWorker software will use the clone volume for the remainder of the recovery process. You might have to update the volume location to indicate that the original volume is not available.

2. Start the NetWorker Utilities program by entering the following command at the NetWare system console:

   load NETUTIL

   ![warning triangle icon]

   Important: Disable scheduled backups and do not use the NetWorker software to perform backups or recovers while running the NetWorker Utilities program. If backup and recovery processes are enabled, the state of the NetWorker indexes will become confused. From the NetWorker Utilities dialog box, select Recover from a Disaster.

3. Enter the full name of the backup administrator (for example, *".cn=Admin.O= 'top level container'"*) into the User field and the appropriate NetWare password into the Password field and press [Enter].

   The Device Selection window appears.

4. From the Device Selection window, select the device you intend to use and press [Enter].

5. Insert the most recent media or clone volumes used for scheduled backups into the appropriate device.

   • If you are using a single tape device, manually insert the volume.
   • If you are using an autochanger, use the autochanger controls to manually select the slot containing the most recent backup volume.

   Refer to your printed bootstrap records to determine the required backup volume.

6. Press [Enter] when the following message appears.

   ```
   Put the volume for disaster recovery in device xxxx and
   press Enter.
   ```

7. Press [Enter] to exit the NetWorker Utilities. The server's processor will halt with multiple ABENDs.

8. Restart NetWorker.

9. From NetWorker, select F3>Operation>Recover.

10. Browse and mark the following files for recovery:

    - *SYS:NSR\NSR.RES*
    - *SYS:NSR\NSRJB.RES*

11. Press [F2] to start the recovery. When messages indicating name conflicts appear, select Rename the Recover File for both files.

12. When recovery is complete, exit the NetWorker Utilities program.

Task 5: Rename the NetWorker Server Configuration Files

To rename the configuration files:

1. Unload all of the associated NLM files using **nwdown**.

2. Delete the existing files (*NSR.RES* and *NSRJB.RES*).

3. Rename the recovered files (which were renamed upon restore with a tilde (~) prefix) to *NSR.RES* and *NRJB.RES*.

4. Restart the NetWorker software. This process restores the NetWorker software to its last backup configuration, including passwords, administrator privileges, backup groups, and schedules.

5. Verify that the NetWorker indexes and configuration files are restored. If they are not restored, select Recover from a Disaster from the NetWorker Utilities program, or use an older volume.

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Task 6: Recover the NetWorker Server Data

This section describes how to recover the remainder of the server's data using the NetWorker Utilities program.

To recover the NetWorker server data:

1. Insert the most recent backup or clone volumes into the device.

2. From the Mount dialog box, select the required volume.

   Notice that the volume is now marked (R); this means the volume is write protected.

3. From the [F3] Operation menu, select Recover to display the Client List window.

4. Select the client with the NetWare server name and press [Enter].

   Another login window appears.

5. Enter the full name of the backup administrator (for example, *".cn=Admin.O= 'top level container'"*) into the User attribute and the appropriate NetWare password into the Password attribute and press [Enter].

   The Browser window appears.

6. Select Schema and mark it for recover to recover all extensions to the NDS schema.

7. From the [F2] File menu, select Start Recover, and press [Enter].

8. If you have NDS data to restore, continue with "Task 7: Restore NDS Data".

   If you do not have any NDS data to restore, continue with "Task 8: Complete the Server Recovery" on page 104.

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Task 7: Restore NDS Data

Before performing an NDS backup or recover, read the *Novell® Application Notes* section "Backing Up and Restoring Novell Directory Services in NetWare 4.11," dated October 1996. This document explains concepts and procedures that you need to understand before working with NDS backups and recovers.

On networks with multiple servers, NDS automatically creates replicas (copies) of the NDS database or portions of it (partitions) and stores them on other servers. This process provides a readily available backup if NDS or a partition is damaged. Do *not* circumvent this replication process.

Whenever possible, use an active replica to restore what was lost from the NDS tree. If this is not feasible, you must restore from a Storage Management Services (SMS) backup in the following way:

1. Restore the NDS information.

2. Restore the filesystem data and trustee rights.

   NDS backup and restore is based on object names. The objects must exist in the tree before you can restore the filesystem data and trustee assignments for those objects. NDS should be functional (time and partitions synchronizing normally) before you proceed with a restoration.

To restore NDS data to this server using the NetWorker software:

   a. From the [F3] Operation menu, select Save Set Recover, and press [Enter].
   b. Select this server's name as both the source and destination client.
   c. Enter the full name of the backup administrator, and the password.
   d. Select the {NDS} save set, and press [Enter] to display versions.
   e. Select the version with the most recent full backup.

If there are any later save sets with level 1 or incremental backups, recover them from the oldest to the most recent.

The NDS is now restored to the state of the most recent backup.

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Task 8: Complete the Server Recovery

To complete the recovery of the server:

1. Use NetWorker to recover the remaining data, including the client indexes. In the Browser window, mark everything for recovery, and then unmark all still-operational volumes, *LEGATOMM*, the server's *LEGATODB*, *NSR.RES*, *NSRJB.RES*, Schema, and NDS.

   ⚠️

   Important: Make sure you recover each client index by selecting the client folder from the indexes directory. Each client has a *legatodb* file that is located in *SYS:NSR\INDEX\CLIENT-NAME*.

   If you run out of memory while recovering multiple files, try recovering one volume at a time.

2. From the [F2] File menu in the Browser window, display the NetWorker Recover Options dialog box. Select Don't Overwrite Data.

3. Verify the recovered data. From a workstation, use the **ndir** command or NetWare Administrator (NWAdmin) to check the data, trustee assignments, file ownership, and other related information.

4. Select Cross-Check Index from the Indexes dialog box of the NetWorker Administrator program to compare the index records to the records in the media index.

5. Perform a check to make sure the server is fully recovered:

   - Verify that the server and its associated clients are included in a scheduled backup.
   - Run **dsrepair** to verify the integrity of any NDS databases.
   - Use the **nwadmn** server utility or the **ndir** workstation utility to verify the data, trustee assignments, and file ownership.

Recovering a Replicated NDS Partition

If the NetWare server did not contain an NDS partition (replicated or not), you only need to rebuild the NetWare operating system and the server's filesystems.

This section contains the following information on recovering a replicated NDS partition over the network:

-
-

Important: For NetWare 4.11/IntraNetWare® servers, do not delete the server or volume objects for the failed volume from the NDS tree; you do not want to eliminate any references other objects might have to the volume. If you must delete objects on a NetWare 4.11/IntraNetWare server, use the NetWare 4.10 procedure for recovering from a disaster.

How to Recover a NetWare 4.10 SYS Volume

To recover a SYS volume on a NetWare 4.10 server, follow these procedures, explained in detail in the following sections:

1. Recover the SYS Volume.

2. Restore the SMS Remote File System.

3. Complete the recovery of the SYS volume.

Task 1: Recover the NetWare 4.10 SYS Volume

To recover a SYS volume on a NetWare 4.10 server:

1. Use **nwadmn** or **netadmin** to delete the volume objects associated with the failed server.

2. Use NDS Manager or **partmgr** to delete the server object for the failed server. You cannot use **netadmin** to delete a server object.

   Partition Manager displays a warning message; enter **yes** to confirm the deletion.

3. Use NDS Manager or **dsrepair** to check the replica synchronization.

   If you see error messages, wait a few minutes and try again.

4. From your NetWorker server, perform a directed recover to restore the failed server's *Server Specific Info (SSI)* files from a tape backup to a functioning NetWorker for NetWare client.

   The server-specific information files (*SERVDATA.NDS*, *VOLSINFO.TXT*, *STARTUP.NCF*, and *AUTOEXEC.NCF*) are restored to a subdirectory under *SYS:\SYSTEM* on the server you selected. This subdirectory is given a DOS 8.3 name derived from the source server name.

5. If the failed server held a master replica, use NDS Manager or **dsrepair** to designate a new master replica on a different server in the replica ring.

6. Use NDS Manager or **dsrepair** to perform an unattended full repair to check replica synchronization. If necessary, use NDS Manager or **dsrepair** on the servers containing master replicas to remove the failed server from the replica ring.

7. Shut down the failed server and replace any damaged server hardware. If you replace a hard drive, be sure that it is the same size or larger.

8. Format the DOS partitions and reinstall DOS.

![warning triangle icon]

Important: Use the DOS Time command to ensure that your computer is set to the correct time to avoid time synchronization errors.

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9. Reinstall NetWare 4.10 and NDS on the repaired or replaced server. Run **install** or **nwconfig**, select Custom Install, and follow the directions on the screen. Use the *STARTUP.NCF* and *AUTOEXEC.NCF* files recovered with SSI to answer the questions displayed on the screen.

   – Enter the same server name and internal IPX number that the server had prior to the disaster.

   – When prompted, insert the NetWare License diskette for the server into the disk drive.

   – When prompted for the name of the NDS tree, select the name of the tree that the server resided in before the disaster.

   – Select the time zone and configure the time.

      –   Log in and specify the context for the server and its objects. Use the same context used before the disaster.

      –   Edit the *STARTUP.NCF* and *AUTOEXEC.NCF* files to match the versions recovered with SSI.

Installation continues; when complete, the server will contain all the files necessary to perform an SMS remote filesystem restore. For more information, see .

Task 2: Restore the SMS Remote File System

To restore the SMS remote filesystem to a SYS volume on a NetWare 4.10 server:

1. Load the required name space modules for each restored volume. Use the *VOLSINFO.TXT* file to determine which name spaces need to be loaded (*MAC.NAM*, *LONG.NAM*, etc.).

2. Load the filesystem TSA specific to your version of the NetWare operating system, by entering one of the following commands:

   LOAD TSA410

   LOAD TSA312

   LOAD TSA500

3. Recover the filesystem for each volume affected by the failure. Do not recover the Schema and [Root]; they are restored from a replica. You also do not need to recover Server Specific Info again. When prompted, suppress further prompting and overwrite files.

4. When you are prompted, log in using the full name of the backup user.

5. If the failed server had non-SYS volumes that were not affected by the failure, from the [F2] File menu in the Browser window, select Recover to display the NetWorker Recover Options dialog box. Select the **Don't Overwrite Data; restore trustees, etc.** command, and then recover the volumes that were not affected by the failure.

6. Shut down and restart the repaired or replaced server.

5

Task 3: Complete the Recovery of the NetWare 4.10 SYS Volume

To complete the recovery of a NetWare 4.10 SYS volume:

1. If necessary, use NDS Manager or **dsrepair** to re-establish replicas on the repaired or replaced server.

2. Type the following commands at the command prompt:

   LOAD TSA410

   LOAD TSANDS

   LOAD TSA500

3. From the Recover Browser window, recover the server object, volume objects, and any objects that formerly referenced the recovered volume or server objects. Expand the [Root] resource, mark the required objects, and then select Recover. When prompted, suppress further prompting and overwrite files.

4. Use NDS Manager or the Schedule immediate synchronization function of **dsrepair** to synchronize the replica on all servers.

5. Verify the recovered data. From a workstation, use either the **nwadmn** server utility or the **ndir** workstation utility to check the data, trustee assignments, file ownership, and other related information.

The SYS volume should now be restored.

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How to Recover a NetWare 4.11, NetWare 5.0, or IntraNetWare Server SYS Volume

To recover a SYS volume on a NetWare 4.11, NetWare 5.0, or IntraNetWare server, follow these procedures, explained in detail in the following sections:

1. Recover the SYS Volume.

2. Install the operating systems.

3. Complete the SYS Volume recovery.

![warning icon]

Important: For NetWare 4.11/IntraNetWare servers, do not delete the server or volume objects for the failed volume from the NDS tree; you do not want to eliminate any references other objects might have to the volume. If you must delete objects on a NetWare 4.11/IntraNetWare server, use the NetWare 4.10 procedure for recovering from a disaster.

Task 1: Recover the NetWare SYS Volume

This section describes how to recover a NetWare 4.11 or IntraNetWare SYS volume.

To recover a SYS volume:

1. From your NetWorker server, perform a directed recover to restore the failed server's *Server Specific Info (SSI)* files from a tape backup to a functioning NetWorker for NetWare client.

    The server-specific information files (*SERVDATA.NDS*, *DSMISC.LOG*, *VOLSINFO.TXT*, *STARTUP.NCF*, and *AUTOEXEC.NCF*) are restored to a subdirectory under *SYS:\SYSTEM* on the client you have selected. This subdirectory is given a DOS 8.3 name derived from the source server name.

![warning icon]

Important: For NetWare 4.11/IntraNetWare servers, do not delete the server or volume objects for the failed server from the NDS tree. You do not want to eliminate any references other objects might have to the server. If objects were deleted from the NDS tree, use the NetWare 4.10 procedure for recovering from a disaster.

2. If the failed server held a master replica, use NDS Manager or **dsrepair** to designate a new master replica on a different server in the replica ring. Refer to *DSMISC.LOG* to determine which replicas were stored on the failed server.

3. If the failed server also contained any non-master replicas, use NDS Manager or **dsrepair** on the servers containing master replicas to remove the failed server from the replica ring.

   A NetWare warning message appears. Continue with the recovery procedure. Refer to "Backing Up and Restoring Novell Directory Services in NetWare 4.11" in *Novell Application Notes*, October 1996.

4. Use **dsrepair** to perform an unattended full repair to ensure the ring is functioning properly.

   Refer to *DSMISC.LOG* to determine which replicas were stored on the failed server. If *DSMISC.LOG* shows that no other server has exactly the same replicas as the failed server, run **dsrepair** on any servers containing replicas of partitions on the failed server.

5. Shut down the failed server and replace any damaged hardware. If you need to replace a hard drive, install a drive that is the same size or larger.

Task 2: Install the Operating Systems

To install the operating systems:

1. Format the DOS partitions and reinstall DOS.

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Important: Use the DOS Time command to ensure that your computer is set to the correct time to avoid time synchronization errors.

2. Reinstall NetWare 4.11, NetWare 5.0, or IntraNetWare and NDS on the repaired or replaced server. Run **install** or **nwconfig**, select Custom Install, and follow the directions on the screen.

   a. When prompted, enter the same server name and internal IPX number that the server had prior to the failure. Use the *STARTUP.NCF* and *AUTOEXEC.NCF* files included with the server-specific information for needed information.

   b. After the preliminary files are copied, the Choose a Directory Tree dialog box appears. Press [F5] to restore NDS (option listed at the bottom right of the screen).

   c. A new window displays two options: A: (the default) or Press [F3] to specify a different path. If the *Server Specific Info* files are contained on diskette, insert the diskette into drive A and press [Enter]. Otherwise, press [F3] and enter the path to the *Server Specific Info* files restored in step 1.

   d. A Remote Server Authentication login dialog box is displayed. Log in. When prompted, enter the Directory tree name.

   e. Press [Enter], and both the files and NDS are copied to the new server. *DSMISC.LOG*, *VOLSINFO.TXT*, and *AUTOEXEC.NCF* are copied to the *SYS:SYSTEM* directory. *STARTUP.NCF* is copied to the *C:\NWSERVER* directory.

   f. The NDS restoration uses the information from *SERVDATA.NDS* (*TSANDS.NLM* is not needed). NDS is now fully functional on the server, but the partitions and replicas must still be reestablished.

   g. When prompted, insert the NetWare License diskette for the server into the diskette drive.

   h. Edit the *STARTUP.NCF* and *AUTOEXEC.NCF* files.

   i. If either the *STARTUP.NCF* or the *AUTOEXEC.NCF* files have changed because they were backed up with the server-specific information, both the original and the new files are displayed for you to compare and make edits as necessary. If the current files are the same as the original files, only the current files are displayed.

The server now contains all the files necessary to perform an SMS remote filesystem restore.

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3. To finish the installation, either:

- Press [Enter] to exit the utility. NetWare will not copy the remaining system and public files but will exit the utility. These files should be recovered from a backup.

  — or —

- Press [F3] to Continue installation and wait while the utility copies the remaining system and public files. Then exit.

Task 3: Complete the NetWare SYS Volume Recovery

This section describes how to complete the recovery of the 4.11 SYS volume.

To complete the recovery of the SYS volume:

1. Load the required name space modules for each restored volume. Use the *VOLSINFO.TXT* file to determine which name spaces need to be loaded (*MAC.NAM*, *OS2.NAM*, and so on).

2. Load the filesystem TSA specific to your version of NetWare by typing one of the following commands, at the prompt of the repaired or replaced server:

   LOAD TSA410

   LOAD TSA500

3. Recover the filesystem for each volume affected by the failure. Do not recover the Schema and [Root]; they will be restored from a replica. You also do not need to recover Server Specific Info again. When prompted, suppress further prompting and overwrite files.

   If the failed server had non-SYS volumes that were not affected by the failure, no further action is needed because the *SERVDATA.NDS* file preserves the trustee assignments on these other volumes.

4. Shut down and restart the server.

5. Use NDS Manager or **dsrepair** to re-establish replicas on the failed server. Use *DSMISC.LOG* to view a copy of the replica list that resided on the server at the time of backup.

6. Verify the recovered data. From a workstation, use NWAdmin32 or the **rights /T /S** and **ndir** commands to check the data, trustee assignments, file ownership, and other related information.

Chapter 6: Windows 95/98 Client Disaster Recovery

This chapter describes how to perform a disaster recovery on a Windows 95/98 system using the NetWorker software. It also describes the prerequisites for recovering the hardware, operating system, and software.

Refer to the following list of disaster recovery scenarios to determine which instructions apply to your situation.

To recover...	See...
Hard drive	• "Replacing a Hard Drive" on page 114
Operating system	• "Recovering the Windows 95/98 Operating System" on page 115
NetWorker client	• "Recovering a Windows 95/98 NetWorker Client" on page 118
Data	• Refer to the appropriate Legato backup utility *Administrator's Guide*

Replacing a Hard Drive

To replace a hard drive:

- Obtain the hard drive information.
- Replace the hard drive.

Obtaining the Hard Drive Information

You can use **fdisk** to obtain the following information about each drive:

- Size of the drive
- Size, filesystem type, and volume label assigned to each disk partition

After you obtain this information, you can replace the hard drive.

How to Replace a Hard Drive

If you are experiencing the failure of one or more hard drives, refer to the appropriate Microsoft Windows 95/98 documentation and the appropriate hard drive vendor documentation for detailed instructions on how to replace your hard drive(s).

Important: Install a new drive that is the same size or larger than the original drive. This will ensure that you can recover all of the drive's data.

To begin the recovery process, recover:

- The operating system, if necessary. See "Recovering the Windows 95/98 Operating System" on page 115 for details.
- The NetWorker software, if necessary. See "Recovering a Windows 95/98 NetWorker Client" on page 118 for details.
- The computer's data using NetWorker. Refer to the *NetWorker 6.1 Administrator's Guide, Windows Version* for details.

6

Recovering the Windows 95/98 Operating System

To recover the operating system:

- Meet the operating system recovery prerequisites.
- Recover the operating system.

Prerequisites

To recover the operating system, you need the following:

- Version, service pack, and patch level of the Windows 95/98 operating system
- The Windows 95/98 Setup Boot Disk
- Virtual memory settings
- The following files:
    - *config.sys*
    - *autoexec.bat*
    - CD-ROM drivers
- Protocols installed
- TCP/IP Properties:
    - Adapter type
    - IP address
    - Default gateway
    - Subnet mask
    - DNS server
- Windows 95/98 Workstation Properties:
    - Computer name
    - Domain name
    - Login name and password
- Date and time properties

6

How to Recover the Windows 95/98 Operating System

This section provides instructions on how to recover the Windows 95/98 operating system using the NetWorker software. You can use this process to recover the Windows 95/98 operating system back to the original computer or to a different computer.

To recover the operating system, follow these procedures, explained in detail in the following sections:

1. Install the operating system.

2. Complete the installation process.

Task 1: Install the Operating System

To install the operating system:

1. Install the same version, service pack level, and patches of the operating system into its original location. Refer to documentation accompanying the operating system for details.

2. Copy the original *config.sys*, *autoexec.bat*, and CD-ROM drivers to the replacement drive.

3. Reboot the system.

4. Ensure that all disk partitions and volumes are as they were before the disaster. The volumes must be:

    • The same filesystem type as before, for example FAT, FAT32.

    • At least the same size as before to hold all of the backed-up data.

5. Configure the TCP/IP properties as they were configured before the disaster, with the same hostname, IP address, default gateway, subnet mask, and DNS server.

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Important: If the Windows 95/98 client participates in a DHCP network, it will not have a fixed IP address. Instead, the client will have a radio button and the name of the DHCP server, which is also known as the PDC (Primary Domain Controller).

If you are recovering the operating system to a different computer, you must:

- Use the same *hostname* for the new computer. If you do not use the same *hostname*, you will not be able to recover the NetWorker indexes associated with the original computer.

- Assign the same TCP/IP address for the new computer; otherwise it will be assigned a new host ID by NetWorker.

6. Configure the Windows 95/98 Workstation properties as they were configured before the disaster, with the same computer name, domain name, administrator name, and password.

7. Configure the date and time properties as they were configured before the disaster.

8. Restart the computer.

9. Reset the Virtual Memory Settings to what they were previously, by selecting System Properties>Performance>Virtual Memory>Change.

10. If you had any additional Windows 95/98 components installed, such as File and Printer sharing, you should reinstall them before recovering the computer's data.

Task 2: Complete the Installation Process

To complete the installation process:

1. Verify that:

- The operating system is functioning properly.
- The network protocols are functioning properly.
- The devices are recognized by the operating system.
- The "Network connectivity" is correct.

2. If you are using a device with a configuration that is not directly supported by the computer's operating system, you may need to reinstall the device driver software.

3. If you want to use Active Desktop, install it after you have recovered all of the computer's data.

To complete the recovery process, recover the Windows 95/98 NetWorker software, if necessary. See for details.

6

Recovering a Windows 95/98 NetWorker Client

This section describes how to recover a Windows 95/98 NetWorker client. You can use this process to recover the client software back to the same computer or to a different computer.

To recover a Windows 95/98 NetWorker client:

- Meet the Windows 95/98 NetWorker client recovery prerequisites.
- Recover the Windows 95/98 NetWorker client.

Prerequisites

To recover the Windows 95/98 NetWorker client software, you need the following:

- Version and patch level of NetWorker
- Location of NetWorker
- NetWorker ClientPak for Windows 95/98

How to Recover a Windows 95/98 NetWorker Client

To recover a Windows 95/98 NetWorker client, follow these procedures, explained in detail in the following sections:

1. Install NetWorker.
2. Recover the Windows 95/98 NetWorker client data.
3. Recover the registry files.

Task 1: Install NetWorker

To install NetWorker:

1. Install the same version and patch level of the NetWorker software into its original location. Refer to the appropriate *NetWorker 6.1 Installation Guide, Windows Version* for details.

   If you want to upgrade the client software, first recover the client to its original state, and then perform the upgrade.

2. Install any software patches that were originally installed.

6

Task 2: Recover the Windows 95/98 NetWorker Client Data

To recover the Windows 95/98 NetWorker client data using the NetWorker User program:

1. Mark all the drives for recovery.

2. Set the recover options by selecting the Overwrite Existing File radio button from the Options>Recover Options menu.

   If you did not set the recover options, you must select Suppress Further Prompting and the Overwrite Existing File radio button, when the Naming Conflict Dialog Box appears during the recovery process. This will enable automatic overwriting of files with the same name.

3. Select Start.

4. When the Password Protection window appears, select Recover > OK to recover these files. Files in the Recycle Bin are not password-protected.

   NetWorker logs the output of the recovery process in *%Systemroot%\networkr.log*. This file is overwritten *each* time a recovery is performed, it must be renamed to be preserved.

5. Restart the computer. The computer should now be restored to its pre-disaster state.

   Once data has been recovered, you may have extra files that were recovered from open files. Find all of these files by selecting *.*.*a** (for example, *nsrexecd.exe.a1001789*) and then delete them.

Note: In Windows 95, the files will follow the Windows 8.3 naming convention. The recovered files will likely take the following form: *~2345678.123*.

6. If you want to use Active Desktop, install it after you have recovered all of the computer's data.

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Task 3: Recover the Registry Files

Windows 95/98 does not support the functionality that enables the NetWorker software to replace the Windows 95/98 registry files when the computer is rebooted. If you have backed up the registry files *USER.DAT* and *SYSTEM.DAT* in your *Windows* directory and need to recover them, you must recover each registry file individually, with a reboot between each file, until everything synchronizes correctly.

Note: The registry contains important system configuration information and should not be overwritten unless absolutely necessary.

To recover the Windows 95/98 registry:

1. From NetWorker User, recover only the *SYSTEM.DAT* file from the *Windows* directory.

2. Reboot the computer.

3. Restart NetWorker User and recover only the *USER.DAT* file from the *Windows* directory.

4. Reboot the computer to complete the recovery.

6

Chapter 7: NetApp Client Disaster Recovery

This chapter provides instructions on how to perform a disaster recovery using NetWorker software on a NetworkAppliance® (NetApp®) filer running the Data ONTAP™ operating system. It also describes the prerequisites for recovering the hardware, operating system, and software.

![warning icon]

Important: Use the **na_recover** command when recovering data for a NetApp filer. For information on the **na_recover** command, refer to the **na_recover** man page, the *Legato Command Reference Guide*, or the *Legato NetWorker ClientPak for NetApp Installation Guide*.

The set of instructions you need to follow depends upon the extent of the damage caused by the disaster. Refer to the following list of disaster recovery scenarios to determine which set of instructions apply to your situation.

To recover...	See...
Hard drive	• "Replacing a Hard Drive" on page 122
Operating system	• "Recovering the Data ONTAP Operating System" on page 122
NetWorker client	• "Recovering a NetApp NetWorker Client" on page 125
Data	• Refer to the *Legato NetWorker ClientPak for NetApp Installation Guide*

Replacing a Hard Drive

If you are experiencing the failure of one or more hard drives, refer to the *Data ONTAP System Administrator's Guide* and the disk shelf hardware guide appropriate for your disk shelf hardware.

![warning triangle icon]

Important: Install a new drive that is the same size or larger than the original drive. If you use a larger hard drive, the filer only uses as much space as was available on the replaced hard drive.

To begin the recovery process, recover:

- The operating system. See "Recovering the Data ONTAP Operating System" on page 122 for details.
- The NetWorker software, if necessary. See "Recovering a NetApp NetWorker Client" on page 125 for details.
- The hard drive's data using the command **na_recover**. Refer to the *Legato NetWorker ClientPak for NetApp Installation Guide* for details.

Recovering the Data ONTAP Operating System

To recover the operating system:

- Meet the operating system repair prerequisites.
- Recover the operating system.

Prerequisites

To recover the operating system, you need the following:

- Version and patch level of the Data ONTAP operating system
- Filer system boot disks
- Protocols installed
- TCP/IP properties:
  - IP address
  - Default gateway
  - Subnet mask
  - DNS server

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- Filer properties:
  - Filer name
  - DNS domain name
  - Administrator name and password
- Domain information
- Date and time properties
- Network media type
- License information

CIFS setup requires the following:

- WINS IP address
- Windows NT Domain information
- PC code page number (for non-ASCII character support)

How to Recover the Data ONTAP Operating System

This section provides instructions on how to recover the Data ONTAP operating system using the NetWorker software. Use this process to recover the Data ONTAP operating system back to the original filer or to a different filer.

You can recover the operating system by performing either a:

- Complete installation. Perform a complete reinstallation and configuration of the operating system.

  — or —

- Partial recovery. Install and configure only those files that enable the filer to communicate over the network. Then, recover the remaining system and configuration files using the NetWorker software.

To recover the operating system, follow these procedures, explained in detail in the following sections:

1. Install the operating system.

2. Complete the installation process.

7

Task 1: Install the Operating System

To install the operating system:

1. Install the same version and patch level of the Data ONTAP operating system into its original location.

   This step includes setting the TCP/IP properties as they were before, with the same hostname, IP address, default gateway, subnet mask, and DNS server. It also includes setting the same filer name, domain name, administrator name, and password.

   If you install the operating system to a different filer, use the same hostname for the new filer. If you do not, you cannot recover the NetWorker indexes from the original filer. Also, assign the same TCP/IP address for the new filer. Otherwise the filer is assigned a new host ID by NetWorker, forcing you to reregister the NetWorker software.

   If you want to upgrade the Data ONTAP operating system, first recover the operating system to its original state, and then perform the upgrade.

2. Re-create all volumes that were previously on the filer. The volumes must be at least the same size as before or larger, to hold all of the backup data.

3. Restart the filer after reinstalling the Data ONTAP operating system.

4. Reinstall any additional NetApp components or services (licensing the filer or enabling Java services, for example), before recovering the filer's data.

Task 2: Complete the Installation Process

To complete the installation process, perform a test to verify that the:

- Operating system is functioning properly.
- Network protocols are functioning properly.
- Name-to-Address resolution is correct.

To complete the recovery process, recover:

- The NetWorker software and each software application, if necessary. See "Recovering a NetApp NetWorker Client" on page 125 for details.
- The computer's data using the **na_recover** command. Refer to the Legato NetWorker ClientPak for NetApp *Installation Guide* for details.

7

Recovering a NetApp NetWorker Client

This section describes how to recover a NetWorker client. Use this process to recover the client software back to the same filer or to a different filer.

To recover a NetWorker client:

- Meet the NetWorker client recovery prerequisites.
- Recover the NetWorker client.

Prerequisites

To recover the NetWorker client software, you need the following:

- Version and patch level of each software application.
- Location of each software application.
- Configuration files for each major software application, for example NetWorker components and database applications.
- The NetWorker binaries and configuration files. By default, these files are located in the *filer-name/vol/vol0/etc/app/legato/unix/bin* directory for filers administered by Solaris servers and the *filer-name/vol/vol0/etc/app/legato/windows/bin* directory for filers administered by Windows NT servers.

How to Recover a NetApp NetWorker Client

To recover a NetApp NetWorker client, follow these procedures, explained in detail in the following sections:

1. Install NetWorker.
2. Recover the NetApp client data.

Task 1: Install NetWorker

To install the NetWorker client software:

1. Install the same version and patch level of the NetWorker software into its original location. Refer to the *Legato NetWorker ClientPak for NetApp Installation Guide* for details.

   If you want to upgrade the client software, first recover the client to its original state, and then perform the upgrade.

2. Install any software patches that were originally installed.

7

Task 2: Recover the NetApp Client Data

This section provides instructions on how to recover the client data, including the configuration files for the operating system and each of the software applications.

To recover the data using the NetWorker User program, use the **na_recover** command to recover backed-up files and data.

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Important: You *must* use the **na_recover** command when recovering data for a NetApp filer. Using the **recover** command can cause the recover to fail or cause the access control lists (ACLs) to be stripped from the files; do not use this command. Also, you should not attempt to use the NetWorker graphic user interface (GUI) to recover data. For information on the **na_recover** command, refer to the **na_recover** man page, the *Legato Command Reference Guide*, or the *Legato NetWorker ClientPak for NetApp Installation Guide*.

To perform a partial recovery, refer to "How to Recover a Single File or Directory" for the appropriate server in the *Legato NetWorker ClientPak for NetApp Installation Guide*.

To perform a full recovery, refer to "How to Recover a Save Set" for the appropriate server in the *Legato NetWorker ClientPak for NetApp Installation Guide*.

7

Chapter 8: Microsoft Cluster Disaster Recovery (Windows NT 4.0)

This chapter describes how to recover one or more computers in a Windows NT 4.0 server cluster. The following scenarios are described:

Important: To ensure proper termination, never power off any node in the cluster unless it is connected with a Y cable.

8

Recovering One Node in a Cluster

This section describes how to recover one node in a cluster. In this scenario, Node_A is still working and Node_B is the failed node in the cluster.

How to Recover One Node in a Cluster

To recover a failed node within a cluster, follow these procedures, explained in detail in the following sections:

1. Evict Node_B from the cluster.

2. Reinstall the Windows NT software.

3. Reinstall the MSCS cluster and NetWorker software.

4. Recover the data.

Task 1: Evict Node_B from the Cluster

To evict Node_B from the cluster:

1. Make sure that the cluster resources failed over to Node_A, the working node. This includes the quorum disk and any shared disks.

2. If any of the data that failed over from Node_B to Node_A is corrupt, use the NetWorker software to recover the data.

Note: You might need to shut down some cluster resources that depend on this data.

3. From the Cluster Administrator on Node_A, evict Node_B from the cluster.

4. Shut down Node_B if it is still running and disconnect it from the cluster.

5. Fix or replace the damaged hardware, if necessary.

6. Reconnect the fixed or new Node_B to the cluster.

Task 2: Reinstall the Windows NT and MSCS Software

To reinstall the Windows NT software on Node_B (the failed node):

1. Install the Windows NT 4.0 Server Enterprise Edition software.

2. Install Windows NT Service Pack 3.

3. Install the MSCS software.

4. If the node had a local tape drive, install the driver.

5. Install the latest Windows NT Service Pack.

6. Join Node_B to the cluster that Node_A is already a member.

7. Use the same drive letters that were previously used for the disk volumes.

![warning icon]

Important: Any local drive letters you assign should not conflict with the drive letters assigned to any of the shared disks.

Task 3: Reinstall the NetWorker Software

To reinstall the NetWorker software, on Node_B:

1. Log on to the same domain as Node_A.

2. Install the NetWorker software, and apply any needed patches. For specific instructions, refer to the *NetWorker 6.1 Installation Guide, Windows Version*.

3. Complete the following steps to ensure that the correct versions of the *msvcrt.dll* and *mfc42u.dll* files are used by the Cluster Administrator program.

   a. Close the Cluster Administrator program on the node where you are copying the *msvcrt.dll* and *mfc42u.dll* files.

   b. Copy the *msvcrt.dll* and *mfc42u.dll* files from the NetWorker software installation directory to the cluster installation directory. For example, copy the *msvcrt.dll* and *mfc42u.dll* files from:

   `%SystemDrive%\Program Files\nsr\bin`

   to

   `%SystemDrive%\winnt\cluster`

   c. Open the Cluster Administrator program if required.

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Task 4: Recover the Data

To recover the data:

1. Recover all the hives in the registry or system state.

2. Use NetWorker to recover any data that is local only to Node_B.

3. Restart Node_B.

4. Make sure that the cluster that both Node_A and Node_B are members of is working properly.

Recovering a Cluster Shared Disk

This section describes how to recover data from a cluster shared disk that is not a quorum disk.

How to Recover a Cluster Shared Disk

To recover a cluster shared disk, follow these procedures, explained in detail in the following sections:

1. Take the dependant resources offline.

2. Replace the hard drive.

3. Recover the data belonging to the shared disk.

4. Configure the cluster to include the shared disk.

Task 1: Take the Dependant Resources Offline

For detailed instructions, refer to the Microsoft Cluster Server documentation.

To take all of the resources that are dependant on the shared drive that you are replacing offline:

1. Create a new Resource Group.

2. If the current shared disk's resource group contains the shared disk and its interdependent resources, move the cluster resources that represent the affected shared disk into the resource group you just created.

3. Take the resource group that contains the shared disk offline.

Note: You do not need to create a new resource group if the shared disk's resource group only contains resources that depend on it.

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Task 2: Replace the Hard Drive

For detailed instructions, refer to the Microsoft Cluster Server documentation.

To replace the hard drive:

1. Set the Startup Type of the Cluster Server service to Manual.

2. Open the Property window for each resource in the resource group. Select the Do Not Restart property from the Advanced window.

3. Remove the shared disk from the dependency list of any resources that depend on the shared disk.

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Important: If you fail to perform this step, you might not be able to delete this disk resource in the following step.

4. Delete the cluster resource that represents the shared disk.

5. If required, shut down the nodes.

   Refer to the *MSCS Cluster Hardware Manual* to determine if you are required to shut down the nodes before you replace the shared hard drives between the nodes.

6. Remove the affected shared disk and replace it with the new shared disk.

7. If you had shut down the nodes previously, reboot them.

8. Create the drive volumes and format the new disk as it previously existed.

Task 3: Recover the Data Belonging to the Shared Disk

To recover the data belonging to the shared disk:

1. Make sure that the NetWorker software is properly installed. For details, refer to the *NetWorker 6.1 Installation Guide, Windows Version*.

2. Use NetWorker to recover all the data that belonged to the shared disk.

   If the resource group is a virtual server, you might need to perform a directed recover. For details, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*.

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Task 4: Configure the Cluster to Include the Shared Disk

For detailed instructions, refer to the Microsoft Cluster Server documentation.

To configure the cluster to include the shared disk:

1. Restart the Cluster Service if it was previously stopped.

2. Create a new cluster resource to represent the new disk.

3. Add the cluster resource to the resource group you created in "Task 1: Take the Dependant Resources Offline" on page 130.

   If a new resource group was not created in Step 1, add the resource to the resource group where it existed before the replacement.

4. Add the shared disk to the dependency list of all the cluster resources that depend on this resource.

5. Start the resource group in which the shared disk exists.

6. If you created a new resource group:

   a. Move the disk resource and all dependant resources to their original resource group.

   b. Delete the now-empty resource group.

7. Make sure that the Startup Type of the Cluster Server service is set to Automatic.

8. Make sure that the following resource group property is set to its original setting: Do Not Restart. In most situations, it is unselected.

Replacing the Quorum Disk and Recovering Its Data

This section provides information about the quorum resource and explains how to recover a quorum disk's data.

About the Quorum Resource

If there is a communication failure between the nodes, the MSCS software uses the quorum resource in an arbitration process to determine the members of the cluster nodes. The quorum resource also records changes made to the cluster database when one of the nodes in the cluster is down. For further information about nodes in the MSCS environment, refer to the appropriate Microsoft documentation.

Refer to the MSCS cluster documentation for detailed information on how to:

- Locate the quorum disk
- Locate the quorum data directory
- Change the quorum disk designation

Recovering the cluster configuration data in the quorum disk is important during a disaster recovery. Recovery of the quorum resource information is not automatic.

If the quorum disk is owned by a virtual server, configure the virtual servers as a NetWorker client. Use one of the following save sets:

- "All"
- Drive volume or directory that has quorum data

If the quorum disk is *not* owned by a virtual server, configure all the nodes as NetWorker clients. Use one of the following save sets:

- "All" (this is preferred)
- Drive volume or directory that has quorum data

The quorum disk is accessible from only one node at a given point in time. Therefore, the backup will fail over to the node that does not have access to the quorum disk. This is why specifying "All" as the save set is preferred over specifying the drive volumes as the save set.

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How to Replace the Quorum Disk and Recovering Its Data

To recover the quorum disk's data:

1. Take offline any cluster resources or applications that depend on the quorum disk's data.

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   Important: Do not take the cluster service offline.

2. Change the quorum disk designation and replace a new disk as the quorum disk.

   For detailed instructions, refer to the Microsoft documentation, including *Article ID: Q172944*.

3. If required, install the NetWorker software on the node that has access to the quorum disk.

4. Recover the data that resided on the quorum disk before the disaster.

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   Important: Do not recover the quorum data.

Recovering the MSCS Cluster Configuration

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This section describes how to recover the MSCS cluster configuration.

The following procedure is based on these assumptions:

- You have not changed the disk configuration from the time you performed the last backup on the cluster database.
- You have not replaced any hardware, including the shared disk, from the time you performed the last backup on the cluster database.
- Node_A has the latest backup of the system state.
- Node_A or a virtual server has the latest backup of the quorum data.

How to Recover the MSCS Cluster Configuration

To recover the MSCS cluster configuration, follow these procedures, explained in detail in the following sections:

1. Recover the system state and quorum data.

2. Replace the quorum data with the recovered quorum data.

3. Evict Node_B from the cluster.

4. Install the cluster software and patches on Node_B.

Task 1: Recover the System State and Quorum Data

To recover the system state and quorum data:

1. Select a node in the cluster that has the good, and possibly the latest, backup of the system state and the quorum data. This procedure uses Node_A.

2. Make sure that the cluster service is running on Node_A.

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3. From Node_A, recover the following:

   - System state

   - Quorum data (If the quorum disk is owned by a virtual server, use the directed recover procedure. For details, see the *NetWorker 6.1 Administrator's Guide, Windows Version*.)

   Make sure that you recover the quorum data to a different directory in the quorum drive.

   For example, if the quorum data previously resided in *G:\MSCS*, recover the data to *G:\RECOVER\MSCS*.

4. Shut down Node_A.

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Important: Do not reboot Node_A.

———————————————————————————————

Task 2: Replace the Quorum Data with the Recovered Quorum Data

To replace the quorum data to Node_B:

1. On Node_B, uninstall the cluster software.

2. Reboot Node_B.

3. Copy the existing quorum data from its original location to another directory. For example, copy:

   G:\MSCS

   to

   G:\TEMP\MSCS

4. Replace the existing quorum data with the recovered quorum data. For example, copy:

   G:\RECOVER\MSCS

   to

   G:\MSCS

5. Shut down Node_B.

Task 3: Evict Node_B from the Cluster

To evict Node_B from the cluster:

1. Reboot Node_A.

2. Open the Cluster Administrator and evict Node_B from the cluster.

Task 4: Install the Cluster Software and Patches on Node_B

To install the cluster software and patches on Node_B:

1. Reboot Node_B.

2. Install the cluster software and join it to the cluster in which Node_A is a member node.

3. On Node_B, apply any needed cluster patches and Windows service packs.

4. Verify that the cluster configuration has been successfully recovered.

Performing a Cluster Wide Recovery

This section describes how to perform a cluster wide recovery. Use the following procedures to perform a complete cluster recovery, including reinstallation of the operating system on all nodes participating in the cluster environment. These procedures also describe how to perform a recovery for both new and existing hardware.

In the following example:

- If the NetWorker server is part of the cluster, it is represented as Node_A.
- If the NetWorker server is external to the damaged cluster, choose a node that has the most up-to-date backup of the cluster database (part of the registry) as Node_A.
- Defective nodes and shared drives have been replaced.

8

How to Perform a Cluster Wide Recovery

To recover the cluster to new hardware or existing hardware, follow these procedures, explained in detail in the following sections:

1. On Node_A, install and configure the software.

2. On Node_B, install and configure the software.

3. Install and configure NetWorker.

4. Perform a disaster recovery.

5. Check and reassign the drive assignments.

6. Recover the data.

7. Check the disk signatures.

8. Join Node_B to the cluster.

Task 1: On Node_A, Install and Configure the Software

To install and configure the software, on Node_A:

1. Make sure that the node has been properly:

   - Shut down
   - Connected through the shared disks
   - Terminated

2. Install Windows NT 4.0 Enterprise Edition server.

   a. Add the server to the domain using the same cluster login account.

   b. Create the partitions so that the new disk configuration of Node_A matches the original configuration.

   c. Use the same server name (fully qualified DNS if used) and IP address that were used originally.

   d. Configure the network adapters and the IP address using the original settings whenever possible.

   e. Log on to the domain.

3. Run the Windows NT Disk Administrator and configure the drives to match their previous configuration.

4. Install Windows NT 4.0 Enterprise Edition server-specific service packs (Service Pack 3).

5. Install the cluster software.

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6. Install any required service pack software. Make sure that the version is greater than Service Pack 3.

7. If Node_A is a NetWorker server, configure the tape devices.

8. Log on to Node_A using the cluster account on the domain.

Task 2: On Node_B, Install and Configure the Software

To install and configure the software, on Node_B:

1. Make sure that the node has been properly:

   - Shut down
   - Connected through the shared disks
   - Terminated

2. Install Windows NT 4.0 Enterprise Edition server.

   a. Add the server to the domain using the same cluster login account.

   b. Create the partitions so that the new disk configuration matches the original configuration.

   c. Use the same server name (fully qualified DNS if used) and IP address that were used originally.

   d. Configure the network adapters and the IP address using the original settings whenever possible.

   e. Log on to the domain.

3. Run the Windows NT Disk Administrator and configure the drives to match their previous configuration.

4. Install Windows NT 4.0 Enterprise Edition Server-specific service packs (Service Pack 3).

Task 3: Install and Configure NetWorker

To install and configure NetWorker on Node_A and Node_B:

1. Install the NetWorker software and any required patches.

2. If NetWorker server was originally installed as a failover server, configure the NetWorker server as a cluster resource. For details, refer to the *NetWorker 6.1 Installation Guide, Windows Version*.

8

Task 4: Perform a Disaster Recovery

To perform a disaster recovery:

1. Shut down Node_B.

2. If Node_A is a NetWorker server, perform a NetWorker disaster recovery from Node_A. For details, refer to "Chapter 3: Windows NT 4.0/UNIX Disaster Recovery" on page 27.

3. Restore the following directories:

   - Windows NT registry or system state
   - Windows NT *system* directory

   Select Overwrite and Suppress Messages.

4. Recover the quorum and the shared drives data. Follow the directed recover procedure. For detailed instructions, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*.

Note: Make sure that you restore the *MSCS* directory in the quorum to a different location, for example *MSCStemp*.

5. Shut down Node_A. Do not reboot Node_A.

   a. The system will ask you to restart; select Yes.

   b. Shut down the node when the system is in its reboot cycle.

6. Restart Node_B and log on with Administrator privilege.

7. On the quorum drive:

   a. Rename the existing *MSCS* directory to *MSCSold*.

   b. Move the restored *MSCS* directory that was restored to *MSCStemp* to the *MSCS* directory.

8. Shut down Node_B.

Task 5: Check and Reassign the Drive Assignments

If you are replacing the cluster shared disks with new hardware, follow these steps to check and reassign the drive assignments:

1. Reboot Node_A. The drive assignments might have changed.

   Use the Disk Administrator to reassign the drives to their former drive letters.

2. From the Control Panel>Services, set the startup parameter of the MSCS service to Manual.

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3. Reboot Node_A.

4. Replace the cluster shared disks with the new hardware.

   Check the drive assignments through Windows Explorer. The "phantom" drives you see are the original shared disks. These drives cannot be deleted or disconnected from the Windows Explorer.

5. Remove the registry entries for the phantom disks:

   a. Use **regedit** to display the following registry entry:

      HKEY_LOCATION_MACHINE\SYSTEM\CurrentControlSet\Services \ Clusdisk\Parameters\Signatures

      The numbers listed under Signatures are the drive signatures for the former shared disks. Delete these numbers.

   b. Reboot the node.

   c. Check the status of the disks through Windows Explorer.

      There should no longer be any phantom disks and the new shared disks should have the proper drive letter assignments.

      The new shared disk signatures are located in the following registry key:

      HKEY_LOCATION_MACHINE\SYSTEM\CurrentControlSet\Services \Clusdisk\Parameters\AvailableDisks

Task 6: Recover the Data

To recover the data:

1. Use the NetWorker User GUI to restore the remaining data from tape. Do not restore the data from the following directories:

   • *%SystemDrive%\Program Files\NetWorker\nsr\index* (if this node is the NetWorker Server)

   • System state

   • RepairDisk

   • Windows NT *system* directory

   For details, refer to "Chapter 3: Windows NT 4.0/UNIX Disaster Recovery" on page 27.

2. Reboot Node_A.

3. Log on to a domain with Administrator privileges.

8

Task 7: Check the Disk Signatures

If you are replacing the cluster shared disks with new hardware, follow these steps to check the disk signatures:

1. Replace the cluster shared disks with the new hardware:

   a. From the Control Panel>Services, start the MSCS service with the **-fixquorum** startup option. This option allows you to fix or add a new quorum drive.

   b. Start the Cluster Administrator program and attach Node_A to the cluster you are restoring.

   c. Create the new disk resource for the quorum drive and place it in the Quorum Group.

   For detailed information, refer to *Microsoft's TechNet Article Q172944 "How to Change the Quorum Disk Designation."*

   d. From the Cluster Administrator GUI:

   – Rename all of the old shared disks.

   – Create new resources for the physical disks to match the old shared disks.

   – Check for dependencies for the physical disk and make the necessary modifications.

   e. Create a new group and move all of the old shared disks to this group. This is done for cleanup purposes.

   ⚠️

   Important: You *cannot* delete the old shared disks until both nodes are running and both nodes are members of the cluster.

2. From the Control Panel>Services, set the MSCS service to Automatic.

3. Remove any Startup Parameters that may have been previously set. For example:

   -fixquorum

Task 8: Join Node_B to the Cluster

To join Node_B to the cluster:

1. On Node_A, use the Cluster Administrator to evict Node_B from the cluster.

2. Restart Node_B.

3. On Node_B, install the cluster software and rejoin the cluster.

4. Install the latest service pack software on Node_B. Make sure that the version is greater than Service Pack 3.

5. If NetWorker Server is installed in Node_A as a failover server:

   a. Install NetWorker server software.

   b. Register the resource extension. This manages the NetWorker Server resource-type in Node_B. For more details, see the *NetWorker 6.1 Installation Guide, Windows Version*.

   c. On Node_B, you can choose to:
      – Configure the tape devices
      – Install the NetWorker client software

6. Install any NetWorker specific patches.

7. Recover all the data that belongs to Node_B. This includes the system configuration data. For example:

   • System state
   • RepairDisk
   • Windows NT *system* directory
   • C:\

8. Reboot Node_B.

9. Verify that the system has been restored to its original state before the disaster.

8

Chapter 9: Microsoft Cluster Disaster Recovery (Windows 2000)

This chapter explains how to recover a Microsoft Cluster Server (MSCS) host system in a Windows 2000 environment. Familiarity with MSCS concepts and operations is assumed. For complete information about MSCS, refer to the related Microsoft documentation.

The following scenarios are described in this chapter:

Prerequisites

To recover an MSCS host in a Windows 2000 environment, you must ensure that each of the following prerequisites is satisfied:

- The NetWorker client is installed on each cluster node.
- Backups that include the SYSTEM save sets (SYSTEM FILES, SYSTEM DB, and SYSTEM STATE) have been performed on a regular basis by a NetWorker server host in the same domain as the cluster nodes. This will help ensure that data is available from the NetWorker server for recovery to the desired point in time. (The Microsoft cluster database is a component of the Windows 2000 system state, and as such is automatically included when the SYSTEM STATE save set is specified for backup or recovery.)
- During the recovery, the domain controller (for the domain to which the cluster nodes belong) is available to authenticate the node joining the cluster.

Recovering a Failed Quorum Disk

This section describes the procedure for recovering a failed quorum disk. The procedure assumes the following:

- The quorum disk is designated for exclusive use by MSCS.
- The quorum disk resides in a drive array that is not a Redundant Array of Inexpensive Disks (RAID).
- A spare disk (identical in type to the quorum disk) is available to replace the failed disk. The spare disk contains at least as much total disk space as the total space on the quorum disk.
- The new quorum disk is to be assigned the same drive letter as the failed disk.

For related information, refer to *Microsoft knowledge base article Q172944: How to Change Quorum Disk Designation ID*.

How to Recover a Failed Quorum Disk

To recover a failed quorum disk:

1. Close all instances of Microsoft Cluster Administrator.

2. Stop the cluster service on both nodes.

3. Use the Computer Management services facility to access the Cluster Service Properties page. Change the Cluster Service Startup Type to Manual on both nodes.

4. Shut down both nodes. Power down both nodes and the drive array.

5. Replace the failed quorum disk.

6. Power on both nodes and the drive array.

7. Format the new disk with the same file system, partitioning scheme, drive letter, and label as the failed quorum disk. Verify that it appears identical on both nodes.

8. On one node, use the Computer Management services facility to access the Cluster Service Properties page.

9. Add **-fixquorum** as a start parameter and start the service.

10. Use Cluster Administrator to rename the failed quorum resource to **RemoveMe**.

11. Create a new disk resource **Disk***x***:** (where *x* is the drive letter of the old quorum disk). Place the new disk resource in the Cluster Group.

12. Bring this disk resource online.

13. Right-click the cluster name and select Properties.

14. Select the Quorum tab and make the new drive the quorum resource.

15. Use the Computer Management services facility to access the Cluster Service Properties page:

    a. Stop the service.

    b. Remove **-fixquorum** as a start parameter.

    c. Start the service.

16. Start the cluster service on the other node.

17. Delete the RemoveMe resource.

18. Bring the cluster group online.

19. Use the Computer Management services facility to access the Cluster Service Properties page. Change the Cluster Service Startup Type to Automatic on both nodes.

20. Reboot both nodes.

Recovering One Cluster Node

This section describes how to restore the Cluster Server and cluster database in the event of failure of one of the cluster nodes.

Unexpected software behavior, such as corruption of a cluster-critical file, may cause a partitioned cluster, in which one node of the cluster is unaware of the presence of the other operating node. In this situation, each node may attempt to take control of the shared quorum device, thus potentially rendering one node unable to function as a member of the cluster.

How to Recover One Cluster Node

In the following scenario, Node_B has failed and the quorum resource has successfully failed over to Node_A. The operating system on each cluster node is intact and therefore does not require recovery. However, the status of the MSCS component on Node_B is unknown; therefore the Cluster Server must be reinstalled on Node_B.

To recover a Microsoft cluster configuration:

1. Using Cluster Administrator on Node_A, evict Node_B from the cluster.

2. On Node_B, select Control Panel>Add/Remove Programs>Windows Components. Uninstall the Cluster Service.

3. After the Cluster Server is uninstalled from Node_B, reboot the node.

4. From Node_B, log on as Administrator to the domain in which the cluster nodes reside.

5. On Node_B, select Control Panel>Add/Remove Programs>Windows Components, and select Cluster Server for installation.

   This will reinstall the cluster binaries and start the cluster Setup Wizard.

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   Important: After reinstalling MSCS on Node_B, you will need to reproduce the preexisting application environment on Node_B so that MSCS can administer the applications as it was doing before the node failed. One way to reproduce the old cluster-controlled application environment is to perform the necessary disaster recovery procedures for each application that was previously installed on the node.

6. During the Wizard setup, select "Join an existing cluster" and enter the cluster name.

   After the Wizard finishes on Node_B, go to Cluster Administrator on Node_A. From Cluster Administrator on Node_A, ensure that Node_B appears available for failover operations.

7. Only Node_A, the node that owns the shared resources, may be running at the time of recovery of the cluster database. Therefore, stop the Cluster Server service on Node_B using one of the following methods:

   • On Node_B, go to Control Panel>Services and manually stop the Cluster Service running on Node_B.

     — or —

   • On Node_B, run the command **net stop clussvc** from a command prompt.

     — or —

   • Shut down Node_B.

8. From the NetWorker User Recovery window on Node_A, mark at least the SYSTEM STATE save set for recovery. The cluster database is a component of the Windows 2000 system state, and as such is automatically included when the SYSTEM STATE save set is specified for backup or restore.

Note: With NetWorker 5.7 (and later) for Windows 2000, the three SYSTEM save sets are interdependent. It is safest to restore *all* of the SYSTEM save sets whenever you need to restore any particular SYSTEM save set. For more information, refer to the section on save set interdependencies in the *NetWorker 6.1 Administrator's Guide, Windows Version*.

9. Click Start to begin the SYSTEM STATE recovery process.

10. After the SYSTEM STATE save set is restored, reboot Node_A.

11. Using Cluster Administrator on Node_A, confirm that the cluster resources were restored to the point in time when the backup occurred. If you have been performing regular scheduled backups using NetWorker, this will recover the cluster database to a point in time shortly before the loss of Node_B.

12. Start the cluster service on Node_B. To do so, at Node_B, run the command **net start clussvc** from a command prompt, or use Computer Management>Services.

13. From Cluster Administrator on Node_A, monitor the cluster joining status of Node_B.

14. From Node_B, use Cluster Administrator to verify that the cluster group can be moved between the nodes by right-clicking the group and selecting Move group.

The cluster configuration should now have been recovered.

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Recovering Multiple Cluster Nodes

This section provides *general* guidelines for performing a cluster recovery in the case of a failure of both cluster nodes. In this scenario, the operating system is unusable on each node. Therefore, this recovery procedure includes reinstallation of Windows 2000 on each node, as well as NetWorker recovery of the cluster database from a previous backup.

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Important: Because cluster configurations may vary, it is not possible to provide cluster disaster recovery procedures for every situation. Depending on the particular cluster configuration and the nature of the failure, it might be necessary to vary some of the procedures described in this section.

How to Recover Multiple Cluster Nodes

To perform a complete cluster recovery in a situation in which both cluster nodes, Node_A and Node_B, have failed:

1. On the system disk of each cluster node, reproduce the partition table information that was in use prior to the loss of the node.

Note: On each cluster node, the repaired or replaced system disk *must* have the same partition tables and drive letter configuration that were in place prior to the node failure. However, enumeration of available volumes during Windows 2000 text setup mode might cause the system disk drive letter to change. Therefore, prior to reinstalling the Windows 2000 operating system, disconnect the SCSI bus if the shared drives are being enumerated before the local system drives.

2. Format and verify the system disk on each node.

3. On each node, reinstall Windows 2000 Advanced Server to the partition it occupied before the node failure. During operating system setup on each node, verify that the domain controller is available and that each potential node is able to join.

4. Delete the MSCS folder on the quorum drive.

5. On the quorum disk, run **chkdsk**.

6. While Node_B is still detached from the shared SCSI bus, start the MSCS installation on Node_A from Control Panel>Add/Remove Programs>Windows Components. The MSCS Cluster Wizard will appear and provide guidance through the setup process.

7. During the setup process using Cluster Wizard, enter the same configuration information that was used prior to the failure of the cluster nodes (including user account, IP addresses, and cluster name).

8. Reboot Node_A.

9. Install MSCS on Node_B, joining A.

10. Reboot Node_B.

11. On Node_B, run the **net stop clussvc** command from a command prompt.

12. Install the NetWorker client software on Node_A.

13. From NetWorker User on Node_A, select the SYSTEM FILES and SYSTEM STATE save sets to recover to the desired point in time prior to the cluster failure. Click Start to begin the recovery process.

14. After the recovery on Node_A is complete, reboot Node_A.

15. On Node_A, run Cluster Administrator to confirm that the states of the cluster resources were restored to the desired point in time.

16. Start the cluster service on Node_B. To do so, at Node_B, run the **net start clussvc** command from a command prompt, or use Computer Management>Services.

17. From Cluster Administrator on Node_B, verify that the cluster group can be moved between the nodes by right-clicking the group and selecting Move group.

18. Re-install the NetWorker client software on Node_B.

Recovering Multiple Cluster Nodes

9

Chapter 10: Sun Cluster Disaster Recovery

This chapter explains how to recover one or more computers in a Sun® Cluster environment.

Restoring a cluster following a disaster is similar to any NetWorker restoration. The important difference is that you must synchronize the cluster database data.

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Important: Unsynchronized cluster databases produce unexpected and unfavorable results. It is very important to ensure that the cluster databases remain synchronized. Be sure to read and understand this entire section before you attempt to restore a Sun cluster or cluster node.

The following scenarios are described:

Restoring a Single Cluster Node

This section describes how to restore a single cluster node. If a single node within the cluster has failed, follow this procedure.

How to Restore a Single Cluster Node

To recover a single node:

1. Install NetWorker. For detailed installation and configuration instructions, refer to the *NetWorker 6.1 Installation Guide, Solaris Version*.

2. Start the NetWorker client.

3. Using the cluster's virtual NetWorker server running on an unaffected node, restore the node's data and software from a recent backup. For detailed instructions, refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version*.

4. Copy the contents of the following directory from another node in the cluster to the node that you are recovering:

   `/etc/opt/SUNWcluster/conf`

   This synchronizes the cluster database data.

10

Restoring an Entire Cluster

This section describes how to restore an entire cluster. It is unlikely that all the nodes in a cluster would fail simultaneously; but if this does occur, follow this procedure.

How to Restore an Entire Cluster

To recover an entire cluster, follow these procedures, explained in detail in the following sections:

1. Install the software.

2. Restore the cluster.

3. Start the cluster.

4. Restore the data.

Task 1: Install the Software

To install the software on a primary node:

1. Configure the hardware and install the operating system.

2. Reinstall the Sun Cluster software. For detailed instructions, refer to the *Sun Cluster Installation Guide*. Run the **scinstall** command (on the Sun Cluster installation CD) to reinstall the cluster software.

3. Install the NetWorker software. For detailed instructions, refer to the *NetWorker 6.1 Installation Guide, Solaris Version*.

Task 2: Restore the Cluster

Redefine the virtual host and disksets for the cluster. To aid in this, you can recover the old configuration files to a different directory.

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- If you know where the latest save set files are located, use the following command to recover the latest configuration files:

  scanner -S *saveset_id device_path* **-x uasm -rv -m /etc/opt=/etc/opt.backup**

- If you do not know the save set ID, use the **scanner device_path** command to determine its value:

  scanner *device_path* **> /tmp/savefile 2>&1**

Task 3: Start the Cluster

1. Run the following command to create the first node in the cluster:

   scadmin startcluster *local-node cluster-name*

![warning icon]

Important: Depending on the nature of the disaster from which you are recovering, you might have several versions of the cluster database (up to a maximum of one for each cluster node). If the first database retrieved is badly out of sync, then remove that node from the cluster--thereby deleting the cluster definition--and start with a different cluster node.

2. To add nodes to the cluster, enter the following for each additional node:

   scadmin startnode *clustname*

3. Run the **/usr/sbin/NetWorker.cluster** script on each node in the cluster. For more information, refer to the *NetWorker 6.1 Installation Guide, Solaris Version*.

Task 4: Restore the Data

On the primary node:

1. Use the **mmrecov** command to restore the media database and resource files.

2. Use the **nsrck -L7** command to restore the indexes.

3. Use the **recover** command to recover the initialization directories.

   For detailed instructions on using the **recover**, **nsrck**, or **mmrecov** commands, refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version*.

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Chapter 11: Compaq Cluster Disaster Recovery

This chapter explains how to recover one or more computers in a Compaq®
TruCluster™ Server, releases 1.5 or 1.6 cluster. The following scenarios are
described:

- "Recovering All Nodes in the Cluster" on page 158
- "Recovering the Virtual Servers" on page 159
- "Performing a Cluster Wide Recovery" on page 160

Prerequisites

When preparing or planning for a disaster, such as a single node or entire
cluster failure, you must record the following information:

- Network settings for every node in the cluster
- Partition information for the disk drives in your system

This information must be entered manually because the NetWorker software
cannot configure it automatically.

How to Prepare a Cluster for Disaster Recovery

To ensure that your cluster is disaster-ready:

1. Create client resources for each physical and virtual node in the cluster.

2. Enter the associated filesystems in the client resource of each node in the
   cluster.

3. Ensure that the client resources of the physical nodes have only the private
   (or local) filesystems defined in the save set list. Private filesystems are
   those filesystems that are not dependent on a cluster service for mounting.

4. Ensure that the clients resources of the virtual services have the public (shared) filesystems defined in the save set list. Public filesystems are disk partitions mounted by a cluster service.

5. Add all the physical nodes to the Remote Access field of the client resources of each virtual node.

6. Create a NetWorker group to which you add all the client resources you have defined and schedule this group for regular backups.

7. Perform at least one full backup in preparation for disaster recovery.

Recovering All Nodes in the Cluster

This section explains how to recover one or more physical nodes in a cluster. The solution is to completely reinstall the operating system, cluster software and NetWorker software on as many nodes as have failed and then use the NetWorker software to recover the cluster database from a previous backup.

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How to Recover All Nodes in the Cluster

To recover all nodes in a cluster, follow these procedures, explained in detail in the following sections:

1. Recover nodes in the cluster.

2. Recover the private filesystems of each node.

Task 1: Recover Nodes in the Cluster

To recover one or more failed nodes within a cluster:

1. Replace all defective equipment with the same model equipment as was previously installed. Connect all the equipment as it was connected prior to the disaster.

2. Install the operating system on all nodes that failed in the cluster.

3. Partition the drives with the same partitions you had used previously. Each partition must be equal to or greater than the size used before the disaster occurred.

4. Configure the network settings so that the nodes in the cluster can access the remote NetWorker server. If your NetWorker server was local, refer to "Chapter 3: Windows NT 4.0/UNIX Disaster Recovery" on page 27 for the appropriate disaster recovery procedure.

5. Install the NetWorker client software on each node in the cluster. If you need to recover your server software, refer to "Chapter 3: Windows NT 4.0/UNIX Disaster Recovery" on page 27.

Task 2: Recover the Private Filesystems of Each Node

To recover the private filesystems of each node:

1. Log in to the console of each node that had failed and enter the following commands to start the recovery:

   cd /

   recover -s *NetWorker-server*

   recover> **add ***

   recover> **force**

   recover> **recover**

2. Reboot each recovered node in the cluster.

   If the cluster database has changed since the last backup of this node, you must rebuild it using ASE setup. Refer to the *Compaq TruCluster Server Administrator's Guide* for further information regarding ASE setup.

Recovering the Virtual Servers

This section explains how to recover the public filesystems within a cluster.

How to Recover the Virtual Servers

To recover the public filesystems:

1. Shut down all systems.

2. Boot one node after you have shut down all nodes.

3. Using the Cluster Administration Tool (**asemgr**), relocate all the services to run on the node you have booted.

   If a service fails to start, you need to manually mount the disk service associated with that service.

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4. Enter the following commands to recover each virtual server that you have defined:

cd /

recover -s *NetWorker-server* **-c** *virtual-server*

recover> **add ***

recover> **force**

recover> **recover**

5. Boot the remaining nodes in the cluster and restart all cluster services.

Performing a Cluster Wide Recovery

To perform a cluster wide recovery, you must complete the steps outlined in the previous sections:

- "Recovering All Nodes in the Cluster" on page 158
- "Recovering the Virtual Servers" on page 159

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Chapter 12: HP-UX Cluster Disaster Recovery

This chapter explains how to recover one or more computers in a HP-UX MC/ServiceGuard cluster environment. The following scenarios are described:

- "Recovering a Single Cluster Node"
-

Recovering a Single Cluster Node

This section describes how to restore a cluster server on one node. This scenario assumes that the operating system on the participating nodes has failed and must be reinstalled.The functionality of the MC/ServiceGuard component on the node is also in question.

How to Recover a Single Cluster Node

To recover a single node:

1. Install the operating system and the cluster software. Configure the volume groups.

2. Add the node to the cluster:

   a. Click Cluster in the System Administration Manager (SAM).

   b. Select High Availability Clusters>Cluster Administration>Specify Nodes to Join Cluster.

   Note: You can also use the **cmrunnode** command instead of SAM.

3. Recover the node's data from a recent backup.

Performing a Cluster Wide Recovery

This section explains how to perform a complete cluster recovery, including reinstallation of the operating system on all nodes. It also explains how to recover the associated cluster database.

This procedure assumes a worst case scenario where one node of a two-node cluster has completely failed, followed shortly by the second node failing. The only solution is to reinstall the operating system, cluster software, and NetWorker software on both nodes and then to use NetWorker to recover the cluster database from a previous backup.

How to Perform a Cluster Wide Recovery

To perform a complete cluster recovery:

1. Install the operating system and cluster software on each node.

2. Install the NetWorker software as required within the HP-UX MC/ServiceGuard cluster environment. For detailed instructions, refer to the *NetWorker 6.1 Installation Guide, HP-UX Version*.

3. Select any node in the cluster and run the NetWorker server and client on that node.

4. Re-create the configuration of the cluster and the configuration and control files for the NetWorker package. The cluster configuration file is usually in */etc/cmcluster* and the NetWorker package configuration and control files are usually located in the */etc/cmcluster/NetWorker* directory.

   - If you know where the latest save sets are located, use the **scanner** command to restore the configuration files. For example:

     scanner -S saveset_id *device-path* **| uasm -i y -rv**

   - If you do not know the save set id, use the **scanner** *device_path* command to determine the saveset id. For example:

     scanner *device-path* **> /tmp/savefile 2>&1**

5. Run the NetWorker **/opt/NetWorker/bin/NetWorker.cluster** script.

   Do not re-create the files *legato.control* and *pkg.control* when prompted by the **NetWorker.cluster** script.

6. If the shared disk has to be replaced, configure the disk and file system of the replacement.

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7. Create the file system. For example:

```
vgchange -c n /dev/vg03
vgchange -a y /dev/vg03
newfs -F hfs /dev/vg03/rlvol1
vgchange -a n /dev/vg03
```

8. Enter the following command to delete the existing cluster and package configurations:

```
cmdeleteconf -c cluster1
```

9. Enter the following command to apply the cluster and package configurations, including the NetWorker package, to all the nodes within the cluster:

```
cd /etc/cmcluster
cmapplycomf -C cluster1.ascii -P networker/pkg.conf \
-P other_pkg/other_pkg
```

Note: It is advisable to run the **cmgetconf** command to save the new cluster or package ASCII configuration file whenever the cluster or a package configuration is created or modified. For example:

```
cmgetconf -c cluster1 cluster1.ascii
cmgetconf -p networker pkg.conf
```

These ASCII files can be saved in the */etc/cmcluster* directory of a node. Make sure that the NetWorker software backs up */etc/cmcluster* so that the configurations can be restored using **cmapplyconf** whenever necessary.

10. Activate the cluster. For example:

```
cmruncl
```

This should also start the NetWorker package.

11. Perform disaster recovery on the shared disk using **mmrecov** and **recover**. For further information explaining how to perform a disaster recovery, refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version*.

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Whenever you have to shut down NetWorker at this stage, use **cmhaltpkg** and *not* **nsr_shutdown**. For example:

```
cmhaltpkg networker
exchange -a c /dev/vg03
mount /dev/vg03/lvol1 /vg031
mv /vg031/nsr/res /vg031/nsr/res.old
mv /vg031/nsr/res.R /vg031/nsr/res
umount /vg031
vgchange -a n /dev/vg03
cmmodpkg -e networker  (to restart NetWorker package)
```

12. Recover the clients' data from recent backups.

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Chapter 13: Legato Cluster for AIX, HP-UX, Linux, and Solaris Disaster Recovery

This chapter explains how to recover one or more computers in a Legato Cluster™ for AIX®, HP-UX®, Linux®, and Solaris™ environment. The following topics are described:

- "Recovering a Single Cluster Node"
- "Performing a Cluster Wide Recovery" on page 168
- "Renaming the Resource Directory" on page 174

Recovering a Single Cluster Node

This section describes how to recover a failed node within a cluster. This scenario assumes that the operating system on the participating nodes is intact and will not be recovered. The functionality of the Legato Cluster component on the node is in question.

How to Recover a Single Cluster Node

To recover a single node:

1. Install the NetWorker software. For detailed installation and configuration instructions, refer to the appropriate *NetWorker 6.1 Installation Guide*.

2. Start the NetWorker client.

3. Using the cluster's virtual NetWorker server running on an unaffected node, restore the node's data and software from a recent backup. For detailed instructions, refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version*.

4. Make sure that the following directories have been restored:

AIX

- *   */etc/rc**
- *   *$FT_DIR/config/**
- *   *$FT_DIR/log/**
- *   *$FT_DIR/DomainName_NodeName*

HP-UX

- *   */etc/rc**
- *   *$FT_DIR/config/**
- *   *$FT_DIR/log/**
- *   *$FT_DIR/DomainName_NodeName*

Linux

- *   */etc/rc*.d*
- *   */etc/init.d*
- *   *$FT_DIR/config/**
- *   *$FT_DIR/log/**
- *   *$FT_DIR/DomainName_NodeName*

Solaris

- *   */etc/init.d*
- *   */etc/rc0.d*
- *   */etc/rc1.d*
- *   */etc/rc2.d*
- *   */etc/rc3.d*
- *   *$FT_DIR/config/**
- *   *$FT_DIR/log/**
- *   *$FT_DIR/DomainName_NodeName*

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5. Restore or copy the following files from the active node:

    AIX
    - *$FT_DIR/bin/envsh* (*$FT_DIR/bin/envcsh* if using C shell)
    - */usr/bin/nw_ux.lc*

    HP-UX
    - *$FT_DIR/bin/envsh* (*$FT_DIR/bin/envcsh* if using C shell)
    - */opt/networker/bin/nw_ux.lc*

    Linux
    - *$FT_DIR/bin/envsh* (*$FT_DIR/bin/envcsh* if using C shell)
    - */usr/sbin/nw_ux.lc*

    Solaris
    - *$FT_DIR/bin/envsh* (*$FT_DIR/bin/envcsh* if using C shell)
    - */usr/sbin/nw_ux.lc*

6. Start the cluster virtual server on the node. For example:

    `cd $FT_DIR/bin` (or source **`./envcsh`** if using C shell)

    `. ./envsh`

    `./ft_startup -domain` *DomainName*

    If the virtual server fails to start on the node because of an outdated sites file, copy the following file from the active node:

    $FT_DIR/config/DomainName-sites

7. Run the **networker.cluster** script. For example:

    AIX: **`/usr/bin/networker.cluster`**

    HP-UX: **`/opt/networker/bin/networker.cluster`**

    Linux: **`/usr/sbin/networker.cluster`**

    Solaris: **`/usr/sbin/networker.cluster`**

    If you have already restored or copied the *nw_ux.lc* file from an active node, answer *no* to the following prompt:

    ```
    Do you wish to automatically add site-specific values for:
    NSR_SHARED_DISK_DIR and NSR_SERVICE_ID in
    ```
    /LegatoCluster_ installation_ directory
    ```
    Yes or No [Yes]? no
    ```

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Performing a Cluster Wide Recovery

This section describes how to perform a complete cluster recovery including reinstallation of the operation system on all nodes participating in the cluster.

How to Perform a Cluster Wide Recovery

To perform a cluster wide recovery, follow these procedures, explained in detail in the following sections:

1. Install the software.

2. Restore the cluster.

3. Configure the NetWorker software as a highly available application.

4. Restore the data.

5. Start the cluster software on each node.

This procedure assumes a worst case scenario: where one node of a two-node or more cluster lost contact and completely failed, followed shortly by the second node completely failing. This is a total loss of both cluster nodes.

Task 1: Install the Software

To install the software, on a primary node:

1. Configure the hardware and install the operating system.

2. Install the Legato Cluster software. For detailed instructions, refer to the *Legato Cluster Installation Guide*.

3. Install the NetWorker software. For detailed instructions, refer to the appropriate *NetWorker 6.1 Installation Guide*.

4. Make sure that the NetWorker client and server software are running locally.

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Task 2: Restore the Cluster

1. Determine the save set id that contains the platform configuration and system files listed below:

   If you do not know the save set id, enter the **scanner device_path** command to determine its value:

   scanner *device_path* **>** */tmp/savefile* **2>&1**

   AIX
   - */usr/bin/nw_ux.lc*
   - *$FT_DIR/config/**
   - *$FT_DIR/log/**
   - *$FT_DIR/DomainName_NodeName*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   HP-UX
   - */opt/networker/bin/nw_ux.lc*
   - *$FT_DIR/config/**
   - *$FT_DIR/log/**
   - *$FT_DIR/DomainName_NodeName*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   Linux
   - */usr/sbin/nw_ux.lc*
   - *$FT_DIR/config/**
   - *$FT_DIR/log/**
   - *$FT_DIR/DomainName_NodeName*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   Solaris
   - */usr/sbin/nw_ux.lc*
   - *$FT_DIR/config/**
   - *$FT_DIR/log/**
   - *$FT_DIR/DomainName_NodeName*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   Note: *$FT_DIR* is the install location for the Legato Cluster software.

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2. On the primary node, enter the **scanner** command to restore the following configuration files:

```
scanner -S saveset_id device_path -x uasm -rv -i Y path_name
```

Note: The *path_name* variable represents the platform configuration and system files listed in Step 1.

Task 3: Configure NetWorker as a Highly Available Application

On the primary node, configure the NetWorker software as a highly available application:

1. Run the **envsh** script. For example:

   AIX

   ```
   cd /usr/lpp/LGTOlcxx/bin
   ```

   . ./envsh (or source **./envcsh** if using C shell)

   HP-UX

   ```
   cd /opt/LGTOlcxx/bin
   ```

   . ./envsh (or source **./envcsh** if using C shell)

   Linux

   ```
   cd /opt/LGTOlcxx/bin
   ```

   . ./envsh (or source **./envcsh** if using C shell)

   Solaris

   ```
   cd /opt/LGTOlcxx/bin
   ```

   . ./envsh (or source **./envcsh** if using C shell)

2. Run the **networker.cluster** script.

   If you have already restored the *nw_ux.lc* file, answer **no** to the following prompt:

   ```
   Do you wish to automatically add site-specific values for:
   NSR_SHARED_DISK_DIR and NSR_SERVICE_ID in
   /LegatoCluster_ installation_ directory
   Yes or No [Yes]? no
   ```

3. Start the cluster virtual server: For example:

   $FT_DIR/bin/ft_startup -domain *DomainName*

4. Use the Legato Cluster Console to start the NetWorker resource group.

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Task 4: Restore the Data

The procedures to restore the data on the primary and each of the remaining nodes in the cluster differ. For more information, see the following sections:

On the Primary Node

To restore data on the primary node:

1. Use the **mmrecov** command to restore the indexes, media database, and resource files.

2. Use the **recover** command to recover the following initialization directories:

   AIX
   - */etc/rc**

   HP-UX
   - */etc/rc**

   Linux
   - */etc/init.d*
   - */etc/rc*.d*

   Solaris
   - */etc/init.d*
   - */etc/rc0.d*
   - */etc/rc1.d*
   - */etc/rc2.d*
   - */etc/rc3.d*

   For detailed instructions on using the **recover** and the **mmrecov** command, refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version*.

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On Each of the Remaining Nodes in the Cluster

To restore data on each of the remaining node in the cluster:

1. Install NetWorker software and run the NetWorker client.

2. Recover the data and software from recent backups or from the product installation CD-ROMs.

3. Using the virtual NetWorker server, recover the following files:

   - *$FT_DIR/config/**
   - *$FT_DIR/log/**
   - *$FT_DIR/ DomainName_NodeName*

4. Recover or copy the following files from the active node:

   AIX
   - */usr/bin/nw_ux.lc*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   HP-UX
   - */opt/networker/bin/nw_ux.lc*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   Linux
   - */usr/sbin/nw_ux.lc*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   Solaris
   - */usr/sbin/nw_ux.lc*
   - *$FT_DIR/DomainName_NodeName*
   - *$FT_DIR/bin/envsh* (*envcsh* for C-shell)

   For detailed instructions on using the **recover** and the **mmrecov** commands, refer to the *NetWorker 6.1 Administrator's Guide, UNIX Version*.

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Task 5: Start the Cluster Software on Each Node

On each of the remaining nodes in the cluster:

1. Start the cluster virtual server. For example:

   cd $FT_DIR/bin

   . ./envsh

   ./ft_startup -domain *DomainName*

   If the virtual server fails to start on the node because of an outdated sites file, copy the following file from the active node:

   $FT_DIR/config//*DomainName-sites*

2. Run the **networker.cluster** script.

   If you have already restored or copied the *nw_ux.lc* file from the active node in step 3, answer **no** to the following prompt:

   ```
   Do you wish to automatically add site-specific values for:
   NSR_SHARED_DISK_DIR and NSR_SERVICE_ID in
   ```
   /LegatoCluster_ installation_ directory
   ```
   Yes or No [Yes]? no
   ```

3. Repeat the steps 1 and 2 above for each node in the cluster.

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Renaming the Resource Directory

This section describes how to rename the resource directory. While performing a disaster recovery on a shared disk, you might need to rename the resource directory.

To rename the resource directory:

1. Use the Legato Cluster Console to stop the NetWorker resource group.

2. Use the Legato Cluster Console to activate and mount the following:

   a. If using the Logical Volume Manager, activate the volume group by bringing the logical volume group datasource online.

   b. Mount the shared disk (that contains the shared *nsr* directory) by bringing the shared disk datasource on-line.

Note: You can also activate and mount the logical volume group and the shared disk using UNIX commands.

3. Move the newly recovered resource directory *nsr/res.R* to the current resource directory. For example:

   ```
   mv /nsr_shared_mnt_pt/nsr/res /nsr_shared_mnt_pt/
   nsr/res.old
   mv /nsr_shared_mnt_pt/nsr/res.R /nsr_shared_mnt_pt/
   nsr/res
   ```

4. In the reverse order, take the data sources (logical volume group and the shared disk) offline that you used in step 2.

5. Use the Legato Cluster Console to start the NetWorker resource group.

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Chapter 14: Legato Cluster for Windows Disaster Recovery

This chapter explains how to recover one or more cluster nodes in a Legato cluster for Windows NT or Windows 2000 environment. It contains the following sections:

- "Recovering a Single Cluster Node"
- "Performing a Disaster Recovery (Entire Cluster)" on page 176

Recovering a Single Cluster Node

This section describes how to recover a failed node within a cluster. The failed node is Node_B.

In the examples in this chapter, the backup devices are local tape drives.

To recover a single cluster node:

1. Reinstall the operating system, ensuring that it is configured identically to the way it was configured before Node_B failed. Use the same drive letters for the disk volumes as those that were used prior to the failure. Local drive letters should not conflict with drive letters assigned to the shared disk.

2. Install and configure backup devices.

3. Reinstall the NetWorker client software on Node_B. For detailed installation and configuration instructions, refer to the *NetWorker 6.1 Installation Guide, Windows Version*, available for download from the Legato web site, *www.legato.com*.

4. Start the NetWorker User (client) software.

5. Select, mark, and recover all items on the node, including the Legato Cluster software and data. Be sure to select and mark the cluster's shared drive so that it is included in the recover operation.

For detailed instructions about performing recover operations, refer to the *NetWorker 6.1 Administrator's Guide, Windows Version*, available for download from the Legato web site, *www.legato.com*.

Performing a Disaster Recovery (Entire Cluster)

This section describes how to perform a disaster recovery; that is, a recovery of both cluster nodes and the cluster's shared drive.

Prerequisites

Re-install the operating system and the NetWorker software on each cluster node.

How to Perform a Disaster Recovery

To perform a cluster wide recovery:

1. First, on the primary cluster node, complete:

2. Repeat the tasks on the secondary node.

![warning icon]

Important: As you perform the disaster recovery, be sure to duplicate exactly the original designations for all configured devices, including drives, servers, virtual servers and Legato cluster domain names, including those for the shared disk.

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In our examples, the backup devices for the cluster are tape devices. The tape devices must be connected locally to each node when the node is recovered.

Task 1: Reinstall Operating System and NetWorker Software

To reinstall software:

1. Configure the hardware identically to the way it was configured before the cluster node failed.

2. Install the operating system.

3. To ensure an error-free recovery, delete information on the Legato Cluster's shared disk.

4. Install the Legato Cluster software. For detailed instructions, refer to the *Legato Cluster Installation Guide*, available for download from the Legato web site, *www.legato.com*.

5. Install the NetWorker software:

   a. Install the NetWorker server software.

   b. Configure the NetWorker server as cluster-aware.

   c. Add and configure the backup devices.

   For detailed instructions for performing steps a, b and c, refer to the *NetWorker 6.1 Installation Guide, Windows Version*, available for download from the Legato web site, *www.legato.com*.

Task 2: Recover the Cluster Nodes

This section provides instructions for recovering both cluster nodes and the cluster's shared disk.

1. If you know the NetWorker save set ID number for the bootstrap file, skip this step.

   If you do not know the NetWorker save set ID number for the bootstrap file, use the **scanner -B** command to display it, and note it so that you can enter it later.

   The **scanner -B** command must be executed on the computer that the bootstrap is installed on; otherwise it won't work.

   For detailed information about the **scanner -b** command, refer to the *Legato Command Reference Guide,* available for download from the Legato web site, *www.legato.com*.

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To use the **scanner -B** command, enter:

scanner -B \\.*device_name*

After you enter the command, the following messages appear:

```
scanner -B \\.\Tape0
scanner: no `NSR device' with the name of `\\.\Tape0' found
scanner: scanning 4mm tape trail.001 on \\.\Tape0
scanner: done with 4mm tape trail.001
scanner: Bootstrap 4171575297 of 10/26/00 14:42:08 located
on volume trail.001, file 36.
C:\>
```

2. To recover the media database and resource configuration files, run the **mmrecov** command as follows:

   mmrecov

   Note: Be sure to run **mmrecov** on the node that currently owns the NetWorker server resources.

   For detailed information about the **mmrecov** command, refer to the *Legato Command Reference Guide*, available for download from the Legato web site, *www.legato.com*.

   After you enter the command, screen messages similar to those shown below appear, and you are prompted to enter information. When you are prompted for the starting file and record numbers, you can accept the defaults by pressing the [Enter] key.

   These advisories appear:

```
mmrecov: Using clarks as server

NOTICE: mmrecov is used to recover the NetWorker server's
media index and resource files from media (backup tapes or
disks) when any of this critical NetWorker data has been
lost or damaged. Note that this command will OVERWRITE the
server's existing media index. mmrecov is not used to
recover NetWorker clients' on-line indexes; normal recover
procedures may be used for this purpose. See the Legato
NetWorker Disaster Recovery Guide for more details.

rd=clarks:\\.\Tape0

rd=lewiss:\\.\Tape0

What is the name of the device you plan on using
[rd=clarks:\\.\Tape0]?

Enter the latest bootstrap save set id: 4171575297
```

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```
Enter starting file number (if known) [0]:
Enter starting record number (if known) [0]:
Please insert the volume on which save set id 4171575297
started into rd=clarks:\\.\Tape0. When you have done this,
press <RETURN>:
Scanning rd=clarks:\\.\Tape0 for save set 4171575297; this
may take a while...
scanner: scanning 4mm tape trail.001 on
rd=clarks:\\.\Tape0
Q:\nsr\res.R\nsr.res
Q:\nsr\res.R\nsrjb.res
Q:\nsr\res.R\nsrla.res
scanner: ssid 4171575297: scan complete
scanner: ssid 4171575297: 47 KB, 6 file(s)
Q:\nsr\res.R\
Q:\nsr\mm\
rd=clarks:\\.\Tape0: Mount operation in progress
rd=clarks:\\.\Tape0: verifying label, moving backward 2
file(s)
rd=clarks:\\.\Tape0: mounted 4mm tape trail.001 (write
protected)
```

3. As the **mmrecov** process finishes, advisory messages show on the screen. Detailed information regarding the advisories appears in steps 3a - 3d. The advisories are as follows:

```
If your resource files were lost, they are now recovered
in the 'res.R' directory. Copy or move them to the 'res'
directory, after you have shut down the service. Then
restart the service. Otherwise, just restart the service.
If the on-line index for clarks was lost, it can be
recovered using the nsrck command.
C:\>
```

   a. Take the cluster resource group offline:

      In the Legato Cluster Enterprise Console, double-click on the NetWorker resource group. The Resource Group Editor dialog box appears. Click the Take Group Offline button.

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Open the Services window (Start>Settings>Control Panel>Services) to stop the NetWorker Remote Exec Service, and check to be sure that the NetWorker Backup and Recovery Server services are stopped.

b. In the *nsr* folder on the cluster's shared disk, find the *res* folder and the *res.R* folders. Copy the contents of the *res.R* folder into the *res* folder, overwriting identically named files.

c. In the Resource Group Editor window, select one of the cluster node groups and then select Bring Group Online.

d. In the NT Services window, check to be sure the Remote Exec Service and the Backup and Recover Server service were restarted when you brought the resource group online; if they were not, start them.

4. To recover the client indexes for the cluster nodes and the shared volume, enter:

nsrck -L7

As the indexes are recovered, the following messages appear:

```
nsrck -L7
index for 'lewiss'
The file index for client 'lewiss' will be recovered.
Recovering index save sets of 'lewiss' from 'trail'
Recover completion time: Fri Oct 27 14:08:43 2000
completed recovery of index for client 'lewiss'
Q:\nsr\index\lewiss contains 6269 records occupying 663 KB
checking index for 'trail'
The file index for client 'trail' will be recovered.
Recovering index save sets of 'trail' from 'trail'
Recover completion time: Fri Oct 27 14:09:20 2000
completed recovery of index for client 'trail'
Q:\nsr\index\trail contains 65 records occupying 8 KB
checking index for 'clarks'
The file index for client 'clarks' will be recovered.
Recovering index save sets of 'clarks' from 'trail'
Recover completion time: Fri Oct 27 14:10:09 2000
completed recovery of index for client 'clarks'
Q:\nsr\index\clarks contains 6268 records occupying 658 KB
Completed checking 3 client(s)
```

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5. From a Windows command prompt, start NetWorker User, using the **winworkr** command and the switch for the virtual server that you are restoring:

   winworkr -s *virtual_server_name*

6. Click the Recover button to open the Recover view.

   In the Recover view, select the following:
   – boot drive
   – system state object
   – all the data on the cluster node
   – shared volume.

   Click the Mark button to mark each selection for the recover operation.

   For more detailed information about recovering the system save sets, refer to "Chapter 4: Windows 2000 Disaster Recovery" on page 61.

   Click the Recover button to start the recover operation.

7. When the recover operation is complete on the primary node, repeat the disaster recovery steps on the secondary node.

Troubleshooting the Disaster Recovery

If the recovery does not succeed and there is a message saying there are no client indexes, use the **scanner -i** command *on each node* to perform the client index recovery again. Enter:

scanner -i rd=*virtual_server_name***:\\.***<device_name>*

The scanning operation can take a long time to complete. After it is complete, repeat steps 5 and 6 above.

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Chapter 15: HACMP for AIX Disaster Recovery

This chapter explains how to recover one or more computers in a High Availability Cluster Multi-Processing for AIX (HACMP for AIX) environment. The following topics are described:

For detailed installation and configuration instructions, refer to the following documentation:

- *NetWorker 6.1 Installation Guide, AIX Version*
- *NetWorker 6.1 Administrator's Guide, UNIX Version*
- HACMP for AIX documentation

Restoring a Single Node

This section describes how to recover a failed node within a cluster. This situation assumes that the operating system on the participating nodes is intact and will not be recovered. The functionality of the HACMP for AIX component on the node is in question.

Restoring a cluster following a disaster is similar to any NetWorker software restoration. The important difference is that you must synchronize the data in the cluster database.

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How to Recover a Single Node

To recover a single node:

1. Install the NetWorker software.

2. Start the NetWorker client.

3. From an unaffected node in the cluster, use the virtual NetWorker server to restore the node's data and software from a recent backup.

4. From an unaffected node in the cluster, use the **SMIT** utility to synchronize the cluster topology and resources.

Restoring an Entire Cluster

This section describes how to perform a complete cluster recovery including reinstallation of the operating system on all nodes participating in the cluster.

Note: It is unlikely that all the nodes in a cluster would fail simultaneously; but if this does occur, follow this procedure.

How to Perform a Cluster-Wide Recovery

To perform a cluster-wide recovery, follow these procedures, explained in detail in the following sections:

1. Install the software on the primary node.

2. Restore the cluster database.

3. Start the cluster.

4. Restore the data.

Task 1: Install the Software

To install the software on a primary node:

1. Configure the hardware and install the operating system.

2. Reinstall the HACMP for AIX software.

3. Install the NetWorker software.

Task 2: Restore the Cluster Database

To restore the cluster database:

1. From all nodes in the cluster, make sure that all cluster software is halted.

2. From one node in the cluster:

   a. Determine the save set id that contains the following configuration directories:
      – */etc/objrepos*
      – */usr/sbin/cluster/etc/objrepos*

      If you do not know the save set id, enter the **scanner device_path** command to determine its value:

      ```
      scanner device_path > /tmp/savefile 2>&1
      ```

   b. Enter the following **scanner** commands to restore the cluster database:

      ```
      scanner -S saveset_id device_path -x uasm -i Y -rv
      /etc/objrepos
      ```

      ```
      scanner -S saveset_id device_path -x uasm -i Y -rv
      /usr/sbin/cluster/etc/objrepos
      ```

3. From the restored node in the cluster, use the **SMIT** utility to synchronize the cluster topology and databases.

Task 3: Start the Cluster

To start the cluster:

1. Use the **SMIT** utility to bring up all nodes within the cluster.

2. Run the **/usr/bin/NetWorker.cluster** script on each node in the cluster.

Task 4: Restore the Data

To restore the data from the primary node:

1. Use the **mmrecov** command to restore the media database and resource files.

2. Use the **nsrck -L7** command to restore the indexes.

3. Use the **recover** command to recover the initialization directories.

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Glossary

This glossary provides definitions for terms used in this guide.

ACL
An abbreviation for access control list. This is a list that specifies the permissions assigned to a specific file or directory.

To recover a file that has an associated ACL, you must either be logged into the system as root, as Administrator, or as the file's owner.

active group
A NetWorker backup group that has its Autostart attribute enabled.

administrator
The person normally responsible for installing, configuring, and maintaining NetWorker software.

Administrators group
A Windows NT and Windows 2000 user group whose members have all the rights and abilities of users in other groups, plus the ability to create and manage all the users and groups in the domain. Only members of the Administrators group can modify Windows NT and Windows 2000 operating system files, maintain the built-in groups, and grant additional rights to groups.

agent
The term used to denote a cluster server. Also known as a logical server (Compaq), a package (HP-UX), and a virtual server (Microsoft).

Glossary

annotation	A comment that you associate with an archive save set to help identify that data later. Annotations are stored in the media index for ease of searching and are limited to 1,024 characters.
archive	The process by which NetWorker software backs up directories or files to an archive volume and then grooms them to free disk space. When data is archived, it is written to one or more storage volumes and then marked so that it is never subject to automatic recycling. You can delete the archived files from the client, thus freeing disk space. See also *grooming*.
archive clone pool	A pool composed exclusively of archive clone save sets.
archive pool	A volume *pool* composed exclusively of archive save sets. Archived save sets are in a different format than regular backup save sets, and must be maintained on separate media.
archive volume	A tape or other storage medium used to store NetWorker archive data, as opposed to a *backup volume*.
ASM	An abbreviation for application-specific module. An ASM is a program that, when used in a directive, specifies the way that a set of files or directories is to be backed up and recovered. For example, **compressasm** is a NetWorker directive used to compress and decompress files.
ASM specification	A directive that specifies how files or directories with a matching pattern are backed up. This specification appears in the form [+] ASM [args ...]: pattern ... For more information, refer to the **nsr_5** man page or the *Legato Command Reference Guide*.
attribute	A feature of a resource. It is a service or information that the *resource* provides.
authorization code	A code that is unique to your network that unlocks the software for permanent use.

autochanger	A mechanism that uses a robotic arm to move media among various components located in a device, including slots, media drives, media access ports, and transports. Autochangers automate media loading and mounting functions during backup and recovery. The term autochanger refers to a variety of robotic libraries, including autoloader, *carousel*, datawheel, jukebox, library, and near-line storage.
auto media management	A feature that enables the storage device controlled by the NetWorker server to automatically label, mount, and overwrite a volume it considers unlabeled. Volumes that are eligible for reuse are also automatically recycled.
backup	The writing of saved data to a volume.
backup cycle	The period of time from one level full backup to the next level full backup.
backup group	See *group*.
backup level	See *level*.
Backup Operators group	A group of Windows NT or Windows 2000 users who can log on to a domain from a computer or a server, back it up, and restore the data. Backup operators can also shut down servers or computers.
backup volume	A tape or other storage medium used to store NetWorker backup data, as opposed to an archive volume.
base enabler code	See *enabler code*.
bootstrap	A save set that is essential for the NetWorker disaster recovery procedures. The bootstrap is composed of three components that reside on the NetWorker server: the *media database*, the *resource database*, and a *server index*.
browse policy	A policy that determines how long entries for your backup data remain in the client file index.

carousel	A tray or tape cartridge that holds multiple backup volumes.
client	A computer that accesses the NetWorker server to back up or recover files. Clients may be workstations, computers, or fileservers.
client file index	A database of information maintained by the NetWorker server that tracks every database object, file, or *filesystem* backed up. The NetWorker server maintains a single client index file for each client computer.
client-initiated backup	See *manual backup*.
clone	The NetWorker process used to make an exact copy of saved data (save sets). You can clone individual save sets or the entire contents of a backup volume. Cloning is different from a simple copy operation carried out on an operating system or hardware device. It is indexed and tracked by NetWorker software in both the *client file index* and the *media database*.
clone pool	A pool of volumes composed exclusively of cloned data. Three types of clone pools can be used: backup clone, archive clone, and migration clone. Save sets of different types (for example, archive and migration) cannot be intermixed on the same clone volume.
clone volume	A volume belonging to a clone pool.
cluster	Two or more nodes that are connected and appear to network users as a single, highly available system. A highly available system allows the application services to continue despite most hardware or software failures.
connection port	The port NetWorker processes use to perform backup and recovery sessions through a firewall.

consolidate	To create a complete backup of a save set by merging the most recent level 1 save set with its corresponding full level save set. For more information, refer to the **nsrssc** man page or the *Legato Command Reference Guide*.
continued save set	Data associated with a save set that is continued from a previous volume. Continued save sets are created by the backup server when large save sets are being backed up, cloned, or archived to multiple volumes.
daemon	A program that lies dormant waiting for a specified condition to occur.
datawheel	See *autochanger*.
device	1. A storage unit that reads from and writes to storage volumes (see volume). A storage unit can be a tape device, optical drive, *autochanger*, or file connected to the *server* or *storage node*. 2. When Dynamic Drive Sharing (DDS) is enabled, refers to the access path to the physical drive.
DFS component	An abbreviation for Distributed File System root or child node. DFS is a Microsoft add-on for Windows NT 4.0 Server (Alpha or Intel) or Windows 2000 that allows you to create a logical directory of shared directories that span multiple machines across a network.
directed recover	A method of recovery that recovers data that originated on one client computer and re-creates it on another client computer.
directive	An instruction that directs the NetWorker software to take special actions on a given set of files for a specified client during a backup.
drive	When Dynamic Drive Sharing (DDS) is enabled, refers to the physical backup object, such as a tape drive, disk, or file. See also *device*.

Glossary

enabler code	A special code provided by Legato that activates the software. The enabler code that unlocks the base features for software you purchase is referred to as a base enabler. Enabler codes for additional features or products (for example, autochanger support) are referred to as add-on enablers.
exit code	An indicator that specifies whether a backup or recovery session succeeded. An exit code of zero ("0") indicates the session completed successfully. A nonzero exit code indicates the session did not complete successfully.
expiration date	The date when the volume changes from "read/write" to "read-only."
expired save set	A save set whose browse time has been reached; therefore, it can no longer be browsed. In addition, the save set has been removed from the client file index.
failover	In a cluster network, the process of relocating a resource to its redundant or backup component, either because of a hardware or software failure or for administrative purposes.
file index	See *client file index*.
filesystem	1. A file tree that is on a specific disk partition or other mount point. 2. The entire set of all files. 3. A method of storing files.
firewall	A system designed to prevent unauthorized access to or from a private network. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria. There are several types of firewall techniques. The NetWorker software supports client backups from computers that are protected by *packet filtering*.

fork	A child process created by NetWorker software to perform the requested operation. In instances where a command uses a parallelism value, NetWorker software creates multiple instances of that command. Each instance of the command is identical to the original command and is referred to as a child process. Once each child process is created, they are run simultaneously.
full backup	See *level*.
grooming	The NetWorker process of removing the original files from a local disk after a successful archive operation.
group	A client or group of clients configured to start backing up files to the NetWorker server at a designated time of day.
high-availability system	A system that allows the application services to continue despite a hardware or software failure. Each cluster node has its own IP address. Each cluster node also has private (local) resources or disks that are available only to that machine.
inactivity timeout	An attribute that indicates the number of minutes NetWorker software waits before determining that a client is unavailable for backup.
incremental	See *level*.
index policy	A policy that specifies how long file and data index entries should remain valid. Clients specify which index policies they wish to use.
jukebox	See *autochanger*.
LCP	An abbreviation for library control program, a program that the Legato GEMS SmartMedia software uses to control robotic libraries.

level A measurement that determines how much data NetWorker software saves during a scheduled or manual backup.

A full (f) backup backs up all files, regardless of whether they have changed. Levels one through nine [1-9] back up files that have changed since the last lower numbered backup level. An incremental (incr) backup backs up only files that have changed since the last backup.

library See *autochanger*.

license enabler The enabler code that enables you to run a feature or product.

local cluster client A NetWorker client that is not permanently bound to a physical machine, but is instead managed by a cluster manager. It can be bound to more than one physical machine in the cluster and can own its own data disks. It is also referred to as a logical or virtual client.

local host The node on which the client or server program is running.

logical server The term used by Compaq to denote a cluster server. Also known as an agent (Solaris), a package (HP-UX), and a virtual server (Microsoft).

LUS An abbreviation for User SCSI. The LUS driver is used by Legato software products as a proprietary device driver that sends arbitrary SCSI commands to an autochanger.

manual backup A backup that a user requests from the client's **save** program. The user specifies participating files, filesystems, and directories. A manual backup does not generate a *bootstrap* save set.

media The physical storage medium to which backup data is written. NetWorker software supports tape, magnetic or optical disk, and filesystems as backup media. See also *volume*.

media database	A database that contains indexed entries about the storage volume location and the life cycle status of all data and volumes managed by the NetWorker server. See also *volume*.
migration	The process of moving data from a local filesystem to storage media in the migration store to free up disk space on the local drive.
multiplexing	A NetWorker feature that permits data from more than one save set to be simultaneously written to the same storage device.
NDMP	An abbreviation for Network Data Management Protocol, which is a storage management client/server protocol for enterprise-wide backup of network-attached storage. NetWorker software uses NDMP to provide connections to computers with NDMP data modules for tape operations, allowing a significant reduction in network traffic.
near-line storage	See *autochanger*.
NetWorker client	See *client*.
NetWorker server	See *server*.
NetWorker storage node	See *storage node*.
NFS client	A computer that can access files on a network file system (NFS) server.
NFS server	A computer that contains exported filesystems that NFS clients can access.
nonclone pool	Pools that contain data that has not been cloned.
notification	A message generated and sent to the NetWorker administrator about important NetWorker events.

online indexes	The databases located on the NetWorker server that contain all the information pertaining to the client backups (*client file index*) and backup volumes (*media database*).
operator	The person who monitors the server status, loads backup volumes into the server devices, and otherwise executes the day-to-day NetWorker tasks.
override	A NetWorker feature that allows you to configure a different backup level for a specific date listed in a Schedule resource.
package	The term used by HP-UX to denote a cluster server. Also known as an agent (Solaris), logical server (Compaq), and virtual server (Microsoft).
packet filtering	A method of firewall protection that looks at each packet entering or leaving the network and accepts or rejects it based on user-defined rules. See also *firewall*.
parallelism	A NetWorker feature that enables the NetWorker server to either back up save sets from several clients or many save sets from one client at the same time. Parallelism is also available during recovers.
pathname	A set of instructions to the operating system for accessing a file. An *absolute pathname* tells how to find a file beginning at the root directory and working down the directory tree. A *relative pathname* tells how to find the file starting where you are now.
physical cluster client	A NetWorker client that is bound to a physical machine in the cluster and can represent its own resources (private or local). It can also be called the physical client.
physical host	Any one of the nodes (or machines) that forms the cluster.

policy	A set of constraints that specify how long an entry can remain in a client's online file index. When a policy expires, the save sets associated with that policy are marked recyclable. Each client resource uses two policies: a browse policy and a retention policy. For more information, refer to the **nsr_policy (5)** man page or the *Legato Command Reference Guide*.
pool	A feature that enables you to sort backup data to selected volumes. A pool contains a collection of backup volumes to which specific data has been backed up.
probe	The process NetWorker software uses to determine the directories or files to back up on each client.
purging	The process of deleting all entries for files on the volume from the client file index, but allowing entries for the save sets to remain in the media database.
recover	A recovery method that re-creates an image of the client filesystems and database on the NetWorker server.
recyclable save set	A save set whose browse and retention policies have been reached; therefore, the save set has been removed from the media database.
recyclable volume	A volume whose data has passed both its browse and retention policies and is now available for relabeling and use by a NetWorker server or storage node.
Registry	A database of configuration information central to Windows NT and Windows 2000 operations. It centralizes all Windows settings and provides security and control over system, security, and user account settings.
remote device	A storage device that is attached to a NetWorker storage node.
RPC	An abbreviation for remote procedure call, which is the protocol the NetWorker server uses to perform client requests over a network.

resource	A component of the NetWorker software that describes the NetWorker server and its clients. Devices, schedules, clients, groups, and policies are examples of NetWorker resources. Each resource contains a list of attributes that define the parameters to use for the specific NetWorker resource.
resource database	A database that contains information about each of the configured backup server's resources.
resource owner	The cluster (logical, not physical) host that owns the resource. If a resource (for example, a shared disk) is not owned by any virtual host, it is assumed to be owned by the local host (physical node) that hosts the resource.
retention policy	A policy that determines how long save set entries are retained in the NetWorker server's media database.
retrieve	The process of locating and copying back files and directories that NetWorker software has archived.
retry mechanism	The action NetWorker software performs when client operations fail. This situation might occur when the rate of transmission is either low or nonexistent. By using this mechanism, a previously failed operation might be more successful. Another common situation whereby a retry mechanism might succeed is when the client is in a reboot cycle.
root	1. (UNIX only) The UNIX superuser account (with user name "root" and user ID). By extension, the privileged system-maintenance login on any operating system. 2. (Windows NT/Windows 2000 and UNIX) The top node of the system directory structure; the home directory of the root user.
save set	A group of files or a filesystem from a single client computer backed up onto storage media.
save set consolidation	The process that merges a level 1 backup with the last full backup of a save set to create a new full backup. See also *level*.

save set ID	An internal identification number that NetWorker software assigns to a save set.
save set recover	The recovery of specified save sets to the NetWorker server.
save set status	The NetWorker attribute that indicates whether a given save set is restorable, recoverable, or recyclable. The save set status also indicates whether the save set has been successfully backed up.
save stream	The data and save set information being written to a storage volume during a backup. A save stream originates from a single save set.
server	The computer on a network that runs the NetWorker server software, contains the online indexes, and provides backup and recovery services to the clients and storage nodes on the same network.
server index	A file that lists all the server files that were backed up during a scheduled backup.
service port	The port used by a server or storage node to listen for backup and recovery requests from clients through a firewall.
shared disk	The storage disk that is connected between multiple nodes in the cluster.
shell prompt	A cue for input in a shell window where you enter a command.
silo	A repository for holding hundreds or thousands of volumes. Silo volumes are identified by barcodes, not by slot numbers.
skip	A backup level in which designated files are not backed up. See also *level*.

SMS   An abbreviation for system management software, which is a Microsoft-based software installation system that allows the wide-scale, automatic installation of software products on clients from a single remote server.

SNMP   An abbreviation for Simple Network Management Protocol, which is a protocol that defines the communication between a manager (sometimes called a monitor or management station) and an object (the item being managed). NetWorker software uses SNMP to send messages to the administrator about NetWorker events.

ssid   See *save set ID*.

staging   The process of moving data from one storage medium to another, less costly medium, and later removing the data from its original location.

stand-alone   In a cluster environment, if the *NetWorker.clustersvr* file is missing at the binary location, the NetWorker server will start in noncluster mode, also called stand-alone mode. The stand-alone mode is sometimes referred to as the server backing up itself.

stand-alone device   A *storage device* that contains a single drive for backing up data.

storage device   The hardware that reads and writes data during backup, recovery, or other NetWorker operations.

storage node   A storage device physically attached to another computer whose backup operations are administered from the controlling NetWorker server.

versions   The date-stamped collection of available backups for any single file.

virtual cluster client	A NetWorker client that is not permanently bound to a physical machine, but is instead managed by a cluster manager. It can be bound to more than one physical machine in the cluster and can own its own data disks. It is also referred to as a logical cluster client or a virtual client.
virtual server	The term used by Microsoft to denote a cluster server. Also known as an agent (Solaris), a logical server (Compaq), and a package (HP-UX).
volume	A unit of storage media, such as a magnetic tape, an optical disk, or a file. A storage device reads from and writes to volumes, which can be physical units (for example, a labeled tape cartridge) or logical units (for example, optical media can store multiple volumes on a single physical platter).
volume ID	The internal identification assigned to a backup volume by NetWorker software.
volume name	The name you assign to a backup volume when it is labeled.
volume pool	See *pool*.

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