EMC® NetWorker® Module for SnapImage

Release 2.0
Microsoft Windows Version

Installation and Administration Guide

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Preface

As part of an effort to improve and enhance the performance and capabilities of its product line, EMC from time to time releases revisions of its hardware and software. Therefore, some functions described in this document may not be supported by all releases of the software or hardware currently in use. For the most up-to-date information on product features, refer to your product release notes.

If a product does not function properly or does not function as described in this document, please contact your EMC representative.

Audience

This guide is part of the EMC NetWorker Module for SnapImage documentation set. It is intended for use by system administrators during installation and setup of the product. Operators who schedule and monitor backups may also find this guide helpful.

Related documentation

The following documents can be used with the SnapImage product, and are available on the Powerlink website:

- *EMC NetWorker Module for SnapImage Release 2.0 Microsoft Windows Version Release Notes*

  This document contains important information about the SnapImage product. It discusses features, limitations, and known problems.

- *EMC NetWorker Administrator's Guide Microsoft Windows Version*

  This guide provides detailed information about setting up backup devices, schedules, groups, and other criteria necessary for storage operations. Use this guide after you have installed and configured the SnapImage software. It describes how to use and monitor all NetWorker backup and restore operations from the NetWorker Administrator Program.

- *EMC NetWorker Installation Guide Microsoft Windows Version*

  This guide provides instructions for installing the NetWorker software and NetWorker License Manager, which are required products for using the SnapImage product. It also contains information about configuring storage devices.

  Note: NetWorker recommends that you install NetWorker License Manager when you install the NetWorker software.

- *NetWorker License Manager Installation and Administrator's Guide*

  This guide describes how to manage all NetWorker licenses from a centralized system. Use this guide to license the NetWorker, SnapImage, and NDMP TapeServer licenses, as well as other NetWorker products.

- *NetWorker Command Reference Guide*

  This manual describes the entire suite of NetWorker commands that can be executed from the command prompt. Some command operations are intended to be performed by advanced NetWorker administrators.

- *NetWorker Disaster Recovery Guide*

  This guide provides instructions for recovering NetWorker software and backup data after a system disaster.

Conventions used in this guide

EMC uses the following conventions for notes and caution notices.

Note: A note presents information that is important, but not hazard-related.

CAUTION

A caution contains information essential to avoid data loss or damage to the system or equipment. The caution may apply to hardware or software.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (nonprocedural) text for: • Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) • Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, functions, utilities • URLs, pathnames, filenames, directory names, computer names, filenames, links, groups, service keys, file systems, notifications
Bold	Used in running (nonprocedural) text for: • Names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system calls, man pages Used in procedures for: • Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) • What user specifically selects, clicks, presses, or types
Italic	Used in all text (including procedures) for: • Full titles of publications referenced in text • Emphasis (for example a new term) • Variables
`Courier`	Used for: • System output, such as an error message or script • URLs, complete paths, filenames, prompts, and syntax when shown outside of running text
`Courier bold`	Used for: • Specific user input (such as commands)

Courier italic	Used in procedures for: • Variables on command line • User input variables
< >	Angle brackets enclose parameter or variable values supplied by the user
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces indicate content that you must specify (that is, x or y or z)
...	Ellipses indicate nonessential information omitted from the example

Where to get help

EMC support, product, and licensing information can be obtained as follows.

Product information — For documentation, release notes, software updates, or for information about EMC products, licensing, and service, go to the EMC Powerlink website (registration required) at:

http://Powerlink.EMC.com

Technical support — For technical support, go to EMC Customer Service on Powerlink. To open a service request through Powerlink, you must have a valid support agreement. Please contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

Your comments

Comments and suggestions about our product documentation are always welcome.

To provide feedback:

1. Go to:

   http://Powerlink.EMC.com

2. Click the **Feedback** link.

1 Introduction

This chapter includes the following sections:

NetWorker module for SnapImage overview

The NetWorker® Module for SnapImage is a high-performance storage solution that backs up and recovers high-density file systems across a LAN or SAN. It is based on the Network Data Management Protocol (NDMP) and provides full-image, block-level backups and recoveries, allowing large amounts of data to be backed up quickly, which reduces the backup window. The SnapImage software backs up high-density file systems faster than traditional file-based backup systems. It supports full backups as well as differential backups, which back up only the blocks that have changed since the last full backup. It can recover data at the block level, and also can recover specific files and directories at the volume level. Combined with the NetWorker software, the SnapImage module provides a complete, reliable, and efficient storage management solution.

To keep file systems available to users, the software uses snapshot technology that creates a frozen (or snapshot) view of the file systems to be backed up. During a backup, the SnapImage software backs up the snapshot to media. Any changes to blocks on the file system that occur during the backup are intercepted by the write intercept driver. Once the backup is complete, the driver copies the blocks that have changed to the SnapImage cache device before it allows the changes to be committed to the file system.

The SnapImage software is installed on all SnapImage clients that the NetWorker server backs up. The NDMP TapeServer is a required product that must be installed and licensed on the SnapImage client in addition *to* the SnapImage software. If storage devices are attached to a remote host, then the NDMP TapeServer must be installed and licensed on the SnapImage client and on the host with the storage devices attached.

Note: The NetWorker server, NetWorker License Manager, and NDMP TapeServer are separate NetWorker products that must be installed and enabled in addition to the SnapImage software. *EMC NetWorker Installation Guide Release 7.0 Microsoft Windows Version* provides more information on licensing NetWorker products.

SnapImage features

The SnapImage software provides the following features:

- Fast data backup and recovery

  Full, block-level image snapshot technology significantly reduces backup and recovery time compared with traditional, file system backup and recovery methods.

- Flexible backup scheduling

  The SnapImage software allows operators full flexibility in scheduling differential and full backups. A differential backup only backs up blocks that have changed since the last full backup.

- Directory and file-level restores

  If it is not necessary to restore a complete file system, users can select specific directories and files to restore.

- Local and remote NDMP storage device support

  SnapImage clients can be configured to support locally attached and remote storage devices. The criteria for setting up local or remote tape device support depends on system environments, storage requirements, and operational procedures.

SnapImage software in a SAN environment

The SnapImage product supports SAN environments. Additionally, depending on the system environment, a LAN is required in the following configuration setups:

- If the SnapImage client and NetWorker server are installed on separate hosts. The LAN transports commands, messages, and other information between the two systems.
- If the NDMP TapeServer is installed on a remote host. The LAN transmits data and provides communications between the SnapImage client and the remote NDMP TapeServer storage node.

Note: The storage node must be installed with the NetWorker NDMP TapeServer Release 2.0 Windows version.

SnapImage software in a cluster environment

The SnapImage product can exist in a cluster environment. The software can co-exist with the following cluster products:

- Microsoft Cluster Server (MSCS) for Windows 2000 Advanced Server, Service Packs 1 and 2
- EMC® Automated Availability Manager, release 4.8.1, and Windows 2000

  In a cluster environment, backup level 0 and backup level 1 backups are supported. In the event of a cluster failover during a backup operation, the SnapImage software then performs a full backup from the failover node.

Note: Multiple licenses are required if a cluster environment has storage nodes or dedicated storage nodes. Each storage node in the cluster must be installed with a separate NDMP TapeServer license.

Distributed file system support

A distributed file system (DFS) allows operators to access multiple shared volumes that are on different network servers from a single location, without requiring specific server information where the volumes are located.

The following limitations exist for DFS in a SnapImage environment:

- Only primary volumes that are locally mounted are backed up; backups of DFS replicas are not.
- Operating system (OS) partitions containing the system registry and DFS root must be backed up with the NetWorker client software, not the SnapImage software.
  - The DFS root and the registry must be backed up at the same time to ensure consistency.
  - The active directory for domain-based DFS trees must be backed up with the NetWorker client.
  - If the DFS root is not on the OS partition, the partition on which it is located must be added to the NetWorker client configuration containing that partition. This way, the two partitions can be backed up at the same time.

  - All DFS root and registry backups must be full backups. Differential DFS backups are not supported.
  - The registry and the DFS root partition must be restored from the same saveset.
- When you perform a directed restore of a DFS partition to a host other than the original host, the DFS link to the partition will not be restored. You must use the DFS console to create a new DFS link.

Multipathing support with the SnapImage software

The SnapImage module supports multipathing software. Multipathing allows two or more paths to transfer data concurrently, increasing backup and recovery speed and protecting against path failure. Multipathing provides load balancing by switching the data transfer to the path with the least traffic. In addition, if one path fails, the data transfer is switched to the functioning path.

The following multipathing software is certified for use with the NetWorker Module for SnapImage:

- EMC PowerPath®, version 3.0.0
- HP StorageWorks Secure Path Release 4.1

Additional Windows 2000 Server and Windows 2000 advanced Server features

The SnapImage software supports the following additional recovery features specific to Windows 2000 Server and Advanced Server:

- Savesets can be recovered to a mount point path location.
- Drives can be basic or dynamic. Existing SnapImage drives can be upgraded from basic to dynamic.
- Most new and enhanced NTFS file system features are incorporated into SnapImage functions.

Note: You should not recover an NTFS file system file or directory to a file allocation table (FAT) partition. The multinamed data streams and access control lists (ACLs) are not successfully restored. Only the file data and basic directory information and attributes are restored.

System requirements

This section identifies the hardware, operating systems, software, and installation requirements and recommendations for the SnapImage module.

SnapImage hardware and operating system requirements

The minimum requirements for the SnapImage client in a Windows environment are the following:

- Windows 2000 Server or Windows 2000 Advanced Server, Service Packs 2 and 3
- 256 MB RAM minimum
- 50 MB disk space to install the SnapImage directory

Note: The disk space required for the SnapImage home directory is based on the average number of files and directory levels in a high-density file system, among other factors. "Directory and pagefile size guidelines" on page 19 provides information.

- One or more dual-channel ultra SCSI cards and/or Fibre Channel host adapters
- Tape drives or autochangers

  The Hardware Compatibility Guide provides more infomation for the NetWorker Module for SnapImage on the Powerlink® website to determine which tape drives and autochangers are supported.
- SAN devices

  If you are using the SnapImage software with SAN devices, refer to the SAN Component Compatibility Guide on the Powerlink website to determine which host bus adapters (HBAs) are supported for your configuration.

Required EMC software

The following EMC products are required:

- EMC NetWorker software, release 7.0 and later
- EMC NetWorker Module for SnapImage Release 2.0 Microsoft Windows
- NetWorker NDMP TapeServer, release 2.0 and later

Note: The SnapImage Release 2.0 software does not support NDMP TapeServer release 1.6.

- NetWorker License Manager

Note: NetWorker software, release 7.0 and later, Windows version, includes an option for installing NetWorker License Manager during the NetWorker installation procedure. EMC recommends that you install NetWorker License Manager at the same time that you install the NetWorker software.

Volume management support

SnapImage software supports the following volume management products:

- Microsoft Logical Disk Manager subsystem (LDM)
- VERITAS VxVM 2.7 and later RAID 0, 1, 5

  RAID 1 and RAID 5 volumes contain redundant data. Because SnapImage does not restore redundant data, the volume is not fault tolerant after a SnapImage recovery.

File system support

NTFS file system is supported.

Note: FAT is not supported. Operating system documentation provides more information about NTFS.

Cluster support

SnapImage software supports the following cluster products:

- MSCS for Windows 2000 Advanced Server, Service Packs 1 and 2
- LAAM, release 4.8.1, and Windows 2000

Dynamic multipathing support

SnapImage software supports the following dynamic multipathing (DMP) products:

- EMC PowerPath, version 3.0.0
- HP StorageWorks Secure Path, version 4.1

Directory and pagefile size guidelines

This section provides recommendations for the sizes of the following:

- The SnapImage and NetWorker directories that store temporary files
- The NetWorker pagefile sizes

Determining directory sizes

Use the following guidelines for determining the sizes of the NetWorker and SnapImage directories that contain temporary files:

- The NetWorker tmp directory requires approximately 250 MB for every million files in a backup.
- The SnapImage *%NDMPHOME%* directory requires approximately 400 MB for every million files in a file system.

Determining pagefile sizes

Microsoft recommends setting the pagefile size to 2.5 times the amount of RAM that is installed on the system. Use the following recommendations in addition to the Microsoft guideline to determine the NetWorker and SnapImage pagefile sizes:

- For the NetWorker pagefile size, estimate approximately 110 MB for each 1 million files in a backup.
- For the SnapImage pagefile size, estimate approximately 50 MB for each 1 million files in a backup.

Appendix B, "Calculating the Pagefile and Directory Sizes." provides more information about calculating NetWorker and SnapImage directory and pagefile sizes.

2 Installation

This chapter includes the following sections:

Installation roadmap

Use the following roadmap when installing the NetWorker Module for SnapImage software:

1. Ensure that all system and installation requirements are satisfied. "System Requirements" on page 18 and "Installation requirements" on page 23 provides information.
2. Ensure the NetWorker and NetWorker License Manager software are properly installed and configured. *EMC NetWorker Installation Guide Release 7.0 Microsoft Windows Version* provides more information.
3. The NetWorker software, release 7.0 and later Windows installation program includes an option to install NetWorker License Manager as part of the NetWorker installation procedure. EMC recommends that you install the License Manager when you install the NetWorker software.
4. Ensure the storage devices are connected, and the operating system and the NetWorker software recognize the devices. *EMC NetWorker Installation Guide Release 7.0 Microsoft Windows Version* provides more information.
5. Access the NDMP Tape Services and SnapImage software, and either download or copy the packages to your system. "Accessing the software" on page 24 provides information.
6. Install the software. "Installing the software" on page 27 provides information.
7. Enable and register the SnapImage software. "Evaluating and licensing the software" on page 31 provides more information.

Installation requirements

Before you install the NetWorker Module for SnapImage software, you must complete the following tasks:

- Allocate separate partitions for cache devices. Ideally, cache devices should be 10 percent to 20 percent of the largest backup partition.

  "Setting Up the Cache for SnapImage Backups" on page 43 provides recommendations.

- Allow at least 5 percent of the total amount of data you plan to back up for SnapImage space requirements in *%NDMPHOME%*.

  Note: "Directory and Pagefile Size Guidelines" on page 20 provides information on estimating required disk space.

- Install the NetWorker software and NDMP Client Connection on a computer designated as the NetWorker server, or on the SnapImage client. *EMC NetWorker Administrator's Guide, Microsoft Windows Version* provides information on NetWorker and NDMP connection configuration instructions.

- Install NDMP passwords on each computer you want to secure. "Setting Up Passwords for SnapImage Clients" on page 42 provides more information.

Accessing the software

To install the NDMP TapeServer and SnapImage software, you first must access the SnapImage installation files. For instructions, the following sections provides information:

- "From a local DVD drive" on page 24.
- "How to access the Installation files on a shared network volume" on page 24.
- "From the website" on page 25.

From a local DVD drive

To access NetWorker installation files on a local CD-ROM:

1. Log in with administrator privileges where the NetWorker software is being installed.
2. Insert the NetWorker software media into the DVD drive.
3. If Autorun is enabled, the NetWorker software installation screen appears automatically. Perform the following:
   a. Select **Install NetWorker Module for SnapImage Release 2.0** software.
   b. In the **File Download** dialog box, select **Run this program from its current location**.
   c. If a security warning appears, click **Yes** to continue.
4. If Autorun is disabled, change directories to win_x86 (to install on a 32-bit computer).

How to access the Installation files on a shared network volume

To access NetWorker installation files on a shared network volume:

1. On a remote computer, make the NDMP Services and SnapImage software CD-ROM drive a shared volume, or copy the installation files to a shared volume.
2. Log in with administrator privileges to the target computer for the software installation.

3. Map a drive to the shared volume. Using other methods to access the shared volume, such as navigating to the volume using Network Neighborhood, will result in an error message and a failed installation.

Note: If you are logged in to the target computer through a terminal server connection, you must use a Universal Naming Convention (UNC) path to use the SnapImage Setup program from a shared network volume. This is a Microsoft Windows security feature. For example, to access the installation files in *Install_share* on a computer named *MYSERVER*, select Run from the Start menu, and type *MYSERVER**Install_share* in the Open text box. When the *MYSERVER**Install_share* window appears, navigate to the NetWorker installation files.

4. "Installing the software" on page 27 provides information to install the NDMP TapeServer and SnapImage software.

From the website

To access the installation software from Powerlink website:

1. Create a temporary folder to download and extract the evaluation software.
2. Go to http://Powerlink.EMC.com website, select **Support > Software Downloads and Licensing > Downloads J-O > NetWorker > NetWorker Module for SnapImage**.
3. Download the evaluation software to the temporary folder.

Note: If the SnapImage client does not have tape devices attached for NDMP backups, the NDMP Services package must also be downloaded to the remote system. "Installing the SnapImage software with remote device support" on page 29 provides information.

4. Extract the downloaded file.

Note: After downloading the software from the Powerlink website, be sure to retain the self-extracting executable file for future repairs or changes you might want to make. Once you have installed the SnapImage software, the installation files that are extracted from the downloaded file are deleted from

your system. To perform maintenance tasks, such as repairing a damaged installation, you need to extract the installation files again and use the SnapImage Setup program in maintenance mode.

Installing the software

The NDMP Services and SnapImage installation programs provide graphical, easy-to-use interfaces for installing the software.

Device support

Tape devices and libraries can be directly attached to the SnapImage client, or tape devices can be attached to a remote system that backs up SnapImage clients. Refer to the appropriate section:

- "Installing the SnapImage software with attached device support" on page 27 provides more information if the tape devices are attached to the SnapImage client.
- "Installing the SnapImage software with remote device support" on page 29 provides more information if the tape devices are attached to a remote system.

Note: In remote configurations, data are transmitted between the NDMP TapeServer and the SnapImage client over a LAN.

Installing the SnapImage software with attached device support

If tape devices are directly connected to the SnapImage client, install the following packages in the order listed:

- NDMP Services software
- SnapImage software

Note: The NDMP TapeServer from the NDMP Services package must be installed on the SnapImage client before the SnapImage software is installed.

Installing the NDMP services software

Note: You must be the administrator or part of the administrator's group to complete the installation.

To install the NDMP Services software:

1. Log in as Administrator on the computer where the software is being installed.
2. Locate the **NDMP Services 2.0** files.

3. Double-click the **NDMP Services setup** icon in the NDMPsvc folder.

   A window that setup is initializing is displayed. The **installation program** windows is displayed. Click **Next**.

   The **NetWorker End-User License Agreement** is displayed.

4. Read the agreement, then click **I accept the terms in this license agreement** and click **Next**.
5. The Customer Information window is displayed. Type the appropriate **User Name** and **Organization**, then click **Next**.
6. The **Destination Folder** window is displayed.
7. Do one of the following:
   - Select the default directory, *C:\ Program Files\NetWorker\NDMPSvc* and click **Next**.
   - Click **Change**, specify an alternate directory, and click **Next**.
8. The **Ready To Install The Program** window is displayed.
9. Verify the information and click **Install**.

   The installation program installs NDMP Services, and the Installation Wizard completion window is displayed.

10. Click **Finish**.

Note: After installation is complete, you must license the NDMP TapeServer. "Evaluating and licensing the software" on page 31 provides more instructions.

Installing the SnapImage software

To install the SnapImage software:

1. Log in as Administrator on the computer where the SnapImage software is being installed.
2. Locate the **SnapImage 2.0** files.
3. Double-click the **SnapImage** setup icon in the NDMPsvc folder.

   The Installation Wizard opens.

4. Click **Next**.

   The **NetWorker End-User License Agreement** is displayed.

5. Read the entire agreement and click **I accept the terms in this license agreement** and click **Next**.
6. The **Customer Information** window is displayed. Type the appropriate **User Name** and **Organization**, and click **Next**.

   The installation program installs the software in the directory where you installed the NDMP Services. For example, if you accepted the default directory, the SnapImage software is installed in the following directory:

   C: \Program Files\NetWorker\NDMPSvc
7. Click **Next**.
8. The **Ready To Install The Program** window is displayed.
9. Verify the information and click **Install**.
10. Click **Finish**.

    A dialog box is displayed prompting you to reboot now or later.

After you reboot, the system configuration changes are implemented.

Note: After installation is complete, you must license the NDMP TapeServer and SnapImage software. "Evaluating and licensing the software" on page 31 provides more instructions.

Installing the SnapImage software with remote device support

If tape devices are connected to a remote host instead of the SnapImage client, you must obtain an additional NDMP TapeServer license.

Note: You must be the administrator or part of the administrator's group to complete the installation.

To install the NDMP TapeServer software:

1. Log in as Administrator on the computer where the software is being installed.
2. Locate the **NDMP Services 2.0** files.
3. Double-click the **NDMP Services** setup icon in the NDMPsvc folder.

A window that setup is initializing is displayed. The **installation program** windows is displayed. Click **Next**.

The **NetWorker End-User License Agreement** is displayed.

4. Read the agreement, click **I accept the terms in this license agreement** and click **Next**.
5. The Customer Information window is displayed. Type the appropriate **User Name** and **Organization**, and click **Next**.
6. The **Destination Folder** window is displayed.
7. Do one of the following:
   - Select the default directory, *C: \Program Files\NetWorker\NDMPSvc*, and click **Next**.
   - Click **Change**, specify an alternate directory, and click **Next**.
8. The **Ready To Install The Program** window is displayed.
9. Verify the information and click **Install**.

   The installation program installs NDMP Services, and the Installation Wizard completion window is displayed.
10. Click **Finish**.

Note: After installation is complete, you must license the NDMP TapeServer. "Evaluating and licensing the software" on page 31 provides more instructions.

Evaluating and licensing the software

To license SnapImage software and the NDMP TapeServer, type the enabler and authorization codes in NetWorker License Manager. Without these codes, the software will not run beyond the evaluation period.

The Evaluation process

You can evaluate the SnapImage software and NDMP TapeServer in two ways:

- On a new installation of the NetWorker server
- On an existing NetWorker installation

Evaluating a new installation of the NetWorker software

When you first install the NetWorker software, you can evaluate it with the SnapImage module and the NDMP TapeServer for 30 days free without typing any codes. If 30 days is not sufficient, you can gain an additional 15 days by typing "grace" in the Auth Code attribute, as described in "How to apply for grace period" on page 33.

By the end of the evaluation period, you must purchase, type, and authorize a base enabler to continue using the NetWorker software. The base enabler is the license that enables the NetWorker edition purchased. To continue using the SnapImage module and NDMP TapeServer, you need to purchase add-on enablers.

To obtain a NetWorker base enabler and the SnapImage, NDMP TapeServer, and NDMP Client Connection add-on enablers, contact EMC Sales. "Information and Services" on page 10 provides contact information. "Licensing process" on page 34. provides information about typing and authorizing enablers.

Evaluating the software on an existing NetWorker installation

If you are evaluating the products on a release of NetWorker software that has already been installed and enabled, you must type temporary evaluation enablers for NetWorker Module for SnapImage, NDMP TapeServer, and NDMP Client Connection. The temporary enabler is valid for 45 days.

To obtain temporary enabler codes, refer to the documentation in the EMC media kit, or contact EMC Sales. "How to type a temporary

enabler code" on page 32 provides information to how to type the temporary enabler codes.

By the end of the evaluation period, you must purchase, type, and authorize the license enablers to continue using the SnapImage software. "Licensing process" on page 34 provides more information.

How to type a temporary enabler code

The SnapImage product requires NetWorker License Manager to be installed and configured on the NetWorker server. *EMC NetWorker Installation Guide Microsoft Windows Version* and the *EMC NetWorker License Manager Installation and Administrator's Guide, 2nd Edition* provides more information.

The following procedure describes how to type enabler codes using the NetWorker Console and NetWorker License Manager on the Windows platform. If the NetWorker server and NetWorker License Manager are installed on platforms other than Windows, the installation guide for the respective platform provides information.

To type temporary enabler codes:

1. From the **NetWorker Console**, display hidden attributes.

   To display hidden attributes:

   a. In the **NetWorker Administrator** program, select **Customize** from the **Options** menu.

   b. In the **Window Configurations** tab, select **Display Hidden Attributes**.

   c. Click **OK**.

2. In the **NetWorker** window, click **Setup Server**.
3. In the **General** tab, type the host name for NetWorker License Manager in the **License Server** attribute.
4. Start the **License Manager**.
5. Type the enabler codes in the License Manager database using the lgtolic command:

   - For the SnapImage license, type:

     `lgtolic -s"::1" -c` *`SnapImage_license_ID`*

   - For the NDMP TapeServer license, type:

```
lgtolic -s"::1" -c NDMP_TapeServer_license_ID
```

Note: The 45-day evaluation enabler code is valid on only one computer in a network. If you type the same code on more than one computer in a network, a copy protection violation error occurs and the software is disabled on all clients with duplicate enablers.

How to apply for grace period

To apply the grace period at the end of the evaluation period:

1. From the **NetWorker Administrator** program, display hidden attributes.

   To display hidden attributes:

   a. In the **NetWorker Administrator** program, select **Customize** from the **Options** menu.

   b. In the **Window Configurations** tab, check **Display Hidden Attributes**.

   c. Click **OK**.

1. In the **NetWorker** window, click **Setup Server**.
2. In the **Registration** window, double-click **SnapImage**.
3. Type **grace** in the **Auth Code** attribute and click **OK**.

Licensing process

To permanently use the software, you must purchase and type the following enabler codes and then authorize them:

- EMC NetWorker enabler code
- SnapImage License enabler code
- NDMP TapeServer License enabler code
- NDMP Client Connection enabler code

The license enabler codes that you purchase are valid for 45 days, as a registration period, during which time you must obtain and type corresponding authorization codes. To purchase the license enablers, contact a EMC Sales Representative.

The following sections explain how to type and authorize a license enabler:

- "Task 1: Type the license enabler codes" on page 34
- "Task 2: Obtain authorization codes" on page 35
- "Task 3: Type the authorization codes" on page 36

Task 1: Type the license enabler codes

License enabler codes are included in either the letter announcing the updated or upgraded software, or on the Enabler Certificate you receive when you purchase a software license. This depends on whether the software purchased is a first-time purchase, or an updated or upgraded version.

To type a license enabler code:

1. Log in with administrator privileges to the system that is hosting NetWorker License Manager.
2. In the **NetWorker Administrator** program, click **Registration**.
3. If a temporary enabler is listed, right-click the enabler and select **Delete**.
4. Log in to the License Manager host to install the SnapImage, NDMP Services, and NDMP Client Connection Enablers.
5. In the **Registration** window, right-click **Registration** and select **Create**.

EMC NetWorker License Manager Installation and Administrator's Guide 2nd Edition on the Powerlink website provides more information.

After you type a license enabler code, you have 45 days, as a registration period, to authorize the SnapImage, NDMP TapeServer, and NDMP Client Connection licenses.

Task 2: Obtain authorization codes

Registering the SnapImage software and NDMP TapeServer requires obtaining authorization codes. Obtain authorization codes for the required software using one of the following methods:

- "Using the EMC website" on page 35
- "Using fax or e-mail" on page 35

Note: If you do not authorize the required software by the end of the 45-day registration period, the SnapImage backup function is disabled. However, data that was backed up during the registration period can be recovered from local devices.

Using the EMC website

Register EMC products and obtain authorization codes online by completing the appropriate registration form on the Powerlink website. Web registration takes just a few minutes and is available 24 hours a day, 7 days a week.

Authorization codes that permanently enable EMC product licenses will be sent by e-mail.

If you have any questions regarding software updates, contact EMC Licensing. "Licensing and Registration" on page 12 provides more information.

Using fax or e-mail

To register the SnapImage software and NDMP TapeServer, and obtain authorization codes by fax or e-mail:

1. Log in with administrator privileges to the NetWorker server.
2. Complete your contact information:
   a. In the NetWorker Console, on the Configure tab, select **Setup Server**.
   b. In the **Setup Server** dialog box, select the **Company Information** tab.

c. Complete the contact information and click **OK**.

3. Print the registration information sheet:

   a. In the NetWorker Console, on the **Configure** tab, select **Registration**.

   b. Right-click the appropriate license and select **Print Registration Information**.

4. Send your contact information to EMC Licensing. You can either:

   - Fax the printed registration information sheet
   - E-mail the registration information

   "Licensing and Registration" on page 12 provides the contact information.

Authorization codes that permanently enable the SnapImage software, the NDMP TapeServer, and the NDMP Client Connection will be sent to you.

Task 3: Type the authorization codes

To complete the licensing process, you must type the unique authorization codes on the NetWorker server within 45 days of typing the license enabler codes.

To type authorization codes:

1. Log on with administrator privileges to the system that is hosting NetWorker License Manager.
2. Type the authorization codes required to run the SnapImage software.

   EMC NetWorker Installation Guide Release 7.0 Microsoft Windows Version and the *NetWorker License Manager Installation and Administrator's Guide, 2nd Edition*, on the Powerlink website provides more information.

3. In the NetWorker Console, click **Registration**.
4. Right-click the appropriate license and select **Edit**.
5. In the **Auth Code** text box, type the authorization code, then click **OK**.

   If the authorization process is successful, the expiration date for the license displays "Authorized - No expiration date." If the authorization is not verified in this way, contact EMC Support.

Removing or repairing the software

To remove or repair the software, use the Windows operating system Add/Remove Programs utility, select the appropriate option, and follow the prompts on the monitor. *EMC NetWorker Installation Guide Release 7.0 Microsoft Windows Version* provides more information.

Note: If the NDMP Tape Services and SnapImage software are installed on the same system, the SnapImage package must be uninstalled first.

Note: If you change the IP address or NIC card, or reinstall the operating system, you must obtain a new license code. For example, if you move the SnapImage software from one computer to another, or if you reinstall the operating system where the SnapImage software was previously installed, you will need a new license code. You must obtain the new license code *before* attempting to reinstall the software or the installation will fail. Go to the Product Licensing link at www.Powerlink.EMC.com or contact EMC Licensing to obtain a *host transfer* to avoid an interruption of your scheduled backups or other SnapImage operations. "Licensing and Registration" on page 12 provides the contact information.

3

Configuration

This chapter includes the following sections:

Configuration roadmap

To set up and configure SnapImage software, use the following roadmap:

- "Setting up passwords for SnapImage clients" on page 41 provides information to set up NDMP passwords.
- "Setting up the cache for SnapImage backups" on page 43 provides information to set up cache disks.
- "Configuring resources in NetWorker" on page 47 provides information to configure the NetWorker resource settings.
- "Configuring media devices" on page 52 provides information to configure the NDMP storage devices.

Setting up passwords for SnapImage clients

When you start a backup or recovery, the NetWorker server initiates the NDMP connection on the computer where the SnapImage software is installed. SnapImage authenticates the NDMP connection using either a clear text (unencrypted) password or a password encrypted through the MD5 password authentication (encrypted). Clear text passwords are the default. MD5 encrypts the password, providing more security than clear text passwords.

Clear text passwords

Note: Clear text passwords are limited to eight characters.

If you use clear text passwords, the following conditions apply:

- Only the administrator can perform the backup or recovery.
- The local password file or another network resource, such as the primary domain controller (PDC), authenticates the account and password.
- The username and password for the user logged on to the SnapImage system must match the user name and password specified for the SnapImage Client resource in the NetWorker Administrator program.

Encrypted passwords

At some sites, sending passwords as clear text could violate security policies. If this is the case at your site, you can enable MD5. Encrypted MD5 passwords are sent to the NetWorker server and are decrypted by the SnapImage computer.

To enable MD5 using the ndmp_passwd utility, you must be a valid user on the SnapImage client with administrative privileges. The following conditions apply:

- The user name and password you type using the ndmp_passwd utility must match the Windows user ID and password.

- The user name and password you type using the ndmp_passwd utility must match the NDMP user name and password specified for the SnapImage Client resource in the NetWorker Administrator program.

"Configuring the Client resource" on page 47 provides information on configuring the SnapImage Client resource.

"How to enable MD5 password encryption" on page 42 provides information on using the ndmp_passwd utility.

How to enable MD5 password encryption

To enable MD5 password encryption:

1. Log on as administrator on the system where the SnapImage software is installed.
2. At a command prompt, type the ndmp_passwd utility command:

   %NDMPHOME%`\bin\ndmp_passwd /u` *user*

   where user is the user name for the administrator of the SnapImage computer.
3. When prompted, type the password for the administrator of the SnapImage computer.
4. When prompted, retype the password to verify it.

The ndmp_passwd utility encrypts the password and stores the user name and password in the ndmp_password file in the *%NDMPHOME%\etc* directory.

Setting up the cache for SnapImage backups

SnapImage requires that you configure a raw partition as cache, which is necessary to perform backups. A cache device must be a simple volume, and at least one cache device must be configured on each SnapImage client. However, caches cannot be shared by parallel backups; you need to configure a separate cache for each simultaneous backup that is scheduled. If you do not setup a cache for each concurrent backup operation, the backup will fail.

Note: If the cache fills up, backups will fail. Typically, 10 percent to 20 percent of the total disk space of the largest backup volume should be allocated to the cache. More disk space should be allocated for file systems that are actively being updated during the backup process, and less space can be allocated for file systems with a low activity rate during backups.

A valid cache must meet the following requirements:

- Be a raw partition (a disk partition that does not contain file systems)
- Be a simple volume
- Assigned a drive letter
- Not in use by any application or the system
- Not a shared device
- Set up by using the SnapImage Administrator program or the SIConfigCache utility. The following sections provides more information:
  - "Using the SnapImage Administrator program" on page 43
  - "Using the SIConfigCache utility" on page 45

Using the SnapImage Administrator program

Cache devices can be configured and managed with the SnapImage Administrator utility.

To use the SnapImage Administrator program for setting up cache devices:

1. From the **Windows Programs** menu, select **SnapImage Administrator**.

The **SnapImage Administrator** program is displayed.

2. Click **Cache Manager**.

   The **Configure Cache Devices** window is displayed, as shown in Figure 1 on page 45.

3. Do one of the following:

   - "How to add a cache device" on page 44 provides information on how to add a cache device.
   - "How to remove a cache device" on page 45 provides information on how to remove a cache device.

How to add a cache device

To add a cache device:

1. Select the device to be used as a cache from the devices listed in the **Cache Device Candidates** list.
2. Click the right-arrow.

The cache device you created appears in the Configured Cache Devices list, as shown in Figure 1 on page 45.

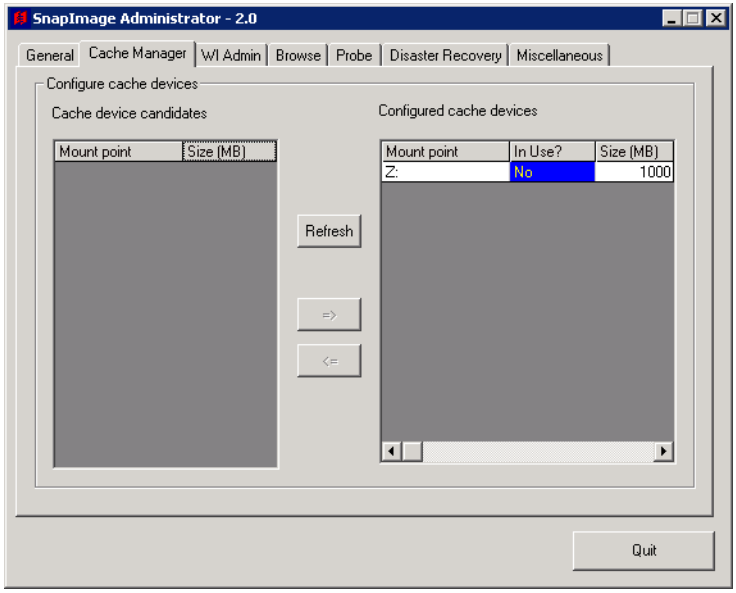

Figure 1 SnapImage administrator cache manager

How to remove a cache device

To remove a cache device:

1. Select the cache device to remove from the configured devices listed in the **Configured Cache Devices** list.
2. Click the left-arrow.

   The cache device you removed now appears in the Cache Device Candidates list column, which lists the available devices that can be used for a cache.

Using the SIConfigCache utility

The SIConfigCache program, which is installed with the SnapImage software, is a command line utility for creating and managing SnapImage cache devices.

The SIConfigCache utility, located in *%NDMPHOME%\bin*, uses the following syntax:

SIConfigCache /[**c** [*rawDevPath*]] /[**d** [*rawDevPath*]] /[**l** /v]

You must specify at least one option to use the utility. Table 1 on page 46 lists the SIConfigCache utility options and when to use them.

Table 1 SIConfigCache utility options

To	Use this option
Create the cache device. The **SIConfigCache** utility writes a label specific to SnapImage on the partition, and an entry is made into the *%ndmphome%\etc\.rawdevdir* file. A valid cache partition is identified by both the SnapImage-specific label and the entry in the *.rawdevdir* file. If the **-f** option is used, the cache is created without prompting for confirmation. If the raw device path is not specified, **SIConfigCache** searches for raw devices and prompts to confirm each device before it configures it as a SnapImage cache partition.	**/c** *rawDevPath*
Delete the entry for the cache partition specified. If the raw device path is not specified, **SIConfigCache** deletes all existing cache partitions after prompting for confirmation for each valid cache partition.	**/d** *rawDevPath*
Execute the command without prompting for confirmation. Used with the **/c** and /**d** options only.	/f
List all available cache devices.	/l
List detailed information for the cache devices. Used with the **/l** option only.	/v

Configuring resources in NetWorker

Before you can back up SnapImage clients, you must configure certain resources specifically for SnapImage operations. The attributes in these resources are configured differently from the attributes in other NetWorker client types.

This section provides specific information about configuring the following NetWorker resources for SnapImage operations.

- Client
- Device
- Schedule
- Group

Configuring the following resources is not required for setting up the SnapImage software; however, they are standard NetWorker configuration options that should be considered when setting up SnapImage resources:

- Policy
- Pool
- Label Template

Note: For general information about configuring resources in NetWorker software, *EMC NetWorker Administrator's Guide, Microsoft Windows Version* provides information.

Configuring the Client resource

The following procedure describes how to set up the SnapImage Client resource in the NetWorker Administrator program.

Note: If you are creating a special schedule that includes Device resources, they must be configured before setting up the Client resources.

To configure the Client resource:

1. In the **NetWorker Administrator** program, click **Configure**.
2. Click **Manage Clients**.

   The **Clients** window is displayed, listing the configured clients.

3. From the **Resources** menu, select **Create**.

   The **Create Client** dialog box is displayed.

4. From the **General** tab, type the client name in the **Name** attribute.
5. In the Saveset attribute, type the drive letter of the drive to back up; for example, *D:*.

Note: The NDMP TapeServer does not support the default attribute All. You must list each saveset to include in the backup in the Saveset attribute. If you select All, the backup will fail.

---

6. Click the **Preferences** tab and click **Yes** for the NDMP attribute.
7. Click the **Remote** tab and complete the attributes as follows:

   a. In the Remote Access attribute, type **`*@*`**.

   This byte combination allows all users to have access to the remote computer.

   b. In the **Remote User** attribute, type a valid user name with administrator privileges.

   c. In the **Password** attribute, type a valid password.

   d. In the **Backup Command** attribute, type the following:

   ```
   nsrndmp_save -T image
   ```

Note: -T image is the backup type for SnapImage backups. The **-T** must be capitalized.

---

   e. Complete the other Client attributes as you would for any NetWorker Client resource. *EMC NetWorker Administrator's Guide, Microsoft Windows Version* provides more information.

Note: Staging and cloning are not supported. Typing a value in the Clone Storage Nodes attribute has no effect on NDMP storage nodes.

Configure parallel SnapImage backups

The SnapImage product supports parallel backups. To perform parallel backups, complete the following steps:

1. In the **NetWorker Administrator** program, create one Client resource for every saveset that will be backed up simultaneously.

   For example, create three Client resources if you need to back up three partitions concurrently.
2. Define one Group resource for each Client resource.
3. Verify if there is one tape device available for each group.
4. Schedule the backup operations for these groups to start at the same time.
5. Define separate pools for the NDMP backups and the non-NDMP backups.
6. Assign the NDMP backup devices to the NDMP pool and the non-NDMP devices to a separate pool.
7. Verify there is a non-NDMP backup device connected to the NetWorker server so the client file indexes and media database can be backed up.
8. Ensure that a separate cache is set up for each concurrent back up.

Note: SnapImage does not multiplex to a single tape device.

Configuring the Group resource

The following sections describe how to set up the Group resource for SnapImage backups:

- "Configuring the Group resource for high-density file systems" on page 50
- "Configuring the Group resource for Supported backup levels" on page 51

Configuring the Group resource for high-density file systems

When a SnapImage backup is initiated, the software backs up the entire data set before it backs up the metadata associated with it. For high-density file systems, there might be a period of inactivity between backing up the disk partition and writing the corresponding metadata to tape. During this time, if the backup exceeds the Inactivity Timeout setting, the backup will time out.

To prevent a backup from timing out, EMC recommends setting the Inactivity Timeout attribute in the Group resource to zero for high-density file systems. This ensures the system will not time out while metadata is being generated and backed up.

Note: The default value for the Inactivity Timeout attribute in the NetWorker Group resource configuration is 30 minutes.

Configure the Group resource for high-density file systems

To configure the Group resource for SnapImage clients in the NetWorker Administrator program:

1. Ensure the NetWorker interface is configured to display hidden attributes.

   To display hidden attributes:

   a. In the **NetWorker Administrator** program, select **Options > Customize.**

   b. In the **Window Configurations** tab, select **Display Hidden Attributes**.

   c. Click **OK**.

2. In the main NetWorker window, click **Manage Groups**.
3. In the Groups window, do one of the following:
   - To create a group, right-click on the **Groups** icon and select **Create**.
   - To modify an existing group, right-click on the group and select **Edit**.
4. In the **Create Group or Edit Group** dialog box, set the **Inactivity Timeout** attribute to 0, and click **OK**.

Configuring the Group resource for Supported backup levels

To configure the group resource for full or level 1 backups:

1. In the **NetWorker Administrator** program, click **Manage Groups**.
2. In the **Groups** window, do one of the following:
   - To modify an existing group, right-click on the group and select **Edit**.
   - To create a group, right-click on the **Groups** icon and select **Create**.
3. In the **Edit Group or Create Group** dialog box, select **Full** for the **Level** attribute.
4. Click **OK**.

EMC NetWorker Administrator's Guide, Microsoft Windows Version provides more information on configuring NetWorker resources.

Configuring the Schedule resource for supported backup levels

The SnapImage software supports differential (level 1) and full (level 0) backups. Backup levels are specified when configuring the Schedule and Group resources in the NetWorker Administrator program.

To configure the schedule resource for full or level 1 backups:

1. In the **NetWorker Administrator** program, click **Manage Schedules**.
2. In the **Schedules** window, do one of the following:
   - To create a schedule, right-click on the schedule and select **Create**.
   - To modify an existing schedule, right-click on the Schedule icon and select **Edit**.
3. In the **Create Schedule or Edit Schedule** window, click **Set Level.**
4. In the **Set Level** dialog box, do one of the following:
   - To schedule a full backup, select **Full**.
   - To schedule a level 1 backup, select **1**.

Note: Selecting Incremental will result in a failed backup.

Configuring media devices

The SnapImage software supports stand-alone devices and autochangers. The following sections provide information on configuring media devices:

- "Configuring stand-alone SnapImage device resources" on page 52
- "Configuring autochangers" on page 53

Configuring stand-alone SnapImage device resources

NDMP storage devices can be either direct- or remote-attached to the SnapImage client. NDMP compatible devices are certified by EMC for SnapImage operations. If storage devices are directly attached to the SnapImage client, the Windows user ID and password must be specified when setting up the Device resource.

To support the NDMP connection between the NetWorker server and the SnapImage client, you must configure a Device resource in the NetWorker Administrator program.

For a list of compatible devices, refer to the NetWorker Compatibility Guides on the Powerlink website.

The following procedure describes the attributes that must be configured to support NDMP storage devices.

Configure a stand-alone device resource

To configure the Device resource:

1. In the **NetWorker Administrator** program, click **Devices**.

   The **Devices** window is displayed, listing the configured devices.

2. Right-click the **Devices** icon and select **Create**.

   The **Create Device** window is displayed.

3. Complete the attributes as follows:

   a. In the **Name** attribute, type the address of the backup tape device, for example: *rd=hostname:*\\.*Tape0*.

   b. Set the Target Sessions attribute to 1.

Note: Multiplexing to a single tape is not supported for NDMP backups.

4. Click the **Miscellaneous** tab and complete the attributes as follows:
   a. In the **NDMP** attribute, select **Yes**.
   b. In the **Remote User** attribute, type a valid user name with administrator privileges.
   c. In the **Password** attribute, type a valid password (the password of the remote user on the storage node).

Note: To back up the bootstrap file, you must have a non-NDMP device attached to the NetWorker server. The bootstrap includes the media database, the client file indexes, and the configuration files needed to recover the NetWorker server after a disk crash. *EMC NetWorker Administrator's Guide, Microsoft Windows Version* provides more information.

Configuring autochangers

Autochangers can be connected to the NDMP TapeServer host, which is installed on either a remote system or on the SnapImage client. To configure autochangers, use the NetWorker jbconfig program.

If autochangers are directly attached to the SnapImage client, the Windows User ID and password must be specified when setting up the Device resource.

Note: Before using the jbconfig program, you must obtain the autochanger handle SCSI ID and the device handle IDs. "Obtain hardware information" on page 53 provides more information.

The autochanger must be connected to the NDMP TapeServer host, and the operating system must recognize all devices before you can obtain the required information.

Obtain hardware information

To obtain the necessary hardware IDs:

1. From the **Windows** Start menu, select **Run**.
2. In the text box, type **regedt32** and click **OK**.

3. Access the HKEY_LOCAL_MACHINE registry file.
4. Double-click the **HARDWARE** folder to open it.
5. Double-click the **DEVICEMAP** folder to open it.
6. Double-click the **SCSI** folder to open it.
7. Navigate through the SCSI ports to identify the autochanger and device handle IDs.
8. Record the SCSI port for the jukebox and device handles.

   For example, if the jukebox is at SCSI port 2, the jukebox handle is \\.*scsi2:*.

Example 1 Configuring an Autochanger Using jbconfig

The following example shows how to set up an autochanger for NDMP tape operations. Note that your setup can vary, depending on your hardware environment.

Note: Access the **jbconfig** utility from the NetWorker command line.

```
C:\>jbconfig
          1) Configure an AlphaStor/SmartMedia Jukebox.
          2) Configure an Autodetected SCSI Jukebox.
          3) Configure an Autodetected NDMP SCSI Jukebox.
          4) Configure an SJI Jukebox.
          5) Configure an STL Silo.
          6) Configure a Microsoft Removable Storage
             Jukebox.
What kind of Jukebox are you configuring? [1] 3
Enter NDMP Server name: ? dell2400b
Enter NDMP user name: ? root
Enter NDMP password (characters will not be echoed):
Enter NDMP jukebox handle: ? \\.\scsi2:
What is the NDMP type of 'dell2400b'?
          1) One of the Standard NDMP Servers.
          2) NetApp or Celestra HP.
Choice? 1
Communicating to devices on NDMP Server 'dell2400b', this
may take a while...
NDMP Service Log: L: (124 0063) MD5 authentication
successful
NDMP Service Log: L: (124 0063) MD5 authentication
successful
Installing 'Standard SCSI Jukebox' jukebox -
scsidev@1024.1.0.
What name do you want to assign to this jukebox device?
ADICjb
```

```
NDMP Service Log: L: (124 0063) MD5 authentication
successful
Turn NetWorker auto-cleaning on (yes / no) [yes]y?
The following drives have been detected in this
auto-changer:
 1> dlt7000 @ 1024.2.0 ==>
These are all the drives that this auto changer
possesses.
Do you want to change the model(s) or configure them as
shared or NDMP drives? (yes / no) [no] yes
Is (any path of) any drive intended for NDMP use? (yes /
no) [no] yes
Is any drive going to have more than one path defined?
(yes / no) [no] yes
After you have typed a device path, you will be prompted
for an NDMP user name for that path's host. If this
device path is not an NDMP device, press the enter key to
advance to the next device path.  For NDMP devices, you
need to type the user name and password the first time we
encounter that NDMP host. Pressing the enter key for the
NDMP user name for any subsequent device path on the same
host will set the user name and password to those defined
the first time. You will not be prompted for the password
in such a case.
Drive  1, element 82 local bus / target / lun value =
1024/2/0, model dlt7000
Drive path ? dell2400b:\\.\Tape0
Enter NDMP user name for host 'dell2400b'? [] root
Enter NDMP password (characters will not be echoed):
Only model dlt7000 drives have been detected.
Are all drives in this jukebox of the same model?  (yes /
no) [yes]
Should this device be configured as a dedicated storage
node? (yes / no)? [no]
Jukebox has been added successfully
The following configuration options have been set:
> Jukebox description to the control port and model.
> Autochanger control port to the port at which we found
it.
> Networker managed tape autocleaning on.
> Barcode reading to on.
> Volume labels that match the barcodes.
> Slot intended to hold cleaning cartridge to 7.  Please
insure that a cleaning cartridge is in that slot
> Number of times we will use a new cleaning cartridge to
20.
> Cleaning interval for the tape drives to 6 months.
You can review and change the characteristics of the
autochanger and its associated devices using nwadmin.
Would you like to configure another jukebox? (yes/no)
[no]
```

```
Communicating to devices on NDMP Server 'dell2400b', this
may take a while...
NDMP Service Log: L: (124 0063) MD5 authentication
successful
Jukebox ADICjb:
slot  volume       pool barcode  volume id recyclable
1: dell2400b.001*         4292178541
2: dell2400b.001    Default 4292194879no
3: dell2400b.004*         4140838590
4:
5:
6:
7:
   *not registered in the NetWorker media data base
drive 1 (rd=dell2400b:\\.\Tape0) slot   :
C:\>
```

Note: *EMC NetWorker Administrator's Guide, Microsoft Windows Version* and the *EMC NetWorker Installation Guide, Microsoft Windows Version* provides more information about using the jbconfig utility.

4

Backups

This chapter includes the following sections:

Overview of live file system backups

When a backup is initiated, the SnapImage software synchronizes the file systems and creates a snapshot of the volume using copy-on-write technology. It then performs a block-level backup of the snapshot.

During the time a backup is in progress, any changes made to file systems are intercepted by the write intercept driver, allowing file systems to be available during the backup. Once intercepted, the changed blocks are queued by the driver until the original blocks on the volume are moved to the SnapImage cache device. When the SnapImage software reaches a block that changed, it reads the changed block from cache instead of the original block location.

Note: All disk blocks in the volume are copied to tape, even if the blocks do not contain data.

Limitations

The following are the limitations when using the SnapImage software:

- Only full backups (all data) and differential backups (all data that has changed since the last full backup) are supported. Full backups are level 0, and differential backups are level 1. You must only use levels 0 or 1 to schedule and perform backups.

Note: In the NetWorker Administrator program, if you configure Schedule and Group resources with incremental backup levels or the incremental backup type, the backup will fail. Similarly, if you use an incremental level (any level except 0 or 1) from a command prompt, the backup will fail.

- Use the NetWorker client software to back up the system state files (SYSTEM STATE components registry and program counters).

Creating a SnapImage saveset

Before performing a SnapImage backup, a saveset must be defined in the SnapImage client. The following section describes how to create a SnapImage saveset.

Create a SnapImage saveset

To create a SnapImage saveset:

1. Start the **NetWorker Console** and click **Manage Clients**.

   The **host_server Clients** window is displayed.

2. Right-click the **host_server** icon.

   The **Edit Client host_server** window is displayed.

3. From the **General** tab, type a drive letter in the **saveset** attribute.

   For example, type *D:*.

   If you are backing up a mounted volume, set the saveset attribute to the complete path of the mount point, for example, D: users\Marvin. The SnapImage software discovers that D: users\Marvin is a mount point path pointing to another volume, and backs up that mounted volume.

Note: The NDMP TapeServer does not support the default attribute All. You must list each saveset to include in the backup in the saveset attribute. If you select All, the backup will fail.

4. Click **Preferences** and click **Yes** in the NDMP attribute.
5. Click **Remote** and complete the attributes as follows:
   a. In the **Remote Access** attribute, type **`*@*`**.
   b. In the **Remote User** attribute, type a valid user name.
   c. In the **Password** attribute, type a valid password.
   d. In the **Backup Command** attribute, type **`nsrndmp_save -T image`**.

Note: The **`-T`** must be capitalized.

SnapImage differential backups

SnapImage differential backups (level 1) back up all blocks of data that have changed since the last full backup. Differential backups can take less time than full backups; however, note the following:

- A SnapImage differential backup generates metadata for the entire file system, not only for the files that have changed. For high-density file systems with millions of small files, a significant amount of metadata is generated, even if the backup itself is small. In these cases, the metadata becomes the major component of the differential backup.
- High-density file systems that have millions of files or multiple directory levels will generate more metadata than file systems with fewer files and a simple directory tree, even when the files are large.

Performing SnapImage software backups

Perform SnapImage backups as follows:

- Schedule SnapImage backups using the NetWorker Administrator program.
- Start backups manually, either from the command prompt or the NetWorker User program.

EMC NetWorker Administrator's Guide, Microsoft Windows Version provides information about using the NetWorker Administrator or User programs.

Note: Before backing up SnapImage data, make sure you have configured the NetWorker resources for a supported SnapImage backup levels (0 or 1).

The following sections provides more information:

- "Configuring the Group Resource for Supported Backup Levels" on page 50.
- "Configuring the Schedule Resource for Supported Backup Levels" on page 50.

Initiating a SnapImage backup from the command prompt

You can initiate SnapImage backups from a Windows command prompt using the nsrndmp_save command. Table 2 on page 61 lists the nsrndmp_save options available from the command prompt.

Table 2 Command prompt options for SnapImage backups (page 1 of 2)

To	Use this option
Display the usage statement for **nsrndmp_save**.	None (type **nsrndmp_save** and press Enter)
Specify the backup type, which must be **image**. The **-T** must be capitalized.	**-T image**
Specify the name of the NetWorker server with NDMP Connection enabled. The local host is the default.	**-s** *server name*
Specify the name of the computer to be backed up.	**-c** *ndmp_data_server*

Table 2 Command prompt options for SnapImage backups (page 2 of 2)

To	Use this option
Specify the backup level. Only full backups (level 0) and differential backups (level 1) are supported.	**-l** *backup_level*
Specify the name of the saveset. **Note:** If you are backing up a mounted volume, set the saveset attribute to the complete path of the mount point; for example, *D:\users\Marvin*. The SnapImage software discovers that *D:\users\Marvin* is a mount point path pointing to another volume, and backs up that mounted volume.	**-N** *name*
Specify the group to be backed up.	**-g** *save_group*
Restrict the width when formatting summary information output.	**-W** *width*
Print additional output for savegrp(8) use when **-LL** is specified. The **-L** option alone has no effect on the command.	**-L** *local*
Display only summary information and error messages. Quiet.	-q

Note: The **-m** and **-n** options are not used.

The NDMP TapeServer provides information on the amount of data moved during backup and recovery operations. This status information is sent to the NetWorker server and can be accessed through the NetWorker Administrator program.

Note: To browse directories or files that have been backed up, you must use the NetWorker User program.

5

Recoveries

This chapter contains the following sections:

Understanding SnapImage and NetWorker recoveries

NetWorker provides several ways to recover SnapImage backups. Most recoveries are performed by selecting recover options in the NetWorker User program, or by using the recover and nsrndmp_recover commands from the NetWorker command prompt.

The following list describes the differences between standard NetWorker recoveries and SnapImage recoveries:

- NetWorker conflict resolution options (Overwrite, Discard, or Rename) are ignored during SnapImage recoveries. Although NetWorker software allows you to specify options during file conflicts, the SnapImage software does not adhere to those settings.
- After a SnapImage backup, the scanner program cannot access information from the NetWorker file index. The scanner program can rebuild the media database, which stores pertinent information about savesets on the media, but it cannot retrieve information available about the individual files. Therefore, the scanner program can only recover savesets, not individual files and directories.
- The SnapImage software includes an option for disaster recovery. The option can be accessed as follows:
  - From the Disaster Recovery tool in the SnapImage Administrator program
  - By typing drutil.exe from the command prompt
- Recovering differential SnapImage backups processes the data from the differential backup tape first, then it processes the full backup tape. This is unlike standard backup methods, which first recover the full backup data, then the differential backup data.

Note: Differential backups are level 1, and full backups are level 0.

Recoveries of NTFS file system attributes

Files in an NTFS file system have certain attributes. The following attributes are automatically recovered for Windows 2000 Server and Windows 2000 Advanced Server:

- Multiple data streams in a file
- Compression
- File security information (ACLS)
- Registry files
- Reparse point
- Object ID
- Sparse files
- Mounted volumes

Overview of SnapImage recoveries

SnapImage recoveries can either overwrite the entire contents of a disk or partition (destructive), or overwrite only files that have changed (nondestructive).

Non-destructive recoveries

Non-destructive recoveries (also known as file-by-file recoveries) allow you to select specific files to recover from the file system, and recover only those files. Non-destructive recoveries require that the client file indexes contain entries from the backup of the files that are selected. This type of recovery is used when a specific group of files needs to be recovered instead of an entire file system.

If all of the NetWorker client file indexes are intact, nondestructive recoveries are straightforward. However, if the index entries for the files to be restored have been purged or lost, you cannot perform a nondestructive recovery. Instead, you must perform a destructive recovery. Once the destructive recovery is complete, a new backup can be initiated that will generate the client file indexes. After the index entries are available for recovery, you can recover individual files using either the NetWorker User program or the recover command.

Note the following about performing SnapImage nondestructive recoveries:

- When using the NetWorker User program, the SnapImage software does not support the conflict resolution options overwrite, discard, rename, or relocate.
- When using the recover command from a command prompt, the SnapImage software does not support the conflict resolution options force/noforce or relocate.
- If files in the file system are read only, the recovery must be directed to a different location than the location where the backup was generated. If the file-by-file recovery is directed to the backup drive and files are marked read only, the recovery will fail.

Note: To perform a file-by-file recovery to a different system, make sure the SnapImage software is installed. You can also recover to a different drive on the same SnapImage client for the backup.

Both the NetWorker User program and the recover command overwrite existing files, unless they are read-only. Therefore, the force option is turned on in the SnapImage software, regardless of the NetWorker setting. However, if you do not want to overwrite existing files, you can relocate the files to another directory by selecting Recover/Directed Recover from the Operations menu in the NetWorker User program.

Note: Files and directories could take a long time to display in the NetWorker User program, particularly if the file system has multiple directory levels, and each directory contains a large number of files.

When recovering a large number of files, it might be quicker to perform a destructive recovery of the entire file system to another location, rather than recovering individual files. After restoring the file system, you can move the individual files to their original location.

Destructive recoveries

A destructive recovery (also known as saveset recovery) recovers the entire partition, including the SnapImage metadata, which contains the required file system structure information. Therefore, a destructive recovery doesn't depend on the NetWorker client file index entries to locate files on tape.

A destructive recovery is normally used to recover an entire file system. In addition, a destructive recovery might be quicker than a nondestructive recovery when you need to recover a large list of individual files. In this case, it is more efficient to recover the entire saveset to an alternate location, and then move the individual files to their original location.

Because a SnapImage destructive recovery restores all of the data and the file system structure information, the recovery must be saved to a partition equal to or larger than the size of the original file system. If the destination partition is larger than the file system to be recovered, the operating system will report the recovered file system as its

original size because the original file system size information is written to the destination partition.

Destructive recoveries can be performed using the following:

- NetWorker saveset recovery feature in the NetWorker User program
- NetWorker nsrndmp_recover command with the appropriate arguments

  "How to use nsrndmp_recover for a Saveset recovery" on page 72 provides information on the nsrndmp_recover command.

Note: Destructive recoveries can always be performed because they do not require client file indexes.

Performing recoveries

Recoveries are performed through the NetWorker User program or command prompt. The following sections provide instructions for recovering data:

- "File and directory-level recoveries" on page 69
- "Saveset recoveries" on page 70
- "Recovering to a different location" on page 73

File and directory-level recoveries

When you recover data at the file and directory level, you can restore the files and directories to the original location or to a new location. The following section describes how to perform a file-by-file recovery from the NetWorker User program.

How to perform a file or directory-level recovery

To recover specific files from a saveset:

1. Open the NetWorker User program by doing one of the following:
   - From the Windows Start menu, select **Programs > EMC NetWorker > NetWorker User Program**.
   - Type **Winworkr** at a command prompt.
2. Click **Recover**.

   The **Source Client** window is displayed.
3. Select the client to recover and click **Ok**.
4. Select the destination client to recover to, and click **Ok**.

   The local client is the default selection.
5. In the left panel of the **Recover** window, click the appropriate directory folder.
6. To mark each directory and file to be recovered, select the directory or file, and click the **Mark** button or **right-click the directory or file**.

Note: To clear an item, right-click the directory or file again.

7. Click **Start** to begin the recovery.

   When the operation is complete, the NetWorker User window is displayed. Click **Ok**.

Note: If you select All Files to restore in a directory, you will receive an error message that the special file drive_name System_Volume_Information\tracking.log cannot be restored. This file is a hidden file in the file system and it is not necessary to restore it. The NetWorker software continues restoring the remaining files in the directory. When you recover an entire file system, as opposed to a directory, this error is not logged.

Saveset recoveries

To perform a saveset (destructive) recovery, use one of the following methods:

- Open the NetWorker User program by doing one of the following:
  - From the Windows Start menu, select **Programs > EMC NetWorker > NetWorker User Program**.
- Type **nsrndmp_recover** command with the **-S** option from the command prompt.

The following rules apply to saveset recoveries:

- You must recover data that was backed up by a SnapImage client to a system that is installed with the SnapImage software.
- You can only recover a complete partition.
- Any data remaining in the partition where the recovery is directed will be overwritten.
- The size of the destination partition must be the same or larger than the partition being recovered.
  - If the destination partition is larger, the extra space will no longer be available (operating system utilities must be used to regain the lost disk space).
  - If it is smaller, the recovery will fail.

- You must specify the drive letter or mount point for the recovery. If you are directing a recovery to a different partition than the partition that was backed up, you must specify the same value in the Path and Raw Device attributes.
- The destination partition must not be busy.

Note: The partition will be locked during the recovery process to prevent other applications from accessing it.

Perform a saveset recovery with the NetWorker user program

When you recover a full partition, it must be directed to either the original location or to a new location you specify.

Note: You cannot recover SnapImage backups to a system that is not installed with the SnapImage software.

To perform a saveset (destructive) recovery:

1. Open the NetWorker User program by doing one of the following:
   - From the Windows Start menu select **Programs > EMC NetWorker > NetWorker User Program**.
   - Type **winworkr** from the command prompt.
2. From the **Operation** menu, select **Saveset Recover.**
3. In the **Source Client** window, select the **client to recover**.
4. In the **Saveset Name** list, select the **name of the saveset** to recover.
5. In the **Version Date** list, select the **version to recover**, if applicable.
6. Click **Recover Options**.
7. In the **Relocate Recovered Data To This Path** text box, specify the restore path for the volume. This value must be the same path typed in the Raw Device attribute.

Note: The default drive listed is the backup source drive. "Recovering to a different location" on page 73 provides information to restore data to a different location.

8. In the **Relocate Recovered Data To This Raw Device** text box, specify the drive of the destination drive. This value must be the same as the **Path** attribute.

   If you do not specify the raw device name of the destination, the recovery fails.

9. Click **OK**.

10. In the **Saveset** window, click **OK**.

Note: *EMC NetWorker Administrator's Guide, Microsoft Windows Version* provides information about recovery operations, such as redirected recovers and renaming savesets.

How to use nsrndmp_recover for a Saveset recovery

You can use the nsrndmp_recover utility in the command prompt to perform a saveset (destructive) recovery.

Note: You cannot use the nsrndmp_recover utility to perform file-level recoveries. Instead, use the NetWorker User program or the recover utility.

Table 3 on page 72 describes the nsrndmp_recover command options.

Note: If you do not specify the -r, m, -s, -c, and -S options, the recovery operation fails.

Table 3 Command prompt options for nsrndmp_recover (page 1 of 2)

To	Use this option
Specify the raw device name of the destination. This option is required.	**-r** *rawdev*
Specify the file system mount point after the recovery is complete. This option is required and can be the same as the **-r** option.	**-m** *mntpt*

Table 3 Command prompt options for nsrndmp_recover (page 2 of 2)

To	Use this option
Specify the NetWorker server host name. The default is the local host.	**-s** *server*
Specify the SnapImage client. This option is required. **Note**: The SnapImage client must be enabled as a NetWorker NDMP client. The backup type must be specified as **`-T image`** in the NetWorker client resource.	**-c** *client*
Specify the saveset ID (*ssid*). Use the **mminfo** command to find the *ssid*. Make note of the *ssid*. This option is required.	**-S** *ssid*

Recovering to a different location

The SnapImage software supports recovering data to a location that is different from the location where the backup originated. You can relocate a recovery to another drive on the SnapImage client where the backup was performed (relocated recovery), or you can direct the recovery to a different SnapImage client (directed recovery).

Note: When restoring backups to a different SnapImage client, make sure the SnapImage software is installed before beginning the recovery.

Recover to a different location

To recover a SnapImage backup to a different location:

1. In the **NetWorker User** program, select **Recover** from the **Operation** menu.
2. From the **Options** menu, select **Recover** Options.

   The **NDMP Recover Options** window is displayed. The backup client by default is displayed.
3. In the **Destination Client** text box, specify the client to restore the data.
4. In the **Relocate Recovered Data To This Path** text box, specify the restore path for the volume. This value must be the same as the drive letter in the Raw Device attribute.

5. In the **Relocate Recovered Data To This Raw Device** text box, specify the drive of the destination drive. If you do not specify the raw device name of the destination, the recovery fails.
6. Click **OK**.
7. In the **Saveset** window, click **OK**.

Note: *EMC NetWorker Administrator's Guide, Microsoft Windows Version* provides information about recovery operations.

Performing disaster recoveries

Before you can perform a disaster recovery using the SnapImage drutil.exe utility, you must identify the file image number for the recovery using the NetWorker scanner program or mminfo command.

After identifying the file image number, use the drutil.exe utility to recover data.

Note: You can access the drutil.exe utility from the command prompt or the SnapImage Administrator program.

If the client file indexes are intact, you can perform a level 7 consistency check of these indexes using the NetWorker nsrck -L7 command after using the drutil.exe utility.

EMC NetWorker Administrator's Guide, Microsoft Windows Version provides more information about the nsrck program.

Obtaining the file image number

The following sections describe how to retrieve the file image number using either the scanner program or the mminfo command.

Once you determine the file image number, use the drutil.exe utility in interactive mode to recover the data from the backup volume. See one of the following sections:

- "Use drutil.exe from the SnapImage administrator program" on page 76
- "Use drutil.exe from the command prompt" on page 77

How to obtain the file image number using the scanner program

To obtain the file image number using the scanner program:

1. On the backup volume that contains the file you want, type the following:

   scanner -v *device_name*

   where:

   -v option lists the file information.

device_name is the name of the backup device, for example, *rd=hostname:\\.\Tape0*.

2. Identify the file image number from the output that is generated.

Note: The scanner program only rebuilds media database entries for NDMP data. You cannot use it to recover data or regenerate the client file index.

How to obtain the file image number using the mminfo command

To determine the file image number using the mminfo command:

1. From the command prompt, type **mminfo**.
2. Identify the file image number from the output that is generated.

Use drutil.exe from the SnapImage administrator program

Before you can recover from a disaster, make sure you have obtained the image file number using the scanner program or the mminfo command. "Obtaining the file image number" on page 75 provides more information.

To use the SnapImage Administrator program for disaster recoveries:

1. From the **Windows Start** menu, select **Programs** >**SnapImage Administrator**.

   The **SnapImage Administrator** program is displayed.

2. Click **Disaster Recovery**.

The Perform Disaster Recovery dialog box opens, as shown in Figure 2 on page 77.

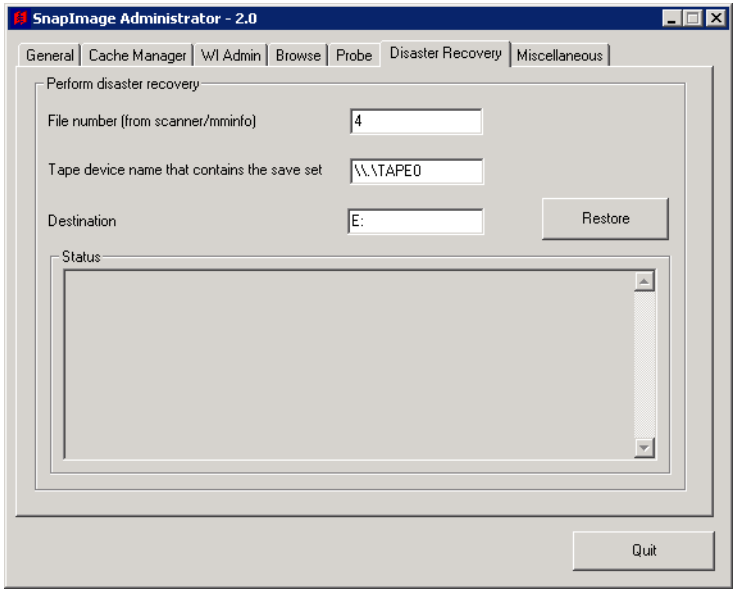

Figure 2 **Perform disaster recovery**

3. Complete the following attributes:
   a. In the File Number attribute, type the file image number retrieved from the **scanner** program or **mminfo** command.
   b. In the **Tape Device Name** text box, type the tape device volume of the saveset.
   c. In the **Destination** text box, type the target disk for restoring the saveset.

Use drutil.exe from the command prompt

To use **drutil.exe** to perform a disaster recovery:

1. Type the following at a command prompt:

   `drutil.exe -f` *`[fileNumber] tapeDevice destinationDevice`*

   where:

filename is the name of the file to be recovered.

tapeDevice is the name of the backup device.

destinationDevice is the address of the destination disk drive.

Note: All information must be typed to successfully recover the file.

2. At the file image number prompt, type the following value:
   - If you used the screen output from the **scanner** program to obtain the file image number, subtract 1 from the file image number and type the result. For example, if the file image number is 5, you type 4.
   - If you used the **mminfo** command to obtain the file image number, add one to the number and type the result. For example, if you want to start retrieving data from the first data file, you type 2.

     The **drutil.exe** utility then captures all records on tape until it reaches the end of tape.

After you recover data using **drutil.exe**, you can use the **chkdsk** command with the **/f** option to verify the restored partition.

EMC NetWorker Disaster Recovery Guide provides information on how to recover data in the event of a disaster.

A

SnapImage Administrator Program

This appendix contains the following sections:

The following sections provies more information on using the SnapImage utilities:

- "Setting up the cache for SnapImage backups" on page 43
- "Performing disaster recoveries" on page 75

Updating information after system reboots or upgrades

The SnapImage software includes the wiadmin utility, which can be used to update information in the write intercept driver. The driver maintains a bitmap that tracks the changed blocks for each SnapImage volume since the last successful backup. It uses the registry to store the information in the bitmap after the system is rebooted, or after a drive is upgraded from basic to dynamic.

You must use the wiadmin utility in the following cases:

- After rebooting the SnapImage client.
- When upgrading a SnapImage drive from a Windows basic drive to a dynamic drive.

The following sections provides information on how to use the wiadmin utility:

- "Use wiadmin from the SnapImage administrator program" on page 82 provides information to use the wiadmin utility from the SnapImage Administrator program.
- "Use wiadmin from the command prompt" on page 82 provides information to use the wiadmin utility from the command prompt.

Rebooting the SnapImage client

After a full SnapImage backup is initiated, subsequent file system changes are tracked by the write intercept driver. The driver uses a bitmap to store changed blocks for each backup that has completed successfully. Every time the computer is shut down, the bitmap is stored in the registry for a possible level 1 backup after reboot.

After a reboot, a new bitmap is created to track changes in the current session. However, the block identifiers in the bitmap are no longer valid, because the data map of changes from the last session in the registry is not merged with the current data map. You must merge the previous data map with the current data map using the wiadmin utility, to ensure that level 1 backups can be performed successfully.

Note: If you try to perform a level 1 backup after you reboot the system and you do not restore the state of the WI driver, a full backup is performed.

Note: Using the wiadmin utility is only recommended if the system is shut down properly. If you encounter a system crash, you should immediately initiate a full backup (level 0) after the system is brought back up. This generates a new bitmap, which resets and reinitializes the write intercept driver to a usable state.

Do not attempt to restore the WI driver if:

- The computer crashes.
- The computer was rebooted more than once before the bitmap file was restored.

In these cases, the bitmap in the registry is invalid and must not be used.

Upgrading a SnapImage drive

If you upgrade a SnapImage drive from basic to dynamic, the SnapImage software must correlate the previous drive identifier with the upgraded drive to continue operations for that drive. Because the Windows 2000 operating system records system changes in the registry, the wiadmin utility can access this information after a drive upgrade is complete. To expedite SnapImage processing, EMC recommends the following:

- Before upgrading a drive, update the device information.

  This ensures the Windows registry is current with the information stored in the WI driver.

- After upgrading a drive, provide the mount point associated with the basic disk.

  The wiadmin utility retrieves the volume name from Windows Mount Point Manager, and merges the bitmap from the system registry with the current bitmap.

  For example, if you upgrade *C:* to a dynamic drive, use the wiadmin utility to designate *C:* as the block level differential state for mount point.

For instructions, see:

- "Use wiadmin from the SnapImage administrator program" on page 82
- "Use wiadmin from the command prompt" on page 82

Use wiadmin from the SnapImage administrator program

To use the **wiadmin** utility from the SnapImage Administrator program:

1. From the **Windows Programs** menu, select **SnapImage Administrator**.

   The **SnapImage Administrator** program is displayed.

2. Click the **WI Admin** tab.

   The **WI Admin** window is displayed.

Do one of the following:

- To restore the WI driver state after rebooting the system, click **Restore**.
- To update device information in the registry before upgrading a drive, click **Update**.
- To restore the block level differential state after drives are upgraded or changed, click Restore Block Level Differential State for Mount Point and type the drive that was updated; for example, *C:*.

Use wiadmin from the command prompt

To use the **wiadmin** utility from the command prompt, use the following syntax:

```
wiadmin [/?] [/r] [/m [mountpoint]] [/v]
```

Table 4 on page 82 lists the **wiadmin** utility options and when to use them.

Table 4 wiadmin utility options (page 1 of 2)

To:	Use this option:
Restore the WI state—Always use this option after the system is rebooted properly.	/r

Table 4 wiadmin utility options (page 2 of 2)

To:	Use this option:
Restore the state for the given mount point—Use this option after upgrading a SnapImage drive from basic to dynamic.	/m
Update the device information—Use this option before upgrading a SnapImage drive from basic to dynamic.	/v
Display usage.	/?

Note: To ensure that the file stored in the registry can be used for the level 1 backup, use the wiadmin /r command every time the system is booted after a successful shut down.

Do not use the **wiadmin /r** command if the computer crashes or was rebooted more than once before the system was restored. In these cases, the bitmap in the registry is invalid and must not be used.

Changing default retention values

By default, all SnapImage metadata files are kept for one day, and all diagnostic files are kept for three days.

Note: If multiple backups occur during the same day, the original metadata files are replaced with the new metadata files from the subsequent backup.

The one-day retention period for metadata files that are stored on disk is generally adequate because you can retrieve the same metadata files from the backup tape to initiate a nondestructive (file-by-file) recovery. However, if a nondestructive recovery is required, and the metadata files on disk have not been overwritten by files from a subsequent backup, using the files from disk will result in slightly better performance.

The diagnostic files are typically not needed past the three-day default retention period.

The one- and three-day default retention periods reduce the amount of disk space required for temporary SnapImage files. You can increase the retention period for these files; however, you might need to allocate additional disk space to the %*NDMPHOME*% directory.

Note: These retention values are specific to SnapImage temporary files. NetWorker default retention values are specified differently.

How to Change retention values using SnapImage administrator

To change retention values using the SnapImage Administrator program:

1. From the Windows Programs menu, select **SnapImage Administrator**.

   The **SnapImage Administrator** program is displayed.

2. Click **Miscellaneous**.

3. Under Retention Policies, type the number of days to retain the data in a specific file.

   A dialog box is displayed, prompting you to confirm your entry.

4. To accept the retention setting, click **Yes**.

A dialog box that displays the new retention value is displayed.

5. Click **OK**.

   Continue changing retention values for additional files as appropriate.

Obtaining general information

To obtain general system and SnapImage information, open the SnapImage Administrator program, as shown in Figure 3 on page 87.

Table 5 on page 87 describes the information displayed in the **General** tab.

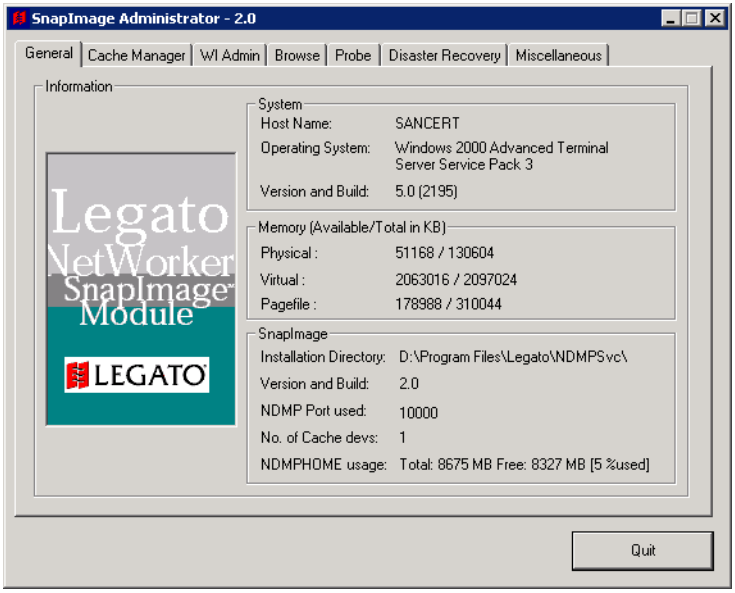

Figure 3 General information

Table 5 General system information

System Information	Description
Host	Displays the following information about the SnapImage system: Host name Operating system version and build Service Pack level Version and build
Memory	Displays the following information: Physical memory Virtual memory Pagefile usage
SnapImage	Displays the following information about SnapImage: Installation directory Version and build NDMP port The number of cache devices configured The amount of disk space used and available in the *%NDMPHOME%* directory

Browsing diagnostic files

The SnapImage diagnostics File Browser tool enables you to view diagnostic files generated by SnapImage operations. You can browse all available diagnostic files, or you can specify a date range.

To browse diagnostic files using the SnapImage Administrator program:

1. From the Windows Programs menu, select **SnapImage Administrator**.

   The **SnapImage Administrator** program is displayed.

2. Click **Browse**.

   The SnapImage Diagnostics File Browser is displayed, as shown in on page 88.

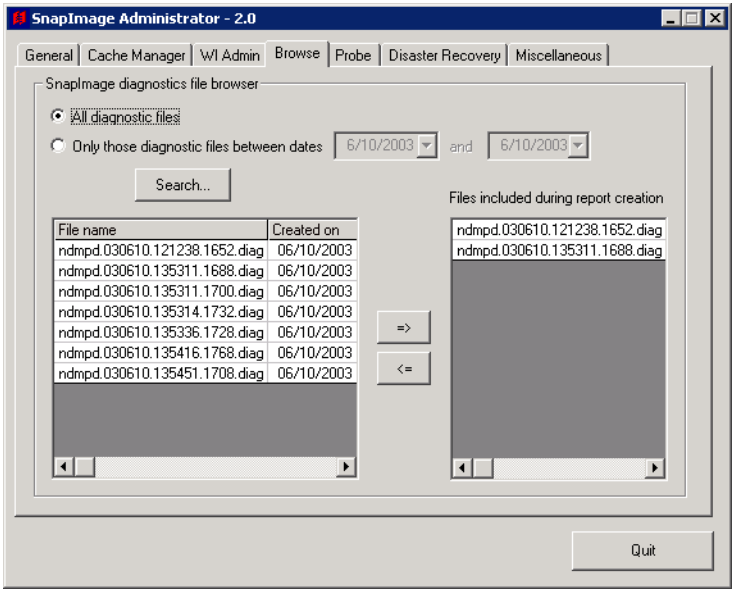

Figure 4 **Diagnostics file browser**

3. To retrieve all available files, select **All diagnostic Files**.
4. To select files from a specific date range, select **Only Those Diagnostic Files Between Date**s, and specify a date range from the drop-down lists.

5. To identify diagnostic files to send to EMC Technical Support, select the files and click the right arrow (optional).

   The files are marked for inclusion in a report. "Collecting system information and generating reports" on page 90 provides more information on generating the report.

Note: By default, diagnostic files are retained for three days in the *%NDMPHOME%\diag* directory. You can also view diagnostic files from the NetWorker Administrator program, and then use the Browse tool in the SnapImage Administrator program to mark the files to include in a for troubleshooting report.

Note: You can identify diagnostic files by the filename extension .diag.

"Changing default retention values" on page 84 provides information to change the default three-day retention period.

Collecting system information and generating reports

The SnapImage Probe tool uses operating system and SnapImage utilities to collect information and generate reports about the system. Once reports are generated, you can view the output or send it to EMC Customer Support by e-mail or FTP.

To generate system information:

1. From the Windows Programs menu, select **SnapImage Administrator**.

   The **SnapImage Administrator** program is displayed.

2. Click **Probe**.

   The Probe dialog box is displayed, as shown in Figure 5 on page 90.

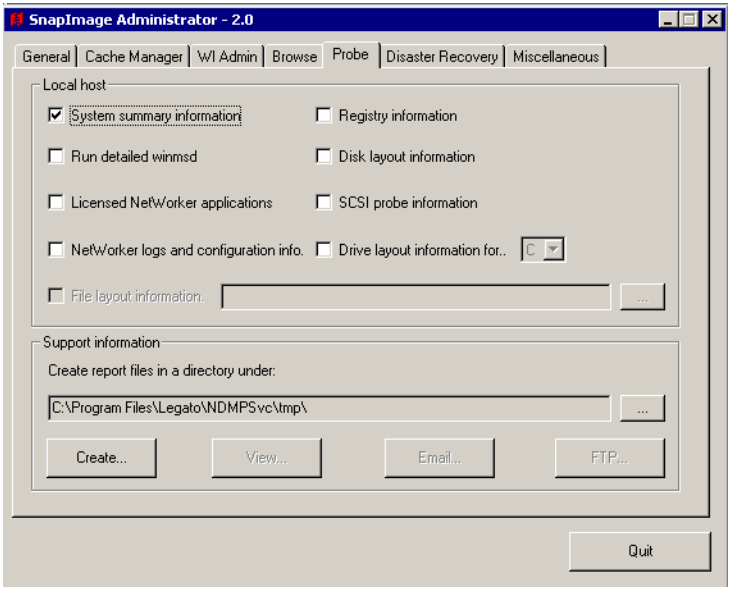

Figure 5 Local host window

Table 6 on page 91 describes the Probe Local Host options and file output names.

Table 6 Local host information

Option	Description	File
System summary information	Provides the following information: Hostname IP address, mac address System hardware configuration Swap space/pagefile size Operating system version and patches Installed EMC applications Installed application and packages	host_gen.txt
Run detailed winmsd	Generates detailed system summary information, if necessary.	host_adv.txt
Registry information	Retrieves registry information about EMC software, WI driver, and Sync driver.	reg_val.txt
Licensed NetWorker applications	Currently not supported.	
NetWorker logs and configuration info	Currently not supported.	
Disk layout information	Provides disk information about the physical hard drives in the system, including cylinders, tracks, bytes per sector, media type, signature, and size.	disk_layout.txt
SCSI probe information	Returns the following information for each SCSI hard disk on the system: Port Bus Target Logical unit numbers (LUNs) Signature Size	scsi_probe.txt
Drive layout information for	Generates volume information for the selected drive.	drive_layout.txt
File layout information	Retrieves the file layout information for the file specified.	file_layout.txt

Monitoring NDMP daemon processes

When troubleshooting SnapImage operations, EMC recommends checking the status of NDMP daemon processes that are currently running.

To monitor NDMP daemon processes:

1. From the Windows Programs menu, select **SnapImage Administrator.**

   The **SnapImage Administrator** program is displayed.

2. Click **Miscellaneous**.

   The NDMPD Watchdog is displayed and displays the NDMP daemon processes that are currently running, as shown in Figure 6 on page 92.

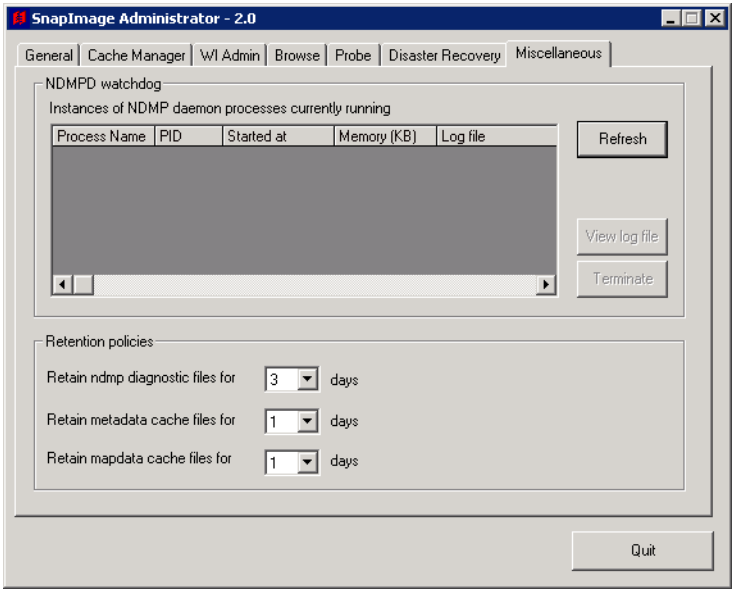

Figure 6 NDMP daemon watchdog

3. The following functions are available:

   - To refresh the list of processes in the current display, click **Refresh**.

- To view the log file associated with a process, select the process and click **View Log File**.
- To terminate a process, select the process and click **Terminate**. This function is currently not supported.

B

Calculating the Pagefile and Directory Sizes

This appendix contains the following section:

Sizing considerations

This appendix provides detailed information and procedures for estimating the physical disk space for NetWorker and SnapImage operations, as well as recommendations for determining the *pagefile* size required for the NetWorker server.

You can estimate the space requirements for the NetWorker *tmp* and the SnapImage *%NDMPHOME%\mdcache* directories by identifying information about the file system. This information includes, but is not limited to:

- An average number of levels in the directory trees in the file system
- An approximate number of files in directories
- An average filename length

"Directory and Pagefile Size Guidelines" on page 20 provides general guidelines.

NetWorker recommendations

The following sections provides information to estimate the space requirements that the NetWorker program requires:

- "How to estimate the size of the NetWorker tmp directory" on page 97
- "How to estimate the size of the pagefile" on page 97

How to estimate the size of the NetWorker *tmp* directory

To estimate the disk space required for the NetWorker temporary directory *<NetWorker_install_path>\tmp*:

1. Estimate the length of the average filename in the file system.
2. Multiply the average filename length by 2.
3. Add 180 to the result of step 2 .
4. Estimate the total number of files in the file system.
5. Multiply the results of step 3 and step 4 .

In summary, the formula for estimating the disk space required for the NetWorker tmp directory is:

```
((2 x average filename length)  + 180) x (approximate
number of files in file system)
```

Example 2 Calculating the Size of the Temporary Directory File

The average length of a filename is = 32
Multiply the filename length by 2: 32 x 2 =64
Add 180 to the filename length calculation: 64 + 180 = 244
The approximate number of files in file system is = 1,000,000

The calculation:

```
((2 x 32) + 180) x (1,000,000) = 244 MB
```

How to estimate the size of the pagefile

This section provides guidelines for determining the *pagefile* size required for NetWorker operations.

Note: These recommendations are in addition to the Microsoft recommendation for setting the pagefile size. The following files are the basis for the pagefile size requirement:

- "How to calculate the size of the nsrndmp_2fh file" on page 98
- "How to calculate the size of the nsrdmpix file" on page 98

How to calculate the size of the *nsrndmp_2fh* file

Multiply the approximate number of files in the file system by 16.

Example 3 ***nsrndmp_2fh* size requirement**

The approximate number of files in file system is = 1,000,000
Multiply the number of files by 16

The calculation:

1,000,000 x 16 = 16 MB

How to calculate the size of the *nsrdmpix* file

To calculate the size of the *nsrdmpix* file:

1. Estimate the average number of files in a directory in the file system.
2. Estimate an average number of directory levels in directory tree structures for the file system to be backed up.
3. Estimate the length of the average filename.
4. Add 40 to average filename length.
5. Multiply (average number of files in directory) x (average directory structure) x (filename length calculation from *step 4*).
6. Add 32 to the calculation from step 5 .
7. Estimate the average number of files in the file system.
8. Multiply the calculation from step 6 by the estimate in step 7 .

In summary, the formula for estimating the pagefile size for nsrdmpix is the following:

(average number of files per directory) x (average number of directory levels in directory trees) x (average file length + 40) + 32 x (approximate number of files in file system)

Example 4 **Calculating the Size of the *nsrdmpix* file**

The average number of files in a directory = 10,000
The average number for the levels of directories in the directory trees = 2

The average length of a filename = 32 bytes
The average number of files in the file system = 1,000,000

The calculation:

10,000 x 2 x (32 + 40) + 32 x 1,000,000 = 32 MB

Find the larger value of *nsrndmp_2fh* and *nsrdmpix* and add 3 MB to determine the pagefile size.

For example, 32 MB + 3 MB = 36 MB

SnapImage recommendations

To estimate the space requirements for the metadata cache directory *%NDMPHOME%\mdcache* directory that stores temporary metadata files, refer to the following sections:

- "Estimating the size of the directory Metadata file" on page 100
- "Estimating the size of the Metadata file" on page 100
- "Estimating the size of the index table file" on page 101
- "Estimating the size of the map datafile" on page 101

Estimating the size of the directory Metadata file

The directory metadata file contains hierarchal information about a directory and the files within each directory. Each entry in this file contains a 12-byte record and the filename this entry represents. Consequently, if a file system has millions of files in a multilevel directory structure, the space requirements are increased because 12 bytes per directory are added to each file in the file system.

Example 5 Calculating the Size of the directory Metadata file

The average number of files in the file system = 1,000,000
An average filename length = 32 bytes

The calculation:

```
(12 + 32) x 1,000,000 = 44 MB
```

Estimating the size of the Metadata file

The file metadata file contains information about a file's attributes and identifies the associated disk blocks. A unique identifier is assigned to each file when the metadata are generated. Each entry in this file requires approximately a 300-byte record space.

Note: For small files that are less than 512 bytes, NTFS does not always allocate the data blocks and stores the entire file in the record structure. In these cases, the File Metadata file contains the file data in addition *to* the 300-byte record space, so the space requirements for the File Metadata file could increase substantially.

Example 6 **SnapImage file metadata file size**

The average number of files in the file system = 1,000,000

The calculation:

```
300 x 1,000,000 = 300 MB
```

Estimating the size of the index table file

The index table file contains index information about the directory and file metadata files to provide quick, random access during file-by-file recoveries. The index table metadata file requires 8 bytes for each file in the backup.

Example 7 **SnapImage index table file size**

The average number of files in the file system = 1,000,000

The calculation:

```
8 x 1,000,000 = 8 MB
```

Estimating the size of the map datafile

The map datafile provides information that maps tape blocks to the corresponding disk blocks. The map datafile is used for restoring the proper tape blocks to disk. The map datafile size is directly proportional to the size of the file system. As a general guideline, each gigabyte in the backup requires 200 KB.

Example 8 **Calculating the Map datafile size**

The approximate size of the data in a file system = 20 GB

The calculation:

```
20 GB x 200 KB = 4 MB
```

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