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Introduction to NetBackup for NDMP

This chapter includes the following topics:

- About NetBackup for NDMP
- NetBackup for NDMP features
- NetBackup for NDMP terminology
- Network data management protocol (NDMP)
- Types of NDMP backup
- NDMP policies
- Storage units
- NDMP backup process
- NDMP restore process
- Direct access recovery (DAR)
- NDMP direct copy with VTL
- NDMP information on the Web
- Snapshot Client Assistance
- NDMP multiplexing
About NetBackup for NDMP

NetBackup for NDMP is an optional NetBackup application. It enables NetBackup to use the Network Data Management Protocol (NDMP) to initiate and control backups and restores of Network Attached Storage (NAS) systems.

NetBackup for NDMP features

NetBackup for NDMP includes the following features:

■ Support for NDMP protocol versions V2, V3, and V4.

■ Centralized backup-policy management
  Scheduling, catalog management, and other backup tasks are managed from a NetBackup master server. NetBackup for NDMP can be installed on a NetBackup master or media server.

■ Device and media management
  NetBackup software provides complete management and control of the devices and media that are used for backups and restores of NDMP hosts. The NetBackup Device Configuration wizard discovers and configures the storage devices that are attached to an NDMP host (requires NDMP protocol versions V3 or V4). Note that wizard-based discovery depends upon a number of device-specific features, such as SCSI inquiry and serialization, which some NAS vendors may not support.

■ High speed local backup of NDMP hosts
  Backup data travels between the disk and tape drives that are directly attached to the same NDMP host. This transfer provides high-speed backup without impairing network throughput.

■ Backup of network-attached NDMP hosts to a tape device on another NDMP host or to advanced tape libraries with an embedded NDMP server.
  Backup data travels across the network, from a disk on an NDMP host to tape on another NDMP host. This backup is referred to as three-way backup. This data movement option requires support from the NAS/NDMP host.

■ Backup of a network-attached NDMP host to a tape device on a NetBackup media server. This backup is a form of three-way backup also known as remote NDMP. This feature supports NDMP versions V2, V3, and V4 on the NDMP hosts.

■ Shared tape libraries
  Tape libraries can be shared between NDMP hosts and NetBackup servers, or between multiple NDMP hosts. Robotic control can be on an NDMP host or on a NetBackup server.
■ Shared tape drives with the Shared Storage Option
Tape drives can be shared between servers (both NetBackup servers and NDMP hosts). This setup requires the Shared Storage Option (SSO) license. See “NDMP information on the Web” on page 32.

■ Snapshots of data on NDMP hosts
NetBackup can make point-in-time data snapshots on an NDMP (NAS) host without interrupting client access to data, using the NDMP V4 snapshot extension. The snapshot is stored on the same device that contains the NDMP client data. From the snapshot, you can restore individual files or roll back a file system or volume by means of Snapshot Client Instant Recovery. A NetBackup Snapshot Client license is required, in addition to the NetBackup for NDMP license. This Snapshot Client feature uses the NAS_Snapshot method. Refer to the NetBackup Snapshot Client Administrator’s Guide for details.

■ NDMP direct copy
NetBackup can copy virtual tape library (VTL) images directly from the VTL to physical tape or to another VTL, without using media server I/O resources or network bandwidth. NetBackup can directly copy NDMP backup images from one NDMP-attached tape drive to another NDMP tape drive that is attached to the same NDMP host. Note that the operation does not use media server I/O.

Note: The VTL must have an embedded NDMP tape server.

■ NetBackup can also create a SnapVault disk copy from a NAS snapshot. Configuration details are contained in the NetBackup Snapshot Client Administrator’s Guide.
For a list of NAS vendors that NetBackup currently supports for SnapVault and NAS_Snapshot, refer to the Symantec NetBackup Snapshot Client Configuration online document. Information on how to access that document is available. See “Snapshot Client Assistance” on page 32.

■ Direct Access Recovery (DAR)
For NDMP hosts that support DAR, this feature greatly reduces the time that is needed to restore a directory, a single file, or a small number of files.

■ Path-based file history
The NDMP server can send catalog information consisting of complete path names to NetBackup. Some vendors do not support this feature. Up-to-date information is available on the vendors that support path-based history. See “NDMP information on the Web” on page 32.
NetBackup for NDMP servers are supported in a NetBackup-clustered environment.

- The enhanced ability to run customized scripts during a backup, especially for relational databases residing on NAS devices.

- NDMP multiplexing
  NDMP multiplexing enables NDMP backups to be multiplexed to Media Manager Storage Units. Only remote NDMP multiplexing is supported.

- NDMP to disk
  NetBackup can write NDMP backups to disk storage units.

## NetBackup for NDMP terminology

Table 1-1 describes NetBackup for NDMP terminology. For explanations of other NetBackup terms, consult the NetBackup online glossary in NetBackup help.

### Table 1-1 Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAR (Direct Access Recovery)</td>
<td>The NDMP host positions the tape to the exact location of the requested file(s), reading only the data that is needed for those files. Restore times can be reduced from hours to minutes.</td>
</tr>
<tr>
<td>NDMP (Network Data Management Protocol)</td>
<td>NDMP is a widely used protocol through which an NDMP-conformant backup application can control the backups and restores for an NDMP host.</td>
</tr>
<tr>
<td>NDMP backup to Media Manager storage units</td>
<td>A form of three-way backup and restore also known as Remote NDMP. Data travels from an NDMP host to a tape drive that is attached to a NetBackup media server.</td>
</tr>
<tr>
<td>NDMP client</td>
<td>An NDMP client is an NDMP-compliant backup application (also known as a Data Management Application or DMA) that is an NDMP server application client. An NDMP client sends commands to the NDMP server application to control the backups and restores on an NDMP host. NetBackup for NDMP allows NetBackup to act as an NDMP client.</td>
</tr>
<tr>
<td>NetBackup for NDMP server</td>
<td>A NetBackup for NDMP server is a NetBackup master or media server on which NetBackup for NDMP software is installed.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>NDMP host</td>
<td>A NAS system that serves files to clients using HTTP, FTP, CIFS, or NFS protocols. It also runs an NDMP server application that communicates with NDMP client backup software to configure and perform backup and restore tasks. NAS systems provide fast, multi-protocol file access and cost effective data storage to workstations and servers in the network or across the Internet. In a NetBackup configuration, the NDMP host is considered a client of NetBackup. However, NetBackup client software is never installed on an NDMP host.</td>
</tr>
<tr>
<td>NDMP multiplexing</td>
<td>NDMP multiplexing concurrently writes multiple backup streams to the same Media Manager tape storage device from the same client or different clients. NDMP multiplexing improves overall NetBackup performance by more efficient use of the Storage Unit drives. State of the art storage devices can typically stream data faster than client agents can create backup streams. Therefore multiple data streams can be sent to and effectively processed by a given storage unit. Remote NDMP multiplexing only is supported.</td>
</tr>
<tr>
<td>NDMP server application</td>
<td>An NDMP server application runs on an NDMP host and runs backup, restore, and device control commands that it receives from an NDMP-conformant backup application. The backup application (NetBackup) is considered an NDMP client. A separate instance of an NDMP server process exists for each connection to an NDMP client. That is, if two backups are in progress, an NDMP server process exists for each backup.</td>
</tr>
<tr>
<td>NDMP storage unit</td>
<td>An NDMP storage unit stores the backup data for an NDMP host. The tape drives in this storage unit attach directly to the NDMP host or can be configured on a SAN. Note that NDMP storage units cannot be used to store data for non-NDMP hosts, and NetBackup disk storage units cannot be used for NDMP tasks.</td>
</tr>
<tr>
<td>Redirected restore (to a different client)</td>
<td>In a redirected restore, files are restored to a client other than the one from which they were originally backed up. In NetBackup for NDMP, the following occurs: the restore data travels from an NDMP host (or NetBackup media server) with a locally attached storage device to another NDMP host on the network.</td>
</tr>
</tbody>
</table>
Table 1-1  Terminology (continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote NDMP</td>
<td>See “Configuring NDMP backup to Media Manager storage units” on page 56.</td>
</tr>
<tr>
<td>Three-way backup/restore</td>
<td>In a three-way backup or restore, data travels in the following manner: between an NDMP host and a storage device that is attached to another NDMP host or to a NetBackup media server. This backup contrasts with local NDMP backup or restore where the data travels as follows: between an NDMP host’s disk and a storage device directly attached to the same NDMP host.</td>
</tr>
<tr>
<td>Virtual Tape Library (VTL)</td>
<td>A virtual tape library is a storage system that uses disk-based technology to emulate a tape library and tape drives. For secondary storage, NetBackup can copy VTL images directly to a physical tape or to another VTL, by means of NDMP direct copy.</td>
</tr>
</tbody>
</table>

Network data management protocol (NDMP)

NDMP is a widely used protocol through which an NDMP-conformant backup application controls the backups and restores of any NDMP host that runs an NDMP server application.

NDMP architecture follows the client/server model:

- The NetBackup master or media server where NetBackup for NDMP is installed is called a NetBackup for NDMP server.
- The host where the NDMP server application resides is called an NDMP host.
- The NetBackup software is a client of the NDMP server application. NetBackup for NDMP lets NetBackup act as an NDMP client. The NDMP hosts, on the other hand, act as NetBackup clients.
Figure 1-1  NDMP and NetBackup hosts as clients of each other

Network

![Diagram showing NDMP and NetBackup hosts as clients of each other]

NetBackup for NDMP server
A NetBackup master or media server where NetBackup for NDMP is installed.

The NetBackup for NDMP server acts as an NDMP client.

NDMP Host
NDMP Host
NDMP Host
NDMP hosts act as NetBackup clients ...

NOTE: NetBackup software is NOT installed on NDMP hosts.

Types of NDMP backup

The NDMP server application on the NDMP host performs backups and restores of the NDMP host, directed by commands from an NDMP client (NetBackup). Backups can be conducted in any of the following ways:

- NDMP local backup
- NDMP three-way backup
- Backup to a Media Manager storage unit on the NetBackup server

NDMP local backup

The NetBackup for NDMP server initiates the backup. The data travels from the NDMP host’s disk to a storage device that is attached to the same host. Or the storage device is available on a SAN.
Local NDMP backup

Data travels from disk to tape on same NDMP host, or from disk to tape device on SAN. *Backup data is NOT sent over local network.*

The tape drives must be in NDMP-type storage units.

**NDMP three-way backup**

The NetBackup for NDMP server initiates the backup. Data travels over the network in the following manner: from an NDMP host to a storage device that is attached to another NDMP host on the local network or available on a SAN.
Three-Way NDMP backup

Data travels from disk on an NDMP host to tape device on another NDMP host. *Backup data is sent over the local network.*

The tape drives must be in NDMP-type storage units.

**Backup to Media Manager storage units (remote NDMP)**

The data travels over the network in the following manner: from an NDMP host to a Media Manager-type storage device that is attached to a NetBackup media server or available on the SAN. The NetBackup drive(s) must be in Media Manager storage units (not NDMP storage units).
After you install and configure NetBackup for NDMP, you can schedule backups by creating an NDMP policy in NetBackup.

An NDMP policy can have one or more NetBackup clients. Each NetBackup client must be an NDMP host.

See Figure 1-1 on page 17.

Note that you do not install any NetBackup software on the NDMP hosts.

The allowable backup types for schedules in an NDMP policy are: Full, Cumulative Incremental, or Differential Incremental. User-initiated backups and archives are not allowed because the NDMP protocol does not permit these tasks.

Restores of NDMP host backups can be initiated from any NetBackup media server that meets the following criteria:

- Is within the same overall NetBackup storage domain
- Uses the same NetBackup master server that the media server uses that performed the backup
The data can be restored to the NDMP host where it was backed up, or to another NDMP host.

NDMP policies can use either NDMP storage units or Media Manager storage units.

## Storage units

NetBackup uses either of the following storage units:

- NDMP-type storage units (for local or three-way backup)
- Media Manager storage units (for backup to devices that are attached to a NetBackup media server)

### NDMP Storage units

NetBackup requires NDMP-type storage units when you back up NDMP host data to the devices that are as follows:

- Attached to an NDMP host
- Available to the NDMP host on a SAN

An NDMP storage unit can contain stand-alone or robotic drives. Robotic controls can be in a TLD (Tape Library DLT), TL8 (Tape Library 8MM), TLH (Tape Library Half Inch), or ACS robot type.

### Media Manager storage units

You can use drives that were configured in Media Manager-type storage units when you back up NDMP host data to devices that are as follows:

- Attached to a NetBackup for NDMP server
- Available to the server on a SAN

For NDMP backup, drives in Media Manager-type storage units do not have to be dedicated to NDMP data. They can store backups of regular (non-NDMP) NetBackup clients as well as of NDMP clients.

### Assigning tape drives to different hosts

Robotic tape drives can be divided up among NDMP hosts and NetBackup servers. Figure 1-5 shows the following:

- Tape drives 1, 3, and 5 are attached to NDMP hosts. They are in NDMP storage units that can be used for NDMP backup (local or three-way).
The commands that control these drives originate on the NetBackup for NDMP server and are sent through the NDMP connection on the network. The NDMP server application on each NDMP host translates the NDMP commands into SCSI commands for the local drives.

- Tape drives 2 and 4 are attached to a NetBackup server. They are in non-NDMP storage units and are controlled in the same way as other drives on NetBackup servers. Depending on the type of storage unit, these drives can be used for the following:
  - For non-NDMP clients of NetBackup
  - In the case of tape drives in Media Manager storage units, they can be used for both NDMP (local or three-way) and non-NDMP backup.

In this diagram, all tape drives except drive 4 can be used for NDMP backup.

Figure 1-5    NDMP and non-NDMP storage units

* In NDMP storage unit
† In NetBackup Media Manager storage unit
‡ In another type of NetBackup storage unit (not NDMP or Media Manager)

Drives 1, 3, and 5 (in NDMP storage units) can be used for NDMP backups.

Drive 2 (in Media Manager storage unit) can be used for NDMP or non-NDMP backup.

Drive 4 (in different type of NetBackup storage unit) cannot be used for NDMP backup.
**NDMP host**

Robotics control can be attached to an NDMP host or to a NetBackup server. **Figure 1-6** shows how NetBackup sends commands over the network to the NDMP host, which in turn sends them to the robot.

**Figure 1-6** Robotics control that is attached to an NDMP host

![Diagram](NDMP_host_diagram.png)

**NetBackup server**

**Figure 1-7** shows how the robot is controlled in the same way as other robots on NetBackup servers.

**Figure 1-7** Robotics control that is attached to a NetBackup server

![Diagram](NetBackup_server_diagram.png)
NDMP backup process

During a backup, the following events occur in this order:

- From the EMM database, NetBackup obtains a media ID for the tape that is used for the backup and sends a tape-mount request to \texttt{ltid}.
- \texttt{ltid} on the NetBackup for NDMP server sends the necessary NDMP (SCSI robotic) commands to mount the requested tape on the storage device.
- NetBackup sends the NDMP commands that are necessary to have the NDMP server application perform a backup to the tape. The backup data travels in one of two ways:
  - Between the local disk and tape drives on an NDMP host.
  - Over the network, data travels in the following manner: from an NDMP host without its own storage device to an NDMP host (or NetBackup media server) with a locally attached storage device (three-way backup).
- The NDMP server application sends information to the NetBackup for NDMP server about the files that were backed up. This information is stored in the NetBackup file database.
- The NDMP server application sends status about the backup operation to the NetBackup for NDMP server.

Figure 1-8 shows the NetBackup processes that are involved in NDMP backups.
**NDMP restore process**

Because of the design of the NDMP protocol, only an administrator on a NetBackup server (master or media) can restore files from NDMP backups. During a restore,
the administrator browses the file catalog and selects files from NDMP images in the same manner as for standard backup images.

The following events occur during a restore, in this order:

■ The NetBackup for NDMP server looks in its EMM database for the tape that contains the backup, and asks \textit{ltid} to mount that tape.

■ \textit{ltid} on the NetBackup for NDMP server sends the necessary NDMP commands to load the requested tape on the storage device.

■ NetBackup sends the NDMP commands that are necessary to have the NDMP server application perform a restore operation to the disk. The restore data travels in one of two ways:
  ■ From a tape drive to a local disk (tape drive and disk are on the same NDMP host)
  ■ Over the network, from an NDMP host (or NetBackup media server) with a locally attached storage device to another NDMP host (three-way backup/restore)

■ The NDMP server application sends status about the restore operation to the NetBackup for NDMP server.

\textbf{Figure 1-9} shows the NetBackup processes involved in NDMP restores.
Direct access recovery (DAR)

NetBackup uses Direct Access Recovery (DAR) to restore a directory or individual files from a backup image. DAR can greatly reduce the time it takes to restore files and directories. DAR is enabled by default (no configuration is required).

DAR enables the NDMP host to position the tape to the exact location of the requested file(s). It reads only the data that is needed for those files. For individual file restore, NetBackup automatically determines whether DAR shortens the
duration of the restore. It activates DAR only when it results in a faster restore. Further details are available as to when DAR is used and how to disable it.

See “About enabling or disabling DAR” on page 52.

The following two prerequisites are necessary for using DAR with NetBackup for NDMP:

- The NDMP host must support DAR where the NDMP server application resides.
- NetBackup 4.5 GA or later, with the catalog in binary format (binary format is the default).

**NDMP direct copy with VTL**

NetBackup supports virtual tape libraries (VTLs). A virtual tape library uses disk-based technology to emulate a tape library (robot) and drives. The backup image is written to one or more disks in the VTL. The VTL allows the image to be treated as though it resides on tape, but with the access speed of a disk.

For additional storage (such as for disaster recovery), NetBackup copies backup images from the VTL disk to a physical tape in an NDMP storage unit. It copies without using media server I/O or network bandwidth. NetBackup can also copy NDMP images directly between NDMP tape drives attached to an NDMP host. In both cases, this feature is called NDMP direct copy. This feature also enables NetBackup to restore data directly from either the image in the VTL or from the physical NDMP tape.

To initiate the NDMP direct copy, you can use the NetBackup duplication feature in the Administration Console, or the bpduplicate command, or NetBackup Vault. **Figure 1-10** represents a VTL from two perspectives: it shows the actual hardware present in a VTL configuration and the configuration from the perspective of NetBackup.
The NDMP direct copy feature uses a VTL that has an embedded NDMP tape server using the NDMP protocol. The embedded NDMP tape server moves the image from the VTL disk directly to a physical tape. The image does not pass through the NetBackup media server or travel over the network.

Figure 1-11 shows the data flow and control for a VTL.
Figure 1-11 NDMP direct copy with VTL: data flow and control

1. NetBackup media server sends the backup over a direct device path (SCSI or SAN) to the VTL.
2. NetBackup selects an NDMP device path to the VTL and creates an NDMP control session for the device.
3. NetBackup selects a tape volume from the physical tape library. It then selects an NDMP device path from the library and creates a second NDMP control session for the device.
4. By means of the NDMP protocol, the backup image in the VTL is copied directly to the physical tape library (not sent over the network).
5. The image can be restored directly to the media server from either the VTL or the physical tape.

NDMP direct copy without VTL

By means of the NetBackup duplication feature, NetBackup can copy NDMP images between tape drives attached to an NDMP host. A typical usage is to copy images between tape drives within the same tape library. (Images can also be copied between tape libraries.) Like NDMP direct copy with a VTL, the copied data does not pass through the NetBackup media server or travel over the network.
NDMP direct copy: notes and limitations

Note the following:

- Supports backup to tape and restore from tape, for NDMP data as well as non-NDMP data.
- Does not support synthetic backup or multiple copies.
- Does not support multiplexed backup.
  
  [**fr Don Peterson's original statement, which may not be needed (waiting for reply fr Don): Cannot be used to duplicate multiplexed backup jobs or any backup images that are part of a multiplexed backup job.]

- Does not support storage unit groups for the destination device. If you select a storage unit group, NDMP direct copy is disabled. The data transfer takes place over the network by means of the NetBackup server.

- In a VTL environment, a NAS appliance is not required: the VTL emulates a NAS (NDMP) host. The VTL requires NDMP tape server functionality.

- NetBackup for NDMP software must be installed. NetBackup for NDMP is enabled by the Virtual Tape Option license. Requires the NDMP protocol version V4 or higher.

- NetBackup servers (master and media) must be at NetBackup 6.5 or later.

  **Phil G thinks this ref to 6.5 is OK, because support for NDMP direct copy started then.
The NetBackup 7.x Hardware Compatibility List (HCL) indicates which VTL software supports this functionality:
http://entsupport.symantec.com/docs/336875.htm

NDMP information on the Web

The Symantec support web site has a PDF document on supported NDMP operating systems and NAS vendors. The document is titled NetBackup for NDMP: NAS Appliance Information. It also contains configuration and troubleshooting help for particular NAS systems:
http://entsupport.symantec.com/docs/267773

For the features and software releases for each NAS vendor, for SSO support, and for the NetBackup versions that support these vendors, refer to the NetBackup 7.x Hardware Compatibility List (HCL):
http://entsupport.symantec.com/docs/336875.htm

Snapshot Client Assistance

For Snapshot Client assistance, see the NetBackup Snapshot Client Administrator’s Guide. For additional information, see the Snapshot Client Configuration document:
http://entsupport.symantec.com/docs/288300

Document 288300 includes the following:

- An up-to-date list of supported operating systems and peripherals
- A list of NAS vendors that are supported for the NAS_Snapshot method.
- Sections on SAN device configuration and on setting up NetBackup for off-host data mover backups (including instructions on creating 3pc.conf and mover.conf files)

NDMP multiplexing

NDMP multiplexing concurrently writes multiple backup streams to the same tape storage device from the same client or different clients. NDMP multiplexing only supports remote NDMP and improves overall NetBackup performance by better using tape storage devices. State of the art tape storage devices can typically stream data faster than client agents can create backup streams. Therefore multiple data streams can be sent to and effectively processed by a given tape storage unit.
A Network Attached Storage (NAS) device with an NDMP server is an agent that produces a backup stream that is similar to a NetBackup client. Multiplexing is desired for NDMP backups because NAS devices are limited in the rate at which they create backup streams. These backup streams are often much slower than the tape storage device consuming and writing the stream.

NDMP multiplexing provides the following features:

■ Several backups can be run at the same time writing to the same tape. This process can reduce the need for many tape devices.

■ Backup time is reduced by writing concurrent backups to a single tape storage device.

■ Many tape storage devices require that data is streamed to them at high transfer rates. When data is not streamed fast enough, they do not work efficiently and are subject to possible excessive wear.

About NDMP multiplexing general considerations

Consider the following general items when implementing NDMP multiplexing.

■ Only media manager tape storage units can be used for NDMP multiplexing.

■ Multiplexing of NDMP backups and restores only supports remote NDMP. The remote NDMP processes backup streams by going through the media server.

■ NDMP local and NDMP three-way backups and restores are not supported for NDMP multiplexing. Each of these methods process backup streams without going through the media server.

■ Synthetic backups are not supported.

■ Only tape devices are supported.

■ Disk storage devices are not supported.

■ A mix of NDMP and non-NDMP backups can be present in the same MPX backup group.

■ File and directory DAR are allowed.

■ NDMP multiplexing works with both VTL and PTL. However, VTL users typically do not use NDMP multiplexing because they can add more virtual tape devices to accommodate additional streams.

■ For NDMP multiplexed backups the storage unit and policy schedule multiplex value must be set to a value greater than one.
Installing NetBackup for NDMP

This chapter includes the following topics:

- Installation prerequisites
- Installing on UNIX servers
- Installing on Windows servers
- Uninstalling NetBackup for NDMP

Installation prerequisites

Note the following items:

- The NetBackup for NDMP master or media server must run NetBackup 7.0 or later.
- For a list of operating systems that NetBackup 7.0 for NDMP supports, refer to the NetBackup 7.x Operating System Compatibility List.
- For a detailed list of NAS platforms that NetBackup for NDMP supports, refer to the following document:
- For making snapshots of NDMP (NAS) hosts, NetBackup Snapshot Client software must be installed on the following: The NetBackup master server and the NetBackup clients that are used to perform backups.
  For more information, refer to the NetBackup Snapshot Client Administrator’s Guide.
The drives and robots that are attached to the NDMP host must be the types that the NDMP host and NetBackup support. A list of supported robot types is available. See “NDMP Storage units” on page 21. For more information on storage devices, see the NetBackup Administrator’s Guide, Volume I.

Notes and tips on your particular NDMP host are available. See “NDMP information on the Web” on page 32.

Installing on UNIX servers

NetBackup for NDMP installs on a UNIX or Linux system when the NetBackup server software is installed. No separate installation procedure is required. However, you must enter a valid license key to use NDMP. On the UNIX host that you want to be the NetBackup for NDMP server, perform the following procedure.

**Note:** If you install in a cluster environment, first freeze the active node so that migrations do not occur during installation. For information about freezing a service group, see the clustering section in the NetBackup High Availability Administrator’s Guide for the cluster software you are running.

To install NetBackup for NDMP

1. Log on as root.
2. Install NetBackup server and client software as explained in the NetBackup Installation Guide for UNIX and Linux.
3. To make sure a valid license key for NetBackup for NDMP is registered, enter the following command to list and add keys:
   
   ```sh
   /usr/openv/netbackup/bin/admincmd/get_license_key
   ```
4. If this NetBackup for NDMP server is not your master server, install your NDMP license key on the master.
5. In a clustered environment, perform these steps on each node in the cluster.
6. If you install in a cluster environment, unfreeze the active node after the installation completes.

For information about unfreezing a service group, see the clustering section in the NetBackup High Availability Administrator’s Guide for the cluster software you are running.
Installing on Windows servers

Use this procedure on the Windows host that you want to be the NetBackup for NDMP server.

Note: If you install in a cluster environment, first freeze the active node so that migrations do not occur during installation. For information about freezing a service group, see the clustering section in the NetBackup High Availability Administrator’s Guide for the cluster software you are running.

To install NetBackup for NDMP

1 Log on.
2 Install NetBackup server and client software as explained in the NetBackup Installation Guide for Windows.
3 NetBackup for NDMP is part of the core NetBackup product. To make sure a valid license key for NetBackup for NDMP is registered, do the following to list and add keys:
   ■ In the NetBackup Administration Console, select Help.
   ■ On the Help menu, select License Keys.
   ■ Existing keys are listed in the lower part of the window.
   ■ To register a new key, click the star icon to open the Add a new License Key dialog box. Type the new license key in the New license key field and click Add.
     The new license key appears in the lower part of the dialog box.
4 If this NetBackup for NDMP server is not your master server, install your NDMP license key on the master.
5 In a clustered environment, perform these steps on each node in the cluster.
6 If you install in a cluster environment, unfreeze the active node after the installation completes.

   For information about unfreezing a service group, see the clustering section in the NetBackup High Availability Administrator’s Guide for the cluster software you are running.

Uninstalling NetBackup for NDMP

This procedure uninstalls NetBackup for NDMP (and all of NetBackup).
To uninstall NetBackup

1 On the master server, check the Activity Monitor in the NetBackup Administration Console. Make sure no NetBackup for NDMP backups are active or running for the client (the Job State field should read Done).

2 Perform the uninstall procedure that is described in the NetBackup Installation Guide. Note: that procedure uninstalls all of NetBackup.
About configuring NDMP-attached devices

This chapter includes the following topics:

- About configuring NDMP-attached devices
- Authorizing access to the NDMP host
- Media and Device Management configuration
- Verifying NDMP password and robot connection
- Adding NDMP storage units
- About creating an NDMP policy
- About enabling or disabling DAR
- Setting up clustering
- Testing an NDMP configuration

About configuring NDMP-attached devices

This topic explains how to configure backups on the storage devices that are attached to NDMP hosts. Only NDMP-specific steps are described.

You can also use the NetBackup Device Configuration wizard to discover and configure the robots and drives that are attached to an NDMP host. The wizard requires NDMP protocol versions V3 or V4.

To configure and use the NAS_Snapshot method, see the NetBackup Snapshot Client Administrator’s Guide.
Authorizing access to the NDMP host

Before NetBackup can carry out backups, it must have access to the NDMP host.

Note: Do the following on the master server (not media server) if you plan to create snapshots using the Snapshot Client NAS_Snapshot method.

To authorize NetBackup access to the NDMP host

1. On the NetBackup server, from the Administration Console: under Media and Device Management > Credentials, click NDMP Hosts.
2. Under Actions, select New > NDMP Host.
3. In the NDMP host name dialog box, enter the name of the NDMP server for NetBackup to back up.

   The NDMP host name is case sensitive. Whenever this host name is used, the name must be identical to the name entered here. (For example, when you configure tape drives and storage units for this host.)
4. Click OK.
5. In the New NDMP Host dialog box, specify the following:

   (The term credentials refers to the user name and password that NetBackup uses to access the NDMP host.)

   **Use global NDMP credentials for this NDMP host**
   Select this option to enable all NetBackup media servers under the master server to access this NDMP host using a pre-defined global NDMP login.

   To create this login, click Host Properties > Master Server > Properties > NDMP in the NDMP Global Credentials dialog box.

   **Use the following credentials for this NDMP host on all media servers**
   This option enables all NetBackup media servers that are connected to the NDMP host to access the NDMP host using the login you specify:

   - **Username**: the user name under which NetBackup accesses the NDMP server. This user must have permission to run NDMP commands.
     You can find out whether your NDMP host vendor requires a particular user name or access level.
     See “NDMP information on the Web” on page 32.
   - **Password** and **Confirm Password**: enter the password for this user.
Select this option to specify NDMP logins for particular NetBackup servers. Then click Advanced Configuration.

- In the Advanced NDMP Credentials dialog box, click Add.
- In the Add Credentials dialog box, select a NetBackup server and specify the user name and password it uses to access the NDMP host.
- Click OK. NetBackup validates the user name and password.
- The NetBackup server and user name appear in the Advanced NDMP Credentials dialog box.
- If necessary, click Add again to specify other servers and user

6 Repeat this procedure for each NDMP host that NetBackup backs up.

Access for three-way backups and remote NDMP

To perform three-way backups, you must authorize access to the NDMP host as described in the previous section.

Note the following points:

- Three-way backups: for the NDMP host name, specify the NDMP host that has no attached tape drive.
- NDMP to Media Manager storage units (remote NDMP): for the NDMP host name, specify the NDMP host to back up to the Media Manager storage unit that is defined on the NetBackup server.

See the topic on remote NDMP.

Media and Device Management configuration

On the NetBackup for NDMP server, use Media and Device Management in the Administration Console to add drives and robots. As an alternative, you can use the NetBackup Device Configuration wizard.

The following procedures and examples treat NDMP configuration issues only.

See the NetBackup Administrator’s Guide, Volume I, for general information on configuring NetBackup media.

More information on configuring storage devices for specific NDMP hosts is available.
See “NDMP information on the Web” on page 32.

These procedures do not apply to setting up the devices that are attached to the NetBackup media server. To back up NDMP data to media servers, you must configure storage units in the same way as ordinary NetBackup (non-NDMP) devices.

See “About remote NDMP” on page 55.

See also the *NetBackup Administrator’s Guide, Volume I*.

Adding a robot directly attached to an NDMP host

This procedure describes how to configure a robot that is attached to an NDMP host.

**To add a robot directly attached to an NDMP host**

1. Start the NetBackup Administration Console on the NetBackup for NDMP server as follows:

   Windows
   
   In the Windows Start menu, click Programs > Symantec NetBackup > NetBackup Administration Console.

   UNIX
   
   Enter the following:
   
   `/usr/openv/netbackup/bin/jnbSA &`

2. Select Media and Device Management > Devices in the left pane.

3. On the Actions menu, select New. Then select Robot from the popup.
4. In the Add Robot dialog box, select the following:

<table>
<thead>
<tr>
<th><strong>Media Manager host</strong></th>
<th>Specify the host that manages the EMM database (by default, this host is the NetBackup master server).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Device host</strong></td>
<td>Use the pull-down to select the NetBackup media server.</td>
</tr>
<tr>
<td><strong>Robot type</strong></td>
<td>Specify type.</td>
</tr>
<tr>
<td><strong>Robot number</strong></td>
<td>Specify number.</td>
</tr>
<tr>
<td><strong>Robot control</strong></td>
<td>Click <strong>Robot control is attached to an NDMP host</strong>.</td>
</tr>
<tr>
<td><strong>Robot device path</strong></td>
<td>Enter the device name of the robot. You do not need to include the NDMP host name as part of the device path. More information on your NDMP host is available. See “NDMP information on the Web” on page 32.</td>
</tr>
<tr>
<td><strong>NDMP host name</strong></td>
<td>Enter the name of the NDMP host to which the robot is attached</td>
</tr>
<tr>
<td><strong>Bus, Target, and LUN</strong></td>
<td>Specify these values if the NDMP host requires them. By default, the bus, target, and lun values are 0. More information on your NDMP host is available. See “NDMP information on the Web” on page 32.</td>
</tr>
</tbody>
</table>
For further assistance with the Add Robot dialog box, refer to the online help. The following steps explain the portions that are unique to configuring NetBackup for NDMP.

5 Click OK.

6 In the popup message that asks if you want to stop and restart the device manager service (or daemon), click Yes.

Adding a drive

This procedure describes how to configure a tape drive.
To add a drive

1. In the NetBackup administration console, select Media and Device Management > Devices in the left pane.
2. On the Actions menu, select New.
3. In the popup, select New Drive (on UNIX, Tape Drive).
4. In the Add a New Drive dialog box, in the Drive Name box, enter the name of the drive.
5. Click Add to specify a drive path.
In the Add Path dialog box, select the host and the path information as follows:

**Device host**
Select the name of the NetBackup media server. Use the pull-down to select media servers already defined, or click Add to enter a new one.

**Path**
Enter the device file name of the tape drive, such as nrst2a. Refer to the NAS vendor documentation for your drive for the correct format of the device file name.

Alternate method: use the following command to find the device file name for the drive, if the NDMP host is running NDMP protocol V3 or later:

```
tpautoconf -probe ndmp_host_name
```

Click **This path is for a Network Attached Storage device**.

In the **NDMP Host** drop-down list, select the name of the NAS filer to which the drive is attached.

Click **OK**.

Return to the Add a New Drive dialog box and enter the drive information as required. Repeat this procedure for each drive that must be added.

When you are prompted to restart the Media Manager device daemon and all robotic daemons, click **Yes**.

### Checking the device configuration

On the NetBackup for NDMP server, use the following procedure.

**To check the device configuration**

1. On UNIX, execute `/usr/openv/volmgr/bin/vmps`

   Verify that ltid, vmd, avrd, and any required robotic daemons are active.

2. On Windows, go to the NetBackup Administration Console

   Use the Activity Monitor (Processes tab) to verify that ltid, vmd, avrd, and any required robotic daemons processes are active.

3. From the NetBackup Administration Console, use the Device Monitor to ensure that the drive is in the UP state.
About adding volumes

Use the NetBackup **Media and Device Management** utility to add the volumes that you plan to use for the NDMP host backups.

See the *NetBackup Administrator’s Guide, Volume I*, for instructions.

When you specify the Robot Control Host for a volume that is in a robot, specify the host name for the NetBackup for NDMP server. Do not specify the NDMP host.

Verifying NDMP password and robot connection

When you authorize NetBackup access to the NDMP host and configure robots using the Administration Console, NetBackup automatically verifies NDMP credentials and the robotic configuration. If you want, you can re-verify them. For example:

    tpautoconf -verify ndmp_host_name

A successful verification looks like the following:

Connecting to host "stripes" as user "root"...
Waiting for connect notification message...
Opening session--attempting with NDMP protocol version 4...
Opening session--successful with NDMP protocol version 4
    host supports MD5 authentication
Getting MD5 challenge from host...
Logging in using MD5 method...
Host info is:
    host name "stripes"
    os type "NetApp"
    os version "NetApp Release 7.0.0.1"
    host id "0033625811"
Login was successful
Host supports LOCAL backup/restore
Host supports 3-way backup/restore

Adding NDMP storage units

On the NetBackup master server, add an NDMP-type storage unit for the devices that contain the backup data. Most of the requirements are the same as for adding a Media Manager storage unit. The following explains how to add an NDMP storage unit.
See the *NetBackup Administrator’s Guide, Volume I*, for more information on storage units.

NDMP-type storage units are not used for backups to devices that are attached to NetBackup media servers. Use a non-NDMP storage unit instead.

See the topic on remote NDMP.

**To add NDMP storage units**

1. In the NetBackup Administration Console, select **NetBackup Management > Storage**.
2. On the Actions menu, select **New > Storage Unit**.
3. In the New Storage Unit dialog box, enter the following:

   - **Storage unit name**: Enter a unique name for the storage unit.
   - **Storage unit type**: Select **NDMP**.
   - **On demand only**: This option specifies whether the storage unit is available only when a policy or schedule specifically requests it. If this option is not used, the storage unit is available to any NDMP policy or schedule.
   - **Storage Device**: Select the type of device for this storage unit.
   - **Media server**: Select the media server associated with this storage unit.
   - **Maximum concurrent write drives**: Select the maximum number of drives for concurrent writing.
   - **Reduce fragment size to**: Enter the minimum fragment size for this storage unit.
   - **Enable multiplexing**: Select this item to enable NDMP multiplexing.
   - **Maximum streams per drive**: Select the maximum number of data streams to use with NDMP multiplexing.

   **Note**: You must select at least two data streams.

The remaining fields are described in the *NetBackup Administrator’s Guide, Volume I*.

**About creating an NDMP policy**

On the NetBackup master server, you must create an NDMP policy to configure backups of the NDMP host.
Note: You can use the Backup Policy Configuration wizard to create NDMP policies.

Creating an NDMP policy is very similar to creating other NetBackup policy types. The following topics explain the differences when creating NDMP policies.

See the NetBackup Administrator’s Guide, Volume I, for more information on NetBackup policies and the Policy utility.

To configure a policy for the NAS_Snapshot method, see the NetBackup Snapshot Client Administrator’s Guide.

Attributes

The following policy attributes are required:

Policy Type: NDMP  Do not select any other policy type.

Policy Storage Unit

■ To direct backups for this policy to a specific storage unit if the NDMP host has multiple storage units, specify that storage unit name.
■ For a three-way backup, specify a storage unit that was defined for the target NDMP host with attached tape.
■ For NDMP backup to Media Manager storage units: specify a Media Manager storage unit that is defined for a device that is connected to a NetBackup media server.

See the topic on remote NDMP.

Schedules

In the schedules list under the attributes tab, the following is optional for each schedule in an NDMP policy but is required for NDMP multiplexing:

Media multiplexing  This value must be set to a number greater than one.

Clients

In the client list, the following are required for each client in an NDMP policy:

Hostname  Name of the NDMP host

Hardware and operating system  NDMP NDMP
Files (Backup Selections)

The Backup Selections list must specify directories from the perspective of the NDMP host.

Two examples:

/home/dir1/
/vol1

The following Backup Selections capabilities are NOT supported for an NDMP policy:

- Wildcards in pathnames. For example, /home/* is an invalid entry.
- Individual file names. Only directory or volume names are allowed.
- Exclude list (because client software is not installed on the NDMP host). You can, however, exclude files by using the `SET` keyword.

See “About environment variables in the Backup Selections list” on page 50.

The `SET` option allows you to exclude files on a backup. The format is vendor dependent; refer to the vendor’s documentation for more details on which variable can be passed and in what format.

About environment variables in the Backup Selections list

NDMP allows you to use environment variables to pass configuration parameters to an NDMP host with each backup. NDMP environment variables can be one of the following types:

- Defined as optional by the NDMP protocol specification.
  You can set these variables.

- Specific to an NDMP host vendor.
  You can set these variables.

- Reserved for use by NetBackup:
  FILESYSTEM
  LEVEL
  DIRECT
  EXTRACT
  ACL_START

In NetBackup, environment variables can be set within the Backup Selections list by specifying one or more `SET` directives.
Note: In the Backup Selections list, the SET directive must be the first in the list, followed by the file systems or volumes to back up.

To obtain up-to-date information on environment variables relating to particular NAS vendors, refer to the following:

See “NDMP information on the Web” on page 32.

In general, the syntax of a SET directive is as follows:

```
SET variable = value
```

Where variable is the name of the environment variable and value is the value that is assigned to it. The value can be enclosed in single or double quotes, and must be enclosed in quotes if it contains a space character. For example:

```
SET ABC = 22
SET DEF = "hello there"
SET type = tar
```

Setting a variable equal to no value unsets that variable. For example:

```
SET ABC =
```

Variables accumulate as the Backup Selections list is processed. For example, if Backup Selections contains the following entries:

```
/vol/vol1
SET HIST = N
/vol/vol2
SET DEF = 20
SET SAMPLE = all
/vol/vol3
```

Directory /vol/vol1 is backed up without any user-specified environment variables. The second directory (/vol/vol2) is backed up with the variable HIST set to N. The third directory (/vol/vol3) is backed up with all three of the environment variables set.

If an environment variable appears again later in the list, the value of this variable overrides the previous value of the variable.

The values that each backup uses are saved and provided to subsequent restores of the directory. The NDMP host may have some environment variables that are set internally and these are also saved for restores.
Schedules

You can specify any of the following backup types in a schedule for an NDMP policy:

- Full
- Cumulative Incremental
- Differential Incremental

Specify **Override policy storage unit** only in the following situation: this client of NetBackup (the NDMP host) has more than one storage unit and you want to use a specific storage unit for this schedule. In this case, the client must be the only client in this NDMP policy.

About enabling or disabling DAR

By default, NetBackup for NDMP is configured to use Direct Access Recovery (DAR) when restoring files or directories. DAR is used somewhat differently for file restore than for directory restore, as follows:

- For each restore of files (not of directories), NetBackup automatically determines if the use of DAR speeds up the restore. NetBackup uses DAR only when it results in a faster restore.

- For restore of directories, by default DAR is always used when restoring a subdirectory but never used when restoring the directory containing an entire image. For example, if `/vol/vol0` contains the entire image, and `/vol/vol0/dirl` is a subdirectory, DAR is used by default when restoring `/vol/vol0/dirl`. But it is not used when restoring `/vol/vol0`.

For restore of subdirectories, NetBackup does not attempt to gauge the effectiveness of using DAR. Unless DAR is manually disabled, NetBackup always uses DAR when restoring subdirectories.

See “**Disabling DAR for file and directory restores**” on page 52.

It may be necessary to disable DAR in the following situation: you have problems with DAR and your NDMP host is an older machine or is not running the latest NAS OS version.

Disabling DAR for file and directory restores

This procedure disables DAR for both file and directory restores, for all NDMP policies.
To disable DAR
1. In the NetBackup Administration Console, expand **Host Properties** and click **Master Servers** or **Media Servers**.
2. Right-click the name of the server and select **Properties**.
3. Click **General Server**.
4. Uncheck the **Use direct access recovery for NDMP restores** box and click **Apply**.
   This action disables DAR on all NDMP restores.

Disabling DAR for directory restores only
This procedure disables DAR for directory restores only. It leaves DAR enabled for individual file restore.

To disable DAR on restores of directories only, for all NDMP policies
1. Enter the string **NDMP_DAR_DIRECTORY_DISABLED** in the following file:
   ```
   /usr/openv/netbackup/db/config/ndmp.cfg
   ```
2. To re-enable directory DAR, remove (or comment out) the **NDMP_DAR_DIRECTORY_DISABLED** string from the *ndmp.cfg* file.

Setting up clustering
Before configuring NetBackup for NDMP for clustering, the following must be installed on each node of the cluster:

- The NetBackup server
  See the *NetBackup Installation Guide*.
- NetBackup for NDMP software.
  See “Installation prerequisites” on page 35.
  For Windows servers, only the NetBackup for NDMP licence key has to be installed.

To setup clustering
1. Configure NDMP-attached robots and drives. Then configure storage units and policies as in a normal, non-clustered environment:
   - You can use the Device Configuration wizard, or configure devices manually.
     See “Authorizing access to the NDMP host” on page 40.
To use the same robotic libraries throughout a cluster, robot numbers must be consistent. The Device Configuration wizard attempts to ensure this configuration. If you configure robots manually, be sure to use the same robot number for a given robot, from one host to another in the cluster.

2 When you finish configuring devices and policies for NetBackup for NDMP, fail-over to the next node in the cluster and configure the drives and robots. Select the same robot number that you used when configuring the robot for the first node.

Post-installation changes

After NetBackup is configured in a clustered environment, most configuration information is available to all nodes in the cluster. The information is available by means of a shared hard drive. However, if you make changes in the Host Properties area of the Administration Console, they are not available on the shared drive. Such changes apply only to the active node. You must manually duplicate on each node any Host Properties changes that are made on the active node. This action lets NetBackup perform exactly the same way in case of failover to another node.

Refer to the *NetBackup High Availability Guide* for assistance.

Testing an NDMP configuration

To test the configuration, run the backup and then restore some files. See the following topics:

- See “Performing a manual backup of an NDMP policy” on page 73.
- See “Performing a restore from the server” on page 74.
- See “Sources of information” on page 77.
Configuring NDMP backup to NetBackup media servers (remote NDMP)

This chapter includes the following topics:

■ About remote NDMP
■ Configuring NDMP backup to Media Manager storage units

About remote NDMP

This chapter describes how to configure NetBackup for NDMP to make backups to Media Manager storage units (remote NDMP). Only NDMP-specific steps are described.

Using remote NDMP, you can back up NDMP data to a configured drive in a Media Manager storage unit on a NetBackup media server. The drive can be used for both NDMP backups and for non-NDMP backups.

An added feature to remote NDMP is NDMP multiplexing. NDMP multiplexing works with remote NDMP. It concurrently writes multiple backup streams to the same storage device from the same client or different clients.
Configuring NDMP backup to Media Manager storage units

This section describes how to configure NDMP backups to Media Manager storage units.

**To configure NDMP backups to Media Manager storage units**

1. Authorize the NetBackup server to access the NDMP hosts you want to back up.

   Do the following on the master server (not media server) if you plan to create snapshots using the Snapshot Client NAS_Snapshot method:

   - Under Media and Device Management > Credentials, click on NDMP Hosts. Under Actions, choose New > NDMP Host to display the NDMP Host dialog box.
   - Fill in the values.
     See “Authorizing access to the NDMP host” on page 40.
   - Repeat the above for each NDMP host that the NetBackup server backs up.

2. Use the NetBackup Device Configuration wizard to configure the drive(s) and robot(s).

   Note the following:
Do not use the "Configuring NDMP backup to NDMP-attached devices" topic in this guide. Configure the robots and drives as ordinary NetBackup devices, not as NDMP-attached devices. See the *NetBackup Administrator’s Guide, Volume I*.

Drives can be shared using the Shared Storage Option (SSO) of NetBackup. The drives can be shared as both NDMP drives and non NDMP drives. See “About the Shared Storage Option (SSO)” on page 67.

3 Create a Media Manager storage unit for the drive(s). The storage unit type must be Media Manager, not NDMP.

   Note the following for NDMP multiplexing:

   ■ Select the **Enable Multiplexing** item on the **New Storage Unit** menu.

   ■ Set the **Maximum streams per drive** entry to a value greater than one.

   For details on storage units, refer to the *NetBackup Administrator’s Guide, Volume I*.

4 Create an NDMP-type policy. On the New/Change Policy display, be sure to specify the storage unit that was created in the previous step.

   Note the following for NDMP multiplexing:

   ■ Set the **Media multiplexing** attribute on the **Add New Schedule** menu to a value greater than one.
Configuring NDMP backup to NetBackup media servers (remote NDMP)

Configuring NDMP backup to Media Manager storage units
Configuring NDMP direct copy

This chapter includes the following topics:

- About NDMP direct copy
- How to configure NDMP direct copy
- Using NDMP direct copy

About NDMP direct copy

NDMP direct copy can operate in the following environments:

- A NetBackup media server that is connected to a VTL that has access to a physical tape library. The steps for configuring NDMP direct copy are described in this chapter.

- A NetBackup for NDMP server that is connected to an NDMP host that has access to a tape library (no VTL). This NDMP backup environment is described in other chapters of this guide. In this environment, no additional configuration is required for NDMP direct copy.

If your NDMP host and storage devices are correctly configured, NetBackup uses NDMP direct copy when you duplicate an NDMP backup that NetBackup had created.

Notes and limitations

See “NDMP direct copy: notes and limitations” on page 31.
Prerequisites

Note the following prerequisites:

■ If your environment includes a VTL, the VTL must be installed and set up according to the vendor’s instructions. The NetBackup Virtual Tape Option license(s) are required. The Virtual Tape Option license enables NDMP direct copy functionality.

■ The VTL must have the NDMP capabilities needed to support NDMP direct copy.

■ To make direct copies from one NDMP tape drive to another (no VTL), the NetBackup for NDMP license is required.

How to configure NDMP direct copy

Use the following procedure.

To configure NDMP direct copy from backups that were made to a VTL

1 Configure the VTL as an NDMP host. You can use the Device Configuration Wizard, as follows.
   ■ On the Device Hosts dialog box of the wizard, choose the device host, then click Change.
   ■ In the Change Device Host dialog box, select NDMP server and click OK.
   ■ Click Next. The VTL appears in the NDMP Host column of the NDMP Hosts dialog.
      See “Using the Device Configuration Wizard” on page 69.

2 Authorize NetBackup access to the VTL. Note that the VTL emulates an NDMP host.
   See “Authorizing access to the NDMP host” on page 40.

3 Configure the VTL as a robot, then configure one or more tape drives in a Media Manager storage unit.

   You can use the NetBackup Device Configuration wizard. Additional help configuring devices and Media Manager storage units is also available.
   See the *NetBackup Administrator’s Guide Volume I*. 
4 Configure one or more tape drives in the VTL as Network Attached Storage devices, and create one or more NDMP storage units for the drives.

See “Adding a drive” on page 44.

See “Adding NDMP storage units” on page 47.

The drives can be the same as those that were selected in the previous step. NetBackup supports sharing of drives among media servers and NDMP hosts.

5 Configure one or more NDMP tape drives in the physical tape library, and add the drives to NDMP storage units. Use the same procedures as those mentioned in the previous step.

You can also use these drives in Media Manager storage units, if they are shared on a SAN.

**Using NDMP direct copy**

NetBackup uses NDMP direct copy when you duplicate a backup image. To run a duplication, you can use any of the following:

- The Duplicate option in the Catalog node of the NetBackup Administration Console.
  See “Initiate NDMP direct copy with the Administration Console” on page 62.

- NetBackup Vault.
  Refer to the *NetBackup Vault Administrator’s Guide.*

- The bpduplicate command.
  Refer to the *NetBackup Commands Guide.*

**Requirements**

For NetBackup to use NDMP direct copy when you duplicate an image, note the following:

- For the destination for the duplication, you must designate an NDMP storage unit in a VTL or in a physical tape library.

- An NDMP tape drive must be available to mount the source image. The NDMP tape drive can be one that was defined in the VTL, or it can be a physical tape drive in a tape library.

Setup instructions are available.

See “About NDMP direct copy” on page 59.
If these two requirements are met, NDMP direct copy is enabled. NetBackup copies the image directly to the designated storage unit without using media server I/O or network bandwidth.

**NetBackup policy type**

You can duplicate an image that any NetBackup policy created; the policy need not be an NDMP policy.

See “NDMP direct copy: notes and limitations” on page 31.

The backup can be made to a storage unit in the VTL or to a storage device that is attached to an NDMP host. You can then copy the backup directly to a tape drive using the NetBackup Duplicate feature, as follows.

**Initiate NDMP direct copy with the Administration Console**

Use the following procedure.

**To initiate NDMP direct copy**

1. In the NetBackup Administration Console, expand **NetBackup Management > Catalog**.
2. Set up the search criteria for the image you want to duplicate. Click **Search Now**.
3. Right-click the image(s) you want to duplicate and select **Duplicate** from the shortcut menu.

You must designate an NDMP storage unit as the destination for the duplication. Use the **Storage unit** field in the Setup Duplication Variables dialog box.

See "Duplicating backup images" in the *NetBackup Administrator’s Guide, Volume I*. 
Remote NDMP and disk devices

This chapter includes the following topics:

- About remote NDMP and disk devices
- Configuring remote NDMP

About remote NDMP and disk devices

The remote NDMP feature of NetBackup involves backing up NAS data (Network Attached Storage) to a storage device configured on a NetBackup media server. The NetBackup 6.5.2 release added support for disk devices on the media server.

Figure 6-1 shows the main components for NDMP backup to disk storage.
Figure 6-1 NDMP backup to a storage unit on media server (remote NDMP)

LAN / WAN

NetBackup for NDMP media server

NetBackup drives in disk storage units or Media Manager storage units (tape).

NDMP hosts (NAS filers) ...

Backup data travels from NDMP hosts to a disk or tape drive attached to a NetBackup media server or on a SAN.

NOTE: The NetBackup drive(s) need not be dedicated to NDMP backups: they can be used for non-NDMP backups as well.

Configuring remote NDMP

This topic describes how to configure NetBackup to make backups to either disk or tape storage units attached to a NetBackup media server. Only NDMP-specific steps are described.

To configure NDMP backups to disk or tape storage units

1. Authorize the NetBackup server to access the NDMP hosts you want to back up.

   Do the following on the NetBackup media server:

   - Under Media and Device Management > Credentials, click on NDMP Hosts. Under Actions, choose New > NDMP Host to display the NDMP Host dialog box.

   - Enter the name of the NDMP server (NAS filer) to back up. This NDMP host name is case sensitive.
Repeat the above for each NDMP host that the NetBackup server backs up.

If you plan to create snapshots using the Snapshot Client NAS_Snapshot method, do the above on the master server (not on the media server).

2 Use the NetBackup Device Configuration wizard to configure devices for remote NDMP (disks, or tape drives and robots, on the media server).

Note the following:

- Do not use the device configuration procedure in the “Configuring NDMP backup to NDMP-attached devices” section of the *NetBackup for NDMP Guide*. Rather, configure the disk, or robots and drives, in the same way as ordinary NetBackup devices. See the *NetBackup Administrator’s Guide, Volume I*.

- Tape drives can be shared using the Shared Storage Option (SSO) of NetBackup. The drives can be shared as both NDMP drives and non NDMP drives. See “Using the Shared Storage Option (SSO)” chapter of the *NetBackup for NDMP Guide*.

3 Create a disk or Media Manager storage unit for the drive(s). The storage unit type must be Disk or Media Manager, not NDMP.

For details on storage units, refer to the *NetBackup Administrator’s Guide, Volume I*.

4 Create an NDMP-type policy. On the New/Change Policy display, be sure to specify the storage unit that was created at

See “Creating an NDMP policy” in the *NetBackup for NDMP Guide*. 
Remote NDMP and disk devices

Configuring remote NDMP
Using the Shared Storage Option (SSO)

This chapter includes the following topics:

- About the Shared Storage Option (SSO)
- Setting up SSO: overview
- Using the Device Configuration Wizard

About the Shared Storage Option (SSO)

Figure 7-1 shows a robotic library on a SAN that can share its drives between two NetBackup for NDMP servers and two NDMP hosts. Drive sharing requires a license for the Shared Storage Option. A SAN is not required.
Using the Shared Storage Option (SSO)

**Setting up SSO: overview**

This overview includes an outline of the steps for setting up access to a drive that is shared between NDMP and NetBackup servers.

For a more complete discussion of SSO, refer to the *NetBackup Shared Storage Guide*.

This procedure assumes the following:

- That the prerequisites for SSO have been met, as described in the *NetBackup Shared Storage Guide*.
- That all physical devices, including the NDMP host, are correctly connected to the network.
- That NetBackup for NDMP supports the NDMP host.

A document that lists supported NAS systems is available. See “NDMP information on the Web” on page 32.

The NetBackup NDMP Compatibility List indicates which versions of vendor software support SSO for NDMP. The NAS systems (hardware) do not provide the support; the proper software version provides it.
To set up an SSO

1. Configure NetBackup access to the NDMP host.
   
   See “Authorizing access to the NDMP host” on page 40.

2. Verify that the NDMP host can access the required robots and drives.
   
   To verify NDMP host access to the required devices, run the following commands on a NetBackup media server that is authorized to access the host:

   ```
   tpautoconf -verify ndmp_host_name
   tpautoconf -probe ndmp_host_name
   ```

   The `--verify` option verifies that the NetBackup server can access the NDMP host. The `--probe` option lists the devices that are visible to the NDMP host.

3. From the NetBackup Administration Console, use the Device Configuration Wizard to configure the devices and storage units.
   
   See “Using the Device Configuration Wizard” on page 69.

   An NDMP storage unit must be defined for each NDMP host that shares a drive. If all hosts have access to the shared drive(s), the Device Configuration Wizard can create these storage units automatically.

---

**Using the Device Configuration Wizard**

The most convenient way to configure devices and storage units for NDMP hosts (with or without SSO) is to use the Device Configuration Wizard.
To use the Device Configuration wizard

1. In the NetBackup Administration Console, click Configure Storage Devices to launch the Device Configuration Wizard.

2. Click Next on the Welcome screen. The Device Hosts screen appears.

3. Under Device Hosts, place a check beside the NetBackup media server that accesses the NDMP host.

4. Click the server name to select it and click Change.
5 In the Change Device Host screen, place a check beside **NDMP server**.

6 Click **OK**.

7 In the Device Hosts screen, "NDMP" is now listed in the **Optional Devices to be Scanned** column for the media server.

8 Click **Next** to continue.
9 In the NDMP Hosts screen that shows the NDMP host(s) where you can configure devices, click **Next** to configure the NDMP-attached devices.

10 Follow the screens in the wizard to complete the configuration.
Backup and restore procedures

This chapter includes the following topics:

- About NDMP backup
- Automatic backup of an NDMP policy
- Performing a manual backup of an NDMP policy
- Performing a restore from the server

About NDMP backup

Only the administrator can perform NDMP backups and restores on the NetBackup server (master or media). The NDMP protocol does not allow users to initiate a backup or restore; no NetBackup client software is installed on an NDMP host.

Automatic backup of an NDMP policy

Information is available to help you configure an NDMP policy and set up schedules for automatic, unattended backups.

See the *NetBackup Administrator’s Guide, Volume I*.

Performing a manual backup of an NDMP policy

Only a NetBackup administrator can initiate an NDMP backup. The following procedure explains how to perform the backup using the NetBackup Administration Console.
For further information on the NetBackup Administration Console, see the *NetBackup Administrator’s Guide, Volume I*.

**To back up an NDMP policy manually**

1. As administrator, start the NetBackup Administration Console on the NetBackup server in the following way:
   
   On Windows: on the Windows *Start* menu, click **Programs > Symantec NetBackup > NetBackup Administration Console**.
   
   On UNIX, enter the following:
   
   `/usr/openv/netbackup/bin/jnbSA &`
   
2. Click **Policies**.
3. Right-click the NDMP policy name and select **Manual Backup** from the pop-up menu.
4. In the Manual Backup dialog box, select a schedule and then select the clients (NDMP hosts) that you want to back up.
   
   If you do not select any schedules, NetBackup uses the schedule with the highest retention level. If you do not select any clients, NetBackup backs up all configured NDMP hosts.
5. Click **OK** to start the backup.

**Performing a restore from the server**

User-directed restores of files are not allowed, because no NetBackup client software is installed on an NDMP host.

The administrator can use the Backup, Archive, and Restore interface on a NetBackup server (master or media server) to restore files to the following: the NDMP host from which they were backed up or to a different NDMP host.

For help with the restore procedure, see the NetBackup online help in the Administration Console or the *NetBackup Backup, Archive, and Restore Getting Started Guide*. 
To set up the Specify NetBackup Machines and Policy Type dialog for a restore

1  In the Backup, Archive, and Restore interface on a NetBackup server, click Actions > Specify NetBackup Machines and Policy Type.

2  For the server, select the NetBackup master server.

   If your configuration has multiple master servers, specify the master server that has the policy for the NDMP host that you plan to restore. If the server name is not in the pull-down list, use Edit Server List to add it.

3  For the source and destination clients, select the appropriate NDMP (NAS) hosts.

   The destination host must be an NDMP host compatible with the data format of the source. (The source and destination must be of the same NAS vendor type.)

   Warning: An NDMP restore always overwrites existing files.

   If the hosts you want are not available in the pull-down, use Edit Client List to add the client.

4  In the policy type field, select NDMP.
Performing a restore from the server
Troubleshooting

This chapter includes the following topics:

■ Sources of information
■ NDMP operating notes and restrictions
■ Notes on DAR
■ Types of logs
■ Using logs
■ Troubleshooting suggestions
■ Troubleshooting media and devices on Windows
■ Troubleshooting media and devices on UNIX
■ Troubleshooting NDMP direct copy
■ Troubleshooting DAR
■ Testing a robot

Sources of information

For explanations of NetBackup status codes, refer to the NetBackup Troubleshooting Guide.

Troubleshooting information is also available about particular NAS vendors.

See “NDMP information on the Web” on page 32.
NDMP operating notes and restrictions

Before you try to troubleshoot a suspected problem, review the following operating notes:

■ A tape that was created on an NDMP storage unit is in backup format. It cannot be restored from a non-NDMP storage unit. If you duplicate an NDMP backup image, the new copy is still in backup format. It cannot be used for restores on a non-NDMP storage unit.

■ In the Backup Selections list for an NDMP policy, you can include only directory paths. Wildcards and individual file names are not allowed.

■ You cannot back up files where the path length is greater than 1024 characters.

■ The NDMP protocol uses port 10000 for communication.

■ On UNIX systems, the NetBackup avrd process uses ICMP (Internet Control Message Protocol) to ping NDMP hosts to verify network connectivity. This protocol is required for the NetBackup for NDMP product.

■ If backup or restore jobs are running slowly, verify that the network interface cards (NIC) are set to full duplex. Half duplex often causes poor performance.

For assistance viewing and resetting duplex mode for a particular NAS host, consult the documentation that the manufacturer provides. You may be able to use the ifconfig (or ipconfig) command, as explained in the NetBackup Troubleshooting Guide.

■ Do not perform incremental backups of the same NDMP data from two different policies. Incremental backups performed by one of the policies may be incomplete, because NDMP filers perform level-based incrementals instead of time-based incrementals. Consider the following example:

**from ET 541829

Policy A does a full backup of /vol/vol1 (level 0).

Policy B then does a full backup of /vol/vol1 (level 0). The filer now considers the policy B backup to be the last full (level 0) backup of /vol/vol1.

Policy A does an incremental backup of /vol/vol1 (level 1). The policy A incremental backup captures only the data that changed since the full backup that was done by policy B. The incremental backup misses any changes that occurred between the policy A full backup and the policy B full backup.
Notes on DAR

Note the following points:

■ DAR can be used when restoring NetBackup 4.5GA or later backups. Starting with NetBackup 4.5GA, NetBackup stores the required DAR offset information on each backup.

■ Backups must have been performed with the NetBackup catalog set to binary mode. If backups were made with the catalog set to ASCII mode, the restores cannot use DAR. ASCII mode did not store the required DAR offset information on each backup. Note that all backups that were made before NetBackup 4.5 used ASCII catalog mode.

---

**Note:** Starting with NetBackup 6.0, all backups are in binary mode.

■ To use DAR with NetBackup, the NDMP host you want to restore must support DAR. Some NDMP host vendors do not currently support DAR.

Types of logs

NetBackup uses two types of logging: unified logging and legacy logging. Both are described in the "Using Logs and Reports" chapter in the *NetBackup Troubleshooting Guide*.

Note the following:

■ All unified logs are written to /usr/openv/logs (UNIX) or install_path\logs (Windows). Unlike legacy logging, you do not need to create logging directories.

■ Use the vxlogview command to examine unified logs (see examples in the next section):
  On UNIX: /usr/openv/netbackup/bin/vxlogview
  On Windows: install_path\NetBackup\bin\vxlogview

Refer to the *NetBackup Troubleshooting Guide* for assistance in using the vxlogview command.

See also the vxlogview man page or the *NetBackup Commands Guide*.

Using logs

The following procedure describes how to use NetBackup logs.
**Note:** The legacy and unified logging files can consume a lot of disk space. Delete the log files when you are finished and set logging to a lower level of detail.

**To use the NetBackup logs**

1. In the NetBackup Administration Console: expand **Host Properties** in the left pane, click on **Media Server**, and right click on the server name in the right pane.

2. From the pop-up, select **Properties**, then click **Logging** and set the **Global logging level** to 5.

   This increases logging detail to the highest level, for both unified logging and legacy logging.

3. View the unified logging information in `/usr/openv/logs` (UNIX) or `install_path\logs` (Windows) for the following processes:

   - ndmpagent (originator ID 134)
   - ndmp (originator ID 151)
   - nbpem (originator ID 116)
   - nbjm (originator ID 117)
   - nbrb (originator ID 118)

4. For ndmpagent logs, try the vxlogview command as follows:

   ```
   /usr/openv/netbackup/bin/vxlogview -I ndmpagent -d T,s,x,p
   ```

5. For ndmp logs, try the vxlogview command as follows:

   ```
   /usr/openv/netbackup/bin/vxlogview -I ndmp -d T,s,x,p
   ```

6. On the NetBackup for NDMP server, create bptm, bpbrm, and ndmpagent legacy debug log folders in the `/usr/openv/netbackup/logs` directory (UNIX) or `install_path\NetBackup\logs` folder (Windows).

   NetBackup writes legacy log files in these directories, if the directories exist.

---

**Troubleshooting suggestions**

Try the following:

- Check the NetBackup All Log Entries report for information about the failed job.
To verify that the appropriate services are running, use one of the following:
the NetBackup Activity Monitor, the Windows control panel (on Windows systems), or the `bpps` command (UNIX systems).

If NDMP host backups terminate with a status code of 154 (storage unit characteristics mismatch requests), the problem may be one of the following:

- Verify that the NetBackup configuration is correct.
- There may be a conflict between the policy type and storage unit type. (For example, if the policy type is Standard and the storage unit is of type NDMP.)

If your NDMP backup fails with a status code of 99 (NDMP backup failure), no paths in your NDMP policy Backup Selections list were backed up. Check the NetBackup All Log Entries report for more information. A possible cause of this status is that none of the backup paths exist on the NDMP host.

---

**NDMP backup levels**

At the start of a debug log, you may see an entry titled `LEVEL`. This entry refers to an environment variable that NetBackup set based on the type of backup. Here is an example from a `bptm` log:

```
08:48:38.816 [22923] <2> write_data_ndmp: backup environment values:
08:48:38.816 [22923] <2> write_data_ndmp: Environment 1: TYPE=dump
08:48:38.816 [22923] <2> write_data_ndmp: Environment 2: FILESYSTEM=/vol/vol0/2million
08:48:38.817 [22923] <2> write_data_ndmp: Environment 3: PREFIX=/vol/vol0/2million
08:48:38.817 [22923] <2> write_data_ndmp: Environment 4: LEVEL=0
```

The NDMP backup level is modeled after UNIX dump levels. The backup level is a number in the range of 0 to 9.

An NDMP backup level of 0 is a full backup. A backup level greater than 0 is an incremental backup of all objects that were modified since the last backup of a lower level. For example, level 1 is a backup of all objects that were modified since the full backup (level 0). Level 3 is a backup of all objects that were modified since the last level 2 incremental.

<table>
<thead>
<tr>
<th>NetBackup backup types</th>
<th>NDMP backup levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetBackup Full</td>
<td>NDMP level 0</td>
</tr>
</tbody>
</table>
Table 9-1: NetBackup backup types and corresponding NDMP backup levels (continued)

<table>
<thead>
<tr>
<th>NetBackup backup types</th>
<th>NDMP backup levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetBackup Cumulative Incremental</td>
<td>NDMP level 1</td>
</tr>
<tr>
<td>NetBackup Differential Incremental</td>
<td>NDMP level (last level + 1, up to 9) never goes higher than 9</td>
</tr>
</tbody>
</table>

More information is available on environment variables. See “About environment variables in the Backup Selections list” on page 50.

Troubleshooting media and devices on Windows

Try the following:

- For legacy logging, enable debug logging by creating `reqlib` and `daemon` directories in the `install_path\Volmgr\debug` directory on the NetBackup for NDMP server.
- Check the Windows Event Viewer Application log for troubleshooting clues. For more information on the Event Viewer logging option, refer to the NetBackup Troubleshooting Guide.
- Use the Activity Monitor interface or the Windows control panel to verify that the Media and Device Management services are running.
- Drives can be unexpectedly set to the DOWN state. This action is due to communication problems between `avrd` on the NetBackup for NDMP server and the NDMP server application on the NDMP host. Some possible causes for the communication problems are:
  - Network cable on the NDMP host was unplugged.
  - NIS (Network Information System) problems on the NetBackup for NDMP server (NDMP client).
  - The NDMP host was halted for too long.

Note: Whatever the cause, if the `avrd` connection to the NDMP host fails, the drive is set to DOWN. It is not automatically set to UP when the communication problem is corrected.
Troubleshooting media and devices on UNIX

Try the following:

■ Ensure that `syslogd` logs debug messages relating to `ltid` and other device processes.
  For more information on `syslogd`, refer to the *NetBackup Troubleshooting Guide*.

■ Start `ltid` with the `-v` option. Check the system’s syslog for troubleshooting clues.

■ Use `vmps` to make sure that the appropriate daemons are running.

■ Drives can be unexpectedly set to the DOWN state. This action is due to communication problems between `avrd` on the NetBackup for NDMP server and the NDMP server application on the NDMP host.
  Further details are available.
  See “Troubleshooting media and devices on Windows” on page 82.

Troubleshooting NDMP direct copy

When NetBackup enables NDMP direct copy for a backup image duplication, the NetBackup progress log includes the message "NDMP Direct Copy will be used."
If NDMP direct copy was not enabled for the duplication, no specific messages about NDMP direct copy are listed in the progress log. For detailed messages (such as why NDMP direct copy was not used), consult the legacy debug logs for the admin log or the bptm log.

Refer to the *NetBackup Troubleshooting Guide* for information on legacy NetBackup logs.

Troubleshooting DAR

Table 9-2 lists messages that may appear in the unified logs for ndmpagent (originator ID 134) on the NetBackup media server. These messages are also written to the progress log.
<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAR disabled - number of files $n &gt; x$</td>
<td>The number of files being restored is greater than the maximum that is allowed (default is 1024). You can either select fewer files for the restore, or increase the DAR maximum Backup Selections list count. (Some NDMP host vendors do not support increasing the maximum.) To increase the DAR maximum Backup Selections list count, place a &quot;DAR_MAXIMUM_FILE_LIST_COUNT $x$&quot; entry in the following file. Specify $x$ as a number greater than 1024. On UNIX: /usr/openv/netbackup/db/config/ndmp.cfg On Windows: install_path\NetBackup\db\config\ndmp.cfg</td>
</tr>
<tr>
<td>DAR disabled - data host does not support DAR recovery</td>
<td>The current NDMP host does not support DAR.</td>
</tr>
<tr>
<td>DAR disabled—continuing restore without DAR</td>
<td>DAR information is not available for the file.</td>
</tr>
<tr>
<td>DAR disabled—backup was performed before NB 4.5</td>
<td>The DAR feature can be used when restoring the backups that NetBackup 4.5GA or later made. Starting with NetBackup 4.5GA, NetBackup stores the required DAR offset information on each backup. For pre-4.5GA NetBackup backups, restores cannot use DAR because the pre-4.5 versions did not store DAR offset information.</td>
</tr>
<tr>
<td>DAR disabled—NDMP host did not provide DAR info during backup</td>
<td>The backup was performed with an NDMP host version that does not support DAR. Ask the NDMP host vendor if a later NAS software version is available that supports DAR.</td>
</tr>
<tr>
<td>DAR disabled—Exceeded optimal DAR parameters for this image size</td>
<td>NetBackup determined that the restore would take longer with DAR than without it.</td>
</tr>
<tr>
<td>DAR disabled—Directory DAR not supported</td>
<td>DAR is automatically disabled when a restore job specifies a directory to restore. DAR can be used when restoring files, but not when restoring directories.</td>
</tr>
</tbody>
</table>
Table 9-2  DAR log messages (continued)

<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| DAR disabled by DAR config file              | **Not needed, acc to Phil G.**
| DAR disabled by host parameters              | DAR was disabled on the Master or Media Server Properties dialog box. See “About enabling or disabling DAR” on page 52. |

Testing a robot

Depending on the type of robot, use the tests in Table 9-3 to exercise the robot.

Table 9-3  Robot types and tests

<table>
<thead>
<tr>
<th>Robot type</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLD</td>
<td>tldtest</td>
</tr>
<tr>
<td>TL8</td>
<td>tl8test</td>
</tr>
<tr>
<td>TLH</td>
<td>tlhtest</td>
</tr>
<tr>
<td>ACS</td>
<td>acstest</td>
</tr>
</tbody>
</table>

TL8 example for Windows

To exercise the TL8 robot `c2t310` that the NDMP host stripes controls, use the following test and commands on Windows:
Note: The drive must be down before you perform this test, or avrd may interfere.

install_path\Volmgr\bin\tl8test -r stripes:c2t3l0 -d1 stripes:/dev/RMT/0cbn

At the prompt, enter ? for help information.

inquiry (Displays the vendor and product ID. If you get a UNIT ATTENTION message, try the mode command and then continue your testing.)

s s (Checks slot status.)

s d (Checks drive status.)

m s3 d1 (Moves a tape from slot 3 to drive 1.)

m d1 s3 (Moves the tape back to slot 3.)

TLD example for UNIX

To exercise drive 1 in the TLD robot c2t3l0 the NDMP host stripes controls, use the following commands on UNIX:

/usr/openv/volmgr/bin/tldtest -r stripes:c2t3l0 -d1 stripes:/dev/RMT/0cbn

At the prompt, enter ? for help information.

inquiry (Displays the Vendor and Product ID. If you get a UNIT ATTENTION message, try the mode command and then continue your testing.)

s s (Checks slot status.)

s d (Checks drive status.)

m s3 d1 (Moves a tape from slot 3 to drive 1.)

unload d1 (Unloads the tape.)

m d1 s3 (Moves the tape back to slot 3.)

TLH example for UNIX

To exercise drive 1 in a TLH robot, use the following command on UNIX:

/usr/openv/volmgr/bin/tlhtest -r /dev/lmcp0 -d1 stripes:/dev/RMT/0cbn

Note that a TLH robot cannot attach directly to the NDMP host; only a TLH drive can directly attach to the NDMP host.

At the prompt, enter ? for help information.

inv (Inventories the robot.)
drstat *(Shows drive status.)*

m media_id drive_name *(Moves specified media to the specified drive.)*

dm drive_name *(Dismounts the tape.)*

unload drive_name *(Unloads the tape.)*
Using scripts

This chapter includes the following topics:

- About scripts
- ndmp_start_notify (UNIX)
- ndmp_start_notify.cmd (Microsoft Windows)
- ndmp_end_notify (UNIX)
- ndmp_end_notify.cmd (Microsoft Windows)
- ndmp_start_path_notify (UNIX)
- ndmp_start_path_notify.cmd (Microsoft Windows)
- ndmp_end_path_notify (UNIX)
- ndmp_end_path_notify.cmd (Microsoft Windows)
- ndmp_moving_path_notify (UNIX)
- ndmp_moving_path_notify.cmd (Microsoft Windows)

About scripts

This topic explains how to customize the NDMP-specific notify scripts.

NetBackup for NDMP provides the following scripts (commands on Windows) for collecting information and providing notification of events.

<table>
<thead>
<tr>
<th>Table 10-1</th>
<th>Scripts to run on the NetBackup for NDMP server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scripts for UNIX</td>
<td>Scripts for Windows</td>
</tr>
<tr>
<td>ndmp_start_notify</td>
<td>ndmp_start_notify.cmd</td>
</tr>
</tbody>
</table>
Table 10-1  Scripts to run on the NetBackup for NDMP server (continued)

<table>
<thead>
<tr>
<th>Scripts for UNIX</th>
<th>Scripts for Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>ndmp_end_notify</td>
<td>ndmp_end_notify.cmd</td>
</tr>
<tr>
<td>ndmp_start_path_notify</td>
<td>ndmp_start_path_notify.cmd</td>
</tr>
<tr>
<td>ndmp_end_path_notify</td>
<td>ndmp_end_path_notify.cmd</td>
</tr>
<tr>
<td>ndmp_moving_path_notify</td>
<td>ndmp_moving_path_notify.cmd</td>
</tr>
</tbody>
</table>

The scripts are similar to those already included in your NetBackup server installation. To create the scripts on UNIX, copy the `bpstart_notify` and `bpend_notify` scripts from

```
/usr/openv/netbackup/bin/goodies (UNIX)
```

to

```
/usr/openv/netbackup/bin
```

on the NetBackup for NDMP server. Then rename the copied scripts and modify as needed.

On Windows, you must create the scripts from scratch.

**ndmp_start_notify (UNIX)**

The UNIX scripts are provided as examples only. You must customize the scripts before using them. For example, the `-ne` value in the first `if` statement must be modified to reflect the number of passed parameters. For the `ndmp_start_notify` script, the `-ne` value must be set to 5.

On the UNIX media server, NetBackup calls the `ndmp_start_notify` script each time the client starts a backup operation. To use this script, create a script similar to

```
/usr/openv/netbackup/bin/goodies/bpstart_notify
```

on the server, and copy it to

```
/usr/openv/netbackup/bin/ndmp_start_notify
```

on the UNIX NetBackup for NDMP server. Then, modify the script and ensure that you have permission to run it.
Note: Before you use this script, make sure that you can run it by using other on the media server. Run `chmod 755 script_name`, where `script_name` is the name of the script.

The `ndmp_start_notify` script runs each time a backup starts and after the tape has been positioned. This script must exit with a status of 0 for the calling program to continue and for the backup to proceed. A nonzero status causes the client backup to exit with a status of `ndmp_start_notify` failed.

If the `/usr/openv/netbackup/bin/ndmp_start_notify` script exists, it runs in the foreground. The `bptm` process that is on the NetBackup for NDMP server waits for it to complete before continuing. Any commands in the script that do not end with an & character run serially.

The server expects the client to respond with a `continue` message within the period of time that the NetBackup `CLIENT_READ_TIMEOUT` option on the server specifies.

The default for `CLIENT_READ_TIMEOUT` is 300. If the script needs more time than 300 seconds, increase the value to allow more time.

NetBackup passes the following parameters to the script:

<table>
<thead>
<tr>
<th>Table 10-2</th>
<th>Script parameters: ndmp_start_notify (UNIX)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>$1</td>
<td>Name of the NDMP host.</td>
</tr>
<tr>
<td>$2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
| $4 | One of the following:  
| | FULL  
| | INCR (differential incremental)  
| | CINC (cumulative incremental) |
| $5 | The NetBackup status code for the operation. |

For example:

```
ndmp_start_notify freddie cd4000s fulls FULL 0
ndmp_start_notify danr cd4000s incrementals INCR 0
ndmp_start_notify hare cd4000s fulls FULL 0
```
To create an `ndmp_start_notify` script for a specific policy or policy and schedule combination, create script files with a `.policyname` or `.policyname.schedulename` suffix. In the following two examples of script names, the policy is named `production` and the schedule is named `fulls`:

```
/usr/openv/netbackup/bin/ndmp_start_notify.production
/usr/openv/netbackup/bin/ndmp_start_notify.production.fulls
```

The first script affects all scheduled backups in the policy that is named `production`. The second script affects scheduled backups in the policy that is named `production` only when the schedule is named `fulls`.

**Note:** For a given backup, NetBackup uses only one `ndmp_start_notify` script and that is the one with the most specific name. For example, if there are both `ndmp_start_notify.production` and `ndmp_start_notify.production.fulls` scripts, NetBackup uses only `ndmp_start_notify.production.fulls`.

The `ndmp_start_notify` script can use the following environment variables:

- `BACKUPID`
- `UNIXBACKUPTIME`
- `BACKUPTIME`

The NetBackup `bptm` process creates these variables. The following are examples of the strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 1997
```

**ndmp_start_notify.cmd (Microsoft Windows)**

For Windows NetBackup for NDMP media servers, you can create the batch scripts that provide notification whenever the client starts a backup. These scripts must reside on the media server in the following directory:

```
install_path\NetBackup\bin
```

Where `install_path` is the directory where NetBackup is installed.

You can create `ndmp_start_notify` scripts that provide notification for all backups or only for backups of a specific policy or schedule. The `ndmp_start_notify` script runs each time a backup starts and after the tape is positioned.
To create a script that applies to all backups, name the script:

`install_path\netbackup\bin\ndmp_start_notify.cmd`

To create an `ndmp_start_notify` script that applies only to a specific policy or policy and schedule combination, add a `.policyname` or `.policyname.schedulename` suffix to the script name. The following are two examples:

- The following script applies only to a policy named `days`:
  
  `install_path\netbackup\bin\ndmp_start_notify.days.cmd`

- The following script applies only to a schedule that is named `fulls`, which is in a policy named `days`:

  `install_path\netbackup\bin\ndmp_start_notify.days.fulls.cmd`

The first script affects all scheduled backups in the policy named `days`. The second script affects scheduled backups in the policy named `days` only when the schedule is named `fulls`.

For a given backup, NetBackup calls only one `ndmp_start_notify` script and checks for them in the following order:

`ndmp_start_notify.policy.schedule.cmd`
`ndmp_start_notify.policy.cmd`
`ndmp_start_notify.cmd`

For example, if there are both `ndmp_start_notify.policy.cmd` and `ndmp_start_notify.policy.schedule.cmd` scripts, NetBackup uses only the `ndmp_start_notify.policy.schedule.cmd` script.

**Note:** If you also use `ndmp_end_notify` scripts, they can provide a different level of notification than the `ndmp_start_notify` scripts. For example, if you had one of each, they could be `ndmp_start_notify.policy.cmd` and `ndmp_end_notify.policy.schedule.cmd`.

When the backup starts, NetBackup passes the following parameters to the script:

**Table 10-3** Script parameters: `ndmp_start_notify.cmd` (Microsoft Windows)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%1</td>
<td>Name of the client from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
### Table 10-3  
**Script parameters: ndmp_start_notify.cmd (Microsoft Windows) (continued)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>%3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
| %4        | One of the following:  
|           | FULL  
|           | INCR  
|           | CINC  |
| %5        | Status of the operation is always 0 for `bpstart_notify`. |
| %6        | Results file that NetBackup checks for a return code from the script. NetBackup uses %6 to pass the file name and then expects the script to create the file in the same directory as the script.  
If the script applies to a specific policy and schedule, the results file must be named  
`install_path\netbackup\bin\NDMP_START_NOTIFY_RES.policy.schedule`  
If the script applies to a specific policy, the results file must be named  
`install_path\netbackup\bin\NDMP_START_NOTIFY_RES.policy`  
If the script applies to all backups, the results file must be named  
`install_path\netbackup\bin\NDMP_START_NOTIFY_RES`  
An `echo 0> %6` statement is one way for the script to create the file.  
NetBackup deletes the existing results file before it calls the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful. |

The server expects the client to respond with a `continue` message within the period of time that the NetBackup `CLIENT_READ_TIMEOUT` option on the server specifies. The default is 300 seconds. If the script needs more than 300 seconds, increase the value to allow more time.

### ndmp_end_notify (UNIX)

The `ndmp_end_notify` script is run at the end of the backup. The backup does not wait for the script to complete.
Note: Before you use this script, make sure you can run it by using other on the media server. Run chmod 755 script_name, where script_name is the name of the script.

The UNIX scripts are provided as examples only. You must customize the scripts before using them. For example, the -ne value in the first if statement must be modified to reflect the number of passed parameters. For the ndmp_end_notify script, the -ne value must be set to 5.

For a UNIX media server, if you need notification whenever the NDMP host completes a backup, copy

/usr/openv/netbackup/bin/goodies/bpend_notify

from the server, to

/usr/openv/netbackup/bin/ndmp_end_notify

on the UNIX NetBackup for NDMP host. Then, modify the script and ensure that you have permission to run it.

The ndmp_end_notify script runs each time a backup completes.

NetBackup passes the following parameters to the ndmp_end_notify script:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1</td>
<td>Name of the client from the NetBackup catalog.</td>
</tr>
<tr>
<td>$2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$4</td>
<td>One of the following: FULL, INCR (differential incremental), CINC (cumulative incremental)</td>
</tr>
<tr>
<td>$5</td>
<td>Exit code from bptm.</td>
</tr>
</tbody>
</table>

For example:

```
ndmp_end_notify freddie cd4000s fulls FULL 0
ndmp_end_notify danr cd4000s incrementals INCR 73
```
To create an `ndmp_end_notify` script for a specific policy or policy and schedule combination, create script files with a `.policyname` or `.policyname.schedulename` suffix. In the following two examples of script names, the policy is named `production` and the schedule is named `fulls`:

```
/usr/openv/netbackup/bin/ndmp_end_notify.production
/usr/openv/netbackup/bin/ndmp_end_notify.production.fulls
```

The first script affects all scheduled backups in the policy that is named `production`. The second script affects scheduled backups in the policy that is named `production` only when the schedule is named `fulls`.

**Note:** For a given backup, NetBackup uses only one `ndmp_end_notify` script and that is the one with the most specific name. For example, if there are both `ndmp_end_notify.production` and `ndmp_end_notify.production.fulls` scripts, NetBackup uses only `ndmp_end_notify.production.fulls`.

The `ndmp_end_notify` script can use the following environment variables:

- `BACKUPID`
- `UNIXBACKUPTIME`
- `BACKUPTIME`

The NetBackup `bptm` process creates these variables. The following are examples of the strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 1997
```

**ndmp_end_notify.cmd (Microsoft Windows)**

For Windows media servers, you can create the batch scripts that provide notification whenever the client completes a backup. These scripts must reside on the media server in the same directory as the NetBackup binaries:

```
install_path\NetBackup\bin
```

Where `install_path` is the directory where NetBackup is installed.

You can create `ndmp_end_notify` scripts that provide notification for all backups or only for backups of a specific policy or schedule.

To create an `ndmp_end_notify` script that applies to all backups, name the script:
To create a script that applies only to a specific policy or policy and schedule combination, add a .policyname or .policyname.schedulename suffix to the script name. The following are two examples:

- The following script applies only to a policy named days:
  
  \texttt{install\_path\netbackup\bin\ndmp\_end\_notify.\_days.cmd}

- The following script applies only to a schedule that is named fulls, which is in a policy named days:
  
  \texttt{install\_path\netbackup\bin\ndmp\_end\_notify.\_days.\_fulls.cmd}

The first script affects all scheduled backups in the policy named days. The second script affects scheduled backups in the policy named days only when the schedule is named fulls.

For a given backup, NetBackup calls only one \texttt{ndmp\_end\_notify} script and checks for them in the following order:

\texttt{ndmp\_end\_notify.\_policy.\_schedule.\_cmd}
\texttt{ndmp\_end\_notify.\_policy.\_cmd}
\texttt{ndmp\_end\_notify.\_cmd}

For example, if there are both \texttt{ndmp\_end\_notify.\_policy.\_cmd} and \texttt{ndmp\_end\_notify.\_policy.\_schedule.\_cmd} scripts, NetBackup uses only \texttt{ndmp\_end\_notify.\_policy.\_cmd}.

\textbf{Note:} If you also use \texttt{ndmp\_start\_notify} scripts, they can provide a different level of notification than the \texttt{ndmp\_end\_notify} scripts. For example, if you had one of each, they could be \texttt{ndmp\_start\_notify.\_policy.\_cmd} and \texttt{ndmp\_end\_notify.\_policy.\_schedule.\_cmd}.

When the backup completes, NetBackup passes the following parameters to the script:

\begin{table}[h]
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{Parameter} & \textbf{Description} \\
\hline
\%1 & Name of the client from the NetBackup catalog. \\
\hline
\%2 & Policy name from the NetBackup catalog. \\
\hline
\end{tabular}
\end{table}
Table 10-5  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
<tr>
<td>%4</td>
<td>One of the following:</td>
</tr>
<tr>
<td></td>
<td>FULL</td>
</tr>
<tr>
<td></td>
<td>INCR</td>
</tr>
<tr>
<td></td>
<td>CINC</td>
</tr>
<tr>
<td>%5</td>
<td>Status of the operation. It is the same as the status sent to the NetBackup server. This status is 0 for successful backups and 1 for partially successful backups. If an error occurs, the status is the value associated with that error.</td>
</tr>
<tr>
<td>%6</td>
<td>Note: The following file is not checked at the end of a backup.</td>
</tr>
</tbody>
</table>

Results file that NetBackup checks for a return code from the script. NetBackup uses %6 to pass the file name and then expects the script to create the file in the same directory as the script. If the script applies to a specific policy and schedule, the results file must be named 

`install_path\netbackup\bin\NDMP_END_NOTIFY_RES.policy.schedule`

If the script applies to a specific policy, the results file must be named 

`install_path\netbackup\bin\NDMP_END_NOTIFY_RES.policy`

If the script applies to all backups, the results file must be named 

`install_path\netbackup\bin\NDMP_END_NOTIFY_RES`

An `echo 0> %6` statement is one way for the script to create the file.

NetBackup deletes the existing results file before it calls the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful.

**ndmp_start_path_notify (UNIX)**

The UNIX scripts are provided as examples only. You must customize the scripts before using them. For example, the `-ne` value in the first if statement must be modified to reflect the number of passed parameters. For the `ndmp_start_path_notify` script, the `-ne` value must be set to 7.

To use this script, create a script similar to 

```
/usr/openv/netbackup/bin/goodies/bpstart_notify
```
on the server, and copy it to

/usr/openv/netbackup/bin/ndmp_start_path_notify

on the UNIX NetBackup for NDMP server. Then, modify the script and ensure that you have permission to run it.

On the UNIX media server, the ndmp_start_path_notify script runs before the backup process is issued to the NAS machine. This script must exit with a status of 0 for the calling program to continue and for the backup to proceed. A nonzero status causes the client backup to exit with a status of 99 (NDMP backup failure).

*Note:* Before you use this script, make sure you can run it by using `chmod` on the media server. Run `chmod 755 script_name`, where `script_name` is the name of the script.

If the /usr/openv/netbackup/bin/ndmp_start_path_notify script exists, it runs in the foreground. The `bptm` process on the NetBackup for NDMP server waits for it to complete before continuing. Any commands in the script that do not end with an `&` character run serially.

The server expects the client to respond with a `continue` message within the period of time that the NetBackup `CLIENT_READ_TIMEOUT` option on the server specifies.

The default for `CLIENT_READ_TIMEOUT` is 300. If the script needs more time than 300 seconds, increase the value to allow more time.

NetBackup passes the following parameters to the script:

<table>
<thead>
<tr>
<th>Table 10-6</th>
<th>Script parameters: ndmp_start_path_notify (UNIX)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>$1</td>
<td>Name of the NDMP host.</td>
</tr>
<tr>
<td>$2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$4</td>
<td>One of the following:</td>
</tr>
<tr>
<td></td>
<td>FULL</td>
</tr>
<tr>
<td></td>
<td>INCR (differential incremental)</td>
</tr>
<tr>
<td></td>
<td>CINC (cumulative incremental)</td>
</tr>
<tr>
<td>$5</td>
<td>The NetBackup status code for the operation.</td>
</tr>
</tbody>
</table>
Table 10-6  Script parameters: ndmp_start_path_notify (UNIX) (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6</td>
<td>Not used.</td>
</tr>
<tr>
<td>$7</td>
<td>The path being backed up.</td>
</tr>
</tbody>
</table>

For example:

ndmp_start_path_notify freddie cd4000s fulls FULL
ndmp_start_path_notify danr cd4000s incremternals INCR
ndmp_start_path_notify hare cd4000s fulls FULL

To create an `ndmp_start_path_notify` script for a specific policy or policy and schedule combination, create script files with a `.policyname` or `.policyname.schedulename` suffix. In the following two examples of script names, the policy is named `production` and the schedule is named `fulls`:

/usr/openv/netbackup/bin/ndmp_start_path_notify.production
/usr/openv/netbackup/bin/ndmp_start_path_notify.production.fulls

The first script affects all scheduled backups in the policy that is named `production`. The second script affects scheduled backups in the policy that is named `production` only when the schedule is named `fulls`.

**Note:** For a given backup, NetBackup uses only one `ndmp_start_path_notify` script and that is the one with the most specific name. For example, if there are both `ndmp_start_path_notify.production` and `ndmp_start_path_notify.production.fulls` scripts, NetBackup uses only `ndmp_start_path_notify.production.fulls`.

The `ndmp_start_path_notify` script can use the following environment variables:

- BACKUPID
- UNIXBACKUPTIME
- BACKUPTIME

The NetBackup `bptm` process creates these variables. The following are examples of the strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 1997
```
For Windows media servers, you can create the batch scripts that provide notification before the backup process is issued to the NAS machine. These scripts must reside on the media server in the same directory as the NetBackup binaries:

```
install_path\NetBackup\bin
```

Where `install_path` is the directory where NetBackup is installed.

You can create `ndmp_start_path_notify` scripts that provide notification for all backups or only for backups of a specific policy or schedule.

To create an `ndmp_start_path_notify` script that applies to all backups, name the script:

```
install_path\netbackup\bin\ndmp_start_path_notify.cmd
```

To create a script that applies only to a specific policy or policy and schedule combination, add a `.policyname` or `.policyname.schedulename` suffix to the script name. The following are two examples:

- The following script applies only to a policy named `days`:

  ```
  install_path\netbackup\bin\ndmp_start_path_notify.days.cmd
  ```

- The following script applies only to a schedule that is named `fulls`, which in a policy named `days`:

  ```
  install_path\netbackup\bin\ndmp_start_path_notify.days.fulls.cmd
  ```

The first script affects all scheduled backups in the policy named `days`. The second script affects scheduled backups in the policy named `days` only when the schedule is named `fulls`.

For a given backup, NetBackup calls only one `ndmp_start_path_notify` script and checks for them in the following order:

```
ndmp_start_path_notify.policy.schedule.cmd
ndmp_start_path_notify.policy.cmd
ndmp_start_path_notify.cmd
```

For example, if there are both `ndmp_start_path_notify.policy.cmd` and `ndmp_start_path_notify.policy.schedule.cmd` scripts, NetBackup uses only `ndmp_start_path_notify.policy.schedule.cmd`.
Note: If you also use ndmp_start_notify scripts, they can provide a different level of notification than the ndmp_start_path_notify scripts. For example, if you had one of each, they could be ndmp_start_notify.policy.cmd and ndmp_start_path_notify.policy.schedule.cmd.

When the backup starts, NetBackup passes the following parameters to the script:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%1</td>
<td>Name of the client from the NetBackup catalog.</td>
</tr>
<tr>
<td>%2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>%3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
<tr>
<td>%4</td>
<td>One of the following: FULL INCR CINC</td>
</tr>
<tr>
<td>%5</td>
<td>Status of the operation. It is the same as the status sent to the NetBackup server. This status is 0 for successful backups and 1 for partially successful backups. If an error occurs, the status is the value associated with that error.</td>
</tr>
<tr>
<td>%6</td>
<td>Results file that NetBackup checks for a return code from the script. NetBackup uses %6 to pass the file name and then expects the script to create the file in the same directory as the script. If the script applies to a specific policy and schedule, the results file must be named \install_path\netbackup\bin\NDMP_START_PATH_NOTIFY_RES.policy.schedule \install_path\netbackup\bin\NDMP_START_PATH_NOTIFY_RES.policy If the script applies to all backups, the results file must be named \install_path\netbackup\bin\NDMP_START_PATH_NOTIFY_RES An echo 0&gt; %6 statement is one way for the script to create the file. NetBackup deletes the existing results file before it calls the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful.</td>
</tr>
<tr>
<td>%7</td>
<td>Pathname being backed up.</td>
</tr>
</tbody>
</table>
ndmp_end_path_notify (UNIX)

The UNIX scripts are provided as examples only. You must customize the scripts before using them. For example, the -ne value in the first if statement must be modified to reflect the number of passed parameters. For the ndmp_end_path_notify script, the -ne value must be set to 7.

Note: Before you use this script, make sure you can run it by using other on the media server. Run chmod 755 script_name, where script_name is the name of the script.

For a UNIX media server, if you need notification whenever the NDMP host completes a backup, copy

```
/usr/openv/netbackup/bin/goodies/bpend_notify
```

from the server, to

```
/usr/openv/netbackup/bin/ndmp_end_path_notify
```

on the UNIX NetBackup for NDMP host. Then, modify the script and ensure that you have permission to run it.

The ndmp_end_path_notify script runs after the NAS machine has informed NetBackup that it has completed sending data.

NetBackup passes the following parameters to the ndmp_end_notify script:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1</td>
<td>Name of the client from the NetBackup catalog.</td>
</tr>
<tr>
<td>$2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
| $4        | One of the following:  
|           | FULL  
|           | INCR (differential incremental)  
|           | CINC (cumulative incremental) |
| $5        | Exit code from bptm. |
| $6        | Not used. |
Table 10-8  Script parameters: ndmp_end_path_notify (UNIX) (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7</td>
<td>The path being backed up.</td>
</tr>
</tbody>
</table>

For example:

```
ndmp_end_path_notify freddie cd4000s fulls FULL 0
ndmp_end_path_notify danr cd4000s incrementals INCR 73
```

To create an `ndmp_end_path_notify` script for a specific policy or policy and schedule combination, create script files with a `.policyname` or `.policyname.schedulename` suffix. In the following two examples of script names, the policy is named `production` and the schedule is named `fulls`:

```
/usr/openv/netbackup/bin/ndmp_end_path_notify.production
/usr/openv/netbackup/bin/ndmp_end_path_notify.production.fulls
```

The first script affects all scheduled backups in the policy that is named `production`. The second script affects scheduled backups in the policy that is named `production` only when the schedule is named `fulls`.

**Note:** For a given backup, NetBackup uses only one `ndmp_end_path_notify` script and that is the one with the most specific name. For example, if there are both `ndmp_end_path_notify.production` and `ndmp_end_path_notify.production.fulls` scripts, NetBackup uses only `ndmp_end_path_notify.production.fulls`.

The `ndmp_end_path_notify` script can use the following environment variables:

- BACKUPID
- UNIXBACKUPTIME
- BACKUPTIME

The NetBackup `bptm` process creates these variables. The following are examples of the strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 1997
```
For Windows media servers, you can create the batch scripts that provide notification whenever the client is finished writing to tape. These scripts must reside on the media server in the same directory as the NetBackup binaries:

```
install_path\NetBackup\bin
```

Where `install_path` is the directory where NetBackup is installed.

You can create `ndmp_end_path_notify` scripts that provide notification for all backups or only for backups of a specific policy or schedule.

To create an `ndmp_end_path_notify` script that applies to all backups, name the script:

```
install_path\netbackup\bin\ndmp_end_path_notify.cmd
```

To create a script that applies only to a specific policy or policy and schedule combination, add a `.policyname` or `.policyname.schedulename` suffix to the script name. The following are two examples:

- The following script applies only to a policy named `days`:
  ```
  install_path\netbackup\bin\ndmp_end_path_notify.days.cmd
  ```

- The following script applies only to a schedule that is named `fulls`, which is in a policy named `days`:
  ```
  install_path\netbackup\bin\ndmp_end_path_notify.days.fulls.cmd
  ```

The first script affects all scheduled backups in the policy named `days`. The second script affects scheduled backups in the policy named `days` only when the schedule is named `fulls`.

For a given backup, NetBackup calls only one `ndmp_end_path_notify` script and checks for them in the following order:

```
ndmp_end_path_notify.policy.schedule.cmd
ndmp_end_path_notify.policy.cmd
ndmp_end_path_notify.cmd
```

For example, if there are both `ndmp_end_path_notify.policy.cmd` and `ndmp_end_path_notify.policy.schedule.cmd` scripts, NetBackup uses only `ndmp_end_path_notify.policy.schedule.cmd`. 
Note: If you also use `ndmp_end_notify` scripts, they can provide a different level of notification than the `ndmp_end_path_notify` scripts. For example, if you had one of each, they could be `ndmp_end_notify.policy.cmd` and `ndmp_end_path_notify.policy.schedule.cmd`.

When the backup completes, NetBackup passes the following parameters to the script:

**Table 10-9**  Script parameters: `ndmp_end_path_notify.cmd` (Microsoft Windows)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%1</td>
<td>Name of the client from the NetBackup catalog.</td>
</tr>
<tr>
<td>%2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>%3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
| %4 | One of the following:  
| | FULL  
| | INCR  
| | CINC  
| %5 | Status of the operation. It is the same as the status sent to the NetBackup server. This status is 0 for successful backups and 1 for partially successful backups. If an error occurs, the status is the value associated with that error. |
Table 10-9  Script parameters: ndmp_end_path_notify.cmd (Microsoft Windows) (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%6</td>
<td><strong>Note:</strong> The following file is not checked when using <code>ndmp_end_path_notify</code>. Results file that NetBackup checks for a return code from the script. NetBackup uses %6 to pass the file name and then expects the script to create the file in the same directory as the script. If the script applies to a specific policy and schedule, the results file must be named <code>install_path\netbackup\bin\NDMP_END_PATH_NOTIFY_RES.policy.schedule</code> If the script applies to a specific policy, the results file must be named <code>install_path\netbackup\bin\NDMP_END_PATH_NOTIFY_RES.policy</code> If the script applies to all backups, the results file must be named <code>install_path\netbackup\bin\NDMP_END_PATH_NOTIFY_RES</code> An <code>echo 0&gt; %6</code> statement is one way for the script to create the file. NetBackup deletes the existing results file before it calls the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful.</td>
</tr>
<tr>
<td>%7</td>
<td>Pathname being backed up.</td>
</tr>
</tbody>
</table>

**ndmp_moving_path_notify (UNIX)**

The UNIX scripts are provided as examples only. You must customize the scripts before using them. For example, the `-ne` value in the first `if` statement must be modified to reflect the number of passed parameters. For the `ndmp_moving_path_notify` script, the `-ne` value must be set to 7.

To use this script, create a script similar to

```
/usr/openv/netbackup/bin/goodies/bpstart_notify
```

on the server, and copy it to

```
/usr/openv/netbackup/bin/ndmp_moving_path_notify
```

on the UNIX NetBackup for NDMP server. Then, modify the script and ensure that you have permission to run it.

On UNIX media servers, the `ndmp_moving_path_notify` script runs after the backup process sends data to NetBackup.
Note: Before you use this script, make sure you can run it using other on the media server. Run `chmod 755 script_name`, where `script_name` is the name of the script.

If the `/usr/openv/netbackup/bin/ndmp_moving_path_notify` script exists, it runs in the foreground. The `bptm` process that is on the NetBackup for NDMP server waits for it to complete before continuing. Any commands in the script that do not end with an `&` character run serially.

The server expects the client to respond with a `continue` message within the period of time that the NetBackup `CLIENT_READ_TIMEOUT` option on the server specifies.

The default for `CLIENT_READ_TIMEOUT` is 300 seconds. If the script needs more than 300 seconds, increase the value to allow more time.

NetBackup passes the following parameters to the script:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1</td>
<td>Name of the NDMP host.</td>
</tr>
<tr>
<td>$2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
<tr>
<td>$4</td>
<td>One of the following: FULL INCR (differential incremental) CINC (cumulative incremental)</td>
</tr>
<tr>
<td>$5</td>
<td>The NetBackup status code for the operation.</td>
</tr>
<tr>
<td>$6</td>
<td>Not used.</td>
</tr>
<tr>
<td>$7</td>
<td>The path being backed up.</td>
</tr>
</tbody>
</table>

For example:

```
ndmp_moving_path_notify freddie cd4000s fulls FULL
ndmp_moving_path_notify danr cd4000s incrementals INCR
ndmp_moving_path_notify hare cd4000s fulls FULL
```

To create an `ndmp_moving_path_notify` script for a specific policy or policy and schedule combination, create script files with a `.policyname` or
In the following two examples of script names, the policy is named `production` and the schedule is named `fulls`:

```
/usr/openv/netbackup/bin/ndmp_moving_path_notify.production
/usr/openv/netbackup/bin/ndmp_moving_path_notify.production.fulls
```

The first script affects all scheduled backups in the policy that is named `production`. The second script affects scheduled backups in the policy that is named `production` only when the schedule is named `fulls`.

**Note:** For a given backup, NetBackup uses only one `ndmp_moving_path_notify` script and that is the one with the most specific name. For example, if there are both `ndmp_moving_path_notify.production` and `ndmp_moving_path_notify.production.fulls` scripts, NetBackup uses only `ndmp_moving_path_notify.production.fulls`.

The `ndmp_moving_path_notify` script can use the following environment variables:

- **BACKUPID**
- **UNIXBACKUPTIME**
- **BACKUPTIME**

The NetBackup `bptm` process creates these variables. The following are examples of the strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 1997
```

**ndmp_moving_path_notify.cmd (Microsoft Windows)**

For Windows media servers, you can create the batch scripts that provide notification whenever the NAS machine starts sending data. These scripts must reside on the media server in the same directory as the NetBackup binaries:

```
install_path\NetBackup\bin
```

Where `install_path` is the directory where NetBackup is installed.

You can create `ndmp_moving_path_notify` scripts that provide notification for all backups or only for backups of a specific policy or schedule.

To create an `ndmp_moving_path_notify` script that applies to all backups, name the script:
To create a script that applies only to a specific policy or policy and schedule combination, add a .policyname or .policyname.schedulename suffix to the script name. The following are two examples:

- The following script applies only to a policy named days:

  ```
  install_path\netbackup\bin\ndmp_moving_path_notify.days.cmd
  ```

- The following script applies only to a schedule that is named fulls, which is in a policy named days:

  ```
  install_path\netbackup\bin\ndmp_moving_path_notify.days.fulls.cmd
  ```

The first script affects all scheduled backups in the policy named days. The second script affects scheduled backups in the policy named days only when the schedule is named fulls.

For a given backup, NetBackup calls only one `ndmp_moving_path_notify` script and checks for them in the following order:

```
ndmp_moving_path_notify.policy.schedule.cmd
ndmp_moving_path_notify.policy.cmd
ndmp_moving_path_notify.cmd
```

For example, if there are both `ndmp_moving_path_notify.policy.cmd` and `ndmp_moving_path_notify.policy.schedule.cmd` scripts, NetBackup uses only `ndmp_moving_path_notify.policy.schedule.cmd`.

**Note:** If you also use `ndmp_start_notify` scripts, they can provide a different level of notification than the `ndmp_moving_path_notify` scripts. For example, if you had one of each, they could be `ndmp_start_notify.policy.cmd` and `ndmp_moving_path_notify.policy.schedule.cmd`.

When the backup starts, NetBackup passes the following parameters to the script.

**Table 10-11 Script parameters: ndmp_moving_path_notify.cmd (Microsoft Windows)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%1</td>
<td>Name of the client from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
### Table 10-11 Script parameters: ndmp_moving_path_notify.cmd (Microsoft Windows) (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%2</td>
<td>Policy name from the NetBackup catalog.</td>
</tr>
<tr>
<td>%3</td>
<td>Schedule name from the NetBackup catalog.</td>
</tr>
</tbody>
</table>
| %4        | One of the following:  
|           | FULL  
|           | INCR  
|           | CINC  |
| %5        | Status of the operation. It is the same as the status sent to the NetBackup server. This status is 0 for successful backups and 1 for partially successful backups. If an error occurs, the status is the value associated with that error. |
| %6        | **Note:** The following is not checked when using `ndmp_moving_path_notify`.  
Results file that NetBackup checks for a return code from the script. NetBackup uses %6 to pass the file name and then expects the script to create the file in the same directory as the script.  
If the script applies to a specific policy and schedule, the results file must be named  
`install_path\netbackup\bin\NDMP_END_NOTIFY_RES.policy.schedule`  
If the script applies to a specific policy, the results file must be named  
`install_path\netbackup\bin\NDMP_END_NOTIFY_RES.policy`  
If the script applies to all backups, the results file must be named  
`install_path\netbackup\bin\NDMP_END_NOTIFY_RES`  
An `echo 0> %6` statement is one way for the script to create the file.  
NetBackup deletes the existing results file before it calls the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful. |
| %7        | Pathname being backed up. |
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