Veritas NetBackup™ Administrator's Guide, Volume II

UNIX, Windows, and Linux

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VERITAS™

Veritas NetBackup™ Administrator's Guide, Volume II

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https://sort.veritas.com/data/support/SORT_Data_Sheet.pdf

Contents

Chapter 1

NetBackup licensing models and the nbdeployutil utility

This chapter includes the following topics:

About ways to gather and analyze licensing reporting

NetBackup provides several ways to gather and analyze licensing reporting.

Table 1-1 Reporting tools for licensing and run options

Tool	Description	Run options
`nbdeployutil`	Provides command-line access to data or capacity usage and business unit reporting. Generates a Microsoft Excel spreadsheet to review. The master server must have a utility for reading `.xls` files.	Traditional reporting: Run manually only. Capacity reporting: Run as per incremental schedule or manually.
OpsCenter	Provides an interface useful for multi-server environments.	Run manually in OpsCenter.

About NetBackup licensing models

NetBackup uses two licensing models:

- The traditional licensing model counts the number of clients and servers, and then compares this information against licensed options.
  See "About the traditional licensing model" on page 11.
- The capacity licensing model calculates how much data at source is protected.
  See "About the capacity licensing model" on page 11.

About the traditional licensing model

The traditional licensing model is based on the total number of protected clients in a NetBackup environment or on the total storage capacity.

About the capacity licensing model

Capacity licensing is based on the total amount of data that NetBackup protects on the client (or agent). When the capacity licensing model is used, NetBackup automatically gathers the information using the backup image header.

With the existing capacity licensing model, protected data is gathered using backup image header and then stored in the NetBackup catalog. Capacity information is gathered and a report is generated. The user then reconciles the information in the report with the actual capacity in use.

How capacity licensing uses Front-end Terabytes

The licensing fees for the use of NetBackup are based on the total number of Front-End Terabytes (FETBs) protected by NetBackup. Front-End Terabyte Calculation is a way of determining the total terabytes of data NetBackup protects. One FETB is 1 TB of protected data. The data can either be on clients or devices where the software is installed or where the software is used to provide backup functionality.

The nbdeployutil utility uses image headers in the NetBackup catalog to determine the terabytes of data that NetBackup protects. Any partial terabyte of data is rounded up to the next whole terabyte. The final total is the sum of the FETBs for each client or policy combination that the analyzer examines. The utility measures the actual data protected.

nbdeployutil utility options

The nbdeployutil utility is used to gather data and analyze licensing data, and then present the results in a spreadsheet as a report. The utility can be used to report on both the traditional or the capacity licensing model. The utility can be run automatically according to a customizable incremental schedule (for capacity reports only) or manually (for traditional and capacity reports).

- Incremental capacity licensing reports run automatically.
  In NetBackup 8.0, nbdeployutil supports incremental reporting. NetBackup triggers nbdeployutil to run based on a specified schedule, incrementally gather data, and generate capacity based licensing reports for the past 90 days. There are no scheduled reports in traditional licensing. Reports for traditional licensing must be run manually.

  Note: If you upgrade from an older version of nbdeployutil with incremental reporting to NetBackup 8.0 or later version, the operating system-based scheduler or Cron job is removed. NetBackup triggers nbdeployutil to run at a specified schedule, incrementally gather data, and generate capacity based licensing reports for the past 90 days.

  The nbdeployutil utility can be scheduled to run capacity licensing reports, but not traditional licensing reports.
  See “Scheduling capacity licensing reports” on page 13.
- Traditional or capacity licensing reports run manually.
  See “Generating licensing reports manually” on page 17.

Scheduling capacity licensing reports

By default, NetBackup triggers nbdeployutil to run on a specified schedule to incrementally gather data, and to generate capacity licensing reports for the past 90 days.

Incremental reporting parameters

Incremental reporting uses the following four parameters:

- FREQUENCY_IN_DAYS: The frequency at which nbdeployutil is run.
- MASTER_SERVERS: A comma-separated list of the master servers.
- PARENTDIR: The gather and report folder location.
- PURGE_INTERVAL: The number of days for which the folders that contain the gathered data are retained in the incremental directory.

To use the default values, See the section called “Use Case I: Use default values for parameters” on page 14.

To use the custom values, See the section called “Use Case II: Use custom values for parameters” on page 14.

The location where the data and reports are generated contains the following files:

- The generated report for the latest nbdeployutil result.
- Folders containing incrementally gathered data.
- The archive folder that contains the older generated reports.
- nbdeployutil log files.

The following directories contain the most current capacity licensing report:

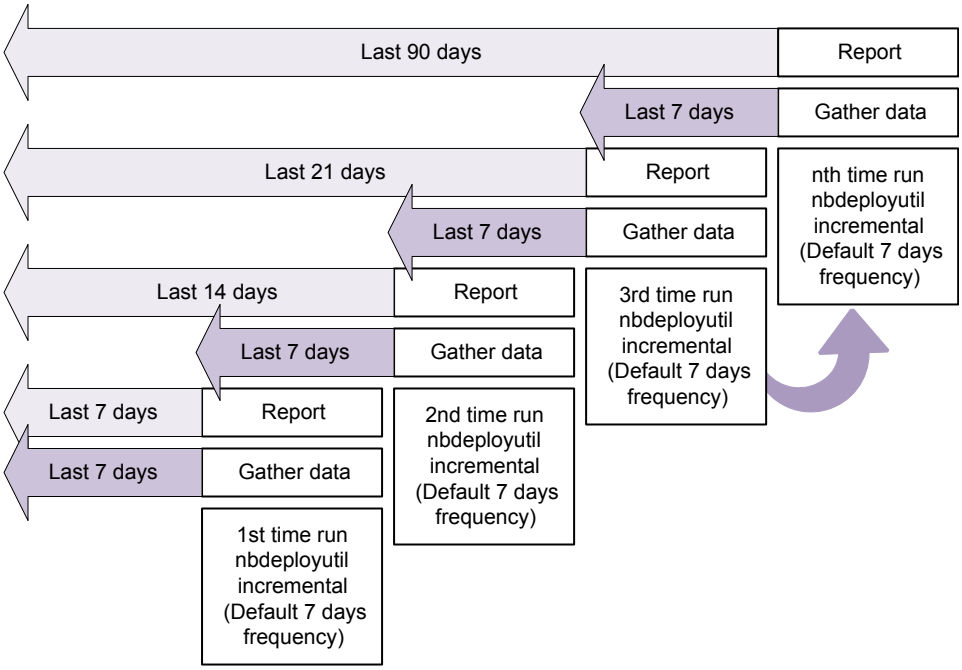
On Windows: *Install_Dir*\NetBackup\var\global\incremental

On UNIX: /usr/openv/var/global/incremental

The older reports are placed in the archive folder. If you want to see how the capacity usage has changed over time, you can view the older reports. Delete the reports or delete the folder if you no longer require the reports. It is recommended that you retain 90 days of reporting data. You can retain data older than 90 days depending on your requirement.

Each time nbdeployutil is triggered, the information is gathered for the following duration: from the last successful run to the latest run of nbdeployutil. For the first run, the duration of the report is as per the frequency specified in the configuration file (default value is 7 days). The report duration is always for the last 90 days based on the availability of the gathered data. Any data prior to 90 days is not considered in the report.

Figure 1-1 Generating incremental capacity licensing reports



Use Case I: Use default values for parameters

The nbdeployutilconfig.txt file is not required when using the default parameters. nbdeployutil uses the following default values:

- FREQUENCY_IN_DAYS=7
- MASTER_SERVERS=*local_server*
- PARENTDIR=*folder_name*
  - For Windows: *Install_Dir*\NetBackup\var\global\incremental
  - For UNIX: /usr/openv/var/global/incremental
- PURGE_INTERVAL=180 (number of days).

Use Case II: Use custom values for parameters

Edit the nbdeployutilconfig.txt file.

To use custom values in the nbdeployutilconfig.txt file

1. Based on your operating system, copy the nbdeployutilconfig.txt file to the following location:

   For Windows: *Install_Dir*\NetBackup\var\global

   For UNIX: /usr/openv/var/global

2. Open and edit nbdeployutilconfig.txt to change the parameters and then save the file.

   - **FREQUENCY_IN_DAYS=*number_of_days***
     Based on the frequency you set here, nbdeployutil gathers the data and generates the report.
     Minimum value: 1 day.
     By default, the frequency value in the configuration file is set as 7 days to capture optimum capacity usage data.
     - If there is no value in this parameter, nbdeployutil uses the default value.
     - If you specify the frequency as 0, incremental reporting is disabled and no licensing information is captured.
     - If you delete the parameter, nbdeployutil uses the default value.
   - **MASTER_SERVERS=*server_names***
     nbdeployutil gathers the information for each master server list and generates the report.
     - If there is no value in this parameter, nbdeployutil uses the default value.
     - If you delete the parameter, nbdeployutil uses the default value.

     Examples of server names:
     - MASTER_SERVERS=newserver,oldserver
     - MASTER_SERVERS=newserver,oldserver.domain.com
     - MASTER_SERVERS=myserver1.somedomain.com,newserver.domain.com
   - **PARENTDIR=*folder_name_with_path***

     To change the gather and report location, edit this parameter.
     - If there is no value in this parameter, nbdeployutil uses the default value.
     - If you delete the parameter, nbdeployutil uses the default value.
   - **PURGE_INTERVAL=*number_of_days***
     Gathered data that does not fit into the purge_interval value is deleted automatically.

- If there is no value in this parameter, nbdeployutil uses the default value.
- If you delete the parameter, nbdeployutil uses the default value.
- If you specify a value less than 90 days, nbdeployutil uses 90 days as the value for the parameter. Data that is older than 180 days is purged.
  Data to be purged = current date – purge_interval.
  Minimum value = 90 days.

Troubleshooting failures for nbdeployutil and incremental reporting

If nbdeployutil fails to gather data and generate the report for your environment, refer to the logs to understand when the task failed and the reason for the failure.

Other points to consider when using nbdeployutil and incremental reporting

To change the directory of the gathered data and licensing report

1. If you have older gathered data and licensing reports, copy the complete directory to the new location.
2. Edit `nbdeployutilconfig.txt` and change the location of the gathered data and licensing report in the `PARENTDIR=`*`folder_name`* field.

To use the previously successful gathered data for generating a capacity licensing report

1. Copy the gather folder that was generated after previous run of nbdeployutil to the following location:

   On Windows: *`Install_Dir`*`\NetBackup\var\global\incremental`

   On UNIX: `/usr/openv/var/global/incremental`
2. Create the gather_end.json file inside the copied folder and add the following text:

   ```
   {"success":0}
   ```

   The next incremental run considers the data inside the copied folder to generate a capacity licensing report.

Note: You must delete any other gather folders inside the copied folder to avoid gaps for the period in which data is gathered. The missing data is automatically generated during the next incremental run.

To create a custom interval report using existing gathered data

- To create a report for a time interval that is different than the default interval of 90 days, run the following command:

  On Windows:

  ```
  nbdeployutil.exe --capacity --incremental --report --inc-settings
  "<Install_Dir>\netbackup\var\global\nbdeployutilconfig.txt"
  --hoursago <custom-time-interval>
  ```

  On UNIX:

  ```
  nbdeployutil.exe --capacity --incremental --report --inc-settings
  "/usr/openv/var/global/nbdeployutilconfig.txt" --hoursago
  <custom-time-interval>
  ```

  The number of hours specified in `--hoursago` must be less than the purge-interval that is specified in the nbdeployutilconfig.txt file.

  Note: nbdeployutil uses existing gathered data to generate the custom interval report. You are not required to use the `--gather` command.

Generating licensing reports manually

Run the nbdeployutil utility to gather data for a local master server, a remote master server, or a subset of clients. nbdeployutil can be run manually to generate a report for either the capacity or the traditional reporting model.

The utility generates the report in multiple steps. Data is gathered in the first step, and then analyzed and presented. The utility is located in the following directory:

On Windows: *Install_dir*\NetBackup\bin\admincmd\

On UNIX: /usr/openv/netbackup/bin/admincmd/

Table 1-2 nbdeployutil options to gather, analyze, and prepare reports

Task Number	Description

Task 1	The `nbdeployutil` utility uses the following options to gather data from one or more master servers.
	
	`nbdeployutil --gather [--output=DIRECTORY]`
	`[--capacity | --traditional] [--hoursago=N]`
	`[--start="mm/dd/yyyy HH:MM:SS"`
	`[--end="mm/dd/yyyy HH:MM:SS"]]`
	`[--clientlist=FILENAME | --clients=HOSTNAME[,...]]`
	`[--master=HOSTNAME[,...]] [--log=FILENAME]`
	`[--runtimestats] [--nolog] [--bpimagelist=OPTIONS]`
	`[--use-bpflist]`
	
	The `nbdeployutil` utility gathers data remotely for multiple master servers from a central location, provided the master servers have granted the initiating server access. The utility supports collecting data remotely from back-level master servers. Load the engineering binary that is associated with this utility onto all master servers for which you want to gather information.

Task 2	The `nbdeployutil` utility uses the following options to analyze the gathered data and prepare the report:
	
	`nbdeployutil --report`
	`<--capacity | --traditional> <directory> ...`
	`[--dirlist=FILENAME | --parentdir=DIRECTORY]`
	`[--capacity] [--debug-inputs] [--log=FILENAME]`
	`[--clientlist=FILENAME | --clients=HOSTNAME[,...]]`
	`[--day-boundary=TIME] [--runtimestats] [--nolog]`
	
	For a traditional report, run: `nbdeployutil --report --traditional`
	
	For a capacity report, run: `nbdeployutil --report --capacity`

Task 3	Examine the results and make adjustments.

The performance of the nbdeployutil utility is dependent on the system running it as well as the size of the NetBackup catalog. The `--gather` command only executes as quickly as the `bpimagelist` command can run for 90 days' worth of images. The speed of report generation is dependent on the number of images and fragments. The operating system running the command also affects the utility's performance.

Depending on the environment, the nbdeployutil utility can take from several seconds to several minutes to run the `--gather` or the `--report` parameters.

Veritas posts the most recent information about the nbdeployutil utility on the following website:

http://www.veritas.com/docs/TECH145972

Gathering information for the local master server

In this example, the nbdeployutil utility is used to gather information for the local master server. Use the --capacity or the --traditional option, depending on the type of report you want to generate

```
C:\Program Files\Veritas\NetBackup\bin\admincmd>nbdeployutil --gather
NetBackup Deployment Utility, version 8.0Beta1
Gathering license deployment information...
  Discovered master server master.example.com
  Output for master.example.com at:
  C:\Program Files\Veritas\NetBackup\var\global\reports\
   20160525_151315_master.example.com
Gather DONE
Execution time: 9 secs
To create a report for this master server, run one of the following:
  capacity   : nbdeployutil.exe --report --capacity
  "C:\Program Files\Veritas\NetBackup\var\global\reports\
   20160525_151315_master.example.com"
  traditional: nbdeployutil.exe --report --traditional
  "C:\Program Files\Veritas\NetBackup\var\global\reports\
   20160525_151315_master.example.com"
```

The utility generates a log file named `nbdeployutil-gather-`*`timestamp`*`.log` during the gathering operation. By default, the log file is created in the directory where the gathered data resides.

Gathering information for a remote master server

```
nbdeployutil --gather --master=sidon.example.com
```

Gathering information for a subset of clients that the local master server protects

```
nbdeployutil --gather --client=dynamo,lettuce,marble2
```

or

```
nbdeployutil --gather --clientlist=filename.txt
```

Note: When the `--clients` or the `--clientlist` option is used, some media servers may show in the report as not connectable, even though the utility can connect to them. This message does not affect the summary information.

Creating and viewing the licensing report

After using nbdeployutil to gather report data, use the `--report --traditional` or `--capacity` option to generate a licensing report in the form of a Microsoft Excel spreadsheet.

Use the utility to generate a report for any of the following:

- A single master server.
- Several master servers.
- A specific subset of clients. For example, a report that contains capacity usage for business unit billing.

Creating a report using data that is collected for the local master server

The `--gather --capacity` command is run for master server `cayce.rm.com`:

```
C:\Program Files\Veritas\NetBackup\bin\admincmd>nbdeployutil.exe
--gather --capacity
NetBackup Deployment Utility, version 8.0Beta1
Gathering license deployment information...
  Discovered master server cayce.rm.com
  Output for master server at:
  C:\Program Files\Veritas\netbackup\var\global\reports\20160527_140620_cayce
Gather DONE
Execution time: 2 secs
```

To create a capacity report based on the data gathered, the utility tells you what command you need to run:

```
To create a report for this master server, run the following:
  nbdeployutil.exe --report --capacity
"C:\Program Files\Veritas\netbackup\var\global\reports\20160527_140620_cayce.

C:\Program Files\Veritas\NetBackup\bin\admincmd>nbdeployutil.exe
--report --capacity
"C:\Program Files\Veritas\netbackup\var\global\report\20160527_140620_cayce.r
NetBackup Deployment Utility, version 8.0Beta1
Analyzing license deployment ...
```

```
  Following directories were given, but do not exist:
    C:\Program Files\Veritas\netbackup\var\global\report\20160527_140620_
cayce.rm.com
```

The utility generates a log file named `nbdeployutil-report-`*`timestamp`*`.log` during the analysis and the report generating operation. By default, the log file is created in the directory where the gathered data resides.

Creating a roll-up report for several master servers

This example assumes that you have gathered the respective master server's data in directories `master1dir`, `master2dir`, `master3dir`. These directories all reside within a parent directory named `EMEA-domains`. The output (report and log file) is saved to the `EMEA-domains` directory.

```
# nbdeployutil --report --parentdir=EMEA-domains
```

This variation creates a report for a smaller set of master servers and specifies a different directory for the output.

```
# mkdir UK-masters
# nbdeployutil --report EMEA-domains/master1dir EMEA-domains/master2dir
--output=UK-masters
```

Creating a report for a set of clients or for a business unit

The utility can be used to examine a specific set of clients in detail.

Example: Gather data for a subset of clients for a time frame different than the default.

```
nbdeployutil.exe --gather --output BusinessUnitFinance --start "11/01/10
06:00:00" --end "11/02/10 01:00:00" --clients marybl2g1,marybl7g1
--verbose
```

To create a report for these clients, run the following:

```
nbdeployutil.exe --report "BusinessUnitFinance\20101102_155246_marybl2g1"
```

Report tab descriptions

The nbdeployutil utility examines the image headers in the NetBackup catalog to determine one of the following:

- For traditional licensing, nbdeployutil determines the servers and clients in the NetBackup environment.

- For capacity licensing, nbdeployutil determines the amount of data NetBackup protects. The way that the client policies and schedules are configured can affect the results.

The licensing report is a Microsoft Excel spreadsheet. The tabs that appear in the spreadsheet depend on whether the report is a traditional or a capacity licensing report.

Table 1-3 Report tab descriptions

Tab	Description	Report type
Summary	The contents of this tab differs for a traditional or a capacity report. ■ Traditional report: Shows the final details about master servers, media servers, and clients. This tab lists the source data for generating the report. The number of media servers and the number of clients is provided, as well as capacity information. ■ Capacity report: Shows the final figures, an overview of the basis for the report (data source), and a breakdown of the source of the capacity. The capacity breakdown includes a reporting by policy type and largest clients.	Traditional and capacity
Itemization	Displays a table similar to the line itemization table you may see in a credit card bill. Each line is a charge that contributes to the final total. Each line lists the capacity that is calculated for a client or policy combination.	Capacity
Unused clients	Displays the names of clients that are registered with the master server but are not backed up.	Capacity
Hosts	A listing of host names, along with associated computer information. The associated information includes information such as: platform, computer type, database software installed, SAN media server, and NDMP.	Traditional
NDMP	A list of computers that are NDMP servers and the corresponding tier number of the client. When you reconcile the report, you need to address the clients that are found on this tab.	Traditional
Virtual Servers	A list of the virtual servers or the virtual hosts that were detected in the environment.	Traditional

Table 1-3 Report tab descriptions *(continued)*

Tab	Description	Report type
Drives	Details the type of drives and the host or the library where the drive resides. Lists the host names that are associated with each drive as well as information about virtual tape libraries, shared drives, and vaulted drives.	Traditional
Interpreting the Results	Explains how to examine the report and how to reconcile the information in the report with your actual environment.	Traditional and capacity

After creating a traditional licensing report

After using nbdeployutil to gather report data, use the `--report --traditional` option to generate a traditional licensing report in the form of a Microsoft Excel spreadsheet.

This topic reviews the different tabs that appear in a traditional licensing report and describes the process of reconciling the report with the actual NetBackup environment.

Use the following steps to examine the report results:

Table 1-4 Examining the traditional licensing report

Step	Description	Reference
1	Examine the **Summary** tab and confirm that the correct information is displayed.	See "Verify the Summary tab" on page 24.
2	Review the **Hosts** tab and resolve any missing information.	See "Complete the Hosts tab" on page 24.
3	Review the **NDMP** tab and resolve any missing information.	See "Resolve the NDMP tab" on page 25.
4	Review the **Virtual Servers** tab and resolve any missing information.	See "Update the Virtual Servers tab" on page 26.
5	Review the **Drives** tab and resolve any missing information.	See "Confirm the Drives tab" on page 26.

Verify the Summary tab

The top of the report's **Summary** tab details the basis for the report's information. Review the **Period Analyzed** for the source of the information for the report. The **Period Analyzed** section includes:

- Start date for the gather for each master server.
- End date for the gather for each master server.
- The total number of days gathered for each master server.
- The input directory for each master server that is associated with the report.

The start and the end dates are not necessarily the dates that are specified for the `--gather` command. These are the dates within the time period that you specified where images exist. If images do not exist for a specified start or end day, the day is not listed. The nearest date with backup images is included and listed.

The **Input Directory** column displays the path to the gathered data. Within the **Input Directory** is the `nbdeployutil-gather-`*`timestamp`*`.log` file. If non-default inputs were used in the collection of catalog data, the log file displays this information.

Under the **Options** section, confirm that the list of master servers is correct. If there are missing or extra master servers, rerun the report.

When the review of the entire report is complete, all the values in the **Unknown** row under **Tiering** should be zero. As you reconcile the other tabs in the report, these values automatically update to zero.

Complete the Hosts tab

The **Hosts** tab provides a listing of all media servers and client servers that are included in the report. The tab includes master servers if they are either a media server or a client server. Review five areas to complete the review of this tab.

To complete the Hosts tab

1. Scan the **Connectable** column to see if the utility was unable to connect to any hosts for its calculations. Be aware the utility cannot connect to NDMP filers. If there is a large number of non-NDMP filer hosts the utility could not connect to, consider rerunning the utility with the --retry option. Use the following command to retry the connections:

   ```
   nbdeployutil --retry path_to_the_gathered_data
   ```

   When the command finishes, use the following command to recreate the report.

   ```
   nbdeployutil --report all_previously_specified_options
   all_previously_specified_gather_directories
   ```

2. Check the **Tier** column for any hosts that are listed as UNKNOWN. Replace these with the appropriate tier number between one and four. Work with your Veritas Sales Engineer to determine the correct tier information. The Platform and Processors values help determine the host's tier. These columns do not calculate the tier, but by knowing this information you can determine the appropriate value to enter in the Tier column.
3. Review the **MSEO Key Server** column and verify that all the listed information is correct. Yes indicates that the host is an MSEO key server. No indicates that the host is not an MSEO key server. The N/A value indicates that the host is not a media server.
4. Check the **Enterprise Client** column and verify that the information is correct. Yes indicates that the host is an enterprise client and was backed up. No indicates that the host is not an enterprise client. The N/A value indicates that no backups were performed on the host during the report period.
5. Review the **SAN Media Server** column and correct any hosts where the value is **UNKNOWN**. Confirm that all other values are correct. A value of N/A for a host indicates that the host is either a client server or a master server.

Be aware that the only column which contributes to the final information on the **Summary** tab is the **Tier** column. Values of **UNKNOWN** in other columns other than **Tier** indicate unknown information. All data aside from the **Tier** column is for informational purposes only

Resolve the NDMP tab

The **NDMP** tab lists the hosts that the utility has determined to be NDMP servers. If there are servers listed which are not NDMP servers, delete these servers from the list. Add any missing NDMP servers to the list. For all servers, review the **Tier** column and confirm that the information is correct. Any **Tier** values of **UNKNOWN** should be replaced with the correct tier number between one and four. Work with

your Veritas Sales Engineer and the NetBackup Pricing and Licensing Guide to determine the correct tier information.

Update the Virtual Servers tab

Complete the **Virtual Servers** tab. Replace any **UNKNOWN** values under the **Used** column with **Yes** or **No**. **Yes** indicates that the host uses the NetBackup ESX-specific feature. **No** indicates that it does not use the feature. Add missing virtual servers to the list and indicate **Yes** in the **Used** column.

Confirm the Drives tab

On the **Drives** tab, review the information in the **VL** column. Verify that all virtual tape libraries are correctly listed as **Yes**. If a virtual tape library has No for a value in the **VTL** column, change the value to **Yes**. Change the value for **VTL** to **No** for any drives that are incorrectly marked as a virtual tape library.

Final steps

Once you reconcile the report, correct the errors and enter the missing information. Compare the results to the install base report. The install base report is provided to you by Veritas or your reseller. Confirm that everything in the report matches with the content in the install base report. If there are discrepancies, Consult with your Veritas sales representative to correct any discrepancies.

After creating a capacity licensing report

After using nbdeployutil to gather report data, use the `--report --capacity` option to generate a capacity licensing report in the form of a Microsoft Excel spreadsheet.

This topic reviews the different tabs that appear in a capacity licensing report and provides an overview on the process of reconciling the report with the actual NetBackup environment.

Use the following steps to examine the report results:

Table 1-5 Examining the capacity licensing report

Step	Description	Reference
1	Verify the completeness of the report inputs.	See "Verify the completeness of the inputs" on page 27.

Table 1-5 Examining the capacity licensing report *(continued)*

Step	Description	Reference
2	Eliminate redundant data due to client aliases and multiple IP addresses.	See "Eliminate redundant data due to client aliases and multiple IP addresses" on page 28.
3	Examine the Itemization tab for flagged conditions in the Accuracy column.	See "Examine the Itemization tab for flagged conditions in the Accuracy column" on page 28.
4	Verify correct grouping and summation of multistreamed backup images.	See "Verify correct grouping and summation of multistreamed backup images" on page 29.

Verify the completeness of the inputs

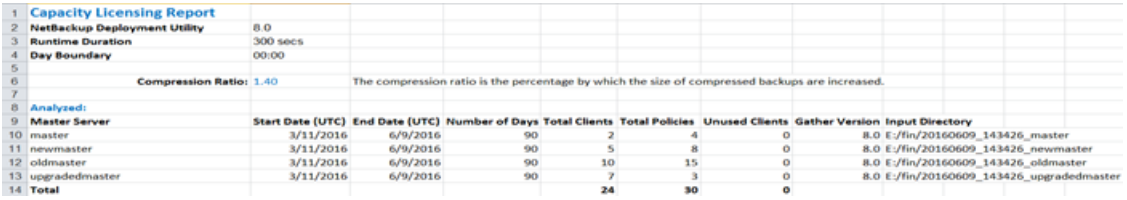
The top of the **Summary** tab shows the basis for the report information. Examine the section marked **Analyzed** to verify the completeness of the gathered data upon which the report is based.

The **Analyzed** section displays the following:

- The master server(s) included in the report.
- The date range for catalog data.
- The number of clients and policies that are seen in the catalog output.

If the client and the policy counts are low, the report may be based on the data that was gathered with narrower, non-default inputs. The analyzer gathers 90 days' worth of catalog data for all clients by default.

The **Input Directory** column displays the path to the gathered data. Within the **Input Directory** is the `nbdeployutil-gather-`*`timestamp`*`.log` file. If non-default inputs were used in the collection of catalog data, the log file displays this information.



1	**Capacity Licensing Report**							
2	**NetBackup Deployment Utility**	8.0						
3	**Runtime Duration**	300 secs						
4	**Day Boundary**	00:00						
5								
6	**Compression Ratio:**	1.40	The compression ratio is the percentage by which the size of compressed backups are increased.					
7								
8	**Analyzed:**							
9	**Master Server**	**Start Date (UTC)**	**End Date (UTC)**	**Number of Days**	**Total Clients**	**Total Policies**	**Unused Clients**	**Gather Version**	**Input Directory**
10	master	3/11/2016	6/9/2016	90	2	4	0	8.0	E:/fin/20160609_143426_master
11	newmaster	3/11/2016	6/9/2016	90	5	8	0	8.0	E:/fin/20160609_143426_newmaster
12	oldmaster	3/11/2016	6/9/2016	90	10	15	0	8.0	E:/fin/20160609_143426_oldmaster
13	upgradedmaster	3/11/2016	6/9/2016	90	7	3	0	8.0	E:/fin/20160609_143426_upgradedmaster
14	**Total**				**24**	**30**	**0**		

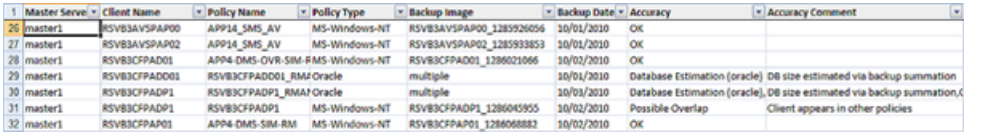
Eliminate redundant data due to client aliases and multiple IP addresses

The analyzer performs calculations based on the client name as stored in the catalog. Clients that are backed up by multiple aliases or multiple IP addresses are not collapsed into a single entry. For ease of accountability, the **Itemization** tab lists all client aliases and IP addresses used for backup separately. In some jurisdictions, the collection of the system IP address may be subject to regulation as personal data.

Determine where multiple client or policy lines refer to the same data set backed up through different interfaces. Make adjustments to the **Charged Size** value for all but one of the client or policy lines. We recommend retaining the value that is most recent. Annotate the duplicate client itemizations with a comment within the adjacent **Reason** cell. Indicate that the client's value is already counted under a different host name and reference the host name.

Examine the Itemization tab for flagged conditions in the Accuracy column

The report's **Itemization** tab shows the calculated capacity for each client or policy combination. The report flags any conditions that have the potential to over count or to under count capacity. These conditions are identified in the **Accuracy** and **Accuracy Comment** columns.



1	Master Server	Client Name	Policy Name	Policy Type	Backup Image	Backup Date	Accuracy	Accuracy Comment
26	master1	RSVB3AVSPAP00	APP14_SMS_AV	MS-Windows-NT	RSVB3AVSPAP00_1285926056	10/01/2010	OK	
27	master1	RSVB3AVSPAP02	APP14_SMS_AV	MS-Windows-NT	RSVB3AVSPAP02_1285933853	10/01/2010	OK	
28	master1	RSVB3CFPAD01	APP4-DMS-OVR-SIM-RM	MS-Windows-NT	RSVB3CFPAD01_1286021066	10/02/2010	OK	
29	master1	RSVB3CFPADD01	RSVB3CFPADD01_RMAN	Oracle	multiple	10/01/2010	Database Estimation (oracle)	DB size estimated via backup summation
30	master1	RSVB3CFPADP1	RSVB3CFPADP1_RMAN	Oracle	multiple	10/03/2010	Database Estimation (oracle),	DB size estimated via backup summation,C
31	master1	RSVB3CFPADP1	RSVB3CFPADP1	MS-Windows-NT	RSVB3CFPADP1_1286045955	10/02/2010	Possible Overlap	Client appears in other policies
32	master1	RSVB3CFPAP01	APP4-DMS-SIM-RM	MS-Windows-NT	RSVB3CFPAP01_1286068882	10/02/2010	OK	

- **Possible overlap - Client appears in multiple policies**
  A client in multiple backup policies has the potential to have the same data backed up more than once. Compare the policy types and names to determine if the case warrants a detailed examination of the respective policies' backup selections.
- **Database estimation - database size estimated using UBAK summation**
  The size of databases that a NetBackup database agent protects cannot be determined with certainty. Third party components external to NetBackup (for example, RMAN) govern the composition of database backups.
  The third-party component determines the number of backup streams and the contents of each stream. These backups are recorded as user-initiated backup images, or UBAKs. NetBackup does not initiate backup streams, nor does it know each stream's relationship to the underlying database. Therefore the

information in the catalog does not provide a single, clear, undisputable figure for the total size.

In these cases, the analyzer calculates an estimation upon which to base follow-on examinations. The analyzer uses the image header information to determine the total terabytes of data that were backed up each day within the date range examined. A day is defined as the 24 hour period from midnight to midnight. The analyzer sums all full and user-initiated backups that started within that period. The day with the largest total volume of protected data during the range that is examined is assumed to be the day when a full backup of the database was performed. This figure that is returned is an estimate of the approximate size of active data under protection for the client and policy.

- **Undiscoverable - No full backup found within range analyzed**
  The catalog has only incremental backups for the range analyzed. That error may indicate that a full backup falls outside the report's range or that a full backup does not exist.
- **Compressed Image**
  The client's data was sent to NetBackup in compressed form. The actual size cannot be determined with certainty. For all compressed backup images, the analyzer multiplies the final backup image size by a fixed value (the compression ratio). The value of the compression ratio is listed on the **Summary** tab.
- **Size unavailable – Only snapshot is present**
  The catalog has only snapshots for the range analyzed. The analyzer requires a backup image of the snapshot to have an accurate figure for the client's protected capacity.
- **Possible multistream backup detected**
  The size of the clients that are protected by multistream backups is the total of all backup images that are created by all streams.

Verify correct grouping and summation of multistreamed backup images

When a client is backed up by multiple streams, the client’s size is equal to the total of all backup images that were created by all streams. Job throttles on the policy, the client, and the storage unit hinder the utility’s ability to group the streams with certainty. For example, instead of starting within minutes of one another a subset of the backup streams may start in a different day than the rest of the backup streams. Because the utility sums only the backup images from streams that originate within the same 24 hour period (midnight to midnight), these streams are counted in separate days. Manually initiating a second full backup within the same

day also skews the results. Streams from both backups are counted together as a group.

Reconciling the capacity licensing report results

After reviewing the resulting spreadsheet you can either:

- Accept the generated information without changes as the basis for license charges.
- Make changes and note the reason for the change.

As you make changes to the spreadsheet assess when any additional changes are no longer meaningful. Since licensing charges are assessed on a per terabyte basis, it may not be beneficial to dispute charges for a few gigabytes of information. You may want to sort the clients by their backup size and focus on the largest backups first. Sorting by backup size provides two benefits. First, your efforts are initially focused on the largest clients. Second, if there are clients backing up only a few kilobytes, these backups may not capture the correct information. You may have important data which is unprotected.

Locate full backups for clients

On the **Itemization** tab, sort the list by the **Accuracy** column. For all rows that indicate Undiscoverable, manually query the NetBackup catalog to determine if a full backup can be found. A full backup may exist in a time period that precedes the period the analyzer examined. Run the utility again with specific options to restrict the collection and reporting to the specific client and a specific date range within which the full backup(s) fall. Alternatively, manually examine the client system to determine the size of data that would be backed up with the backup policy's selections and settings.

Review compressed image information

On the **Itemization** tab, sort the list by **Accuracy** column. For any compressed images, review the **Charged Size** column and confirm that the correct information is displayed. If the information is inaccurate, change the **Charged Size** column, and add a note to the **Enter a Reason here when modifying the Charged Size** column explaining the change.

Eliminate redundant counting of clients

On the **Itemization** tab, sort the list by **Client Name** and search for the use of host name aliases. Look for instances where the itemization table lists the same client

multiple times under the same policy but with a different host name alias. If that occurs, zero out the **Charged Size** column for the lines with an earlier backup date. Add a note to the **Enter a Reason here when modifying the Charged Size** column explaining why the **Charged Size** value is zero.

For some Oracle RAC backups, the presence of itemizations under different aliases can reflect the backup of different data sets. If you zero out the **Charged Size** the protected data is under counted.

If a client is found in more than one policy, confirm that those policies do not have overlapping backup selections. If the backup selections overlap, find the redundant backup policies in the **Itemization** tab. Make adjustments to the **Charged Size** value. Decrement the size by the value of the redundant backup selection and add a comment within the adjacent **Reason** cell.

Determine the effect of multistreamed backups

On the **Itemization** tab, sort the list by the **Accuracy** column. Find all backups that list **Possible multi-stream backup detected** and make a note of the policy name under the **Policy Name** column. Open the log file that was generated when the `nbdeployutil --report` command ran. By default, the log file is in the directory where the gathered report is located.

Note: If OpsCenter generated the report, the log file is found on the OpsCenter server. The email with the report results contains a link to the log file location. The log file name is in the format `nbdeployutil-report-`*`timestamp`*`-log`.

In the log file, find the policy name for the policy in question and look at the corresponding **MAX** value. The excerpt from a log file that is shown highlights the information discussed.

```
Analyzing backups for policy <policy_name>, client <client_name>
Analyzing schedule Full
MAX 2010-09-01   14.6 T    (multiple backups     )
                 21.7 G    (client_name_1283295642)  09:00:42
                  1.0 T    (client_name_1283295643)  09:00:43
                793.1 G    (client_name_1283295644)  09:00:45
                  1.2 T    (client_name_1283295645)  09:00:48
                  1.5 T    (client_name_1283295647)  09:00:49
```

Confirm that this information is correct for the policy. If the information is inaccurate, update the **Charged Size** column, and add a note to the **Enter a Reason here when modifying the Charged Size** column that explains the change.

Confirm the accuracy of any database backups

Reconcile database backups in the same way that you reconcile multistream backups. Find the policy name in the spreadsheet and locate the analyzed information in the `nbdeployutil-report-`*`timestamp`*`.log` file. Does the chosen day appear to correspond to a day upon which the complete database was backed up? If the information is inaccurate, change the **Charged Size** column, and add a note to the **Enter a Reason here when modifying the Charged Size** column explaining the change.

Locate full backups for snapshot images

Examine the backup policy attributes to determine if a backup image is ever created from the snapshot. If it is, rerun the analyzer with specific options to restrict the collection and reporting to the specific client with a longer date range to find a full backup of the snapshot. If a backup image is never created from the snapshot, manually examine the snapshot or the client system to determine the size of the data.

Note: The log file that is associated with this report shows snapshot information.

Chapter 2

Additional configuration

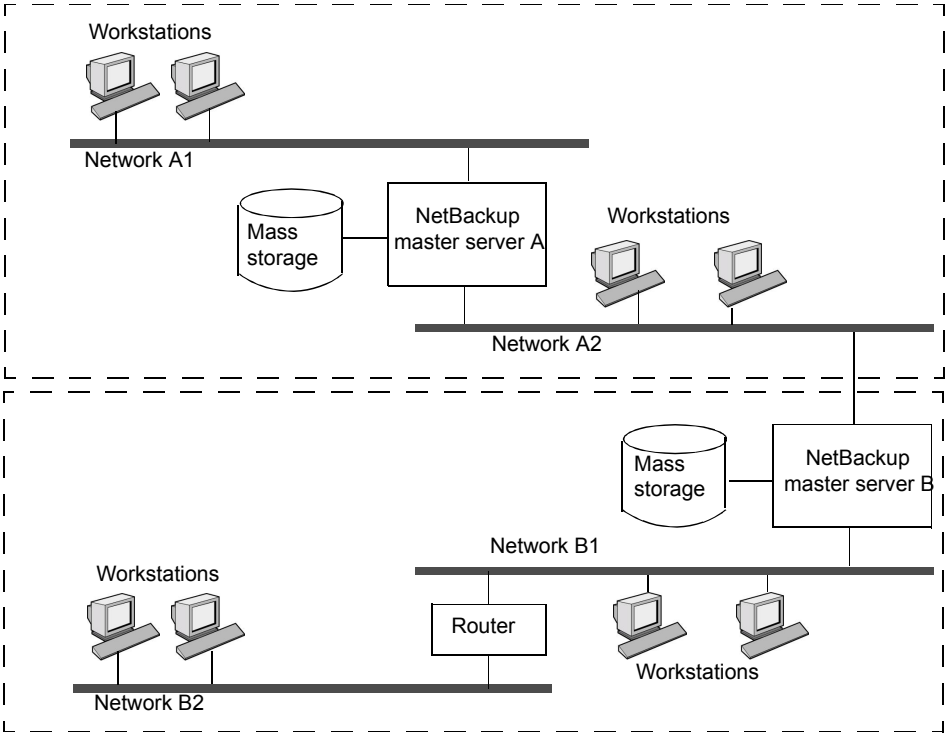
This chapter includes the following topics:

About multiple NetBackup master servers

For a large site, use multiple NetBackup master servers to optimize the backup loads. Divide the clients between the servers as necessary.

Figure 2-1 shows a multiple-server configuration where the two sets of networks (A1/A2 and B1/B2) each have enough clients to justify separate servers.

Figure 2-1 Multiple master server scenario



In this environment, the two NetBackup server configurations are completely independent. You can also create a configuration where one server is the master and the other is a media server.

About multiple media servers with one master server

A protection domain refers collectively to the NetBackup master server, its NetBackup media servers, and its NetBackup clients. In a group of NetBackup servers, a client can have backups directed to any device on any server in the group.

Set up a NetBackup protection domain as follows:

- One master server, which controls all backup scheduling.
- Multiple media servers, which write the backup images to disk or removable media. They can have peripheral devices to provide additional storage.

- Multiple protected NetBackup clients, which send their data to the media servers.

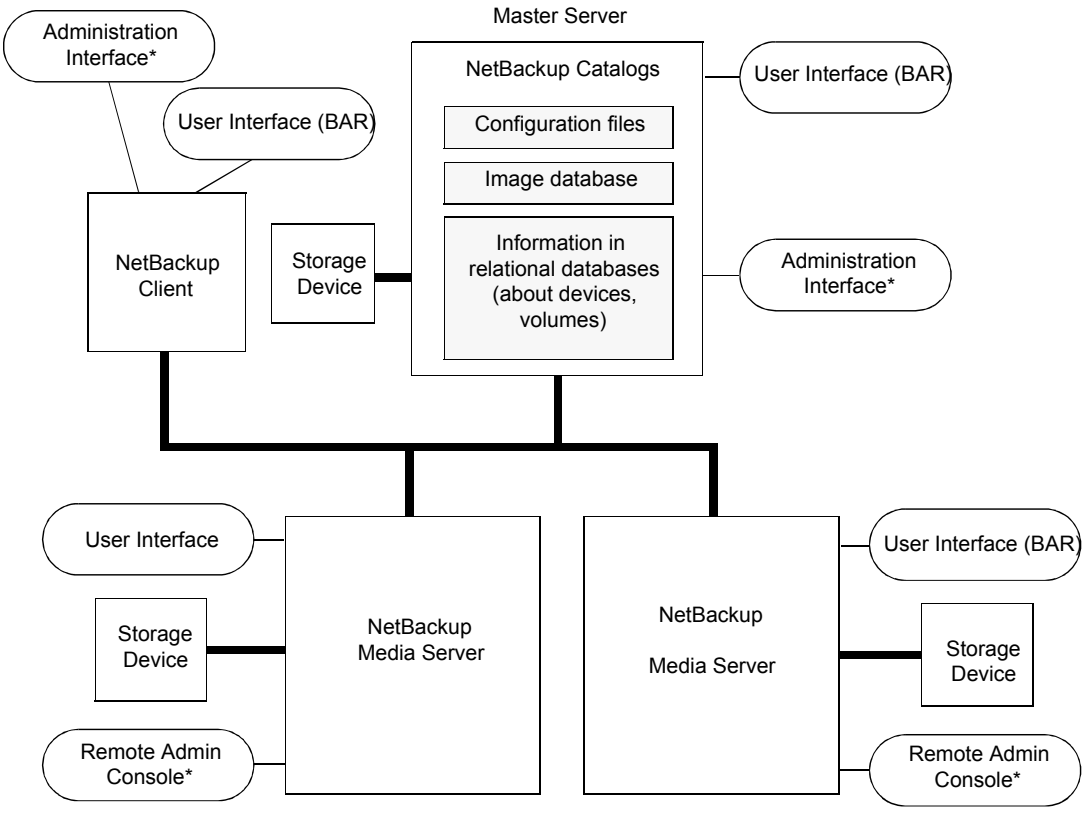
A common alternative strategy is to install extra peripherals on the clients that produce large amounts of data. The master server directs the data from the client to the client's peripherals, which reduces network traffic because the data does not traverse the network. This strategy also distributes the backup load between the master and the media servers.

Important factors to remember about master and media servers are as follows:

- There can be only one master server in a group.
- A NetBackup master server is a media server for itself but cannot be a media server for another master server.

Figure 2-2 shows where software is installed and where the NetBackup catalogs are located (by default).

Figure 2-2 Catalog location using multiple media servers



* You can also use the Backup, Archive, and Restore user interface from a Windows client that has the Remote Administration Console installed.

About the software on each server

Install NetBackup server software on each NetBackup server that has a peripheral that you want to include in a storage unit. The NetBackup installation program has choices for master and media server installation.

About NetBackup catalogs

The master server is the default location for the NetBackup catalogs. The catalogs include the media and the volume database (`emm_data.db`). The volume database contains the media usage information and the volume information that are used during the backups.

About direct I/O for backups on Windows

By default, the buffer size for disk storage units is 256 KB. If the buffer size is set to a value greater than 256 KB, backups written to that storage unit automatically use direct I/O. An increased buffer size can improve backup speed.

To increase the buffer size, the following conditions must be met:

- A Windows media server must own the storage unit.
- The storage unit must be either a BasicDisk or an Array Disk storage unit.
- The backup to be stored cannot be multiplexed.
- The touch file that disables direct I/O must not be present.
  (*install_path*\VERITAS\NetBackup\bin\DISABLE_DIRECT_IO)

To increase the buffer size, create one of the following touch files on the media server that owns the storage unit:

- For backups to disk

  install_path\VERITAS\NetBackup\db\config\
  SIZE_DATA_BUFFERS_DISK

- For backups to disk or tape

  install_path\VERITAS\NetBackup\db\config\
  SIZE_DATA_BUFFERS

If both touch files are present, SIZE_DATA_BUFFERS_DISK overrides the value in SIZE_DATA_BUFFERS. At this time, Veritas recommends that you use SIZE_DATA_BUFFERS_DISK.

Table 2-1 shows the possible values to include in SIZE_DATA_BUFFERS_DISK or SIZE_DATA_BUFFERS.

Table 2-1 Absolute byte values for SIZE_DATA_BUFFERS_DISK, SIZE_DATA_BUFFERS

For a data buffer of this size (kilobytes)	Enter this touch file value
32	32768
64	65536
96	98304
128	131072

Table 2-1 Absolute byte values for SIZE_DATA_BUFFERS_DISK, SIZE_DATA_BUFFERS *(continued)*

For a data buffer of this size (kilobytes)	Enter this touch file value
160	163840
192	196608
224	229376
256	262144

Data buffer sizes continue in multiples of 32. Multiply the buffer size by 1024 for the touch file value.

A direct I/O backup triggers the following message: "Enabling direct I/O. Buffer size: <*buffer size*>."

Disabling direct I/O on Windows

To disable direct I/O

- Create the following touch file on the media server that owns the storage unit:

  install_path\VERITAS\NetBackup\bin\DISABLE_DIRECT_IO

About dynamic host name and IP addressing

Before making changes to a configuration, read this entire topic.

By default, a NetBackup server assumes that a NetBackup client name is the same as the network host name of the client computer. This assumption makes it difficult to back up any clients that have network host names that might change. For example, a computer that plugs into a LAN and obtains IP addresses from a DHCP server. Or, a remote machine that dials into a PPP server. Use dynamic host name and IP addressing to define NetBackup clients that do not have fixed IP addresses and host names.

If dynamic addressing is used, remember that the NetBackup servers still require fixed IP addresses and host names.

All clients that are configured to use dynamic addressing and host names must trust each other, similar to the NetBackup altnames feature.

The following process is required to support the configurations that use dynamic IP addressing for NetBackup.

Table 2-2 Process to support the configurations that use dynamic IP addressing for NetBackup

Action	Process details/requirements
Configure the network to use a dynamic IP addressing protocol like DHCP.	NetBackup requires that IP addresses of clients have a network host name. (On Windows) Be sure to define network host names for the range of dynamic IP addresses in the `hosts` file and (or) DNS on the network. (On UNIX) Be sure to define network host names for the range of dynamic IP addresses in the `hosts` file, NIS, and (or) DNS on the network.
Determine the NetBackup client names for the computers that have dynamic IP addresses and network host names.	These NetBackup client names are used in other steps. Each NetBackup client must have a unique NetBackup client name. The NetBackup client name that is assigned to a client is permanent.
Make changes on the master server, as described.	■ Create NetBackup policies with client lists that include the new names. ■ Create entries in the NetBackup client database for the new client names. Use the `bpclient` command to create the entries.
Make changes on each dynamic NetBackup Windows client, as described.	In the **NetBackup Administration Console**, in the left pane, click **NetBackup Management**. On the **File** menu, click **Backup, Archive, and Restore**. On the **File** menu, click **NetBackup Client Properties**. In the **NetBackup Client Properties** dialog box, select the **General** tab. Enter the correct NetBackup client name for the computer in the **Client Name** text box.
On the master server, enable the **Announce DHCP Interval** option, as described.	In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Host Properties > Clients**. Double-click on the Windows client(s) in the right pane to open the **Client Properties** window. In the **Client Properties** window, in the left pane, expand **Windows Client > Network**. In the right pane, check the **Announce DHCP Interval** check box.

Table 2-2 Process to support the configurations that use dynamic IP addressing for NetBackup *(continued)*

Action	Process details/requirements
Make changes on each dynamic NetBackup UNIX clients, as described.	■ Modify the `bp.conf` file to include a `CLIENT_NAME` entry with the correct NetBackup client name for the computer. ■ Configure the system to notify the master server of the computer's NetBackup client name and current network host name during startup. The `bpdynamicclient` command is used to notify the master server. ■ Configure the system to notify periodically the master server of the computer's NetBackup client name and current network host name.

About setting up dynamic IP addresses and host names

Configure the network to use a dynamic IP addressing protocol. A protocol like DHCP has a server and several clients. For example, when a DHCP client starts up, it requests an IP address from the DHCP server. The server then assigns an IP address to the client from a range of predefined addresses.

NetBackup requires that the IP addresses of NetBackup clients have corresponding network host names. Ensure that each IP address that can be assigned to NetBackup clients has a network host name. The host name should be defined in the host file, NIS, and DNS on the network.

For example, ten dynamic IP addresses and host names are available.

The dynamic IP addresses and host names might be as follows:

```
123.123.123.70 dynamic00
 123.123.123.71 dynamic01
 123.123.123.72 dynamic02
 123.123.123.73 dynamic03
 .
 .
 .
 123.123.123.79 dynamic09
```

Assign a unique NetBackup client name to each NetBackup client that might use one of these dynamic IP addresses. The NetBackup client name that is assigned to a client is permanent and should not be changed. The client name that is assigned to NetBackup clients with dynamic IP addressing must not be the same as any network host names on the network. If the NetBackup client names are changed or are not unique, backup and restore results are unpredictable.

For example, 20 computers share the IP addresses as previously defined.

To make these computers NetBackup clients, assign them the following NetBackup client names:

```
nbclient01
 nbclient02
 nbclient03
 nbclient04
 .
 .
 .
 nbclient20
```

Configuring the NetBackup master server

Use the following procedure to configure the NetBackup master server.

To configure the NetBackup master server

1. On the master server, create the NetBackup backup policies. For client name lists, use the NetBackup client names (for example, *nbclient01*) rather than the dynamic network host names (for example, `dynamic01`).
2. Create the client database on the master server.

   The client database consists of directories and files in the following directory:

   On Windows:

   install_path\NetBackup\db\client

   On UNIX:

   /usr/openv/netbackup/db/client

3 Create, update, list, and delete client entries with the `bpclient` command.

The `bpclient` command is in the following directory:

On Windows:

install_path\NetBackup\bin\admincmd

On UNIX:

/usr/openv/netbackup/bin/admincmd

See "bpclient commands that control client entries" on page 43.

In the example, enter the following commands to create the 20 clients:

On Windows:

```
cd install_path\NetBackup\bin\admincmd
```

On UNIX:

```
cd /usr/openv/netbackup/bin/admincmd
bpclient -add -client nbclient01 -dynamic_address 1
bpclient -add -client nbclient02 -dynamic_address 1
bpclient -add -client nbclient03 -dynamic_address 1
bpclient -add -client nbclient04 -dynamic_address 1
.
.
.
bpclient -add -client nbclient20 -dynamic_address 1
```

4 To see what is currently in the client database, run `bpclient` as follows:

On Windows:

```
install_path\NetBackup\bin\admincmd\bpclient -L -All
```

On UNIX:

```
/usr/openv/netbackup/bin/admincmd/bpclient -L -All
```

The output is similar to the following:

```
Client Name: nbclient01
 Current Host:
 Hostname: *NULL*
 IP Address: 0.0.0.0
 Connect on non-reserved port: no
 Dynamic Address: yes

 Client Name: nbclient02
 Current Host:
 Hostname: *NULL*
 IP Address: 0.0.0.0
 Connect on non-reserved port: no
 Dynamic Address: yes
 .
 .
 .
 Client Name: nbclient20
 Current Host:
 Hostname: *NULL*
 IP Address: 0.0.0.0
 Connect on non-reserved port: no
 Dynamic Address: yes
```

The NetBackup client notifies the NetBackup server of its NetBackup client name and network host name. Then the Current Host, Hostname, and IP address fields display the values for that NetBackup client.

bpclient commands that control client entries

The `bpclient` command creates, updates, lists, and deletes client entries. The following table shows the `bpclient` commands that control client entries.

Table 2-3 `bpclient` commands that control client entries

Action	Command

Create a dynamic client entry	On Windows:
	`bpclient.exe -add -client client_name -dynamic_address 1`
	On UNIX:
	`bpclient -add -client client_name -dynamic_address 1`
	Where *client_name* is the NetBackup client name. The `-dynamic_address 1` argument indicates that the client uses dynamic IP addressing. It's possible to create entries with `-dynamic_address 0` for static IP addressing. However, to do so is unnecessary and adversely affects performance.

Delete a client entry	On Windows:
	`bpclient.exe -delete -client client_name`
	On UNIX:
	`bpclient -delete -client client_name`

List a client entry	On Windows:
	`bpclient.exe -L -client client_name`
	On UNIX:
	`bpclient -L -client client_name`

List all client entries	On Windows:
	`bpclient.exe -L -All`
	On UNIX:
	`bpclient -L -All`

Configuring dynamic NetBackup clients

Configuring a dynamic Windows client

Use the following procedure to configure a dynamic Windows client.

To configure a dynamic Windows client

1. If it's not already installed, install NetBackup on the Windows client.
2. In the **NetBackup Administration Console**, in the left pane, click **NetBackup Management**. On the menu bar, expand **File > Backup, Archive, and Restore**.
3. On the menu bar of the **Backup, Archive, and Restore** dialog box, expand **File > NetBackup Client Properties**.
4. In the **NetBackup Client Properties** dialog box, select the **General** tab. Change the **Client Name** to specify the NetBackup client name for the Windows client. Click **OK**.
5. In the **NetBackup Administration Console**, set **Announce DHCP Interval**. This value specifies how many minutes the client waits before it announces that it will use a different IP address.

   To set the **Announce DHCP Interval**, return to the **NetBackup Administration Console**. In the left pane, expand **NetBackup Management > Host Properties > Clients**. Double-click on the Windows client(s) in the right pane to open the **Client Properties** window. In the **Client Properties** window, in the left pane, expand **Windows Client > Network**. In the right pane, check the **Announce DHCP Interval** check box.

   Additional information is available for **Announce DHCP Interval** in the NetBackup Administrator's Guide, Volume I.

   The server is not notified if the default value of 0 is used. For a DHCP client, a good value to use is one-half of the lease period.
6. On the client, stop and restart the NetBackup Client service to have the changes take effect.

Configuring a dynamic UNIX NetBackup client

Use the following procedure to configure a dynamic UNIX NetBackup client.

To configure a dynamic UNIX NetBackup client

1. If not already installed, install the NetBackup client software.
2. Edit the `/usr/openv/netbackup/bp.conf` file. Use the `CLIENT_NAME` entry to specify the NetBackup client name for the computer, as follows:

```
CLIENT_NAME = nbclient00
```

3 Run the `bpdynamicclient` command once when the system first starts up. `bpdynamicclient` notifies the NetBackup server of the computer's NetBackup client name and current network host name. The `bpdynamicclient` command is in the directory:

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

The format of the `bpdynamicclient` command is as follows:

```
bpdynamicclient -last_successful_hostname file_name
```

When `bpdynamicclient` starts up, it checks for the existence of *file_name*. If *file_name* exists, `bpdynamicclient` determines if the host name that is written in the file is the same as the current network host name. If the host names match, `bpdynamicclient` exits and does not connect to the master server. If the host names do not match, `bpdynamicclient` connects to the master server and informs the server of its NetBackup client name and host name. If `bpdynamicclient` successfully informs the server, `bpdynamicclient` writes the current network host name into *file_name*. If `bpdynamicclient` cannot inform the server, `bpdynamicclient` deletes *file_name*.

Most UNIX systems provide a facility to define startup scripts.

For example, create the following script in the `/etc/rc2.d` directory on a Solaris system:

```
# cat > /etc/rc2.d/S99nbdynamicclient <<EOF
 #! /bin/sh

 rm /usr/openv/netbackup/last_successful_hostname
 /usr/openv/netbackup/bin/bpdynamicclient
 -last_successful_hostname \
 /usr/openv/netbackup/last_successful_hostname
 EOF
 # chmod 544 /etc/rc2.d/S99nbdynamicclient
```

Ensure that the dynamic client startup script is called after the computer obtains its IP address.

4 You must also create a root `crontab` entry to call the `bpdynamicclient` command periodically.

For example, the following entry (one line) calls `bpdynamicclient` at seven minutes after each hour:

```
7 * * * * /usr/openv/netbackup/bin/bpdynamicclient
-last_successful_hostname
/usr/openv/netbackup/last_successful_hostname
```

For DHCP, an acceptable interval to use between calls to `bpdynamicclient` is one-half of the lease period.

About busy file processing on UNIX clients

Busy file processing applies only to UNIX clients.

Information about VSP (Volume Snapshot Provider) is available for Windows clients.

See the NetBackup Administrator's Guide, Volume I.

A busy file is a file that was detected as changed during a user or a scheduled backup. Typically, detection occurs if a process writes to a file while NetBackup attempts to back it up.

The following conditions result in the detection of busy files:

- Read error on the file
- File modification time changed
- File inode time changed
- File size changed

The backup usually completes with a status of 1, which indicates that the backup was partially successful. Busy file processing allows the user control the actions of NetBackup when busy files are detected.

Busy file processing can be configured in the **Busy File Settings** host properties for UNIX clients.

See the NetBackup Administrator's Guide, Volume I.

Busy file processing can also be enabled by adding the `BUSY_FILE_PROCESSING` option to the client `/usr/openv/netbackup/bp.conf` file. Then add other busy file options to control the processing of busy files. The options can exist in both the client `/usr/openv/netbackup/bp.conf` file and a user's `$HOME/bp.conf`. The user's `bp.conf` file takes precedence when the options are in both places.

NetBackup creates several files and directories when it processes busy files. Initially, a working directory named `busy_files` is created under `/usr/openv/netbackup`. NetBackup then creates the `/actions` directory under `busy_files` and places `action` files in that directory. An `action` file contains the information that NetBackup uses to control the processing of busy files.

By default, the contents of the action file are derived from the `BUSY_FILE_ACTION` options in `bp.conf`. A user can also create an action file to control a specific backup policy and schedule. NetBackup creates a logs directory under `busy_files` for storing busy file status and diagnostic information.

Configuring busy file processing on UNIX

Use the following procedure to use the `bp.conf` file to configure busy file processing.

To configure busy file processing

1. Modify the `bp.conf` file options.

   See "Modifying bp.conf to configure busy file processing on UNIX" on page 49.

2. Copy the `bpend_notify_busy` script, located on the master server:

   `/usr/openv/netbackup/bin/goodies/bpend_notify_busy`

   to the following path on the client:

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

   Be sure to set the file access permissions to allow groups and others to run `bpend_notify`.

   (This step is also performed when configuring busy file processing in the **Busy File Settings** host properties.)

3. Configure a policy with a user backup schedule for the busy file backups.

   This policy services the backup requests that the `repeat` option in the `actions` file generates. The policy name is significant. By default, NetBackup alphabetically searches (upper-case characters first) for the first available policy with a user backup schedule and an open backup window. For example, a policy name of `AAA_busy_files` is selected ahead of `B_policy`.

   (This step is also performed when configuring busy file processing in the **Busy File Settings** host properties.)

Modifying bp.conf to configure busy file processing on UNIX

Use the following procedure to modify the `bp.conf` file to configure busy file processing.

To modify the `bp.conf` file to configure busy file processing

1. Configure busy file processing by using the **Busy File Settings** host properties for UNIX clients.

   See the NetBackup Administrator's Guide, Volume I.

2. Or, configure busy file processing by using the entries in the `bp.conf` file on the client. The user can also configure a `bp.conf` file in a home directory. The busy file options that are specified in the user's `bp.conf` file apply only to user-directed backups. NetBackup ignores busy file processing for user backups if a `bp.conf` file does not exist in their home directory.

   The `bp.conf` file entries to use are as follows:

   - `BUSY_FILE_PROCESSING`
   - `BUSY_FILE_DIRECTORY`
   - `BUSY_FILE_ACTION`

bp.conf file entries on UNIX

The following table describes the `bp.conf` file entries that are used to configure busy file processing.

Table 2-4 bp.conf file entries

Entry	Description
`BUSY_FILE_PROCESSING`	Enables the NetBackup busy file-processing feature. By default, this entry is not present in the client's `/usr/openv/netbackup/bp.conf` file.
`BUSY_FILE_DIRECTORY`	Specifies an alternate path to the busy files working directory. This entry is not required. By default, this entry is not present in the client's `/usr/openv/netbackup/bp.conf` or `$HOME/bp.conf` file. By default, NetBackup creates the busy_files directory in `/usr/openv/netbackup` or the user's home directory.

Table 2-4 bp.conf file entries *(continued)*

Entry	Description
BUSY_FILE_ACTION	Directs the action that NetBackup performs on busy files. By default, this entry is not present in the client's /usr/openv/netbackup/bp.conf or $HOME/bp.conf file. Multiple entries may exist in the following form: BUSY_FILE_ACTION = *filename_template action_template* Where ■ *filename_template* is the absolute pathname and file name of the busy file. The shell language metacharacters *, ?, [], [-] can be used to match the patterns of file names or parts of file names. ■ *action_template* is one of the following: MAIL | mail Directs NetBackup to mail a busy file notification message to the user that the BUSY_FILE_NOTIFY_USER option specifies. REPEAT | repeat [repeat_count] Directs NetBackup to retry the backup on the specified busy file. A repeat count can be specified to control the number of backup attempts. The default repeat count is 1. IGNORE | ignore Directs NetBackup to exclude the busy file from busy file processing. The file is backed up and a log entry that indicates that the file was busy appears in the All Log Entries report. BUSY_FILE_NOTIFY_USER Specifies the recipient of the busy file notification message when BUSY_FILE_ACTION is set to MAIL or mail. By default, BUSY_FILE_NOTIFY_USER is not in /usr/openv/netbackup/bp.conf or $HOME/bp.conf file on a client. By default, the mail recipient is root. See Table 2-5 on page 51.

The following table shows examples of how a BUSY_FILE_ACTIONentry works.

Table 2-5 Examples of how a BUSY_FILE_ACTION entry works

Example	Description

`BUSY_FILE_PROCESSING`
`BUSY_FILE_DIRECTORY =`
`/tmp`
`BUSY_FILE_NOTIFY_USER =`
`kwc`
`BUSY_FILE_ACTION =`
`/usr/* mail`
`BUSY_FILE_ACTION =`
`/usr/local ignore`
	This example causes NetBackup to take the following actions when it encounters busy files:
	■ Create the busy files working directory in `/tmp`
	■ Send an email notification message to user *kwc* for all busy files that it finds under `/usr` except for those in `/usr/local`.

`BUSY_FILE_PROCESSING`
`BUSY_FILE_ACTION =`
`/usr/* repeat 2`
`BUSY_FILE_ACTION =`
`/usr/openv mail`
`BUSY_FILE_ACTION =`
`/usr/local ignore`
	This example causes NetBackup to take the following actions when it encounters busy files:
	■ Send a busy file notification message to root for busy files in `/usr/openv`.
	■ Repeat the backup up to two times for all busy files that it finds under `/usr`, except for those in `/usr/openv` and `/usr/local`.
	■ Exclude the busy files in `/usr/local` from all actions.

How NetBackup creates and uses action files on UNIX

When a backup operation begins, NetBackup creates a default action file named `actions` in the `busy_files/actions` directory. The contents of the `actions` file are derived from the `BUSY_FILE_ACTION` options in the `bp.conf` file.

Normally, NetBackup refers to the default action file for all future busy file processing. To override the default, create an action file to control a specific backup policy and schedule. The following entries show the naming convention for the policy and the schedule action files:

```
actions.policy_name.schedule_name
actions.policy_name
```

Where *policy_name* and *schedule_name* correspond to a predefined backup policy and schedule.

NetBackup performs the following steps when it searches for an action file.

Table 2-6 NetBackup steps when it searches for an action file

Step	Example
Checks for a file that names a specific policy and schedule, such as:	`actions.`*`policy_name.schedule_name`*
If a file for a specific policy and schedule is not found, NetBackup searches for a less specific name, such as the following:	`action`*`policy_names`*

If a less specific name does not exist, NetBackup refers to the default action file.
 	
The contents of user-created action files are similar to the default. Optional comment lines can be included. The specification is the same as for the `BUSY_FILE_ACTION` option:
	`# comment_line`
	
	`filename_template action_template`
	
	Example 1:
	
	The `bp.conf` file might contain the following:
	
	`BUSY_FILE_ACTION =`
	`  /usr/openv mail`
	`BUSY_FILE_ACTION = /usr/* repeat 2`
	`BUSY_FILE_ACTION = /usr/local ignore`
	
	If yes, the default actions file (named `actions`) contains the following lines:
	
	`/usr/openv mail`
	`/usr/* repeat 2`
	`/usr/local ignore`
	
	Example 2:
	
	An action file name for a backup policy production_servers with a schedule name full follows:
	
	`actions.production_servers.full`
	
	The `actions` file can contain the following line:
	
	`/bin/* repeat`
	
	If yes, NetBackup repeats the backup for busy files in the `/bin` directory.

About the logs directory on UNIX

During busy file processing NetBackup creates a number of files under the `busy_files/logs directory`. These files contain status and diagnostic information. NetBackup derives the names of these files from the policy name, schedule name, and process ID (PID) of the backup.

NetBackup creates the following logs:

- Busy file log
  NetBackup records the names of any busy files in the busy file log. The name of the busy file log has the following form:

  policy_name.schedule_name.PID

- Diagnostic log file
  NetBackup generates a log file that contains diagnostic information. The name of the log file has the following form:

  log.*policy_name.schedule_name.PID*

- Retry log file
  NetBackup also generates a retry file that contains diagnostic information that is recorded when the repeat option is specified. The name of the retry file has the following form:

  policy_name.schedule_name.PID.retry.retry_count

  Where *retry_count* starts at zero and increases by one every time a backup is repeated. Processing stops when *retry_count* is one less than the number that is specified by the `repeat` option.

Example:

To service busy file backup requests, the administrator defined a policy named AAA_busy_files that has a user backup schedule named user. A scheduled backup is initiated with the policy named production_servers, schedule named full, and PID of 1442.

If busy files are detected, NetBackup generates the following files in the `/usr/openv/netbackup/busy_files/logs` directory:

```
production_servers.full.1442
    log.production_servers.full.1442
```

If the actions file has the repeat count set to `2`, NetBackup generates the following files:

```
production_servers.full.1442.retry.0
    AAA_busy_files.user.10639
    log.AAA_busy_files.user.10639
```

If a repeat backup is attempted, NetBackup generates the following files:

```
production_servers.full.1442.retry.1
    AAA_busy_files.user.15639
    log.AAA_busy_files.user.15639
```

Recommended changes for modifying bpend_notify_busy on UNIX

The administrator can modify busy file processing by changing the `bpend_notify_busy` script.

The only recommended changes are as follows:

- Changing the `RETRY_POLICY` and `RETRY_SCHED` variables from NONE to the busy file backup policy name and schedule name.
- Remove the files in the logs directory after busy file processing (these logs are not removed automatically):
  - At the end of the `busy_files()` function, add the following command:

    ```
    /bin/rm -f $LOG_FILE
    ```

  - After the call to the `busy_files()` function in main, add the following commands:

    ```
    /bin/rm -f $BUSYFILELOG
    /bin/rm -f $RETRY_FILE
    ```

About specifying the locale of the NetBackup installation

NetBackup applications can display a wide range of international date and time formats as determined by the locale of the installation. To help ensure consistency among the applications, NetBackup uses a single, configurable source to define the locale conventions.

The *`install_path`*`\VERITAS\msg\LC.CONF` file (on Windows) and the `/usr/openv/msg/.conf` file (on UNIX) contain information on the supported locales. These files define the date and the time formats for each supported locale. The

`.conf` file and the `LC.CONF` file contain very specific instructions on how to add or modify the list of supported locales and formats.

The `.conf file` and the `LC.CONF` file are divided into two parts, the TL lines and the TM lines:

- TL Lines
  The third field of the `TL` lines defines the case-sensitive locales that the NetBackup applications support. The fourth and the fifth fields define the date and the time fields and associated separators for that supported locale.
  Modify the existing formats to change the default output.
  For example, the `TL` line for the C locale is the following:

  ```
  TL 1 C :hh:mn:ss/mm/dd/yyyy
  ```

  An alternate specification to the order of months, days, and years is as follows:

  ```
  TL 1 C :hh:mn:ss -yyyy-mm-dd
  ```

  Or:

  ```
  TL 1 C :hh:mn:ss/dd/mm/yy
  ```

  To add more `TL` lines, see the comments in the `.conf` file.
  If the `.conf` file is not accessible, the default locales (`TL` lines) are:

  ```
  TL 1 C :hh:mn:ss /mm/dd/yyyy
  TL 2 ov :hh:mn:ss/mm/dd/yyyy
  ```

  Note that `C` and `ov` are synonymous.

- TM Lines
  The `TM` lines define a mapping from unrecognized locales to those supported by NetBackup, as defined by the `TL` lines.
  The third field of the `TM` lines defines the unrecognized locale. The fifth field defines the supported equivalent that is identified in the `TL` lines.
  For example, use the following `TM` line to map the unrecognized locale French to the supported locale `fr`, the `TM` line is:

  ```
  TM 6 french 2 fr
  ```

  To map French to C

  ```
  TM 6 french 1 C
  ```

  To add more `TM` lines, see the specific instructions in the `.conf` file.

If the `.conf` file is not accessible, no default TM lines exist as the default locale is C (ov).

About the Shared Storage Option

The Shared Storage Option allows multiple NetBackup media servers to share individual tape drives (standalone drives or drives in a robotic library). NetBackup automatically allocates and unallocates the drives as backup and restore operations require.

The Shared Storage Option is a separately licensed and a separately purchased NetBackup software option that allows tape drive sharing. The license is the Shared Storage Option key.

The Shared Storage Option is required only if multiple hosts share drives. For example, multiple NDMP hosts may share one or more drives.

The Shared Storage Option requires appropriate hardware connectivity, such as Fibre Channel hubs or switches, SCSI multiplexors, or SCSI-to-fibre bridges.

You can use Shared Storage Option in the following environments:

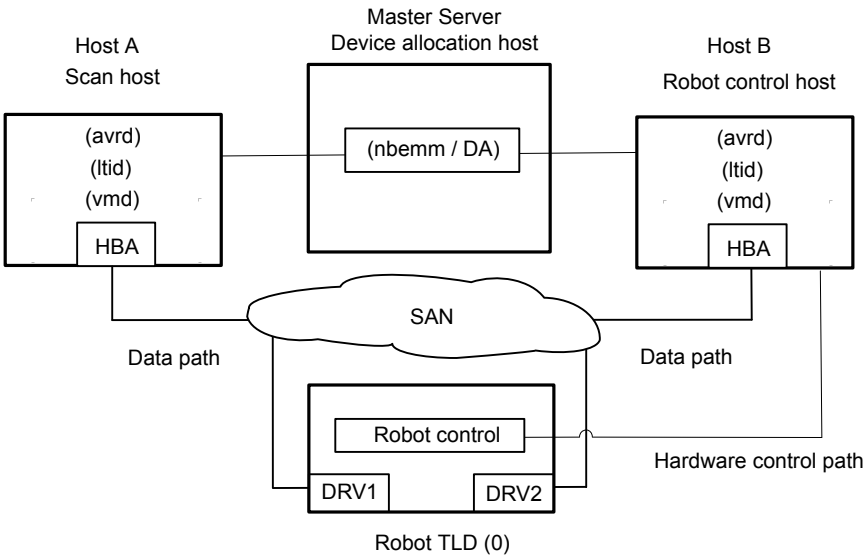
- Fibre Channel SANs
- Environments that do not use Fibre Channel, such as SCSI switches or multi-initiator configurations

About Shared Storage Option components

The NetBackup Enterprise Media Manager (EMM) service manages media information. The Enterprise Media Manager also is the device allocator (DA) for shared drives.

Figure 2-3 shows an example of a shared drive configuration.

Figure 2-3 Shared Storage Option example



The following items describe the NetBackup components for the Shared Storage Option example in Figure 2-3.

- The master server hosts the Enterprise Media Manager (EMM) service. It's the device allocation host.
  See About the device allocation host.
- Host A:
  - Is a NetBackup media server that runs the Automatic Volume Recognition (`avrd`) process, the NetBackup Device Manager service (`ltid`), and the NetBackup Volume Manager (`vmd`) service.
  - Is connected to drives DRV1 and DRV2 through SAN hardware.
  - Is the first host in the environment to come online with a non-zero scan ability factor. Therefore, it's the initial scan host for its drives.
    See About scan hosts.
- Host B:
  - Is a NetBackup media server that runs the Automatic Volume Recognition (`avrd`) process, the NetBackup Device Manager service (`ltid`), and the NetBackup Volume Manager (`vmd`) service.
  - Is connected to drives DRV1 and DRV2 through SAN hardware.

- Controls the robotics. Except for ACS or TLM robot types, only one robot control host exists for each robot.

For a process flow diagram of Shared Storage Option components, see the *NetBackup Logging Reference Guide*:

http://www.veritas.com/docs/DOC5332

About the device allocation host

The NetBackup Enterprise Media Manager (EMM) service allocates devices for Shared Storage Option jobs and tasks. The EMM service runs on the NetBackup master server. The host that allocates devices is also known as the device allocation host.

About SSO and the NetBackup EMM service

To coordinate network-wide allocation of tape drives, the NetBackup Enterprise Media Manager (EMM) service manages all shared tape requests in a shared drive environment. EMM responds to requests from a single NetBackup master server for its corresponding media servers, and NetBackup SAN media servers within a single NetBackup domain.

EMM maintains shared drive and host information. Information includes a list of hosts that are online and available to share a drive and which host currently has the drive reserved. The Media Manager device service (`ltid`) requests shared drive information changes.

About scan hosts

Scan hosts are a component of the NetBackup Shared Storage Option.

Each shared drive has a host that is identified as the scan host. A scan host is the host from which the automatic volume recognition process (`avrd`) scans unassigned drives. (The robotic daemons scan assigned drives.) A scan host must have data path access to the drive.

The EMM database contains the shared drive information; that information includes the scan host. Media servers receive drive status information from the EMM service.

How the scan host is determined	EMM determines scan hosts; a scan host may be different for each shared drive. The first host in the environment to come online with a non-zero scan ability factor is the initial scan host for its drives. To configure the scan ability factor of media servers, use the `nbemmcmd` command. For more information, see the *NetBackup Commands Reference Guide*, available at the following URL: http://www.veritas.com/docs/DOC5332
The scan host can change	A scan host is assigned for a shared drive until some interruption occurs. For example, if one of the following occurs, EMM chooses a new scan host: ■ The socket connection, the host, the drive, the drive path, or the network goes down. ■ The drive is logically placed in the Down mode. The scan host temporarily changes to hosts that request tape mounts while the mount is in progress. Scan host changes occur so only one host at a time has access to the drive path.
Drive paths for the scan host	If a drive has multiple paths that are configured on the selected scan host, EMM selects a scan path as follows: ■ The first local device path it finds in its database in the UP state. ■ The first NDMP-attached drive path it finds in its database in the UP state.

Shared tape drive polling	For shared tape drives, only the scan host polls drives until a mount request is received from NetBackup. During a mount request, NetBackup uses the host that requests the mount to poll the shared drive. This design enables NetBackup to support Dynamic Loop Switching or SAN zones. Each tape drive needs to be detected only from a single host. Each tape drive can potentially have its own scan host that switches dynamically to process errors and continue availability. A central device arbitrating component manages scan host assignments for shared drives. The arbitrating component also provides a network drive reservation system so that multiple NetBackup media servers can share a drive. Polling a shared tape drive allows dynamic loop switching and reduces the number of device accesses and reduces CPU time. However, it cannot detect connectivity breaks (for example, discontinuity in the Fibre Channel fabric) until I/O occurs.

About SAN media servers

SAN media servers are NetBackup media servers that back up their own data. SAN media servers cannot back up the data that resides on other clients.

SAN media servers are useful for certain situations. For example, a SAN media server is useful if the data volume consumes so much network bandwidth that it affects your network negatively.

When you define a backup policy for a SAN media server, add only the SAN media server as the client.

The NetBackup Shared Storage Option can use NetBackup SAN media servers.

About reserving or releasing shared devices

The Shared Storage Option does not load firmware in SAN devices or communicate with hub or switch APIs. The Shared Storage Option can communicate with hub or switch APIs if you use the NetBackup `shared_drive_notify` script.

NetBackup runs the `shared_drive_notify` script when a shared drive is reserved or released.

The script requires the following parameters:

- The name of the shared drive.
- The name of the current scan host.

- The operation, which is one of the following:

RESERVED	The host on which the script is executed needs SCSI access to the drive until it's released.
ASSIGNED	Informational only. It does not change the fact that the host that reserved the drive needs SCSI access.
RELEASED	Only the scan host needs SCSI access to the drive.
SCANHOST	The host that executes the script has become the scan host. A host should not become a scan host while the drive is RESERVED. The scan host may change between a RESERVED operation and a RELEASED operation.

The `shared_drive_notify` script resides in the following directory:

- On Windows: *`install_path`*`\VERITAS\Volmgr\bin`
- On UNIX/Linux: `/usr/openv/volmgr/bin/shared_drive_notify`

Note: The script must be executable by the root user.

The script exits with status 0 upon successful completion.

How to share robotic libraries without using the Shared Storage Option

You can share robotic tape libraries among multiple NetBackup media servers by using any of the following methods:

- Shared library support
  NetBackup allows different drives within the same robotic library to be configured on different media servers. This capability is termed shared library support. Robot types that support shared library are ACS, TL8, TLD, TLH, TLM.
- Partitioned libraries
  Some robot vendors also let you partition libraries. One partitioned view of the robotic library includes one set of drives, while the other view has a different set of drives in the library. Partitions let two robotic control daemons on different control hosts manage the robotic library — possibly each for a different NetBackup master and media server environment.

These capabilities are not related to the Shared Storage Option and should not be confused with the Shared Storage Option.

Shared Storage Option terms and concepts

Table 2-7 describes the terms and the concepts relevant to understanding the Shared Storage Option.

Table 2-7 Shared Storage Option terms and concepts

Term	Definition
Backup Exec Shared Storage Option	The NetBackup Shared Storage Option is not the same as the Veritas Backup Exec Shared Storage Option. The Backup Exec SSO does not include support for UNIX servers and uses a different method for drive arbitration.
SAN media servers	A NetBackup SAN media server backs up its own data to shared drives. It cannot back up data on other NetBackup hosts or clients. Veritas licenses NetBackup SAN media servers.
Shared drive	When the Shared Storage Option is installed, a tape drive that is shared among hosts is termed a shared drive. For the drives that are attached to NDMP hosts, each NDMP attach host is considered an additional host.

About the Shared Storage Option license

The Shared Storage Option is a feature that is licensed separately from base NetBackup. The NetBackup Shared Storage Option license is based on the number of physical tape drives to share. The license activates NetBackup to share the specific number of physical drives for which you are licensed.

About Shared Storage Option prerequisites

To configure your hardware for use with Shared Storage Option, you must ensure that the following prerequisites are satisfied:

- Configure your SAN environment.
- Attach robots and drives.
- Ensure that all of the servers recognize the shared devices. Device recognition may depend on operating system configuration, as follows:
  On UNIX or Linux servers, you may have to modify configuration files, such as the sg driver on Solaris systems.
  On Windows servers, Windows recognizes devices automatically. However, in some instances you may have to install device drivers.

Some of the following tasks may be optional depending on your hardware:

- Determine the physical location of each drive within the robot. Location usually is shown on the connectors to the drives or in the vendor documentation.
  This task may not be required if NetBackup device discovery accurately determines drive location within the robot.
- Connect all drives and all robots.
- Install SAN connecting hardware (for example, bridges, switches, or hubs).
- If fiber is part of your configuration and you use a SCSI-to-fiber bridge, determine the SCSI-to-Fibre Channel mapping for your tape devices.
  Hard-wired SCSI IDs are converted to Fibre Channel logical unit numbers (LUNs) that the hosts read. To ensure correct drive assignments, you should know which LUNs map to which physical SCSI IDs. Use persistent LUN mapping if possible.
  Familiarity with the hardware and various vendor configuration tools help you accomplish this task. See the vendor documentation for your bridge.
- Record the physical configuration.
  When you set up a Shared Storage Option configuration, record your hardware information. Record the adapter, SCSI addresses, World Wide Names (WWNs), and Fibre Channel LUNs to which you connected each drive. Also, record the version levels of firmware and drivers.
- Install and configure the appropriate drivers. See your vendor documentation for instructions.
- On UNIX and Linux servers, create any device files that are needed. Depending on the operating system, a reconfiguration system start (`boot -r`) may create these files automatically.
  Create the device files for each drive; use the Fibre Channel LUNs of the drives and adapters in the device file names. Add the names of the device files to your notes to complete the correlation between device files and physical drive location.
  Use the *NetBackup Device Configuration Guide* and the man pages that are available with the operating system.
  See the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332
- On UNIX and Linux servers, customize the operating system by modifying the appropriate system configuration files. This task requires knowledge of the system files that use the Shared Storage Option environment and their formats. For example, on Sun Solaris systems you may need to modify the sg, st, and HBA driver files.
  Modify the HBA driver files to bind Fibre Channel devices (WWN) to a specific target ID. For procedures, see the operating system documentation.

- For instructions on how to configure the HBA on Windows servers, see the HBA documentation from the vendor.
- Use any available hardware configuration interface to configure and ensure that the configuration is what you expect. For example, on Windows servers you can use the Hyperterminal interface to configure SCSI-to-fibre bridges.

  Use the following order when you configure and verify the hardware:

  - Robot and shared drives
  - Bridges
  - Hub or switches
  - Hosts
- If errors occur and you suspect the operating system, refer to the operating system logs as described in your operating system documentation.

About hardware configuration guidelines

The following are hardware configuration guidelines:

- If you use SAN hardware from multiple vendors, problems may occur. Always use a SAN configuration and use the firmware levels that the hardware vendor supports.
- Consult SAN device, HBA, and operating system documentation to determine how to configure operating system tape drivers and pass-through drivers to detect your SAN devices.
- Check your hub timer settings.
- Use hard arbitrated loop physical addresses rather than soft addresses. Consult with hardware suppliers to verify the recommended usage of their products.
- Check the firmware levels of all your Fibre Channel hardware (for example, bridges). Use the most recent firmware level that is known to operate with other SAN hardware devices.
- Try to duplicate SAN issues and problems using commands and utilities on the host operating system.
- Test both backup and restore capabilities. Backup jobs may complete successfully, but the data may be corrupted. For example, incorrect switch settings may cause problems.
- Ensure that your hardware and SAN configuration are operational and stable before adding Shared Storage Option software.

- Test backup and restore capabilities with dedicated tape drives before you configure them as shared drives.
- For large configurations, begin drive sharing with a few tape drives and two or three media servers (or NetBackup SAN media servers).
- Configuration and troubleshooting processes are easier on smaller configurations. If possible, create multiple and independent Shared Storage Option configurations with subsets of servers sharing subsets of SAN-attached drives.
- Use the correct start order for your Fibre Channel hardware, as follows:
  - Robots or drives
  - Bridges
  - Hubs or switches
  - Hosts
- The start sequence is longer for some devices than others. To verify that the hardware starts completely, examine indicator lights. A green light often indicates a completed start sequence.

About installing and configuring drivers

On the media server systems, install and configure drivers and modify the appropriate system configuration files.

Guidance about the NetBackup requirements is available.

See the *NetBackup Device Configuration Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

Verifying the connectivity

Test your hardware configuration before you configure Shared Storage Option in NetBackup. This task is very important and is often overlooked.

Note the following points:

- Verify that all of your servers (master and media) can communicate with one another. To do so, use the `ping` command from each server to every other server. Be sure to `ping` by host name to verify that the name resolution methods function properly.
- Use the NetBackup `bpclntcmd` utility to resolve IP addresses into host names. For more information, see the *NetBackup Troubleshooting Guide* and the *NetBackup Commands Reference Guide*, available through the following URL: http://www.veritas.com/docs/DOC5332

- Use operating system and NetBackup commands and tools to verify that the devices are configured correctly. Make sure that the operating system detects the devices on the SAN before you configure the Shared Storage Option. If the configuration does not work in the operating system, it does not work for the Shared Storage Option.
  For example, on Solaris systems you can use the `mt -f tapename status` command to determine tape drive status.
- For more information and examples, see the appropriate operating system chapter in the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332

About configuring the Shared Storage Option in NetBackup

You must configure your shared drives, storage units, and backup policies.

About configuring SSO in NetBackup	See "About configuring SSO in NetBackup" on page 66.
Configuring Shared Storage Option devices in NetBackup	See "Configuring Shared Storage Option devices in NetBackup" on page 67.
About adding Shared Storage Option configuration options	See "Configuring Shared Storage Option devices in NetBackup" on page 67.
About configuring NetBackup storage units and backup policies	See "About configuring NetBackup storage units and backup policies" on page 67.

About configuring SSO in NetBackup

Veritas recommends that you use the Device Configuration Wizard to configure Shared Storage Option in NetBackup. Identifying devices when you configure shared devices is difficult, and the wizard increases the likelihood of a successful configuration.

With the Device Configuration Wizard, you should configure all shared drives from one host (usually the master server). Launch the wizard only one time with the current host set to the master server. You then indicate a list of media servers or NetBackup SAN media servers (in the Device Hosts screen). The wizard configures devices on all of the media servers you selected, and these hosts read the shared configuration information.

Configuring Shared Storage Option devices in NetBackup

Veritas recommends that you use the **Device Configuration Wizard** to configure shared drives. The wizard guides you through the steps to configure shared drives.

Be sure to review the limitations of the wizard in the wizard help.

To start the Device Configuration Wizard

1. In the **NetBackup Administration Console**, expand **Media and Device Management**.
2. Click **Configure Storage Devices**.

About adding Shared Storage Option configuration options

You can fine-tune your configuration by adding Shared Storage Option options to the `vm.conf` Media Manager configuration file.

See "About the vm.conf configuration file" on page 77.

About configuring NetBackup storage units and backup policies

You must configure storage units and policies for your shared drives. If you used the **Device Configuration Wizard** to configure the shared drives, you may have configured storage units and policies already.

Configure storage units and backup policies as follows:

Configuring storage units for each media server	In each storage unit definition, logically define the robot and the shared drives for that media server. For the **Maximum concurrent drives** used for backup, specify the total number of all shared drives in the robot. When you configure storage units, select a single media server. Alternatively, you can allow NetBackup to select the media server to use at the time of the backup. For example, you can configure a single storage unit that any media server that shares the storage unit can use.

Configuring a backup policy for each media server	How you define a policy for a media server depends on your media server license, as follows: ■ For a media server that is licensed for Shared Storage Option, the policy can back up the media server and any other NetBackup clients. ■ For a NetBackup SAN media server, only the SAN media server can be backed up. A license for a regular media server provides the greatest flexibility; a license for a NetBackup SAN media server is more restrictive. For a policy for the clients that you want to back up anywhere in your configuration, you can choose any available storage unit. Alternatively, you can use storage unit groups (prioritized storage units).

For more information, see the *NetBackup Administrator's Guide, Volume I*:

http://www.veritas.com/docs/DOC5332

Verifying your Shared Storage Option configuration

In a Shared Storage Option configuration, a shared drive must have the same logical name (drive name) on all of the NetBackup media servers. If the drive resides in a robotic library, it also must use the same drive number in the library. This section describes some tools you can use to verify your configuration.

How you verify that your configuration is set up correctly depends on your devices and how you configured Shared Storage Option, as follows:

- If you have serialized devices, Veritas recommends that you use the Device Configuration Wizard. The wizard verifies your configuration.
- If you have non-serialized devices, see the Veritas support site for tech note TECH31764, "Verifying a Shared Storage Option (SSO) Configuration with Non-Serialized Devices. It describes how to verify your configuration.
- If you have serialized devices but you did not use the Device Configuration Wizard, use the following procedure to verify your configuration.

The verification procedures use the following NetBackup commands:

- On Windows:

```
install_path\VERITAS\Volmgr\bin\scan
install_path\VERITAS\Volmgr\bin\tpconfig
```

- On UNIX/Linux:

```
usr/openv/volmgr/bin/scan
usr/openv/volmgr/bin/tpconfig
```

In the following example the ADIC robotic library has six drives, but only drives 5 and 6 are configured on this particular host.

Perform the verification on all of the NetBackup servers in your configuration. Ensure that each shared drive has the same logical drive name and same drive number ID on each media server that shares the drive.

To verify a manually-configured Shared Storage Option configuration

1 Execute `tpconfig -d` or `tpconfig -dl`. For NDMP devices, use `tpautoconf -probe -ndmp_host_name` *`host_list`*.

The output from `tpconfig` shows the logical names NetBackup assigns to tape drives. The following example shows drive number 5 is named `QUANTUM.DLT7000.000` and drive number 6 is named `QUANTUM.DLT7000.001`:

```
Id    DriveName            Type    Residence
        Drive Path                                          Status
************************************************************
 0    QUANTUM.DLT7000.000  dlt     TLD(0) DRIVE=5
         /dev/st/nh3c0t5l0                                   UP
 1    QUANTUM.DLT.7000.001 dlt     TLD(0) DRIVE=6
        /dev/st/nh3c0t1l0                                   UP
Currently defined robotics are:
  TLD(0)     robotic path = /dev/sg/h3c0t0l0
EMM server = norway
```

2 Execute the `scan` command. The `scan` output shows the robot and the drive properties.

The following is example output:

```
************************************************************
********************** SDT_TAPE    **************************
********************** SDT_CHANGER **************************
************************************************************
Device Name  : "/dev/sg/h3c0t0l0"
Passthru Name: "/dev/sg/h3c0t0l0"
Volume Header: ""
Port: -1; Bus: -1; Target: -1; LUN: -1
Inquiry    : "ADIC Scalar 100 3.10"
Vendor ID  : "ADIC "
Product ID : "Scalar 100 "
Product Rev: "3.10"
Serial Number: "ADIC009K0340314"
WWN          : ""
WWN Id Type  : 0
Device Identifier: ""
Device Type : SDT_CHANGER
NetBackup Robot Type: 6
Removable : Yes
Device Supports: SCSI-2
Number of Drives : 6
Number of Slots  : 50
Number of Media Access Ports: 10
Drive 1 Serial Number      : "PXB03S0979"
Drive 2 Serial Number      : "PXB03S0913"
Drive 3 Serial Number      : "CXA04S2051"
Drive 4 Serial Number      : "PXA31S1787"
Drive 5 Serial Number      : "PXA37S3261"
Drive 6 Serial Number      : "PXA50S2276"
Flags : 0x0
Reason: 0x0
------------------------------------------------------------
Device Name  : "/dev/st/nh3c0t5l0"
Passthru Name: "/dev/sg/h3c0t5l0"
Volume Header: ""
Port: -1; Bus: -1; Target: -1; LUN: -1
Inquiry    : "QUANTUM DLT7000            2561"
Vendor ID  : "QUANTUM "
Product ID : "DLT7000          "
```

```
Product Rev: "2561"
Serial Number: "PXA37S3261"
WWN          : ""
WWN Id Type  : 0
Device Identifier: ""
Device Type    : SDT_TAPE
NetBackup Drive Type: 9
Removable      : Yes
Device Supports: SCSI-2
Flags : 0x4
Reason: 0x0
------------------------------------------------------------
Device Name  : "/dev/st/nh3c0t1l0"
Passthru Name: "/dev/sg/h3c0t1l0"
Volume Header: ""
Port: -1; Bus: -1; Target: -1; LUN: -1
Inquiry    : "QUANTUM DLT7000             296B"
Vendor ID  : "QUANTUM "
Product ID : "DLT7000           "
Product Rev: "296B"
Serial Number: "PXA50S2276"
WWN          : ""
WWN Id Type  : 0
Device Identifier: ""
Device Type    : SDT_TAPE
NetBackup Drive Type: 9
Removable      : Yes
Device Supports: SCSI-2
Flags : 0x4
Reason: 0x0
```

3 For each tape drive in the `tpconfig` output, do the following:

- Use the device file name from the `tpconfig` output to locate the tape drive in the `scan` output.
  Step 1 shows device file pathnames `/dev/st/nh3c0t5l0` and `/dev/st/nh3c0t1l0`.
- Determine the serial number of the drive in the scan output. "Tape" in the device type field identifies a tape drive.
  Step 2 shows example `scan` output shows the following:
  The drive `/dev/st/nh3c0t5l0` serial number is PXA37S3261.
  The drive `/dev/st/nh3c0t1l0` serial number is PXA50S2276.

- Verify that the serial number for the drive matches the serial number in the output from the robot section of scan. "`Changer`" in the device type field identifies a robot.
  In the previous examples, the serial numbers match.

Device Monitor and Shared Storage Option

You can use the **Device Monitor** in the **NetBackup Administration Console** to obtain information about your Shared Storage Option configuration and manage your shared drives. See the following:

For more information about the Device Monitor, see the *NetBackup Administrator's Guide, Volume I*:

http://www.veritas.com/docs/DOC5332

Table 2-8 describes information you can glean from the **Device Monitor**.

Table 2-8 Device Monitor information

Action	Information
Drive Status pane	The **Control** and **Device Host** columns contain shared drive information.
Changing the operating mode for a shared drive	For a shared drive, the **Change Mode** dialog contains a list of all paths to the selected drive. You can choose any number of paths to which the mode change applies.
Adding or changing a comment for a shared drive	For a shared drive, the **Change Drive Comment** dialog box contains the following: ■ A list of all paths to the selected drive ■ The current drive comment for each combination. You can choose any number of paths to which the changes apply.
Performing drive cleaning functions for a shared drive	The three available drive cleaning functions are used with shared drives are as follows: ■ **Clean Now** In the list of hosts that share the drive, you can choose only one host on which the function applies. ■ **Reset Mount Time** In the list of hosts that share the drive, you can choose any number of hosts on which the function applies. ■ **Set Cleaning Frequency** Supported for shared drives.

Viewing SSO summary reports

You can view Shared Storage Option Summary reports.

See "Shared Storage Option summary reports" on page 74.

To view SSO summary reports

1. In the **NetBackup Administration Console**, in the left pane, expand **Media and Device Management > Device Monitor**.
2. On the **Actions** menu, select **View Status of Shared Drives**.
3. In the **Status of Shared Drives** dialog box, select a device allocation host (or hosts) from the list.
4. Use **Add** to move the host to the list of hosts to scan.
5. Click **OK**.

   The **Shared Drive Summary** and **Device Allocation Host Summary** appear in the two lower panes of the dialog.

Shared Storage Option summary reports

The following two reports contain the following information about the drives and hosts:

- The Shared Drive Summary shows the following:
  - Drive name
  - Device allocation host
  - Number of registered hosts
  - Drive reservation status
  - Hosts that reserve the drive
  - Current scan host
- The Device Allocation Host Summary shows the following:
  - Device allocation host
  - Host name of the registered host
  - Number of registered and reserved drives
  - Availability status
  - Scan ability factor
  - Scan status (if the host is scan host for at least one SSO drive)

Operating system assistance

If errors occur during the installation or configuration of the shared devices and you suspect problems with the operating system, refer to the following:

- Operating system logs, as described in the operating system documents.
- NetBackup logs.
- Operating system man pages (UNIX or Linux servers only).
- The *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332

Common configuration issues with Shared Storage Option

If you cannot obtain full functionality after you configure SSO, consider the following:

- Verify that the SAN hardware uses current firmware or drivers. Hardware includes hubs, switches, HBAs, and bridges.
- Verify that the JNI HBA failover value was set to zero to avoid I/O hangs. This value applies to bridges and HBAs.
- Verify that the HBAs with the SCSI-3 protocols are compatible with the operating system drivers.
- Verify that your cluster configuration is supported.
  For more information about cluster configuration, see the *NetBackup Release Notes*, available at the following URL:
  http://www.veritas.com/docs/DOC5332
- Verify that all of your Fibre Channel devices support your Fibre Channel topology. For example, in a switched fabric topology, ensure that all devices supported switched fabric.
- Verify that Shared Storage Option is licensed on each server. To do so, select **Help > License keys** from the **NetBackup Administration Console** on each server. To enable the Shared Storage Option, enter the Shared Storage Option license on each server.
- Verify that you configured Shared Storage Option from the master server. You must configure SSO from the master server not from a media server (or SAN media server).
- Verify that you configured the same robot control host on every host. Remember that except for ACS and TLM robot types, only one host controls the robot.
- Verify that you used the Device Configuration Wizard rather than the `tpconfig` utility to configure Shared Storage Option. The wizard coordinates configuration

with all hosts that share the drives. The `tpconfig` utility may create inconsistent configurations.

- Verify that you selected the appropriate device hosts in the Device Configuration Wizard , including the host with robotic control.
- Fibre Channel connections to the drives and the robots cause increased complexity in a NetBackup device configuration. On some operating systems, SCSI-to-fibre bridges may result in inconsistencies in the device paths when you restart a host. After a restart of the host, the device configuration should be verified.
- Verify that names across all systems that share the drives are consistent.
- Test the drive paths on every media server.
- Define NetBackup storage units for each media server. Do not select any available media server in the storage units.
- Verify that you did not interrupt a data path during a backup. If you do, the NetBackup job fails. It can fail with media write errors or it may hang and have to be terminated manually.
- Verify that you do not use Berkeley-style close on the tape path (UNIX or Linux servers only).
- On Solaris systems, verify the following:
  - That you added tape configuration list entries in `/kernel/drv/st.conf` (if needed).
  - That you defined configuration entries for expanded targets and LUNs in `sg.links` and `sg.conf` files. If you see problems with the entries in the `/etc/devlink.tab` file (created from `sg.links`), verify the following:
    The first entry uses hexadecimal notation for the target and LUN. The second entry uses decimal notation for the target and LUN.
    Use a single tab character between the entries; do not use a space or a space and a tab character.
  - That you configured the operating system to force load the `sg/st/fcaw` drivers.

  For more information, see the Solaris chapter of the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332

Frequently asked questions about Shared Storage Option

Q. What combinations of SAN hardware components are supported for Shared Storage Option?

A. Shared Storage Option works with many hardware combinations. Veritas has an open policy on hardware support for Shared Storage Option. Consult your hardware suppliers to verify the interoperability of their products.

A list of SAN components that have been tested with NetBackup is available on the Veritas support Web site:

http://www.netbackup.com/compatibility

Q. If NetBackup allocates four drives to a server and it finishes with two of the drives, does NetBackup reallocate the two drives? Or does NetBackup wait until the backup schedule that uses the four drives is completely finished before it reallocates the drives?

A. The two available drives are reallocated and used. NetBackup monitors drive status and notifies the NetBackup scheduler of drive availability.

Q. Does NetBackup Shared Storage Option use the IP protocol or the SCSI protocol?

A. Both. IP protocol is used to provide coordination between servers. Shared Storage Option uses SCSI protocol (SCSI reserve) as an added layer of protection.

About the vm.conf configuration file

The `vm.conf` file contains configuration entries for media and device management. NetBackup can create this file, but if it does not exist, you must create it.

On Windows, the pathname is *`install_path`*`\Volmgr\vm.conf`.

On UNIX, the pathname is `/usr/openv/volmgr/vm.conf`.

Various NetBackup components read this configuration file on the host where the component runs. The NetBackup component is a command, daemon, process, or utility. The host can be a NetBackup administration client or a server where administration operations are requested.

See “Example vm.conf file” on page 95.

ACS_mediatype entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
ACS_mediatype = Media_Manager_mediatype
```

If this entry is used in `vm.conf`, the ACS media type is mapped to the specified Media Manager media type. More than one `ACS_mediatype` entry can be specified.

This entry is read and interpreted on the host on which `vmcheckxxx` and `vmupdate` run during a robot inventory operation. Use this entry on every NetBackup media server that functions as an ACS robot control host.

A list of the valid `ACS_mediatype` entries is available.

See the *NetBackup Administrator's Guide, Volume I*:

http://www.veritas.com/docs/DOC5332

ACS_SEL_SOCKET entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
ACS_SEL_SOCKET = socket_name
```

By default, `acssel` listens on socket name 13740. If this entry is specified in `vm.conf`, the default can be changed. This entry is read and interpreted on the host on which `acsd` runs.

ACS_CSI_HOSTPORT entry in vm.conf (on UNIX)

The following configuration entry applies to NetBackup servers:

```
ACS_CSI_HOSTPORT = ACS_library_software_hostname socket_name
```

The valid value for *ACS_library_software_hostname* is the host name of the ACS library host. Do not use the IP address of the ACS library host for this parameter.

The valid values for *socket_name* are 1024 - 65535 and 0. The value must match the value on the ACSLS server for the port that the CSI uses for inbound packets.

If 0 (zero), NetBackup uses the previous behavior of CSI and `acsssi` (no specific ports).

This entry specifies the port where the `acsssi` process sends its ACSLS requests on the ACSLS server. The ACSLS CSI must use this port to accept inbound ACSLS requests from acsssi processes.

This entry, the `ACS_SSI_INET_PORT` entry, and the `ACS_TCP_RPCSERVICE` entry are commonly used with firewall implementations. With these three entries in the `vm.conf` file, TCP connections use the designated destination ports. Note that TCP source ports are not restricted.

See "ACS_SSI_INET_PORT entry in vm.conf (on UNIX)" on page 79.

See "ACS_TCP_RPCSERVICE / ACS_UDP_RPCSERVICE entry in vm.conf (on UNIX)" on page 80.

For example, a NetBackup media server has two ACSLS servers (ACSLS_1 and ACSLS_2) behind firewalls. Both servers listen for queries on port 30031 and the firewall allows traffic through this port.

The `vm.conf` entries are as follows:

```
ACS_TCP_RPCSERVICE
ACS_CSI_HOSTPORT = ACSLS_1 30031
ACS_CSI_HOSTPORT = ACSLS_2 30031
ACS_SSI_INET_PORT = ACSLS_1 30032
ACS_SSI_INET_PORT = ACSLS_2 30033
```

Each `acsssi` process sends queries to the respective ACSLS server's port 30031, and the ACSLS server is configured to listen for queries on this port.

ACS_SSI_HOSTNAME entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
ACS_SSI_HOSTNAME = host
```

Use `ACS_SSI_HOSTNAME` to specify the host to which RPC return packets from ACS library software are routed for ACS network communications. By default, the local host name is used. This entry is read and interpreted on the host on which `acsd` and `acsssi` run. Do not use the IP address of the host for this parameter.

ACS_SSI_INET_PORT entry in vm.conf (on UNIX)

The following configuration entry applies to NetBackup servers:

```
ACS_SSI_INET_PORT = ACS_library_software_hostname socket_name
```

The valid value for *ACS_library_software_hostname* is the host name of the ACS library host. Do not use the IP address of the ACS library host for this parameter.

The *socket_name* entry specifies the port that `acsssi` uses for incoming ACSLS responses. Valid values are 1024 - 65535 and 0. This value must be unique for each `acsssi` process.

A value between 1024 - 65535 indicates the number to be used as the TCP port on which `acsssi` accepts ACSLS responses.

0 (zero) indicates that the previous behavior (allow the port to be dynamically allocated) should remain in effect.

This entry, the `ACS_CSI_HOSTPORT` entry, and the `ACS_TCP_RPCSERVICE` entry are commonly used with firewall implementations. With these three entries in the `vm.conf` file, TCP connections use the designated destination ports. Note that TCP source ports are not restricted.

See "ACS_CSI_HOSTPORT entry in vm.conf (on UNIX)" on page 78.

See "ACS_TCP_RPCSERVICE / ACS_UDP_RPCSERVICE entry in vm.conf (on UNIX)" on page 80.

For example, a NetBackup media server has two ACSLS servers (ACSLS_1 and ACSLS_2) behind firewalls. Ports 30032 and 300033 have been opened in the firewall for `acsssi` to ACSLS server communication.

The entries would be as follows:

```
ACS_TCP_RPCSERVICE
ACS_SSI_INET_PORT = ACSLS_1 30032
ACS_SSI_INET_PORT = ACSLS_2 30033
ACS_CSI_HOSTPORT = ACSLS_1 30031
ACS_CSI_HOSTPORT = ACSLS_2 30031
```

The NetBackup media server starts two `acsssi` processes. One listens for ACSLS_1 responses on port 30032, and the other listens on port 30033 for responses from ACSLS_2.

ACS_SSI_SOCKET entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
ACS_SSI_SOCKET = ACS_library_software_hostname socket_name
```

The valid value for *ACS_library_software_hostname* is the host name of the ACS library host. Do not use the IP address of the ACS library host for this parameter.

By default, `acsssi` listens on unique, consecutive socket names; the names begin with 13741. If this entry is specified in `vm.conf`, specify socket names on an ACS library software host basis. This entry is read and interpreted on the host where `acsd` and `acsssi` are running.

ACS_TCP_RPCSERVICE / ACS_UDP_RPCSERVICE entry in vm.conf (on UNIX)

The following configuration entries apply to NetBackup servers:

```
ACS_TCP_RPCSERVICE
ACS_UDP_RPCSERVICE
```

These entries specify the method over which `acsssi` communicates with ACSLS servers: TCP or UDP.

Only one entry should be entered into `vm.conf`. NetBackup uses UDP if both entries are found or neither entry is found.

For `acsssi` firewall support, `ACS_TCP_RPCSERVICE` must be entered in `vm.conf`.

See "ACS_CSI_HOSTPORT entry in vm.conf (on UNIX)" on page 78.

See "ACS_SSI_INET_PORT entry in vm.conf (on UNIX)" on page 79.

ADJ_LSM entry in vm.conf

The following configuration entry applies to NetBackup servers:

`ADJ_LSM = robot_num ACS_ID,LSM_ID ACS_ID,LSM_ID`

In an ACS robot with multiple library storage modules (LSMs), pass-through mechanisms can move ejected media to the media access port (MAP). A pass-through mechanism passes media from one LSM to another. This travel time can be excessive when media must pass through several LSMs.

Use this entry to specify the physical orientation of the LSMs in an ACS robot. If this entry is specified in `vm.conf`, you do not need to know which MAP (or ACS CAP) to select for efficient ejects. NetBackup determines the appropriate MAP to complete the media eject by using a nearest-MAP algorithm.

This nearest-MAP algorithm is based on the physical orientation of the LSMs that defined with this entry. This algorithm is only for the cases where more than one MAP is requested to handle the eject. If this algorithm is used, any `MAP_ID` entries in `vm.conf` are ignored.

Note: nearest-MAP capability is only available by using the `vmchange` command with the `-map` option or the Vault administrative interface. It is not available from the **NetBackup Administration Console**.

Without this entry present, NetBackup assumes that all LSMs are interconnected with pass-through ports, except for the first LSM and the last LSM. The LSMs are interconnected in a line formation.

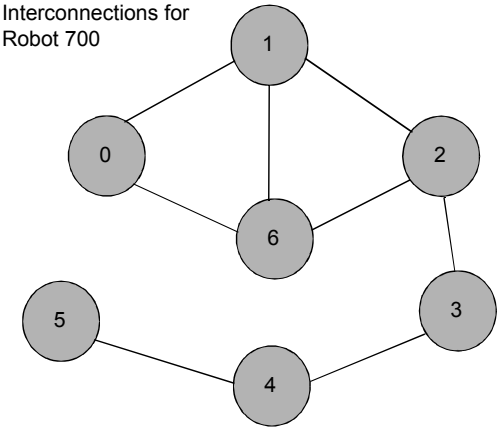
robot_num is the robot number. *ACS_ID* and *LSM_ID* are the coordinates of the LSM.

Figure 2-4 is a diagram of LSM interconnections that are described by the following entries:

```
ADJ_LSM = 700 0,0 0,1
ADJ_LSM = 700 0,0 0,6
ADJ_LSM = 700 0,1 0,2
ADJ_LSM = 700 0,1 0,6
ADJ_LSM = 700 0,2 0,6
ADJ_LSM = 700 0,2 0,3
ADJ_LSM = 700 0,3 0,4
ADJ_LSM = 700 0,4 0,5
```

The robot has pass-through mechanisms between 7 LSMs.

Figure 2-4 Pass-through example



API_BARCODE_RULES entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
API_BARCODE_RULES
```

If this entry is specified in `vm.conf`, barcode rule support for API robots is enabled.

NetBackup barcode rules allow default media mappings to be overridden. Barcode rules are especially useful when multiple generations of the same tape drive use the same type of media.

For example STK 9940A and STK 9940B drives use STK1R media, but write data at different densities. The drive must be configured by using different drive types such as HCART or HCART2. Specify a barcode rule for a series of bar codes to configure some of the media as HCART2. Other STK1R media not in this barcode range are configured as HCART (the default for STK1R). Without this entry, a robot

inventory operation configures all media of type STK1R as either HCART or HCART2, depending on how the drive was configured.

AUTHORIZATION_REQUIRED entry in vm.conf

This entry specifies that NetBackup should use the `vm.conf` file `SERVER` entry to control which hosts can monitor and control devices on this host. This entry is read and interpreted on the media server on which the NetBackup `vmd` service runs, as follows:

```
AUTHORIZATION_REQUIRED
```

If this entry is specified in `vm.conf`, the `vm.conf` file also must include a `SERVER` entry for every media server that controls devices on this host.

If no `AUTHORIZATION_REQUIRED` entry exists and no `SERVER` entries exist, any NetBackup server can monitor and control devices on this host.

For maximum security, Veritas recommends that you use this entry and `SERVER` entries.

This entry is read and interpreted on media servers on which the NetBackup `vmd` service runs.

AUTO_PATH_CORRECTION entry in vm.conf

If this entry is specified in `vm.conf`, it specifies whether automatic device path remapping is enabled or disabled, as follows:

```
AUTO_PATH_CORRECTION = YES|NO
```

If the value is NO, the device configuration remains unchanged when the NetBackup Device Manager (`ltid`) is started. Therefore, the saved device configuration may be different than the actual configuration after devices are changed and the server is restarted.

If the value is YES, NetBackup tries to discover attached devices and then automatically update the device configuration for any device paths that are incorrect. This entry is read and interpreted on the host on which the NetBackup Device Manager (`ltid`) runs.

Device path remapping is enabled by default on Windows and Linux servers. It is disabled by default on all other servers.

AUTO_UPDATE_ROBOT entry in vm.conf

Use this entry to inject media automatically from the Media Access Port (MAP) into a TL8 or TLD robot and update the EMM database. Media are injected if the robot generates a unit attention message.

```
AUTO_UPDATE_ROBOT
```

This entry only operates with the TL8 or TLD robots that post a unit attention when their MAP is opened.

Veritas recommends that this entry not be used with partitioned libraries. Most robotic libraries with multiple partitions do not post a unit attention when the MAP is opened.

AVRD_PEND_DELAY entry in vm.conf

If this entry is specified in `vm.conf`, `avrd` waits *number_of_seconds* before it displays a pending status (PEND) in the Device Monitor. This entry is read and interpreted on the host on which `avrd` runs.

```
AVRD_PEND_DELAY = number_of_seconds
```

On some server operating systems (Windows and HP-UX), NetBackup reports PEND if the drive reports Busy when a volume is unmounted. Use this entry to minimize the display of this misleading status.

The minimum for *number_of_seconds* is zero. The maximum is 255. The default value is 180 seconds.

AVRD_SCAN_DELAY entry in vm.conf

If this entry is specified in `vm.conf`, `avrd` waits *number_of_seconds* between normal scan cycles. This entry is read and interpreted on the host on which `avrd` runs.

```
AVRD_SCAN_DELAY = number_of_seconds
```

Use this entry to minimize tape mount times. Without this entry, NetBackup delays mount requests by an average of 7.5 seconds.

The minimum for *number_of_seconds* is 1. The maximum is 180. A value of zero converts to one second. The default value is 15 seconds. If a value is used that is greater than the default, NetBackup delays mount requests and drive status updates in the Device Monitor.

Note: If *number_of_seconds* is set to a value that allows media to be changed within one scan cycle, NetBackup may not detect media changes. Data loss may occur.

CLEAN_REQUEST_TIMEOUT entry in vm.conf

Use this entry to specify how long NetBackup waits for a drive to be cleaned before it removes the cleaning request from the cleaning queue. Unprocessed requests to clean a drive are removed from the queue after 30 minutes.

```
CLEAN_REQUEST_TIMEOUT = minutes
```

The *minutes* can be from 1 to 144000 (100 days). The default value is 30 and a value of zero converts to the default value of 30.

CLIENT_PORT_WINDOW entry in vm.conf

Use this entry to specify the range of non-reserved ports on this host that are used to connect to `vmd` on other hosts. This entry is read and interpreted on the host on which `vmd` runs.

```
CLIENT_PORT_WINDOW = start end
```

For example, the following entry permits ports from 4800 through 5000:

```
CLIENT_PORT_WINDOW = 4800 5000
```

The operating system determines the non-reserved port to use in the following cases:

- A `CLIENT_PORT_WINDOW` entry is not specified.
- A value of zero is specified for *start*.

CLUSTER_NAME entry in vm.conf

This entry specifies the virtual name for the media server on which the `vm.conf` file resides.

```
CLUSTER_NAME = cluster_alias
```

See “Host name precedence in the vm.conf file” on page 96.

CONNECT_OPTIONS entry in vm.conf

This entry only affects connections to NetBackup 7.0 and earlier. For connections to NetBackup 7.0.1 and later, the `veritas_pbx` port is used.

Add this entry in `vm.conf` to specify the options that enhance firewall efficiency with NetBackup. The server connection options can be any of the following: use `vnetd` or the daemon's port number, use only `vnetd`, or use only the daemon's port number.

```
CONNECT_OPTIONS = server_name 0 0 [0|1|2]
```

`CONNECT_OPTIONS` entries can be specified for multiple servers.

For UNIX, you can also use a similarly named entry in the NetBackup configuration file (`/usr/openv/netbackup/bp.conf`).

See the *NetBackup Administrator's Guide, Volume I*:

http://www.veritas.com/docs/DOC5332

server_name is the name of the media server to connect to.

The first and second options currently are not used. Specify zero for these options.

The third option specifies the connection method to use to connect to *server_name* as follows:

- A value of 0 specifies to use `vnetd` to connect to a daemon on the server. If the `vnetd` service is not active, connect by using the traditional port number of the daemon.
- A value of 1 specifies to use `vnetd` only to connect to a daemon on the server.
- A value of 2 specifies to use the traditional port number of the daemon to connect to the daemon on the server. The default value is 2.

The following example entry specifies to use either `vnetd` or the daemon's port number to connect to server `shark`:

```
CONNECT_OPTIONS = shark 0 0 0
```

The following example entry specifies to use `vnetd` only to connect to server `dolphin`:

```
CONNECT_OPTIONS = dolphin 0 0 1
```

The following example entry specifies to use the daemons's port number only to connect to server `perch`:

```
CONNECT_OPTIONS = perch 0 0 2
```

DAS_CLIENT entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
DAS_CLIENT = client_name
```

If this entry is specified in `vm.conf`, specify the DAS client name that the TLM robot uses for communications with the DAS/SDLC server. By default, this client name is the host name of the media server. This entry is read and interpreted on the host where `tlmd` is running.

DAYS_TO_KEEP_LOGS entry in vm.conf

If this entry is specified in `vm.conf`, specify the number of days to keep debug logs before `vmd` deletes them. This entry is read and interpreted on the hosts where `vmd` is running.

```
DAYS_TO_KEEP_LOGS = days
```

A value of zero means that the logs are not deleted. The default is zero. This entry does not affect the debug logs that Unified Logging creates.

Information about Unified Logging is available.

See the *NetBackup Logging Reference Guide*:

http://www.veritas.com/docs/DOC5332

EMM_RETRY_COUNT entry in vm.conf

The `vmd` daemon and the `ltid` daemon use this entry to determine how many times to retry requests to the NetBackup Enterprise Media Manager.

```
EMM_RETRY_COUNT = number_of_retries
```

The default is one retry.

Only change the value of this `vm.conf` file entry when directed to do so by a NetBackup support representative. If this entry is added to the `vm.conf` file or if this value is changed, restart the `vmd` daemon and the `ltid` daemon.

EMM_CONNECT_TIMOUT entry in vm.conf

This value applies for broken connections between the NetBackup Enterprise Media Manager and the following daemons: the `vmd`daemon and the `ltid` daemon. These two daemons use this entry to determine for how long they should try to reconnect to the NetBackup Enterprise Media Manager.

```
EMM_CONNECT_TIMOUT = number_of_seconds
```

The default is 20 seconds.

Only change the value of this `vm.conf` file entry when directed to do so by a NetBackup support representative. If this entry is added to the `vm.conf` file or if this value is changed, restart the `vmd` daemon and the `ltid` daemon.

EMM_REQUEST_TIMOUT entry in vm.conf

The `vmd` daemon and the `ltid` daemon use this entry to determine how many seconds to allow a request to the NetBackup Enterprise Media Manager to complete.

```
EMM_REQUEST_TIMOUT = number_of_seconds
```

The default is 300 seconds.

Only change the value of this `vm.conf` file entry when directed to do so by a NetBackup support representative. If this entry is added to the `vm.conf` file or if this value is changed, restart the `vmd` daemon and the `ltid` daemon.

ENABLE_ROBOT_AUTH entry in vm.conf

Veritas encourages the use of Veritas Product Authentication and Authorization for NetBackup Access Control (NBAC) instead of legacy security implementations.

For information about the `ENABLE_ROBOT_AUTH` configuration entry, see the NetBackup 6.0 documentation. Information on Veritas Product Authentication and Authorization is available.

See the *NetBackup Security and Encryption Guide*:

http://www.veritas.com/docs/DOC5332

INVENTORY_FILTER entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
INVENTORY_FILTER = robot_type robot_number mode value1 [value2 ...]
```

Used to filter the robot inventory results in ACS or TLH robot types. Add this entry to the configuration file (`vm.conf`) on the NetBackup server on which the inventory operation is invoked. This entry is read and interpreted on the host on which `vmcheckxxx` and `vmupdate` run.

Note: This entry may be required for an ACS robot and the ACS library software host with an STK Library Station. Newer versions of STK Library Station allow robot inventory commands to function correctly so filters are not required.

robot_type can be ACS or TLH.

robot_number is the number of the robot as was configured in NetBackup.

mode is `BY_ACS_POOL` for ACS or `BY_CATEGORY` for TLH.

See the following examples:

```
INVENTORY_FILTER = ACS 0 BY_ACS_POOL 4 5
INVENTORY_FILTER = TLH 0 BY_CATEGORY FFFA CDB0
```

MAP_ID entry in vm.conf

The following configuration entry applies to NetBackup servers:

```
MAP_ID = robot_num map_ID
```

Use this entry to configure the default media access port (MAP) to use to eject media from the Automated Cartridge System (ACS) robots. This default is selected in the **NetBackup Administration Console**, but you can also select other Media Access Ports for ejects.

If the MAP is not available or the vm.comf file does not contain this entry, NetBackup uses the default MAP selection process. By default, NetBackup uses the smallest MAP that can hold the number of media to be ejected.

If NetBackup selects multiple MAPs, NetBackup uses the nearest-MAP algorithm rather than the MAP that is specified in the MAP ID entry.

See “ADJ_LSM entry in vm.conf” on page 81.

robot_num is the robot number. *map_ID* is in the format of an ACS CAP (cartridge access port) ID and cannot contain any spaces.

The following example specifies the MAP ID for ACS robot number 700. The ACS CAP ID of 0,1,0 is used.

```
MAP_ID = 700 0,1,0
```

MAP_CONTINUE_TIMEOUT entry in vm.conf

This entry applies only when the `vmchange` command is used and the `-w` option is specified.

```
MAP_CONTINUE_TIMEOUT = seconds
```

The default timeout value for *seconds* is 300 (5 minutes). *seconds* cannot be zero and values greater than 1200 (20 minutes) can cause the robotic daemon to cancel the operation.

If this entry is specified in `vm.conf`, the SCSI robotic daemons wait the specified number of seconds before they time out. A timeout can occur while the daemons wait for user reply after the user removes volumes from the media access port. If a timeout occurs, NetBackup aborts the operation.

This entry is read and interpreted on the host on which the SCSI-controlled robotic daemon or process runs.

Note: Non-mount activities such as a robotic inventory cannot occur during this timeout period.

MEDIA_ID_BARCODE_CHARS entry in vm.conf

If this entry is specified in `vm.conf`, it controls the NetBackup media ID generation. This entry is read and interpreted on the host on which `vmcheckxxx` and `vmupdate` run as part of the robot inventory operation.

`MEDIA_ID_BARCODE_CHARS = robot_num barcode_length media_ID_rule`

Note: To use this entry, the robot must support bar codes and the robot type cannot be an API robot.

Choose how NetBackup creates media IDs by defining the rules that specify which characters of a barcode on tape NetBackup uses. Alphanumeric characters can be specified to be inserted in the ID.

Multiple entries can be added to the `vm.conf` file. For example, specify media ID generation for each robot or for each barcode format that has different numbers of characters. The multiple entries allow flexibility for multimedia.

If no `MEDIA_ID_BARCODE_CHARS` entries exist or the entry is invalid, NetBackup uses the rightmost six characters of the barcode to create its media ID.

robot_num is the robot number.

barcode_length is the length of the barcode.

A *media_ID_rule* consists of a maximum of six fields that colons delimit. Numbers in the fields define the positions of the characters in the barcode that NetBackup extracts (from left to right). For example, if the number 2 is in a field, NetBackup extracts the second character from the barcode. The numbers can be specified in any order.

If the pound sign (#) prefixes a character, that character is inserted in that position in the generated ID. Any alphanumeric characters must be valid for a media ID. Use rules to create media IDs of many different formats. However, if the generated media ID is different from the label on the media, media management may be more difficult.

The following is an example rule and the resulting generated media ID:

```
Barcode on the tape: 032945L1
Media ID rule:       #N:2:3:4:5:6
Generated media ID:  N32945
```

MEDIA_ID_PREFIX entry in vm.conf

If this entry is specified in `vm.conf`, it defines the media ID prefixes to use for media without bar codes. This entry is read and interpreted on the host where `vmcheckxxx` and `vmupdate` are running as part of the robot inventory operation.

`MEDIA_ID_PREFIX = media_id_prefix`

The best way to add media to a robot is to use the Robot Inventory Update Volume Configuration operation.

MM_SERVER_NAME entry in vm.conf

This entry specifies the name that other NetBackup servers and clients should use when they refer to this server.

`MM_SERVER_NAME = host_name`

See “Host name precedence in the vm.conf file” on page 96.

PREFERRED_GROUP entry in vm.conf

Veritas encourages the use of Veritas Product Authentication and Authorization for NetBackup Access Control (NBAC) instead of legacy security implementations.

For information about the `PREFERRED_GROUP` configuration entry, see the NetBackup 6.0 documentation. Information on Veritas Product Authentication and Authorization is available.

See the *NetBackup Security and Encryption Guide*:

http://www.veritas.com/docs/DOC5332

PREVENT_MEDIA_REMOVAL entry in vm.conf

This topic applies to the TL8 robots only.

Specifying this entry changes the default operation for TL8 robots. Without this entry present, NetBackup allows the removal of media.

If this entry is specified in `vm.conf`, TL8 robots run the SCSI command `PREVENT MEDIUM REMOVAL`. The robot's main door or the MAP cannot be opened while the robotic control daemon runs.

This entry is read and interpreted on the host on which the TL8 robot control daemon or process (`tl8cd`) runs.

To override `PREVENT_MEDIA_REMOVAL`, do one of the following:

- Use the test utility and run `allow media removal`.
- Use inject or eject for access, when volumes are added or moved.

RANDOM_PORTS entry in vm.conf

Use this entry to specify whether NetBackup chooses port numbers randomly or sequentially for communication with other NetBackup servers. This entry is read and interpreted on hosts on which `vmd` runs.

```
RANDOM_PORTS = YES|NO
```

If `YES` or no entry exists (the default), NetBackup chooses port numbers randomly from those that are available in the allowed range.

If `NO`, NetBackup chooses numbers sequentially. NetBackup begins with the highest number in the allowed range, and then tries the next highest, and so on until a port is available.

On UNIX, if random ports are not specified in the NetBackup configuration, specify `RANDOM_PORTS = NO` in the `vm.conf` file.

See the *NetBackup Administrator's Guide, Volume I*:

http://www.veritas.com/docs/DOC5332

To specify no random ports in the NetBackup configuration file, do one of the following:

- Specify `RANDOM_PORTS = NO` in the `bp.conf` file on UNIX.
- Use the NetBackup **Host Properties** in the **NetBackup Administration Console**: **NetBackup Management > Host Properties >** Double-click on master server **> Port Ranges > Use random port assignments**.

REQUIRED_INTERFACE entry in vm.conf

This entry specifies the name of the network interface that the media server uses to connect to another media server.

```
REQUIRED_INTERFACE = host_name
```

A NetBackup server can have more than one network interface, and by default the operating system determines the one to use. To force NetBackup to connect through a specific network interface, use `REQUIRED_INTERFACE` and specify the name of that network interface.

See "Host name precedence in the vm.conf file" on page 96.

SERVER entry in vm.conf

This entry determines the name other NetBackup servers should use when they refer to this server.

`SERVER` entries in the `vm.conf` file are used for NetBackup media server security.

```
SERVER = host_name
```

`SERVER` entries work with the `AUTHORIZATION_REQUIRED` entry to control which hosts can monitor and control devices on this host.

If the `AUTHORIZATION_REQUIRED` entry exists, the `vm.conf` file must include a `SERVER` entry for every media server that controls devices on this host. If the `vm.conf` file contains any `SERVER` entries, it also must include a `SERVER` entry for itself or it cannot manage its own devices.

If no `AUTHORIZATION_REQUIRED` entry exists and no `SERVER` entries exist, any NetBackup server can monitor and control devices on this host.

For security, the entries that allow only specific hosts to access the devices must be added remotely.

This entry is read and interpreted on media servers on which the NetBackup `vmd` service runs.

SSO_DA_REREGISTER_INTERVAL entry in vm.conf

This entry determines the name other NetBackup servers should use when they refer to this server.

The following configuration entry applies to NetBackup servers:

```
SSO_DA_REREGISTER_INTERVAL = minutes
```

This vm.conf entry is for the Shared Storage Option (SSO) for Tape feature only. It is read and interpreted on the host on which ltid runs.

ltid on a scan host periodically registers its shared drives with EMM/DA to ensure that it is still provides the drive scanning function. Only one of the hosts that share a drive scan the drive. This reregistration allows conditions such as a device allocator restart to have minimal effect on use of shared drives.

The default for the reregistration interval is 5 minutes. Use the SSO_DA_REREGISTER_INTERVAL entry to tune this interval. After the entry is added, stop and restart ltid for the change to take effect.

SSO_DA_RETRY_TIMEOUT entry in vm.conf

The following configuration entry applies to NetBackup servers:

SSO_DA_RETRY_TIMEOUT = *minutes*

This vm.conf entry is for the Shared Storage Option (SSO) for Tape feature only. It is read and interpreted on the host on which ltid runs.

The Device Manager ltid delays before if one of the following events occurs:

- Problems during communications with EMM/DA.
- Failure trying to reserve a shared drive.

The default value for the delay is 3 minutes. Use the SSO_DA_RETRY_TIMEOUT entry to tune this delay period. After the entry is added, stop and restart ltid for the change to take effect.

SSO_HOST_NAME entry in vm.conf

The following configuration entry applies to NetBackup servers:

SSO_HOST_NAME = *host_name*

This vm.conf entry is for the Shared Storage Option (SSO) for Tape feature only. It is read and interpreted on the host on which ltid runs.

This entry specifies the name that the current host uses to register, reserve, and release shared drives with EMM/DA. The default is the local host name.

TLH_mediatype entry in vm.conf

The following configuration entry applies to NetBackup servers:

TLH_*mediatype* = *Media_Manager_mediatype*

If this entry is specified in `vm.conf`, IBM ATL media types in tape library Half-inch (TLH) robots are mapped to Media Manager media types. This entry is read and interpreted on the host where `vmcheckxxx` and `vmupdate` are running as part of the robot inventory operation.

TLM_mediatype entry in vm.conf

The following configuration entry applies to NetBackup servers:

`TLM_`*`mediatype`* `= `*`Media_Manager_mediatype`*

If this entry is specified in `vm.conf`, DAS/SDLC media types in tape library Multimedia (TLM) robots are mapped to Media Manager media types. This entry is read and interpreted on the host where `vmcheckxxx` and `vmupdate` are running as part of the robot inventory operation.

VERBOSE entry in vm.conf

If this entry is specified in `vm.conf`, all Media Manager components on the host are started with verbose logging enabled.

Use this option only if problems occur or if requested by Veritas support. After the problem is resolved, remove the debug logs or add a `DAYS_TO_KEEP_LOGS` entry.

Example vm.conf file

The following is an example of a `vm.conf` file, on host server1:

```
SERVER = server1
SERVER = server2
MEDIA_ID_PREFIX = NV
MEDIA_ID_PREFIX = NETB
ACS_3490E = HCART2
```

How to access media and devices on other hosts

For NetBackup to access media and device management functionality on a remote NetBackup host, you may need to add a `SERVER` entry to the `vm.conf` file on the remote host.

The `SERVER` entries are used in the NetBackup `bp.conf` and `vm.conf` files for security. You can add the entries that allow only specific hosts to access those capabilities remotely.

If the vm.conf file on a remote host contains no SERVER entries, a host can manage media and devices on the remote host if it's added to the bp.conf file of the server you logged into. You do not need to add a SERVER entry to the vm.conf file.

If the vm.conf file on a remote host contains any SERVER entries, add a SERVER entry for the host on which the **NetBackup Administration Console** is running (the server you logged into) to that vm.conf file.

Assume that you have three hosts named eel, yak, and shark. You want to centralize device management on host shark and also permit each host to manage its own devices.

The following example scenario applies:

- The vm.conf file on shark contains the following:

  ```
  SERVER = shark
  ```

  The vm.conf file on shark does not require any additional SERVER entries, because all device management for shark is performed from shark.

- The vm.conf file on eel contains the following, which lets eel manage its own devices and permits shark to access them:

  ```
  SERVER = eel
  SERVER = shark
  ```

- The vm.conf file on yak contains the following, which lets yak manage its own devices and permits shark to access them:

  ```
  SERVER = yak
  SERVER = shark
  ```

Host name precedence in the vm.conf file

NetBackup identifies the media server by using the following name precedence:

- CLUSTER_NAME entry if present in vm.conf.
- MM_SERVER_NAME entry if present in vm.conf.
- REQUIRED_INTERFACE entry if present in vm.conf.
- The name of the host in the Server host properties of the master server.
- gethostname() name.

Chapter 3

Holds Management

This chapter includes the following topics:

About Holds Management

NetBackup provides an option to put backup images on hold. The holds mechanism lets you retain the backup images for as long as you need without altering the expiration date.

You can manage the holds by using the command-line interface. You can perform the following:

- Create a hold.
  See "Creating a hold" on page 98.
- View the list of holds.
  See "Viewing hold details " on page 98.
- Add one or more backup images to an existing hold.
  See "Adding a backup image to an existing hold" on page 99.
- Release a hold from the backup image.
  See "Releasing a hold" on page 99.

Note: All hold operations except listing are audited.

Creating a hold

You can create a hold on one or more backup images by using the `nbholdutil -create` command.

Caution: Creating a hold on backup images may disrupt new backups from completing. Storage may fill up if previous backups are not automatically expired.

Note: When you retry a failed Hold creation, an empty hold is created if the backup images have expired between the initial hold and the retry.

To create a hold

The `nbholdutil -create` command lets you create a hold for a backup image.

On a command prompt on the NetBackup master server, enter `nbholdutil -create` with appropriate options and elements. For example:

```
nbholdutil.exe -create -holdname legal_case1 -backupid
win81.sky.com_1307425938 -allcopy
```

This command creates a hold called legal_case1. The backup image ID is `win81.sky.com_1307425938`. You must provide either the `-allcopy` option or the `-primarycopy` option. The `-allcopy` operation indicates that the hold includes all copies of the selected backup image. The `-primarycopy` option indicates that the hold includes only the primary copy of the selected backup image.

For more information about related command options, see the *Veritas NetBackup Commands Reference Guide*.

To display help information about the command and its options, enter `nbholdutil -help [-option]`

Viewing hold details

You can view the list of holds by using the `nbholdutil -list` command.

To view hold details

On a command prompt on the NetBackup master server, enter the `nbholdutil -list` command with appropriate options and elements. For example:

```
nbholdutil.exe -list
```

When you upgrade NetBackup to version 7.7, the legal holds are converted to user holds, which can be managed by using the `nbholdutil` command.

Note: In versions earlier than 7.7, OpsCenter allowed creating holds on backup images. Such holds are known as legal holds.

If the hold name of a legal hold is same as a user hold, all the hold names are renamed as follows:

- The legal hold names are suffixed with _1. For example, hold_1. The number 1 in the hold name denotes that it was a legal hold before conversion.
- The user hold names are suffixed with _3. For example, hold_3. The number 3 in the hold name denotes that it is a user hold.

For more information about related command options, see the *Veritas NetBackup Commands Reference Guide*.

To display help information about the command and its options, enter `nbholdutil -help [-option]`

Adding a backup image to an existing hold

You can add one or more backup images to an existing hold by using the `nbholdutil -add` command.

To add a backup image to an existing hold

On a command prompt on the NetBackup master server, enter the `nbholdutil -add` command with appropriate options and elements. For example:

```
nbholdutil.exe -add -holdname hold123 -reason "Reason1" -backupid
win81.sky.com_1307425938 -primarycopy
```

This command adds primary copy of the backup image win81.sky.com_1307425938 to the existing hold with hold ID equal to hold123.

For more information about related command options, see the *Veritas NetBackup Commands Reference Guide*.

To display help information about the command and its options, enter `nbholdutil -help [-option]`

Releasing a hold

You can release holds by using the `nbholdutil -delete` command.

Note: A backup image expires as per the expiry date when all the holds that include that backup image are released.

To release a hold

On a command prompt on the NetBackup master server, enter the `nbholdutil -delete` command with appropriate options and elements. For example:

```
nbholdutil.exe -delete -holdname legal_case1 -force -reason
Legal_Case1 resolved
```

This command releases a hold that is called legal_case1. For more information about related command options, see the *Veritas NetBackup Commands Reference Guide*

The command `nbholdutil -delete` lets you release a hold.

Chapter 4

Menu user interfaces on UNIX

This chapter includes the following topics:

About menu user interfaces

NetBackup provides several menu user interfaces on UNIX systems to help manage some NetBackup functionality:

- See “About the tpconfig device configuration utility” on page 102.
- See “About the NetBackup Disk Configuration Utility” on page 110.

These utilities are alternatives to using the **NetBackup Administration Console**. The terminology, general concepts, and results are the same regardless of the administration method that is used.

Note: Many NetBackup processes set an upper limit on the number of concurrently open file descriptors allowed by the process. That limit is inherited by the notify scripts run by the process. In the rare event that a command invoked by a notify script requires many additional file descriptors, the script must increase the limit appropriately before invoking the command.

About the tpconfig device configuration utility

UNIX systems only.

The NetBackup `tpconfig` device configuration utility is a character-based, menu-driven interface to configure robots, drives, and logon credentials. It can be used at any terminal (or terminal emulation window) for which `termcap` or `terminfo` is defined.

The NetBackup command utilities are alternatives to the **NetBackup Administration Console**. The terminology, general concepts, and results are the same regardless of which method you use.

After you configure devices, you can use the **NetBackup Administration Console** to configure volumes.

The following list describes the attributes of device configuration and how to use the `tpconfig` utility to configure those attributes.

The `tpconfig` device configuration utility attributes are as follows:

- **Robot number**

  You assign a robot number when you add a robot to the configuration. `tpconfig` prompts you to enter a number or accept the next available robot number that appears. This number identifies the robot in displays and listings, and it follows the robotic type in parentheses, such as TL8(2).

  If you configure robots on multiple systems, robot numbers must be unique. If you connect drives from a robot to multiple systems, specify the same robot number for the robot on all systems.

- **Robotic control path**

  For most robots, you or the operating system creates this path in the `/dev` directory when you add a robot to the configuration. When the `tpconfig` utility prompts you, enter the path to the robotic control as found in the `/dev` directory. If the entries do not exist, more information is available.

  See the *NetBackup Device Configuration Guide*, available at the following URL: http://www.veritas.com/docs/DOC5332

  The control path to a robot may be on another host. If so, enter the host name of the host instead of a path. When you define a robot that another host controls by another host, the robot number must be the same on both hosts.

  Information about how to configure robotic control is available.

  See the *NetBackup Device Configuration Guide*, available at the following URL: http://www.veritas.com/docs/DOC5332

- **Host name**

  You must specify a host name in the following cases:

- When you add an ACS robot, enter the name of the host on which the ACS Library Software resides instead of a robotic control path.
- When you add a TLM robot, enter the DAS or Scalar DLC server name instead of a robotic control path.
- When you add one of the following robots that has robotic control on another host, you are prompted for the name of that host: TL8, TLD, or TLH robot.

- **No rewind on close device name**
  You specify an no rewind on close device name when you add a drive. Usually the letter n precedes or follows the device name. If the device name entries do not exist, you must create them.
  See the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332
  In `tpconfig` displays and `tpconfig` output, the device names are shown under the heading DrivePath.
- **Drive status**
  Drive status indicates whether NetBackup considers a drive available. You specify the initial drive status when you add a drive to the configuration. You can change the status. To do so, use the Update option of the Drive Configuration menu in `tpconfig` (ensure that the device daemon`ltid` is not active). If the device daemon `ltid` is active, use the Administration Console Device Monitor or the `vmoprcmd` command.

About the tpconfig utility menu

The **Device Configuration Utility** menu contains the following information:

```
Device Management Configuration Utility

1) Drive Configuration
2) Robot Configuration
3) Credentials Configuration
4) Print Configuration
5) Help
6) Quit

Enter option:
```

Table 4-1 describes the main menu selections.

Table 4-1 tpconfig main menu selections

Menu choice	Description
Drive Configuration	Opens a menu to add, delete, or update drive definitions; list definitions of drives and robots; or configure drive paths.
Robot Configuration	Opens a menu to add, delete, or update robot definitions or list definitions of drives and robots
Credentials Configuration	Opens a menu to add, delete, update, or list credentials for the following: ■ NDMP filer ■ Disk array ■ OpenStorage server ■ Virtual machine
Print Configuration	The List Configuration commands on subsequent menus let you display the current configuration on the screen or write it to a file. If you specify the `-d` option only on the `tpconfig` command, `tpconfig` writes the current configuration to stdout (the screen) without invoking the menus. Other command options are available. Run `tpconfig -help`. See the *NetBackup Commands Reference Guide*, available at the following URL: http://www.veritas.com/docs/DOC5332
Help	Online Help is available on the main menu and most submenus.
Quit	Terminates the utility and returns you to the UNIX prompt.

You can return to the main menu from anywhere in the utility by entering **Ctrl C** or by using the **Escape** key.

Starting the tpconfig device configuration utility

Several methods exist to start the `tpconfig` utility.

Note: If the Media Manager device daemon is running, stop it by using the `stopltid` command.

To start tpconfig from a UNIX shell

- Enter the following command in a UNIX shell (you must have root user privileges):

  ```
  /usr/openv/volmgr/bin/tpconfig
  ```

Adding robots

When you configure robots and drives, first add the robots by using the **Robot Configuration** menu. Then add the drives by using the **Drive Configuration** menu.

To change standalone drives to robotic, use the **Update** option of the **Drive Configuration** menu.

See "Updating a drive configuration" on page 107.

To add a robot

1. Select the **Robot Configuration** menu.
2. Select the **Add** option.
3. From the list of possible robot types, select the one you want to add.
4. Enter a robot number that you know is unused or accept the default robot number.
5. Indicate where the robotic control for the library is by entering the device file path or library name. The **Help** option on the **Robot Configuration** menu has examples of typical path names.
6. - If robotic control is on another host, enter that host name.
     For an ACS robot, enter the name of the ACS library software host. For a TLM robot, enter the name of the DAS or Scalar DLC server.
   - If robotic control is on this host, enter the device file path or library name. The **Help** option on the **Robot Configuration** menu has examples of typical path names.
     For an ACS robot, enter the name of the ACS library software host.
     For a TLH robot on an AIX system, enter the LMCP Device File; otherwise, enter the Automated Tape Library Name.
     For a TLM robot, enter the name of the DAS or Scalar DLC server.
7. If no conflicts are detected with the new configuration, a message appears to indicate that the robot was added.

Adding drives

Use the following procedure to add a drive.

To add a drive

1. Select the **Drive Configuration** menu.
2. Select the **Add** option.
3. From the list of possible drive types, select the one you want to add.
4. Enter the no rewind on close device path as shown in the `/dev` directory.

   The **Help** option on the **Drive Configuration** menu has examples of typical path names.
5. Enter the drive status (Up or Down).
6. If a robot exists to which you can add the drive, specify whether to add the drive to the robot. Alternatively, you can configure the drives as a standalone drive.

   If there are no robots to which you can add the drive, `tpconfig` automatically adds the drive as a standalone drive.

   If you add a drive to a robot and more than one possible robot exists, enter the number of the robot that controls the drive.

   Depending on the type of robot, you may also be prompted to add the robot drive number.
7. For a drive in an ACS robot, you are prompted for four drive identifiers.

   More information on ACS robots is available.

   See the *NetBackup Device Configuration Guide*, available at the following URL:

   http://www.veritas.com/docs/DOC5332

   For a drive in a TLH robot, you are prompted for an IBM device number.

   For a drive in a TLM robot, you are prompted for a DAS or Scalar DLC drive name.

   More information is available.

   See the *NetBackup Device Configuration Guide*, available at the following URL:

   http://www.veritas.com/docs/DOC5332
8. Type a drive name or press the **Enter** key to use the default drive name.

   If you use the shared drives option, all hosts that share the same physical drive must use the same name for the drive. Descriptive drive names are recommended.

Updating a robot configuration

Use the following procedure to change the robot number or the robotic control path.

To change the robot number or the robotic control path

1. On the main menu, select **Robot Configuration**.

   If only one robot is configured, you do not have to select **Update** or enter the robot number. If only one robot is configured, skip to step 4.
2. On the **Robot Configuration** menu, choose **Update**.
3. Enter the number of the robotic library you want to change.
4. Enter a new robot number to replace the existing robot number or press **Enter** to retain the current robot number.

   You are prompted to enter robotic control information. The actual prompts depend on the type of robotic library you update.
5. Enter the appropriate robotic control path or name of the server that hosts the robot.

Updating a drive configuration

You can change information for a drive (for example, you can add it to a robot).

To change information for a drive

1. On the main menu, select **Drive Configuration**.
2. On the **Drive Configuration** menu, choose **Update**.
3. Enter the name of the drive you want to update.

   The current drive information is displayed, followed by prompts to change each field.
4. Enter a new value or press **Enter** to retain the existing value.

   One of the prompts asks if you want to configure the drive in a robot. If you do, `tpconfig` adds the drive immediately or gives you the opportunity to choose from any existing robot of the appropriate type.

   When you have responded to all prompts, a revised Drive Information display appears, along with the following prompt:

   ```
   Are you sure you want to UPDATE drive name xxxxx? (y/n) n:
   ```
5. Answer yes by pressing **y**.

Deleting a robot

Use the following procedure to delete a robot.

To delete a robot

1. On the main menu, select **Robot Configuration**.

   If only one robot is configured, you do not have to select **Update** or enter the robot number. If only one robot is configured, skip to step 4.
2. On the **Robot Configuration** menu, choose **Delete**.
3. If more than one robot is configured, enter the number of the robot to delete.
4. Enter **y** to delete the robot.

   If you respond with **n**, press any key to return to the **Drive Configuration** menu.

Deleting a drive

Use the following procedure to delete a drive.

To delete a drive

1. On the main menu, select **Drive Configuration**.
2. In the **Drive Configuration** menu, select **Delete**.
3. Enter the name of the drive you want to delete:
4. Enter y to delete the drive.

   If you respond with **n**, press any key to return to the **Drive Configuration** menu.

Configuring drive paths

Use the following procedures to configure and manage drive paths.

To display the drive path menu

1. From the **Drive Configuration** menu, select **Drive Path Configuration**.
2. Enter a drive name.

To add a drive path

1. Select **Add** from the **Drive Path Configuration** menu.
2. Enter a valid drive path.
3. Specify the drive status on the path.

   The drive can be Up, Down, or Disabled for the path.

To delete a drive path

1. Select **Delete** from the **Drive Path Configuration** menu.
2. Enter the drive path to delete.

To update a drive path

1. Select **Update** from the **Drive Path Configuration** menu.
2. Enter the drive path to update.
3. Specify a new drive path or press **Enter** to update the status of the drive path.
4. A prompt similar to the following is displayed:
5. Enter the path status.

Configuring host credentials

You can add, delete, update, or configure the following default host credentials:

- NDMP filer
  You can add the credentials for a specific filer on a specific server. You also can add credentials to be used for all NDMP Filers by all NetBackup servers.
- Disk array
  SharedDisk is supported on NetBackup 6.5 media servers only.
- OpenStorage server
- Virtual machine

To configure host credentials

1. On the main menu, select **Credentials Configuration**.
2. On the credentials menu, select the type of credential you want to configure.

```
Please select the type of host you are trying to configure:

        1) (N)dmp Filer
        2) (D)isk Array Management Server
        3) (O)penStorage Server
        4) (V)irtual Machine
```

3. Select an option at the specific credentials menu and follow the prompts.

Displaying and writing the device configuration

You can display or write out the current configuration from every menu in `tpconfig`.

To display the configuration from the main menu

1. Press `4) Print Configuration`.
2. Press **Enter**.

To display the configuration from a submenu

- Select the `List Configuration` option by pressing the corresponding number.

To write the current configuration to a file

1. On the main menu, press `4) Print Configuration`.
2. Enter the file name.

To write the current configuration to standard output

- Enter the following command in a UNIX shell:

```
tpconfig -d
```

About the NetBackup Disk Configuration Utility

The NetBackup Disk Configuration Utility is a character-based, menu-driven interface that lets you configure and manage disk storage entities. Use this utility for optional NetBackup products that use disk pool storage. It can be used at any terminal (or terminal emulation window) for which `termcap` or `terminfo` is defined.

The NetBackup command utilities are alternatives to the **NetBackup Administration Console**. The terminology, general concepts, and results are the same regardless of which method you use.

After you configure the disk storage, you also can configure a disk storage unit by using a UNIX utility.

Managing OpenStorage servers and disk pools

Use the OpenStorage Disk Management menu to configure and manage disk storage for the OpenStorage Disk Storage Unit Option.

To manage OpenStorage servers and disk pools

1. From the NetBackup disk configuration utility main menu, press **o** (OpenStorage Disk Management) to display the OpenStorage Disk Management menu.

   The menu contains the following information:

```
OpenStorage Disk Management
---------------------------

a)  Add Storage Server
u)  Update Storage Server
r)  Remove Storage Server
v)  View Storage Server
g)  Get Storage Server Configuration
e)  Engage Storage Server Configuration

p)  Preview Disk Volumes
n)  Create New Disk Pool

t)  Take Disk Pool Inventory
m)  Merge Two Disk Pools
c)  Change Disk Pool
s)  Change Disk Pool State
w)  Update Disk Pool Replication Properties From Storage Server
k)  Add Volumes To Disk Pool
d)  Delete Disk Pool
l)  List Disk Pools

h)  Help
q)  Quit Menu

ENTER CHOICE:
```

2. Select a menu option and follow the prompts to configure and manage OpenStorage.

Managing global disk attributes

Use the Global Disk Management Attributes menu to configure and manage disk storage attributes for all disk pool features.

To manage global disk attributes

1. From the NetBackup disk configuration utility main menu, press **g** (Global Disk Management Attributes) to display the Global Disk Management Attributes menu.

   The menu contains the following information:

```
Global Disk Management Attributes
---------------------------------

l)  List Global Disk Management Attributes
s)  SharedDisk SCSI Persistent Reservation

h)  Help
q)  Quit Menu

ENTER CHOICE:
```

2. Select a menu option and follow the prompts to configure and manage attributes.

Chapter 5

Reference topics

This chapter includes the following topics:

Host name rules

NetBackup uses host names to identify, communicate with, and initiate processes on NetBackup client and server computers. The correct use of host names during configuration is essential to the proper operation of NetBackup.

See "About dynamic host name and IP addressing" on page 38.

On Windows:

NetBackup uses TCP/IP host names to connect to NetBackup servers and clients. NetBackup validates its connections by performing a reverse host name lookup. That is, NetBackup determines the IP address of a connection and then uses the IP address to look up the host name with `gethostbyaddr()`. The host name and address resolution must be set up correctly in DNS, WINS, or the local `%Systemroot%\system32\drivers\etc\hosts` file (if necessary).

Note: Place the system host name and IP address in the `%Systemroot%\system32\drivers\etc\hosts` file to accelerate name lookups.

How NetBackup uses host names

A major consideration is the extent to which you qualify host names. In many cases, the short host name of a computer is adequate. If the network environment contains multiple domains, qualify host names to the extent that servers and clients can identify each other in a multi-domain environment.

For example, use a name such as `mercury.bdev.null.com` or `mercury.bdev` rather than only `mercury`.

The following topics discuss how NetBackup stores and uses host names. These topics also address factors to consider when you choose host names.

Note: (On Windows) Do not change the host name of a NetBackup server. This practice is not recommended. You may need to import all previously used media to the server before you can use it under the new host name.

The following table discusses the topics that address how NetBackup stores and uses host names.

Table 5-1 How NetBackup stores and uses host names

Topic	Description
Server and client names on UNIX servers and clients	On both UNIX servers and clients, the `SERVER` entries in the `bp.conf` file define the NetBackup servers that are allowed access. The first `SERVER` entry identifies the master server. The first `SERVER` entry indicates the server to which client requests are made. For this reason, the `SERVER` name must be one by which all clients can connect to the server. If more than one `SERVER` entry exists, the additional entries identify other NetBackup servers that can initiate scheduled backups on the client. The `bp.conf` file must have multiple `SERVER` entries if you configure remote media servers. The NetBackup Request daemon (`bprd`) and NetBackup Database Manager daemon (`bpdbm`) do not run on any server other than a master. When a client makes a list or restore request to the server, the NetBackup client name is used to determine whether to allow the operation. (The client name as specified on the client.) The client name that is used is usually the `CLIENT_NAME` from the `bp.conf` file of the client. Or, the client name can be the actual host name of the client if not in the `bp.conf` file. Alternate client restores can use the name that is specified through the user interface or with a parameter on the `bprestore` command. For a successful request, the client name must match the name that is specified for the client in the NetBackup configuration on the server. The only exception to this rule is if the server is configured to allow alternate client restores.
Host names on Windows servers and PC clients	Windows NetBackup servers and clients also have `SERVER` and `CLIENT_NAME` settings. On these systems, specify server and client settings in the **NetBackup Administration Console**.
Policy configuration	(On Windows) The configured name for a client is the host name as it's added to a policy. This name is how the client is identified in the NetBackup configuration. (On UNIX) The configured name for a client is the host name as it's added to a policy. This name is how the client is identified in the NetBackup configuration. NetBackup also adds a `CLIENT_NAME` entry to a UNIX client's `bp.conf` file when software is first installed on the client. The server uses the client's configured name to connect to the client and start the processes that satisfy client requests. Always use qualified host names to add clients to a policy so that all NetBackup servers can connect to the clients. When a client makes a user backup, archive, or restore request to the NetBackup server, the server uses the peer name of the client. The peer name (identified from its TCP connection) is used to determine the client's configured name. If you add a client to more than one policy, always use the same name in all cases. If the same name is not used, the client cannot view all the files that are backed up on its behalf. In this case, file restores become complicated because both user action and administrator action is required to restore from some of the backups.

Table 5-1 How NetBackup stores and uses host names *(continued)*

Topic	Description
Image catalog	A subdirectory in the image catalog is created for a client when a backup is first created for that client. The subdirectory's name is the client's configured name. Every backup for a client has a separate file in this subdirectory. Each of these backup records contains the host name of the server on which the backup was written.
Error catalog	NetBackup uses the entries in the error catalog for generating reports. These entries contain the host name of the server that generates the entry and the client's configured name, if applicable. The server host name is normally the server's short host name. (For example, *servername* instead of *servername.null.com*.)
Catalog backup information	If you include a media server's catalog files in the NetBackup catalog, qualify the host name of the media server in the file path. Qualified names are necessary because they allow the master server to connect to the media server.

Updating NetBackup after changing the host name

Do not change the host name of a NetBackup server. A name change might require that all previously used media be imported to the server before the host can be used under the new name.

Use the following steps to update the NetBackup configuration if a client's host name is changed.

To update NetBackup after a master server name change	See "To update NetBackup after a master server name change" on page 116.
To update NetBackup after a client name change	See "To update NetBackup after a client name change" on page 117.

To update NetBackup after a master server name change

1. On the master server, delete the client's old name from all policies where it exists and add the client's new name to those policies. You do not need to reinstall NetBackup software on the client. The client continues to have access to all previous backups.
2. (On UNIX) Create a symbolic link from the client's old image directory to its new image directory. For example,

```
cd /usr/openv/netbackup/db/images ln -s
old_client_name new_client_name
```

3 (On Windows) Create a file named `ALTPATH` in the image catalog directory.

For example, if the client name is `client1`, the `ALTPATH` file is created in the following location:

Install_path\VERITAS\NetBackup\db\images\client1\ALTPATH

4 (On Windows) Create a directory for the new `client2` in the `\images` directory:

Install_path\VERITAS\NetBackup\db\images\client2

5 (On Windows) On the first line of the `client1\ALTPATH` file, specify the path to the directory for the new client. The path is the only entry in the `ALTPATH` file.

Install_path\VERITAS\NetBackup\db\images\client2

To update NetBackup after a client name change

1 On PC clients, change the client name setting either through the user interface or in a configuration file.

See the online Help in the **Backup, Archive, and Restore** client interface.

2 On UNIX clients, change the `CLIENT_NAME` value in the `bp.conf` file to the new name.

If users on UNIX clients have a `bp.conf` file in the `$HOME` directory, users must change `CLIENT_NAME` in that file to the new name.

Special considerations for Domain Name Service (DNS)

In some requests to the master server, client software sends the name that it obtains through its `gethostname` library function (on Windows) or the `gethostname(2)` library function (on UNIX). If the name is unknown to the master server Domain Name Service, the master server may not be able to reply to client requests.

This possible situation depends on how the client and the server are configured. If `gethostname` on the client (on Windows) or `gethostname(2)` on the client (on UNIX) returns the host names that DNS on the master server cannot resolve, problems occur.

One possible solution is to reconfigure the client or the master server DNS hosts file. Another option is to create a special file in the altnames directory on the master server. The file forces the translation of NetBackup client host names.

On Windows:

install_path\NetBackup\db\altnames\host.xlate

On UNIX:

/usr/openv/netbackup/db/altnames/host.xlate

Each line in the `host.xlate` file contains three elements: a numeric key and two host names. Each line is left-justified, and a space character separates each element of the line:

key hostname_from_ client client_as_known_by_server

Where

- *key* is a numeric value used by NetBackup to specify the cases where translation is to be done. Currently this value must always be 0, which indicates a configured name translation.
- *hostname_from_client* is the value to translate. The client name must correspond to the name that is obtained by running the client's `gethostname` (on Windows) or `gethostname(2)` (on UNIX). The value must be sent to the server in the request.
- *client_as_known_by_server* is the name to substitute for *hostname_from_client* for request responses. The name must match the name in the NetBackup configuration on the master server and must also be known to the master server's network services.

Consider the following example:

```
0 xxxx xxxx.eng.aaa.com
```

The line specifies that when the master server receives a request for a configured client name (numeric key 0), the name `xxxx.eng.aaa.com` always replaces *xxxx*.

The substitution resolves the problem if the following conditions are true:

- When `gethostname` (on Windows) or `gethostname(2)` (on UNIX) is run on the client, it returns `xxxx`.
- The master server's network services `gethostbyname` library function (on Windows) or `gethostbyname(2)` library function (on UNIX) did not recognize the name *xxxx*.
- The client was configured and named in the NetBackup configuration as `xxxx.eng.aaa.com`. And, this name is also known to network services on the master server.

About reading backup images with nbtar or tar32.exe

NetBackup uses tar-formatted backup images. By using the NetBackup `tar32.exe` on Windows or `nbtar` on UNIX or Linux, NetBackup can understand compressed files, sparse files, long pathnames, and ACL information. It offers features similar to those in `cpio`.

Although non-NetBackup restore utilities that process tar-formatted images can be used to restore files, they provide only limited restore capabilities. You cannot use the NetBackup `tar32.exe` or `nbtar` to extract files from a NetBackup for Windows backup image.

Consequences of using non-NetBackup restore utilities

Non-NetBackup restore utilities do not supply all of the restore capabilities that the NetBackup `/usr/openv/netbackup/bin/nbtar` provides. Possible problems result.

The following is a list of consequences that can occur if using non-NetBackup restore utilities:

- Compressed backups cannot be recovered.
- Multiplexed backups cannot be recovered.
- Solaris extended attributes cannot be restored to a client.
- VxFS named data streams cannot be restored to a client.
- Raw partitions cannot be recovered. (This applies to FlashBackup images as well.)
- NDMP client backup images cannot be restored, though NDMP vendors may have tools or the utilities that can perform a restore directly from the media.
- Non-NetBackup versions of restore utilities may have trouble with sparse files and often skip sparse files.
- HP CDFs are restored with non-NetBackup versions of restore utilities. The directory is no longer hidden and the name of the directory has a + appended to it.
- If the backup spans more than one piece of media, you must read and combine the fragments from the media to give to the restore utility. To combine the fragments, the system's `dd` command may be useful.

  Another possibility is to use a restore utility on the fragments. To use a restore utility on fragments can allow recovery of any file in the backup other than the one that spanned the media.

Some versions of the HP9000-800 `/bin/tar` command are known to give a directory checksum error for the second fragment of a backup that crossed media.

- Some versions of Solaris `tar` combine the `atime`, `mtime`, and `ctime` strings with the file name and create the file paths that are not desirable.

Restoring files with non-NetBackup restore utilities (on UNIX)

This sequence assumes that the media is known to Media Manager and that the tape drive is under Media Manager control.

Before you begin, obtain the following information:

- The media ID of the tape that contains the required backup.
- The tape file number of the backup on the tape.
  See the NetBackup **Images on Media** report for this tape.
- The tape type and density.
- The tape pool.

To restore files with a non-NetBackup utility

1. Enter the following command:

   ```
   tpreq -m media_id -a r -d density -p poolname -f
   /tmp/tape
   ```

   Where the following is true:

   media_id is the media ID of tape that contains the backup.

   density is the density of the tape.

   poolname is the volume pool to which the tape belongs

2. Enter the following command: `mt -f /tmp/tape rew`
3. Enter the following command: `mt -f /tmp/tape fsf file_#`

   Where the following is true:

   file_# is the tape file number of the backup on tape. Determine the tape file number by checking the NetBackup Images on Media report for the tape.
4. Enter the following command: `mt -f /tmp/tape fsr`

5 Enter the following command:

```
/bin/nbtar -tvfb /tmp/tape blocksize
```

Where the following is true:

blocksize is 64 (assume that the tape is written with 32K blocks)

6 Enter the following command: `tpunmount /tmp/tape`

Considerations for file restoration with non-NetBackup restore utilities (on UNIX)

When you restore files with non-NetBackup restore utilities, be aware of the following considerations:

- The file restoration procedure with non-NetBackup utilities does not apply to the encrypted backups that use NetBackup Encryption. Encrypted backups are recoverable. However, the backups cannot be decrypted.
- To determine if a backup is encrypted, run a non-NetBackup restore utility such as `tar -t` before the recovery. The output for an encrypted backup is similar to the following example:

```
erw-r--r-- root/other Nov 14 15:59 2014 .EnCryYpTiOn.388
-rw-r--r-- root/other Oct 30 11:14 2015 /etc/group.10-30
```

Where the `e` at the beginning of line one indicates that the backup is encrypted. (Additional messages appear during recovery.)

- The file restoration procedure with non-NetBackup utilities does not work on the Solaris platform. You cannot use `/usr/sbin/tar` on Solaris to read NetBackup backups. The Solaris `tar` command uses the `ctime` and the `atime` fields differently than other `tar` commands.
  When `/usr/sbin/tar` is used to restore backups, directories with large numbers are created at the top level. These directories are from the `ctime` and the `atime` fields being read as pathnames.
  You can use `/usr/openv/netbackup/bin/nbtar` to read the backups on Solaris platforms.
- Steps 1 and 6 from the file restoration procedure with non-NetBackup utilities are optional in a standalone environment. If step 1 is skipped, DOWN the drive and then substitute the `/dev` path of the drive in place of `/tmp/tape` in the other steps. Remember to UP the drive when you are done.
  See "To restore files with a non-NetBackup utility" on page 120.

About the files that restores generate

The `nbtar` command and any restore utility that processes tar-formatted images, can generate a number of files depending on the circumstances of the recovery, as Table 5-2 shows.

Table 5-2 Files that restores generate

File	Description
`@@MaNgLeD.nnnn`	For backups containing pathnames longer than 100 characters, `nbtar` generates the files that are named `@@MaNgLeD.`*`nnnn`* that contain the actual file.
`@@MaNgLeD.nnnn_Rename`	`nbtar` generates another file (`@@MaNgLeD.`*`nnnn`*`_Rename`) that explains how to rename the `@@MaNgLeD.`*`nnnn`* files to return the files to the correct location.
`@@MaNgLeD.nnnn_Symlink`	For long names of symbolic links, `nbtar` generates the files that are named `@@MaNgLeD.`*`nnnn`*`_Symlink`. These files contain descriptions of the symbolic links that must be made to return a link to the correct file.
For cross-platform VxFS extent attribute restores, `nbtar` creates and stores extent attributes in `.ExTeNt.`*`nnnn`* files in the `root` directory	The files can either be deleted or read and the extent attributes regenerated by hand to the corresponding files.

Factors that affect backup time

The amount of time that NetBackup requires to complete a backup is an important factor in setting up schedules. The importance of time is particularly true for the sites that handle large amounts of data. For example, the total backup time can exceed the time that is allotted to complete backups and interfere with normal network operations. Longer backup times also increase the possibility of a problem that disrupts the backup. The time to back up files can also give an indication of how long it may take to recover the files.

Figure 5-1 shows the major factors that affect backup time.

Figure 5-1 Backup time formula

$$\text{Backup time} = \frac{\text{Total data}}{\text{Transfer rate}} + \text{Compression factor (optional)} \times \text{Device delays}$$

Total amount of data to back up

The total amount of data to back up depends on the size of the files for each client in the policy. The total amount of data also depends on whether the backup is a full backup or an incremental backup.

The implications are as follows:

- Full backups involve all the data. Therefore, a full backup usually takes longer than an incremental backup.
- Differential incremental backups include only the data that changed since the last full or incremental backup.
- Cumulative incremental backups include all the data that changed since the last full backup.

For incremental backups, the amount of data depends on the frequency with which files change. If a large number of files change frequently, incremental backups are larger.

Transfer rate

The transfer rate depends on the following factors.

Table 5-3 Transfer rate factors

Factor	Description
Speed of the backup device	Backups that are sent to tapes with a transfer rate of 800 kilobytes per second are generally faster than tapes with a transfer rate of 400 kilobytes. (Assume that other factors allow for the faster transfer rate.)
Available network bandwidth	The available bandwidth is less than the theoretical network bandwidth and depends on how much other network traffic is present. For example, multiple backups occurring on the same network compete for bandwidth.
Speed with which the client can process the data	The speed varies with the hardware platform and depends on the other applications that run on the platform. File size is also an important factor. Clients can process larger files faster than smaller ones. A backup for 20 files, 1 megabyte each, is faster than a backup for 20,000 files that are 1 kilobyte each.
Speed with which the server can process the data	Like client speed, server speed also varies with the hardware platform and depends on the other applications that run on the platform. The number of concurrent backups being performed also affects server speed.

Table 5-3 Transfer rate factors *(continued)*

Factor	Description
Network configuration can affect performance	For example, when some computers run full-duplex and some run half-duplex in an Ethernet environment, the throughput is significantly reduced.
Compression (on UNIX)	Software compression often multiplies the backup time by a factor of two or three for a given set of data.
Device delays	Device delays can be due to the following factors: ■ The device may be busy or slow to load the media. ■ The device may be slow to find the location on the media at which to start writing the backup. These delays can vary widely and depend on the devices and the computing environments.

Methods for determining the NetBackup transfer rate

Calculate three variations of the backup transfer rate by using NetBackup report data.

Three NetBackup transfer rates and calculation methods are available.

Table 5-4 NetBackup transfer rates

Transfer rate	Description
Network transfer rate	The network transfer rate is the rate provided in the All Log Entries report. The network transfer rate considers only the time it takes to transfer data over the network from client to server. This rate ignores the following: ■ The time the device requires to load and to position media before a backup. ■ The time that the tape file requires to close and write an additional NetBackup information record to the tape.

Table 5-4 NetBackup transfer rates *(continued)*

Transfer rate	Description

Network transfer plus end-of-backup processing rate	This rate ignores the time it takes to load and to position media before a backup. However, the rate does include the end-of-backup processing that is ignored in the network transfer rate. To determine this rate, use the All Log Entries report and calculate the time from the message:
	
	`begin writing backup id xxx`
	
	until the message
	
	`successfully wrote backup id xxx`
	
	To calculate the transfer rate, divide this time (in seconds) into the total bytes that are transferred. (The total bytes that are transferred are recorded in the **All Log Entries** report.)

Total transfer rate	This transfer rate includes the time it takes to load and position the media as well as the end-of-backup processing. Use the **List Client Backups** report to calculate the transfer rate by dividing Kilobytes by Elapsed Time (converted to seconds).

On Windows, the Microsoft Windows System Monitor also displays the NetBackup transfer rate.

Examples of the reports that provide backup data to calculate transfer rates

Assume that the reports provide the following data.

Sample **All Log Entries** report:

```
TIME                SERVER/CLIENT   TEXT
04/28/09 23:10:37   windows giskard begin writing backup
                    id giskard_0767592458, fragment 1 to
                    media id TL8033 on device 1 . . .
04/29/09 00:35:07   windows giskard successfully wrote
                    backup id giskard_0767592458,
                    fragment 1, 1161824 Kbytes at
                    230.325 Kbytes/sec
```

Sample List Client Backups Report:

```
  Client:                    giskard
  Backup ID:                 giskard_0767592458
  Policy:                    production_servers
```

```
Client Type:                Standard
Sched Label:                testing_add_files
Schedule Type:              Full
Backup Retention Level:     one week (0)
Backup Time:                04/28/09 23:07:38
Elapsed Time:               001:27:32
Expiration Time:            05/05/09 23:07:38
Compressed:                 no
Kilobytes:                  1161824
Number of Files:            78210
```

The following three rates were compiled with the backup data from the sample reports:

Network transfer rate:

1161824 KB at 230.325 KB per second

Network transfer plus end-of-backup processing rate:

23:10:30 - 00:35:07 = 01:24:30 = 5070 seconds

1161824 KB/5070 = 229.157 KB per second

Total transfer rate:

Elapsed time = 01:27:32 = 5252 seconds

1161824 Kbytes/5252 = 221.216 KB per second

NetBackup notify scripts

NetBackup provides scripts or batch files that can collect information and be used to notify administrators of specific events.

Many of the scripts are located in the `goodies` directory, which contains sample shell scripts to modify. The scripts in the `goodies` directory are not supported but are intended as examples to customize.

The `goodies` directory is found in the following location:

On Windows: *`Install_path`*`\NetBackup\bin\goodies\`

On UNIX: `/usr/openv/netbackup/bin/goodies`

Notes about using scripts

- Ensure that others can run the script after modifying. To do so, run `chmod ugo+rx` *`script_name`*, where *`script_name`* is the name of the script.

- If you use either the `bpstart_notify` or `bpend_notify` scripts, do not include any commands that write to `stdout`. NetBackup sends the output that is written to `stdout` to the server as part of the backup. The resulting backup can abort with an error message that pertains to block sizes.
  Also, ensure that all commands in the scripts are appropriate to the client platform. For example, the `-s` parameter is invalid for the UNIX `mail` command on some UNIX platforms. Its use can cause data to be written to `stdout` or `stderr`.
- Many NetBackup processes set a limit on the number of concurrently open file descriptors that are allowed. That limit is inherited by the notify scripts run by the process. In the rare event that a command invoked by a notify script requires many additional file descriptors, the script must increase the limit appropriately before invoking the command.

The following topics describe the scripts that are active on the master server and those that are active on the client.

To use the client scripts, first create the script on the client.

Additional comments appear in the scripts.

backup_notify script

The `backup_notify.cmd` script (on Windows) and the `backup_notify` script (on UNIX) runs on the NetBackup server where the storage unit is located. It's called each time a backup is successfully written to media.

The scripts are located in the following directories:

On Windows: *`Install_path`*`\NetBackup\bin\backup_notify.cmd`

On UNIX: `/usr/openv/netbackup/bin/backup_notify`

NetBackup passes the following parameters to this script:

- The name of the program performing the backup
- The backup-image name or path

See the following Windows example:

```
backup_notify.cmd bptm host_0695316589
```

backup_exit_notify script

The `backup_exit_notify.cmd` script (on Windows) and the `backup_exit_notify` script (on UNIX) run on the master server. It's called to perform site-specific processing when an individual backup completes.

The scripts are located in the following directories:

On Windows: *Install_path*\NetBackup\bin\backup_exit_notify.cmd

On UNIX: /usr/openv/netbackup/bin/backup_exit_notify

NetBackup passes the following parameters to the script:

clientname	Specifies the name of the client from the NetBackup catalog.
policyname	Specifies the policy name from the NetBackup catalog.
schedname	Specifies the schedule name from the NetBackup catalog.
schedtype	Specifies one of the following: FULL, INCR (differential incremental), CINC (cumulative incremental), UBAK, UARC
exitstatus	Specifies the exit code for the entire backup job.
stream	Specifies the backup stream number for a job. 0 = The backup job is not running multiple data streams. -1 = The job is a parent job.
done_trying	Specifies whether the job will retry. 0 = The job is not complete and will retry. 1= The job is complete and will not retry. If the system is configured to make 3 attempts in 12 hours, the job could run this script up to 3 times. On the final attempt, the done_trying flag is set to 1. The job has either completed successfully or has failed and exhausted the number of tries.

See the following UNIX example:

```
backup_exit_notify clientname1 pol_prod sched_fulls FULL 0 -1 1

backup_exit_notify clientname2 pol_prod sched_incr INCR 73 0 1
```

bpstart_notify script (UNIX clients)

On UNIX clients, NetBackup calls the bpstart_notify script each time the client starts a backup or an archive.

Note: Ensure that others can run this script on the client before it's used. To do so, run chmod ugo+rx *script_name*, where *script_name* is the name of the script.

To use this script, copy the following file from the server:

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

Then place the script in the following location on the UNIX client:

`/usr/openv/netbackup/bin/`

Modify the script and ensure that you have permission to run the script.

The `bpstart_notify` script runs each time a backup or an archive starts and initialization is completed. The script runs before the tape is positioned. This script must exit with a status of 0 for the calling program to continue and for the backup or archive to proceed. A nonzero status causes the client backup or archive to exit with a status of `bpstart_notify failed`.

If the `/usr/openv/netbackup/bin/bpstart_notify` script exists, it runs in the foreground. The `bpbkar` process on the client waits for the script to complete before it continues. Any commands in the script that do not end with an ampersand character (&) run serially.

The server expects the client to respond with a `continue` message within the time that the `BPSTART_TIMEOUT` option specifies on the server. The default for `BPSTART_TIMEOUT` is 300 seconds. If the script needs more time than 300 seconds, increase the value to allow more time. (The `BPSTART_TIMEOUT` option corresponds to the **Backup start notify timeout** on the **Timeouts** host properties.)

Note: The **Client read timeout** (`CLIENT_READ_TIMEOUT` option) must be equal to or greater than the **Backup start notify timeout** (`BPSTART_TIMEOUT` option). If the **Client read timeout** is less than the **Backup start notify timeout**, the job can time out while the `bpstart_notify` script is running.

NetBackup passes the following parameters to the script:

`clientname`	Specifies the name of the client from the NetBackup catalog.
`policyname`	Specifies the policy name from the NetBackup catalog.
`schedname`	Specifies the schedule name from the NetBackup catalog.
`schedtype`	Specifies one of the following: `FULL`, `INCR` (differential incremental), `CINC` (cumulative incremental), `UBAK`, `UARC`

Note: The `bpstart_notify` script also runs for NetBackup catalog backups if a `.policyname[.schedule]` is not specified.

For example:

```
bpstart_notify client1 pol_cd4000s sched_fulls FULL
bpstart_notify client2 pol_cd4000s sched_incrementals INCR
bpstart_notify client3 pol_cd4000s sched_fulls FULL
bpstart_notify client4 pol_cd4000s sched_user_backups UBAK
bpstart_notify client5 pol_cd4000s sched_user_archive UARC
```

To create a `bpstart_notify` script for a specific policy or policy and schedule combination, create script files with a *.policyname* or *.policyname.schedulename* suffix. The following are two examples of script names for a policy (production) that has a schedule (fulls):

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

The first script affects all scheduled backups in the policy that are 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 `bpstart_notify` script and that is the script with the most specific name. For example, if there are both `bpstart_notify.production` and `bpstart_notify.production.fulls` scripts, NetBackup uses only `bpstart_notify.production.fulls`.

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

```
BACKUPID
UNIXBACKUPTIME
BACKUPTIME
```

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

```
BACKUPID=client1_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 2016
```

In addition, the following environment variables can be used to support multiple data streams.

Table 5-5 Environment variables used to support multiple data streams

Environment variable	Description
STREAM_NUMBER	Specifies the stream number. The first stream from a policy, client, and schedule is 1. A 0 value indicates that multiple data streams are not enabled.
STREAM_COUNT	Specifies the total number of streams to be generated from this policy, client, and schedule.
STREAM_PID	Specifies the PID (process ID) number of bpbkar.
RESTARTED	Specifies the checkpointed restarts or checkpointed backup jobs. A value of 0 indicates that the job was not resumed. (For example, upon first initiation.) A value of 1 indicates that the job was resumed.

bpstart_notify.bat script (Windows clients)

For all Windows clients, you can create batch scripts that provide notification whenever the client starts a backup or archive.

To use this script, copy the following file from the server:

On Windows:

Install_path\NetBackup\bin\goodies\bpstart_notify.bat

Then place the file on the client in the same directory as the NetBackup client binaries:

Install_path\NetBackup\bin\

Where *Install_path* is the directory where NetBackup is installed.

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

To create a script that applies to all backups, name the script bpstart_notify.bat.

To create a bpstart_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 examples of bpstart_notify script names:

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

  install_path\netbackup\bin\bpstart_notify.days.bat

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

install_path\netbackup\bin\bpstart_notify.days.fulls.bat

The bpstart_notify script also runs for NetBackup catalog backups if a .policyname[.schedule] is not specified.

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 bpstart_notify script and checks for them in the following order:

bpstart_notify.*policy.schedule*.bat
bpstart_notify.*policy*.bat
bpstart_notify.bat

For example, if there are both bpstart_notify.policy.bat and bpstart_notify.policy.schedule.bat scripts, NetBackup uses only the bpstart_notify.policy.schedule.bat script.

Note: bpend_notify scripts can provide a different level of notification than the bpstart_notify scripts. For example, to use one of each, the script names might be bpstart_notify.policy.bat and bpend_notify.policy.schedule.bat.

NetBackup passes the following parameters to the script:

%1	Specifies the name of the client from the NetBackup catalog.
%2	Specifies the policy name from the NetBackup catalog.
%3	Specifies the schedule name from the NetBackup catalog.
%4	Specifies one of the following: FULL, INCR, CINC, UBAK, UARC
%5	Specifies that the status of the operation is always 0 for bpstart_notify.

%6 Specifies the 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\BPSTART_RES.*policy.schedule*

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

install_path\netbackup\bin\BPSTART_RES.*policy*

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

install_path\netbackup\bin\BPSTART_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 time that the `BPSTART_TIMEOUT` option specifies on the server. The default for `BPSTART_TIMEOUT` is 300 seconds. If the script needs more time than 300 seconds, increase the value to allow more time. (The `BPSTART_TIMEOUT` option corresponds to the **Backup start notify timeout** on the **Timeouts** host properties.)

Note: The **Client read timeout** (`CLIENT_READ_TIMEOUT` option) must be equal to or greater than the **Backup start notify timeout** (`BPSTART_TIMEOUT` option). If the **Client read timeout** is less than the **Backup start notify timeout**, the job can timeout while the `bpstart_notify` script is running.

---

bpend_notify script (UNIX clients)

To receive a notification whenever a UNIX client completes a backup or an archive operation, copy the following file from the server:

On Windows:

Install_path\NetBackup\bin\goodies\bpend_notify

On UNIX:

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

Then place the file in the following location on the UNIX client:

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

Modify the script and ensure that you have permission to run the script.

Note: The `bpend_notify` script is run when the client is finished sending data, but the server has not yet completed writing to media.

Note: Ensure that other administrators can run the notify scripts after they are modified. To do so, run `chmod ugo+rx` *`script_name`*, where *`script_name`* is the name of the script.

The `bpend_notify` script runs each time a backup or archive completes. For archives, it runs after the backup but before the files are removed.

If `bpend_notify` exists, it runs in the foreground and `bpbkar` on the client waits until it completes. Any commands that do not end with an ampersand character (&) run serially.

The server expects the client to respond within the time that the `BPEND_TIMEOUT` NetBackup configuration option specifies. The default for `BPEND_TIMEOUT` is 300.

If the script needs more than 300 seconds, set `BPEND_TIMEOUT` to a larger value. Avoid too large a value because it can delay the server from servicing other clients.

NetBackup passes the following parameters to the script:

`clientname`	Specifies the name of the client from the NetBackup catalog.
`policyname`	Specifies the policy name from the NetBackup catalog.
`schedname`	Specifies the schedule name from the NetBackup catalog.
`schedtype`	Specifies one of the following: `FULL`, `INCR` (differential incremental), `CINC` (cumulative incremental), `UBAK`, `UARC`
`exitstatus`	Specifies the exit code from `bpbkar`. The status is the client status and does not indicate that the backup is complete and successful. The client can display a status 0 when, due to a failure on the server, the All Log Entries report displays a status 84.

Note: The `bpend_notify` script also runs for NetBackup catalog backups if a `.policyname[.schedule]` is not specified.

For example:

```
bpend_notify client1 pol_1 fulls FULL 0
bpend_notify client2 pol_1 incrementals INCR 73
```

To create a `bpend_notify` script for a specific policy or policy and schedule combination, create script files with a .policyname or .policyname.schedulename suffix. The following are two examples of script names for a policy that is named production with a schedule that is named fulls:

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

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

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

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

```
BACKUPID
UNIXBACKUPTIME
BACKUPTIME
```

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

```
BACKUPID=client1_0857340526
UNIXBACKUPTIME=0857340526
BACKUPTIME=Sun Mar 2 16:08:46 2011
```

The following environment variables can be used for the support of multiple data streams.

Table 5-6 Environment variables used for support of multiple data streams

Environment variable	Description
`STREAM_NUMBER`	Specifies the stream number. The first stream from a policy, client, and schedule is 1. A 0 value indicates that multiple data streams are not enabled.

Table 5-6 Environment variables used for support of multiple data streams *(continued)*

Environment variable	Description
STREAM_COUNT	Specifies the total number of streams to be generated from this policy, client, and schedule.
STREAM_PID	Specifies the PID (process ID) number of bpbkar.
FINISHED	Specifies the status of the checkpointed restarts of backup jobs. A value of 0 indicates that the client was not finished sending all of the data. A value of 1 indicates that the client was finished sending all of the data.

bpend_notify.bat script (Windows clients)

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

Install_path\NetBackup\bin\bpend_notify.bat

Install_path is the directory where NetBackup is installed.

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

To create a bpend_notify script that applies to all backups, name the script bpend_notify.bat

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 as follows:

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

  Install_path\netbackup\bin\bpend_notify.days.bat

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

  Install_path\netbackup\bin\bpend_notify.days.fulls.bat

Note: The bpend_notify script also runs for NetBackup catalog backups if a .policyname[.schedule] is not specified.

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 `bpend_notify` script and checks for them in the following order:

```
bpend_notify.policy.schedule.bat
bpend_notify.policy.bat
bpend_notify.bat
```

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

Note: `bpstart_notify` scripts can provide a different level of notification than the `bpend_notify` scripts. For example, if you had one of each, they could be `bpstart_notify.policy.bat` and `bpend_notify.policy.schedule.bat.`

NetBackup passes the following parameters to the script when the backup completes:

%1	Specifies the name of the client from the NetBackup catalog.
%2	Specifies the policy name from the NetBackup catalog.
%3	Specifies the schedule name from the NetBackup catalog.
%4	Specifies one of the following: `FULL, INCR, CINC, UBAK, UARC`
%5	Specifies the status of the operation. It is the same status as is sent to the NetBackup server. The 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 Specifies the 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\BPEND_RES.*policy.schedule*

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

Install_path\netbackup\bin\BPEND_RES.*policy*

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

Install_path\netbackup\bin\BPEND_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 time that the `BPEND_TIMEOUT` option specifies. The default for `BPEND_TIMEOUT` is 300. If the script needs more than 300 seconds, increase the value to allow more time.

bpend_notify_busy script (UNIX clients)

Use the `bpend_notify_busy` script to configure busy file processing when using the `bp.conf` file.

See "About busy file processing on UNIX clients" on page 47.

Busy file processing can also be configured in the **Busy File Settings** host properties of the **NetBackup Administration Console**.

diskfull_notify script

The `diskfull_notify.cmd` script (on Windows) and the `diskfull_notify` script (on UNIX) run on the NetBackup server that contains the storage unit. The disk media manager (`bpdm`) calls this script if it encounters a disk full condition while it writes a backup to a disk storage unit. The default action is to report the condition and immediately try to write the data again. (The file being written is kept open by the active `bpdm`).

The scripts are located in the following directories:

On Windows: *Install_path*\NetBackup\bin\diskfull_notify.cmd

On UNIX: /usr/openv/netbackup/bin/diskfull_notify

The script can be modified to send a notification to an email address or modified to perform actions such as removing other files in the affected directory or file system.

NetBackup passes the following parameters to the script:

programname	Specifies the name of the program (always bpdm).
pathname	Specifies the path to the file being written.

For example:

```
/disk1/images/host_08193531_c1_F1
```

See the following Windows example:

```
diskfull_notify.cmd bpdm
```

drive_mount_notify script (on UNIX)

The NetBackup tpreq command runs the drive_mount_notify script (if it exists) immediately after media is mounted in a pre-selected, robotic drive. This script is not valid for standalone drives.

Each time a tape volume is mounted, this script gathers information on the drive that is mounted. This script also lets you perform special-handling. For example, you can use the script to gather log sense or other data from a drive and place it in an output file. You can change the information that the script gathers by modifying the script.

After the script runs, control is then returned to NetBackup to resume processing.

This script is located in the following directory:

```
/usr/openv/volmgr/bin/goodies
```

To use this script, activate it and place it into the /usr/openv/volmgr/bin directory. See the script for instructions about how to activate it and how to modify it.

drive_unmount_notify script (on UNIX)

The NetBackup tpunmount command runs the drive_unmount_notify script (if it exists) after media is unmounted. This script is valid for robotic drives and standalone drives.

Each time a tape volume is unmounted, this script gathers information about the drive that is unmounted. This script also lets you perform special-handling. For example, you can use the script to gather log sense or other data from a drive and place it in an output file. You can change the information that the script gathers by modifying the script.

After the script runs, control is then returned to NetBackup to resume processing.

This script is located in the following directory:

```
/usr/openv/volmgr/bin/goodies
```

To use this script, activate it and place it into the `/usr/openv/volmgr/bin` directory. See the script for instructions about how to activate it and how to modify it.

mail_dr_info script

Use the `mail_dr_info.cmd` script (on Windows) and the `mail_dr_info.sh` script (on UNIX) to send NetBackup disaster recovery information to specified recipients after running an online, hot catalog backup.

By default, this script does not exist. You must create it. How you do so depends on the operating system type of your master server.

On Windows: To create the script, copy the following script from the master server:

`Install_path``\NetBackup\bin\goodies\nbmail.cmd`

and place it into the following location:

`Install_path``\NetBackup\bin\mail_dr_info.cmd.`

On UNIX: To create the script, touch the following file:

```
/usr/openv/netbackup/bin/mail_dr_info.sh
```

NetBackup passes the following parameters to the script:

%1	Specifies the recipient's address. For multiple addresses, enter *email1,email2*
%2	Specifies the subject line.
%3	Specifies the message file name.
%4	Specifies the attached file name.

On Windows: NetBackup checks to see if `mail_dr_info.cmd` is present in *`Install_path`*`\NetBackup\bin`. If `mail_dr_info.cmd` exists, NetBackup passes the parameters to the script.

Note: All NetBackup email notifications require that a public domain SMTP mail client be configured. (For example, `blat`.) For details, see the comments in the `nbmail.cmd` script.

On UNIX: NetBackup checks to see if `mail_dr_info.sh` is present in `/usr/openv/netbackup/bin`. If `mail_dr_info.cmd` exists, NetBackup passes the parameters to the script. `mail_dr_info.sh` is not an installed file. Users must create the script.

media_deassign_notify script

The NetBackup Media Manager calls the `media_deassign_notify` script after media is deassigned. To send an email notification when media is deassigned, include an email address in the script where indicated. (The script must be run as the root user.)

On Windows: Copy *`Install_path`*`\NetBackup\bin\goodies\media_deassign_notify.cmd` into *`Install_path`*`\NetBackup\bin\` on the master server.

On UNIX: Copy `/usr/openv/netbackup/bin/goodies/media_deassign_notify` into `/usr/openv/netbackup/bin/` on the master server.

If the script exists in the `\bin` directory, the following parameters are passed to the script: media ID, legacy media type, barcode, robot number, and robot type.

nbmail.cmd script (on Windows)

Use the `nbmail.cmd` script to send the specified recipients notifications about scheduled backups. The recipients' email addresses must also be configured in the **Universal Settings** host properties.

Windows systems also require that you install the Simple Mail Transfer Protocol application to transfer messages to accept script parameters. UNIX platforms have a built-in SMTP transfer method.

To create the script on a client, copy *`Install_path`*`\NetBackup\bin\goodies\nbmail.cmd` from the master server into *`Install_path`*`\NetBackup\bin` of each client that is to receive the notification.

NetBackup passes the following parameters to the script:

%1	Specifies the address of the recipient. For multiple addresses, enter *email1,email2*
%2	Specifies the contents of the subject line.

%3	Specifies the file that is sent in the body of the email. This is generated by another script.
%4	Specifies the attached file name.

NetBackup checks to see if `nbmail.cmd` is present in *`Install_path`*`\NetBackup\bin`. If `nbmail.cmd` exists, NetBackup passes the parameters to the script.

parent_end_notify script

NetBackup calls the `parent_end_notify.cmd` script (on Windows) and the `parent_end_notify` script (on UNIX) each time a parent job ends.

NetBackup passes the following parameters to the script:

`clientname`	Specifies the name of the client from the NetBackup catalog.
`policyname`	Specifies the policy name from the NetBackup catalog.
`schedname`	Specifies the schedule name from the NetBackup catalog.
`schedtype`	Specifies one of the following: `FULL, INCR` (differential incremental), `CINC` (cumulative incremental), `UBAK, UARC`
`status`	Specifies the exit code for the entire backup job.
`stream`	Specifies the stream number; it's always -1.
`stream_count`	Specifies that if the job starts normally, the stream count indicates how may streams were started. Verifies the number of streams that complete and run `backup_exit_notify`. If a failure occurs that makes it impossible to start any streams, a stream count of -1 is returned.

parent_start_notify script

NetBackup calls the `parent_start_notify.cmd` script (on Windows) or the `parent_start_notify` script (on UNIX) each time a parent job starts.

NetBackup passes the following parameters to the script:

`clientname`	Specifies the name of the client from the NetBackup catalog.
`policyname`	Specifies the policy name from the NetBackup catalog.
`schedname`	Specifies the schedule name from the NetBackup catalog.

schedtype	Specifies one of the following: FULL, INCR (differential incremental), CINC (cumulative incremental), UBAK, UARC
status	Specifies the exit code for the entire backup job.
streamnumber	Specifies the stream number; for a parent job it's always -1.

pending_request_notify script

The NetBackup Media Manager calls the pending_request_notify script after a pending request is issued for a media resource (tape volume). To send an email notification when a pending request is initiated, include an email address in the script where indicated. (A root user must run the script.)

On Windows: Copy *Install_path*\NetBackup\bin\goodies\pending_request_notify.cmd into *Install_path*\NetBackup\bin\ on the master server.

On UNIX: Copy /usr/openv/netbackup/bin/goodies/pending_request_notify into /usr/openv/netbackup/bin/ on the master server.

If the script exists in the /bin directory, the following parameters are passed to the script: media ID, barcode, action code, robot type, robot number, media server, volume group, and pending time (in seconds since the UNIX epoch).

restore_notify script

The restore_notify.cmd script (on Windows) and the restore_notify script (on UNIX) run on the server that contains the storage unit. The NetBackup tape or disk manager (bptm or bpdm) calls the script when it finishes sending data to the client during a restore. The script is called regardless of whether data is sent.

The scripts are located in the following directories:

On Windows: *Install_path*\NetBackup\bin\restore_notify.cmd

On UNIX: /usr/openv/netbackup/bin/restore_notify

NetBackup passes the following parameters to the script:

programname	Specifies the name of the program doing the restore or other read operation.
pathname	Specifies the path to the backup name or path.
operation	Specifies one of the following: restore, verify, duplication, import

session_notify script

The `session_notify.cmd` script (on Windows) and the `session_notify` script (on UNIX) run on the master server. It's called at the end of a backup session if at least one scheduled backup succeeded. NetBackup passes no parameters to this script. Scheduling is suspended until this script completes, so no other backups can start until that time.

The scripts are located in the following directories:

On Windows: *`Install_path`*`\NetBackup\bin\session_notify.cmd`

On UNIX: `/usr/openv/netbackup/bin/session_notify`

session_start_notify script

The `session_start_notify.cmd` script (on Windows) and the `session_start_notify` script (on UNIX) run on the master server. When a set of backups is due to run, NetBackup calls this script to do any site-specific processing before it starts the first backup. NetBackup passes no parameters to this script.

The scripts are located in the following directories:

On Windows: *`Install_path`*`\NetBackup\bin\session_start_notify.cmd`

On UNIX: `/usr/openv/netbackup/bin/session_start_notify`

shared_drive_notify script

NetBackup runs the `shared_drive_notify.cmd` script (on Windows) and the `shared_drive_notify` script (on UNIX) when a shared drive is reserved or released.

- The name of the shared drive.
- The name of the current scan host.
- The operation, which is one of the following:

RESERVED	Specifies that the host on which the script is executed needs SCSI access to the drive until it's released.
ASSIGNED	Informational only. Specifies that the host that reserved the drive needs SCSI access.
RELEASED	Specifies that only the scan host needs SCSI access to the drive.

SCANHOST	Specifies that the host that executes the script has become the scan host. A host should not become a scan host while the drive is RESERVED. The scan host may change between a RESERVED operation and a RELEASED operation.

The scripts are located in the following directories:

On Windows: *Install_path*\Volmgr\bin\shared_drive_notify.cmd

On UNIX: /usr/openv/volmgr/bin/shared_drive_notify

The script must be executable by the root user.

The script exits with status 0 upon successful completion.

userreq_notify script

The userreq_notify.cmd script (on Windows) and the userreq_notify script (on UNIX) run on the master server.

The scripts are located in the following directories:

On Windows: *Install_path*\NetBackup\bin\userreq_notify.cmd

On UNIX: /usr/openv/netbackup/bin/userreq_notify

NetBackup calls the script each time a request is made to either of the following:

- List files that are in backups or archives
- Start a backup, archive, or restore

You can change this script to gather information about user requests to NetBackup.

NetBackup passes the following parameters to the script:

action	Specifies the action and can have the following values: backup, archive, manual_backup, restore, list
clientname	Specifies the client name.
userid	Specifies the user ID.

See the following UNIX example:

```
userreq_notify backup mercury jdoe
userreq_notify archive mercury jdoe
userreq_notify manual_backup mercury jdoe
```

```
userreq_notify restore mercury jdoe
userreq_notify list mercury jdoe
```

Media and device management best practices

Use the following best practices for NetBackup media and device management. Follow these recommendations to minimize problems and to reduce the time and the effort that is required to administer the configuration.

For a list of supported devices, server platforms, and the latest device mapping file, see the NetBackup website:

http://www.netbackup.com/compatibility

The following items are general best practices for media and device management:

- Use only the NetBackup commands that Veritas documents and supports.
- Refer to the NetBackup release notes for configuration and operational changes in the current release or in future releases. The release notes also contain information about all new functionality in each release.
- Use the documented methods for terminating the NetBackup Media Manager daemons and services.
- Periodically verify the backups by using **NetBackup Management > Catalog** in the **NetBackup Administration Console**. Also, periodically restore the files to prove that restores work correctly.
- Always back up the NetBackup catalogs. You may also want to back up the `vm.conf` file and the `bp.conf` (UNIX system) files on the media servers.
- When you restore the NetBackup catalog (for example, master server databases and the EMM database), use backups from the same point in time.
- Ensure that all names and numbers for devices and all media IDs and barcodes are unique across the entire enterprise.
- On UNIX hosts: To use the devices that NetBackup controls but are used with other applications, do the following to avoid the potential loss of data:
  - Use the NetBackup `tpreq` command to mount media on a drive and `tpunmount` to remove media from the drive. If you use these commands, another application can control a device when NetBackup is finished with the device.
  - Down the drive, if the drive is in the UP state.
- On Windows hosts: To use the devices that NetBackup controls but are used with other applications, down the drive if the drive is in the UP state.

Media management best practices

The following items are NetBackup media management best practices:

- Use the robot inventory update operation for media management.
- Use a scratch pool for unassigned media.
- Configure cleaning cartridges for tape drives and use TapeAlert for automatic drive cleaning if the drives support automatic cleaning.
- Replace old media according to the life-span recommendations of the manufacturer. Replace old cleaning media also.
- Use the robotic libraries that have a bar code reader and use only the bar code labels that the robot vendor recommends.
- Use bar code rules for media type assignment when you inventory multimedia libraries. Use bar code naming conventions to differentiate between data and cleaning tapes and different physical media types. A common convention is a prefix that identifies the type of media.
- Before performing inject or eject commands, ensure that the media access port is empty. Although NetBackup can handle a port that is not empty, some libraries can have problems.

Device management best practices

The following items are device management best practices:

- Monitor the NetBackup system log for device errors encountered.
- Monitor devices by using the NetBackup Device Monitor.
- Investigate the causes of all the drives that are down.
- Do not use the robotic test utilities while running backup or restore jobs.
- Read the *NetBackup Device Configuration Guide* before configuring devices on media servers (or SAN media servers). See the *NetBackup Device Configuration Guide* at the following URL:
  http://www.veritas.com/docs/DOC5332
- Use only computers, operating systems and devices that Veritas supports. For supported devices, see the NetBackup hardware compatibility list on the NetBackup support site.
- Use only fully-serialized devices. A fully-serialized SCSI library should report a serial number for the robot and also a serial number for each drive in the robot.
- Always configure and use pass-through paths for robotic libraries and drives.

- When possible, use SCSI persistent reserve or SCSI reserve and release.
- Use persistent bindings for fibre-attached devices.
- Use the **NetBackup Device Configuration Wizard** to configure the devices.
- Download and install the latest device mapping file from the NetBackup support Web site before you use the **NetBackup Device Configuration Wizard**.
- Use consistent logical drive types for all physical drive types on all servers in the environment. For example, use the DLT drive type as the logical drive type for all DLT7000 drives.
- Do not load vendor medium-changer drivers on Microsoft Windows hosts. The default Microsoft medium-changer driver is acceptable (but is not required) for use with NetBackup.

Media and device performance and troubleshooting

The following items are performance and troubleshooting best practices:

- Use the performance-tuning documents available on the NetBackup support Web page.
- Use only a dedicated server for the NetBackup master server. Do not use a server that hosts other applications or one that stores data. Plan periodic maintenance for all of the backup servers.
- Consult the Troubleshooter in the **NetBackup Administration Console** or the *NetBackup Status Codes Reference Guide* for all error conditions: http://www.veritas.com/docs/DOC5332
- Always install the latest NetBackup release updates that are available from Veritas.
- Verify all SCSI-related operating system configuration files (such as the Solaris `st.conf` file), when you install system release updates.
- For problems with devices, consult the vendor for firmware upgrades and consult the NetBackup hardware compatibility list for supported firmware levels.
- Do not use the NetBackup `DISABLE_RESOURCES_BUSY` touch file.
- Do not disable the operating system `TCP_NODELAY` functionality.

About TapeAlert

TapeAlert is a tape drive status monitor and message utility. The TapeAlert utility can detect tape quality problems, defects in tape drive hardware, and the need to clean drives. For the tape drives that support TapeAlert, the TapeAlert firmware

monitors the drive hardware and the media. Error, warning, and informational states are logged on a TapeAlert log page.

For the drives that do not support TapeAlert, configure and use frequency-based cleaning.

See "About frequency-based cleaning" on page 154.

About TapeAlert cleaning (reactive cleaning)

Reactive cleaning by using TapeAlert is a function of the tape drive. The drive determines and initiates the cleaning when needed. If a drive supports the TapeAlert capability and it is enabled on the drive, the NetBackup `bptm` process polls the drive for status from TapeAlert.

TapeAlert allows reactive cleaning for most drive types. Not all platforms, robots, drives, or firmware levels support TapeAlert reactive cleaning.

A drive with TapeAlert capability tracks how many read and write errors it has encountered within a certain time period. Although a drive can recover from these errors, the drive sets a CLEAN_NOW or CLEAN_PERIODIC flag when a threshold is reached.

If the `bptm` process detects that either of the following flags are set, it performs a cleaning at one of the following times:

- At the end of a backup or a restore to the drive.
- Before the next backup or restore to the drive.

Veritas recommends that you use reactive cleaning.

See "About TapeAlert" on page 148.

See "About tape drive cleaning" on page 153.

About TapeAlert and frequency-based cleaning

Using TapeAlert with frequency-based cleaning ensures that a drive is cleaned at least every *x* hours, depending on the setting for the cleaning frequency. In addition, the drive can be cleaned sooner if the drive sets the CLEAN_NOW or CLEAN_PERIODIC TapeAlert flag.

When TapeAlert is used without frequency-based cleaning, a drive is cleaned only when the drive sets its CLEAN_NOW or CLEAN_PERIODIC flags.

About TapeAlert requirements

To use TapeAlert, all of the following conditions must be true:

- The host platform, robot type, and drive support drive cleaning.
- The drive must support the TapeAlert capability, and the TapeAlert are enabled on the drive.
  To determine if a drive supports TapeAlert, see the Veritas Support website.
- A cleaning tape is configured and available in NetBackup for the robotic library. The cleaning cartridge is compatible with the drive that needs to be cleaned.
- The cleaning tape has not reached its end of life.
- Pass through device files are configured on UNIX media servers.
  See the *NetBackup Device Configuration Guide*, available at the following URL: http://www.veritas.com/docs/DOC5332

TapeAlert logs and codes

TapeAlert codes are derived from the T10 SCSI-3 Stream Commands standard (see http://t10.org/). For the list of codes that the device supports, see the device's documentation.

TapeAlert checks for errors of the following types:

- Recoverable read and write drive problems
- Unrecoverable read and write drive problems
- Hardware defects
- Wrong or worn-out media
- Expired cleaning tapes
- Abnormal errors

A set of TapeAlert conditions is defined that can cause the media in use to be frozen. Another set of conditions are defined that can cause a drive to be downed.

NetBackup writes TapeAlert conditions into the following logs:

- The `bptm` log
- The error log
- The job details log
- The system log on UNIX and Event Viewer on Windows

The following table describes the codes.

Table 5-7 TapeAlert log codes

TapeAlert code	Default action	Error type	Error message
0x01	None	Warning - WRN	Read warning
0x02	None	Warning - WRN	Write warning
0x03	None	Warning - WRN	Hard error
0x04	Freeze media - FRZ	Critical - CRT	Media
0x05	Freeze media - FRZ	Critical - CRT	Read failure
0x06	Freeze media - FRZ	Critical - CRT	Write failure
0x07	Freeze media - FRZ	Warning - WRN	Media life
0x08	Freeze media - FRZ	Warning - WRN	Not data grade
0x09	None	Critical - CRT	Write protect
0x0a	None	Informational - INFO	No removal
0x0b	None	Informational - INFO	Cleaning media
0x0c	None	Informational - INFO	Unsupported format
0x0d	Freeze media - FRZ	Critical - CRT	Recoverable mechanical cartridge failure
0x0e	Freeze media - FRZ	Critical - CRT	Unrecoverable mechanical cartridge failure
0x0f	Freeze media - FRZ	Warning - WRN	Mic failure
0x10	None	Critical - CRT	Forced eject
0x11	None	Warning - WRN	Read only
0x12	None	Warning - WRN	Directory corrupted on load
0x13	Freeze media - FRZ	Informational - INFO	Nearing media life
0x14	Clean drive - CLN	Critical - CRT	Clean now
0x15	Clean drive - CLN	Warning - WRN	Clean periodic

Table 5-7 TapeAlert log codes *(continued)*

TapeAlert code	Default action	Error type	Error message
0x16	Freeze media - FRZ	Critical - CRT	Expired cleaning media
0x17	Freeze media - FRZ	Critical - CRT	Invalid cleaning tape
0x18	None	Warning - WRN	Retension requested
0x19	None	Warning - WRN	Dual-port error
0x1a	None	Warning - WRN	Cooling fan failure
0x1b	None	Warning - WRN	Power supply failure
0x1c	None	Warning - WRN	Power consumption
0x1d	None	Warning - WRN	Drive maintenance
0x1e	Down drive - down	Critical - CRT	Hardware A
0x1f	Down drive - DOWN	Critical - CRT	Hardware B
0x20	None	Warning - WRN	Interface
0x21	None	Critical - CRT	Eject media
0x22	None	Warning - WRN	Download fail
0x23	None	Warning - WRN	Drive humidity
0x24	None	Warning - WRN	Drive temperature
0x25	None	Warning - WRN	Drive voltage
0x26	None	Critical - CRT	Predictive failure
0x27	None	Warning - WRN	Diagnostics req.
0x28 - 0x31	None	Informational - INFO	Undefined
0x32	None	Warning - WRN	Lost statistics
0x33	Freeze media - FRZ	Warning - WRN	Directory invalid on unload
0x34	Freeze media - FRZ	Critical - CRT	System area write failure
0x35	Freeze media - FRZ	Critical - CRT	System area read failure

Table 5-7 TapeAlert log codes *(continued)*

TapeAlert code	Default action	Error type	Error message
0x36	Freeze media - FRZ	Critical - CRT	No start of data
0x37	Freeze media - FRZ	Critical - CRT	Loading failure
0x38	Freeze media - FRZ	Critical - CRT	Unrecoverable unload failure
0x39	None	Critical - CRT	Automation interface failure
0x3a	None	Warning - WRN	Firmware failure
0x3d - 0x40	None	Informational - info	Undefined

About tape drive cleaning

The following types of drive cleaning are available by using NetBackup:

- Reactive cleaning
  See "About TapeAlert cleaning (reactive cleaning)" on page 149.
  Veritas recommends that you use reactive cleaning.
- Library-based cleaning
  See "About library-based cleaning" on page 153.
- Frequency-based cleaning
  See "About frequency-based cleaning" on page 154.
- Operator-initiated cleaning
  See "About operator-initiated cleaning" on page 154.

See "About using a cleaning tape" on page 155.

About library-based cleaning

NetBackup does not support library-based cleaning for most robots because robotic library and operating systems vendors implement this cleaning in different ways. (Library-based cleaning also is known as robotic cleaning or auto cleaning.) These different methods often interfere with NetBackup robotic control operations.

NetBackup does not define the cleaning media that is used for library-based cleaning, and the robotic library manages the cleaning media.

Because TapeAlert provides the same type of cleaning as library-based cleaning, Veritas recommends disabling library-based cleaning when you use TapeAlert.

About frequency-based cleaning

Frequency-based cleaning occurs when the accumulated mount time exceeds the time you specify for the cleaning frequency. NetBackup updates the mount time for the drive each time a tape is unmounted.

The cleaning frequency is configured when a drive is added to NetBackup. Change the cleaning frequency by changing the drive properties or by using the **Media and Device Management Device Monitor** in the **NetBackup Administration Console**.

If the following conditions are met, drive cleaning occurs when the accumulated mount time exceeds the time specified for the cleaning frequency:

- The drive is in a robotic library that supports drive cleaning.
- A cleaning tape is configured and available for the robotic library.
- The cleaning tape has cleanings remaining.

NetBackup cleans the drive immediately after a tape is unmounted. Drive cleaning does not unmount a drive in the middle of an active backup. The mount time is reset after the drive is cleaned. The cleaning frequency value remains the same.

A cleaning can occur within a backup if the backup spans tapes. For example, if cleaning is due after the first tape is full, NetBackup cleans the drive before it mounts the next tape.

Media can remain in a drive for extended periods. It does not affect the cleaning frequency because NetBackup increments the mount time only when NetBackup assigns the media to a process.

Frequency-based cleaning is not supported for drives in the ACS or the TLH libraries that are under API robotic control. The robotic library software controls the drive cleaning. To manage drive cleaning for these robots, use the robot vendor interfaces.

See “About TapeAlert and frequency-based cleaning” on page 149.

See “About tape drive cleaning” on page 153.

About operator-initiated cleaning

A drive cleaning can be initiated regardless of the cleaning frequency or accumulated mount time of the drive. Clean standalone drives or robotic drives if a cleaning tape of the correct media type and residence for the drive was added to NetBackup.

NetBackup reports that a drive needs cleaning if either of the following conditions are true:

- The value for the mount time is greater than the cleaning frequency.
- The TapeAlert CLEAN_NOW or CLEAN_PERIODIC flag is set.

And either of the following conditions must be true:

- The drive is a standalone drive and a cleaning tape is not defined.
- The drive is a standalone drive and no cleaning tape has any cleanings that remain.

NetBackup displays NEEDS CLEANING as follows:

- The **Tape Cleaning Comment** column of the **Drive List** in the **Devices** node of the **NetBackup Administration Console**.
- The comment field of the output from the `tpclean -L` command.

About using a cleaning tape

You can specify the number of cleanings that are allowed for a cleaning tape. This number is reduced with each cleaning. When the number of cleanings is zero, NetBackup stops by using the cleaning tape. Then, use a new cleaning tape or increase the number of cleanings that are allowed for the tape.

Note: NetBackup does not control the cleaning tapes that library-based cleaning uses.

Veritas suggests following the recommendations from cleaning tape vendors for the amount of tape usage. If you clean a tape past its recommended life, cleaning delays can occur (due to excessive tape position operations) and drives can be downed.

How NetBackup selects drives

NetBackup stores media information and device configuration and status information in the EMM database. When a robotic mount request is issued, the NetBackup Resource Broker (`nbrb`) queries the EMM database for the media ID of the volume requested. If the volume is in the EMM database, the media request is matched with a compatible drive in the robot. The mount request is forwarded to the appropriate robotic daemon (UNIX) or process (Windows) based on the location of the media. Location is the robotic library and the storage slot number, if applicable.

A drive must meet the following criteria to be selected for the mount request:

- The drive is configured.
- The drive is in the robotic library that contains the media.
- The drive allows the requested media density.

The EMM service (`nbemm`) manages the drives and requests for locally-attached or shared drives in the EMM domain.

The EMM service manages the drives by doing the following actions:

- Determines which of the drives are currently available.

  A drive is available if it is one of the following:

  - Configured as UP
  - Not assigned
  - Compatible with the media type
  - Not reserved by another host

- Picks an available drive that was least recently used.
  NetBackup selects the robotic-based drives over standalone drives unless the correct media already is loaded in a standalone drive.

The first drive in the drive configuration is used first, and then the second drive, and then the next. Use the `tpconfig -d` command to see the drive order in the configuration.

If some of the drives are shared drives, NetBackup chooses a nonshared drive first (if one is available). NetBackup chooses a shared drive first so the shared drives can be used on other hosts that share the drives. Shared drives require the Shared Storage Option.

How NetBackup reserves drives

In multiple-initiator (multiple host bus adapter) environments, device-level access protection is required to avoid unintended sharing of tape devices and possible data loss problems. (Shared Storage Option is a multiple-initiator environment.) Access protection on a tape drive prevents an HBA that is not the reservation owner from issuing commands to control the drive. SCSI access protection operates at the SCSI target level and depends on correct operation of the fiber-to-SCSI bridge or the native fiber device hardware.

The only commonly available technique for this purpose is SPC-2 SCSI reserve and release functionality. All tape drive vendors support the SPC-2 SCSI reserve method. NetBackup has used SPC-2 SCSI reserve since NetBackup 3.4.3; it is the default tape drive reservation method in NetBackup. SPC-2 SCSI reserve is effective for most NetBackup environments.

Alternatively, the new SCSI persistent reserve method may be more effective in either of the following environments because it provides device status detection and correction:

- NetBackup media servers are in a cluster environment
  NetBackup can recover and use a reserved drive after a failover (if NetBackup owns the reservation). (With SPC-2 SCSI reserve, a drive reset usually is required because the reservation owner is inoperative.)
- Environments where high drive availability is important
  NetBackup can resolve NetBackup drive reservation conflicts and maintain high drive availability. (SPC-2 SCSI reserve provides no method for drive status detection.)
  However, the SCSI persistent reserve method is not supported or not supported correctly by all device vendors. Therefore, analyze the environment to ensure that all of the hardware supports SCSI persistent reserve correctly.
  NetBackup lets you configure either SCSI persistent reserve or SPC-2 SCSI reserve.

The following table describes the protection options.

Table 5-8 Protection options

Option	Description
SCSI persistent reserve	Provides SCSI persistent reserve protection for SCSI devices. The devices must conform to the SCSI Primary Commands - 3 (SPC-3) standard.
SPC-2 SCSI reserve (default)	Provides SPC-2 SCSI reserve protection for SCSI devices. The devices must conform to the reserve method and release management method in the SCSI Primary Commands - 2 standard.
No protection	Other HBAs can send the commands that may cause a loss of data to the tape drives.

You can configure access protection for each NetBackup media server. The protection setting configures tape drive access protection for all tape drive paths from the media server on which the setting is configured. The media server setting for any drive path can be overridden.

SCSI reservations provide protection for NetBackup Shared Storage Option environments or any other multiple-initiator environment in which drives are shared.

About SCSI persistent reserve

The NetBackup process that reads from or writes to the media in a drive (`bptm`) issues SCSI persistent reserve commands to do the following:

- Register with the tape drive's device server (the server is a logical unit within a drive that processes SCSI tasks)

- Request an exclusive access reservation

If the tape drive's device server grants the reservation, the NetBackup process has exclusive use of the device. The reservation prevents other host bus adapters (HBAs) from issuing any commands that can cause data loss.

If the reservation fails, NetBackup fails the job.

When the NetBackup process is finished with the drive, NetBackup unloads the drive and sends a persistent reserve clear command to the drive. The command removes both the reservation and the registration.

SCSI persistent reserve also provides device status detection, which NetBackup uses to resolve reservation conflicts within NetBackup.

The reservation does not prevent other applications on the host that has the reservation from using the same device and from causing data loss. For example, if a user on the same host issues a UNIX `mt` command, the `mt` command can take control of the drive.

Also, other HBAs can clear or release a SCSI persistent reservation. Therefore, an application can clear another HBA reservation (although it should not do so).

About SCSI persistent reserve commands

When a device receives an exclusive access type SCSI persistent reservation command, it does not process commands from any other HBA. The device processes commands from another HBA only when the HBA that owns the SCSI persistent reservation clears the reservation. If an application sends a command to a reserved device, the device fails the command by returning a status of RESERVATION CONFLICT. The only exceptions to this action are several commands that cannot interfere with the reservation, such as Inquiry or Request Sense.

A device stays reserved until one of the following events occurs on the device:

- Released by the HBA that reserved it
- Power cycled (usually)
- Preempted by a SCSI persistent reserve command

About SCSI persistent reserve conflicts

NetBackup uses unique reservation keys. Therefore, NetBackup attempts to resolve conflicts with other NetBackup reservations. If a conflict exists, NetBackup sends SCSI commands to unload the drive. Based on the drive status, NetBackup tries to unload the drive again by using additional information to release or preempt the persistent reservation.

In cluster environments after a failover event, NetBackup on the active cluster node detects the persistent reservation and clears the reservation. NetBackup regains use of the drive without power-cycling the drive.

If NetBackup does not own the persistent reservation, NetBackup reports a pending status in the Device Monitor. The reservation owner must clear the reservation before NetBackup can use the drive. For example, NetBackup does not clear a NetApp persistent reservation.

About the SPC-2 SCSI reserve process

The NetBackup process issues an SPC-2 SCSI reserve command to the tape drive that contains the media. (The process can be `bptm`, `bprecover`, or `bpbackupdb`.) If the device is not reserved, NetBackup acquires a reservation. The drive does not process commands from any other host bus adapters (HBAs) until NetBackup releases the reservation or the reservation is broken. If the reservation fails, NetBackup fails the job.

The reservation does not prevent other applications on the host that has the reservation from using the same device and from causing data loss. For example, if a user on the same host issues a UNIX `mt` command, the `mt` command can take control of the drive.

After the NetBackup process finishes with the media, it issues an SPC-2 SCSI command to release the reservation during the unmount operation. The release frees the device for access by another HBA.

SCSI reserve does not provide a method to determine if a device is reserved. Only the reservation owner (the host bus adapter) can release the reservation. However, these limitations do not interfere with NetBackup operations in most environments.

About SPC-2 SCSI reserve commands

When a device receives an exclusive access type SCSI persistent reservation command, it does not process commands from any other HBA. The device processes commands from another HBA only when the HBA that owns the reservation issues the release command. If an application sends a command to a reserved device, the device fails the command by returning a status of RESERVATION CONFLICT. The only exceptions to this action are several commands that cannot interfere with the reservation, such as Inquiry or Request Sense.

A device stays reserved until one of the following events occurs on the device:

- Released by the HBA that reserved it
- Released by a TARGET or a LOGICAL UNIT RESET

These resets are protocol-dependent and differ between parallel SCSI and FCP (SCSI on Fibre Channel). These resets can be issued from any HBA.

- Released by Fibre Channel LOGO, PLOGO, PRLI, PRLO, or TPRLO action or failed discovery (link actions)
- Power cycled

A negative consequence of SPC-2 SCSI reserve occurs if the HBA that owns the reservation fails. A device stays reserved until the reservation is removed or broken. Only the original HBA can remove the reservation, which means the system must be available. If the HBA that owns the reservation fails, it cannot remove the reservation. Therefore, the reservation must be broken.

To break a reservation, one of the following actions must break the reservation:

- SCSI reset
- Bus device reset
- LUN device reset
- Power cycle
- Fibre Channel link actions may break reservations

SPC-2 SCSI reserve commands are mandatory for all SCSI-2 and SCSI-3 devices. See the SCSI 2 standard for a detailed description of SCSI reserve command operation and behavior.

About SCSI reservation conflicts

The NetBackup Automatic Volume Recognition process (`avrd`) manages access to tape devices. A properly configured NetBackup environment and properly configured tape devices should not receive a reservation conflict message from a tape drive. When `avrd` starts, it issues an SPC-2 SCSI release to all configured, nondisabled tape drive paths that are currently in the Up state. The command releases all devices that were SPC-2 reserved at the time of a system restart or crash. The SCSI release command returns tape devices to general availability after a system crash.

If the `avrd` process receives a reservation conflict message, it changes the status of the device to PEND. It also writes the following message in the system log:

`Reservation Conflict status from` *`DRIVENAME`* `(device` *`NUMBER`*`)`

Also, the **NetBackup Administration Console Device Monitor** or the output from the `vmoprcmd` command shows PEND in the Control column.

If a conflict occurs, a reservation problem can exist. If the HBA that reserves the drive is unavailable (for example, due to a system crash or hardware failure), it

cannot release the reservation. NetBackup cannot release or break an SPC-2 SCSI reservation automatically. Force a release or break the reservation to make the drive available, even for a failover server in a cluster environment.

When the conflict is resolved, the following message is written to the log:

```
Reservation Conflict status cleared from DRIVENAME (device NUMBER)
```

About forcing a release of an unavailable HBA's SPC-2 reservation

To force a release of an unavailable HBA's SPC-2 reservation, use the following NetBackup `vmoprcmd` command and option:

```
vmoprcmd -crawlreleasebyname drive_name
```

This option requests that all hosts that are registered to use the drive issue SPC-2 SCSI release commands to the drive.

Issue the `vmoprcmd` command on the master server. Alternatively issue the command on a media server and use the `-h` option of the command to specify the master server. The NetBackup EMM service allocates devices (that is, the DA host or device allocation host).

Note: Use this command after a PEND status appears in the **NetBackup Administration Console Device Monitor**. However, do not issue this command during backups.

More information about using the `vmoprcmd` command is available.

See the *NetBackup Commands Reference Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

Breaking a reservation

If you cannot release an SPC-2 SCSI reservation, try to use an operating system command that forces a device reset. A device reset breaks a reservation. The procedure depends on the operating system type.

Note: The reset operation can reset other devices in the configuration. Loss of data is also possible. Try alternate methods first to break the reservation on a device (by using switch and bridge hardware).

Lastly, if the following operating system commands cannot break the reservation, power-cycle the drive. A power cycle breaks SPC-2 SCSI drive reservations (and usually breaks SCSI persistent drive reservations).

To break an SPC-2 reservation on Solaris

1. Issue `mt -f drive_path_name forcereserve`.
2. Issue `mt -f drive_path_name release`.

   See the `mt`(1) man page for more information.

To break an SPC-2 reservation on HP-UX

- Issue `st -f drive_path_name -r`.

  See the `st`(1m) man page for more information.

To break an SPC-2 reservation on AIX

- Issue `tctl -f drive_path_name reset`.

  See the `tctl` man page (in the IBM AIX Commands Reference) for more information.

About SCSI reserve requirements

To use SCSI persistent reserve or SPC-2 SCSI reserve, the following requirements must be met:

- There must be pass through driver access to all shared drives.
  The pass through driver must be installed and all required paths must be created. Information about how to configure and use the pass through driver for UNIX operating systems is available.
  See the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332
- You must configure the operating systems on the NetBackup media servers so they let NetBackup control SCSI persistent reserve or SPC-2 SCSI reserve.
- On HP-UX systems, disable the operating system's use of SPC-2 SCSI reserve.
  See the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332
- Depending on the tape drives, you may have to disable the operating system's use of SPC-2 SCSI reserve. AIX and Solaris may require such a change.
  See the *NetBackup Device Configuration Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332

About SCSI reserve limitations

The NetBackup implementation of SCSI persistent reserve and SPC-2 reserve has the following limitations:

- SCSI persistent reserve and SPC-2 reserve do not apply to NDMP drives.
  The NDMP filer is responsible for providing exclusive device access.
- Third-party copy configurations must be configured correctly.
  To retain reservation of a tape device during a third-party copy backup, configure the NetBackup `mover.conf` file.
  Do not use SCSI persistent reserve on the drive paths that are used for third-party copy backups.
  See the *NetBackup Snapshot Client Administrator's Guide*, available at the following URL:
  http://www.veritas.com/docs/DOC5332
- With SPC-2 SCSI reserve, devices may remain reserved after a failover in cluster environments or multi-path environments with failover capability.
  You cannot use SPC-2 SCSI reserve if the following factors are true: The failover does not break the device reservations and those devices that were in use during the failover must be available without manual intervention. Use SCSI persistent reserve.
- If the drive path changes, the backup jobs and the restore jobs fail.
  Therefore, jobs fail in cluster environments or any multi-path environments that share paths dynamically. If you cannot disable dynamic path sharing, you cannot use SPC-2 SCSI reserve or SCSI persistent reserve in NetBackup.

About SCSI reservation logging

The `bptm` process logs SCSI reservation-related commands. Examine the `bptm` log on all NetBackup media servers to ensure that the SCSI operations are logged. SCSI reservation commands are labeled SCSI PERSISTENT RESERVE or SCSI RESERVE in the log.

In addition, information about the SCSI persistent reservations that are broken are also written to the NetBackup Problems report.

About SCSI reserve operating system limitations on Windows

Windows operating systems cannot distinguish between a reserved device and a busy device. Therefore, PEND appears in the **NetBackup Administration Console Device Monitor** if another application controls the tape drive. NetBackup cannot share tape devices with other applications. If you use other applications, use the NetBackup `tpreq` command or Down the drive before using the drive.

These operating systems also may report PEND if the drive reports Busy when a volume is unmounted. Use the `AVRD_PEND_DELAY` entry in the `vm.conf` configuration file to filter out these extraneous reports.

About checking for data loss

To detect data loss, the NetBackup `bptm` process reads the tape position and then verifies the actual position against the expected position.

If the actual position is less than the expected position at the end of the backup process, the following events occur:

- The tape is frozen.
- The backup fails.
- The following error message entry is written to the `bptm` log:

```
FREEZING media id xxxxxx, External event caused rewind during
write, all data on media is lost
```

About possible data loss causes

If tape drive access protection is not enabled on the NetBackup media servers, the following may cause data loss: configuration errors, incorrect paths, multiple master servers, incorrect Shared Storage Option configurations, and third-party or operating system utilities.

If access protection is enabled on all NetBackup media servers, the following can cause data loss: any third-party or operating system utilities that run on the server that runs the NetBackup backup job.

Unfortunately, data loss cannot be prevented only recognized after the fact. NetBackup does not remove catalog information about the backup sessions that were lost. Use the `bpexpdate` command to expire the images for the lost backup sessions.

About checking for tape and driver configuration errors

To detect data loss, the `bptm` process reads the tape position and then verifies the actual position against the expected position.

If a configuration problem causes the actual position to be greater than the expected position at the end of the backup process, the following events occur:

- The tape is frozen.
- The backup fails.

- The following error message entry is placed in the `bptm` log:

```
FREEZING media id xxxxxx, too many data blocks written, check
tape/driver block size configuration
```

The backup data may be usable. If so, import the image by using the NetBackup `bpimport` command so the data is available for restores.

About common configuration problems

Identify and fix the source of the configuration problem that causes data loss. The most common configuration error is a failure to configure the driver for variable length blocks.

A less common error may be in the tape driver's configuration data, such as in the `/kernel/drv/st.conf` file on a Solaris system.

Information about tape driver configuration is available.

See the *NetBackup Device Configuration Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

About configuring SCSI reserve

The SCSI reserve protection setting configures tape drive access protection for all tape drives from the media server on which the setting is configured. You can configure the protection for each media server and override the global setting for any drive path.

To configure SCSI reserve protection on a media server: use the **NetBackup Administration Console** to set the media server host property **Enable SCSI Reserve** on the **Media** tab.

To override the media server protection setting: use the **NetBackup Administration Console** to set the drive path property **Override SCSI reserve settings** when you add a drive or change a drive's properties.

How NetBackup selects media

How NetBackup selects media depends on whether the media is in a robot or a standalone drive.

See "About selecting media in robots" on page 166.

See "About selecting media in standalone drives" on page 168.

About selecting media in robots

When NetBackup receives a request for a volume, it searches the EMM database for the media ID. The external media ID should correspond to the NetBackup media ID.

A request for a volume includes the following attributes:

- The media ID
- The device density
- The file name that is used to link to the device that is assigned.

Table 5-9 describes the order in which NetBackup selects a volume in a robot.

Table 5-9 How NetBackup selects a volume in a robot

Order	Description
1.	NetBackup searches the media catalog for a volume that is already mounted in a drive and meets the following criteria: ■ Configured to contain backups at the retention level that the backup schedule requires. However, if the NetBackup **Media** host property **Allow multiple retentions per media** is specified for the server, NetBackup does not search by retention level. ■ In the volume pool that the backup job requires. ■ Not in a FULL, FROZEN, IMPORTED, or SUSPENDED state. ■ Of the same density that the backup job requested, and in the robot that the backup job requested. ■ Not currently in use by another backup or a restore. ■ Not written in a protected format. NetBackup detects the tape format after the volume is mounted. If the volume is in a protected format, NetBackup unmounts the volume and resumes the search. If a suitable volume is found, NetBackup uses it.
2.	If NetBackup cannot find a mounted volume that satisfies all of the previous conditions, it checks the media catalog for any volume that is suitable. ■ If a suitable volume is in a robot, NetBackup issues the commands that move the volume to a drive, position the heads to the beginning of the volume, and assign it to the request. No manual intervention is required. ■ If a suitable volume is not in a robot but is in a standalone drive, NetBackup automatically mounts and assigns it. No manual intervention is required. ■ If a suitable volume is not in a robot or a standalone drive and the request is media-specific, NetBackup may pend a mount request. A media-specific mount request is one for a restore, for an import, or from the `tpreq` command. ■ If a suitable volume is not in a robot or a standalone drive, NetBackup may attempt to use another volume only as follows: For backup jobs for which any other media can be used.

Table 5-9 How NetBackup selects a volume in a robot *(continued)*

Order	Description
3.	If a suitable volume does not exist or if a suitable volume is at end of media (EOM), NetBackup assigns a new volume. NetBackup may assign a new volume even if a volume is not full (because NetBackup received an EOM message from the drive). The new volume must meet all of the following criteria: ■ Is the correct media type ■ Is for the correct robot type (if applicable) ■ Is located in the requested robotic peripheral (if applicable) ■ Resides on the requested host ■ Is in the correct volume pool ■ Is not currently assigned (not already allocated to NetBackup) ■ Is not expired (if an expiration date is defined in NetBackup) ■ Has not exceeded the maximum number of mounts allowed
4.	If more than one volume qualifies, NetBackup chooses the volume that was least recently used. NetBackup then adds it to the media catalog and assigns it the specified retention level.
5.	If there are no unassigned volumes of the requested type, the backup terminates with an error message that no media were available. NetBackuptakes no action.

See “About spanning media with automatic media selection” on page 167.

About spanning media with automatic media selection

After an end of media (EOM) is reached, automatic media selection depends on whether NetBackup is configured to allow backups to span media, as follows:

- NetBackup spans media if the NetBackup **Media** host property **Allow backups to span media** is specified for the server.
  In this case, NetBackup uses another volume to start the next fragment and the resulting backup is composed of fragments on different volumes.
- NetBackup does not span media if the media **Allow backups to span media** property is not specified.
  In this case, the backup terminates abnormally and the operation is retried according to the NetBackup Global Attributes host property, **Schedule backup attempts**.

About selecting media in standalone drives

The following topics explain media selection and other aspects of standalone drive operations:

See "About selecting media by using standalone drive extensions" on page 168.

See "About disabling standalone drive extensions" on page 169.

See "About spanning media" on page 169.

See "About leaving standalone drives in the ready state" on page 170.

About selecting media by using standalone drive extensions

With NetBackup standalone drive extensions, NetBackup tries to use any labeled or any unlabeled media that is in a standalone drive. This capability is enabled by default during installation.

The media selection process is as follows:

- If a backup is requested and an appropriate standalone drive contains a volume, NetBackup tries to select and use that volume.
- If an appropriate drive does not contain a volume, NetBackup selects a volume.
  See "About selecting media in robots" on page 166.
  The Device Monitor shows the mount request, and an operator must manually insert the volume and assign it to a drive.

A volume that was used previously for backups must meet the following criteria:

- Not be FULL, FROZEN, or SUSPENDED
- Contain backups at the retention level and be in the same volume pool as the backup that requires a volume.
  However, if the NetBackup **Media** host property **Allow multiple retentions per media** is specified for the server, NetBackup does not require a specific retention level.

NetBackup selects unlabeled media only if the existing volumes that meet the appropriate criteria do not have available space to contain the new backup images.

If the media is unlabeled, the following actions occur:

- NetBackup labels the media.
- NetBackup adds a media ID to the volume configuration, if necessary.
  If a media ID is added, the NetBackup Media ID prefix (non-robotic) is used as the first characters of the media ID.

- If a media ID prefix is not specified, the default prefix is the letter A. For example, A00000.
- NetBackup adds the requested volume pool to the volume configuration (if the backup policy specifies a volume pool).

If the unused media is unlabeled, label it by using the `bplabel` command. Specify the `-u` parameter to force assignment of a specific drive index, which eliminates the need to assign the drive manually.

About disabling standalone drive extensions

Disable the standalone drive extensions by clearing the NetBackup media server host property, **Enable standalone drive extensions**. If this property is cleared, NetBackup uses the same method to select media for standalone drives as it uses for robotic drives.

About spanning media

Media selection after an end of media (EOM) condition depends on whether NetBackup is configured to allow backups to span media, as follows:

- NetBackup spans media if the **Allow backups to span media** host property is specified for the server. NetBackup selects another volume to begin the next fragment, and the resulting backup has data fragments on more than one volume.
  After an EOM condition, NetBackup attempts to use an unassigned volume rather than one that already has images on it. NetBackup checks the EMM database for a volume that is the correct media type, in the correct volume pool, and so on.
  If a suitable unassigned volume is unavailable, NetBackup selects a volume.
- NetBackup does not span media if the **Allow backups to span media** host property is not specified. The backup terminates abnormally when the end of media is reached. The operation is rescheduled according to the master server host property **Schedule backup attempts**.

You can further configure NetBackup behavior for standalone drives. Normally, when NetBackup spans media and an EOM is encountered on a standalone drive, NetBackup searches for other media or generates a pending mount request. You can configure a wait period for standalone drives. The wait period is helpful when a gravity feed tape stacker takes a long time to load the next media in the drive.

To configure NetBackup to wait, specify the **Media request delay** media server host property. This property specifies the number of seconds NetBackup waits to use a volume that is loaded in a compatible drive. After the wait period expires, NetBackup searches for another drive. NetBackup also waits to generate a pending

mount request during tape span operations. The **Media request delay** property applies only when standalone drive extensions are enabled.

About leaving standalone drives in the ready state

To leave standalone drives in a ready condition after a backup or restore completes, use the `nbemmcmd` command to enable the `-do_not_eject_standalone` option. NetBackup does not eject the tape after an operation completes. The media is still ejected if EOM is reached or an error is encountered. Also, the media is ejected if the drive needs to be used with another media or the media needs to be used with another drive.

One standalone drive may be ready and contain suitable media.

Detailed information on the `nbemmcmd` command is available.

See the *NetBackup Commands Reference Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

Volume pool and volume group examples

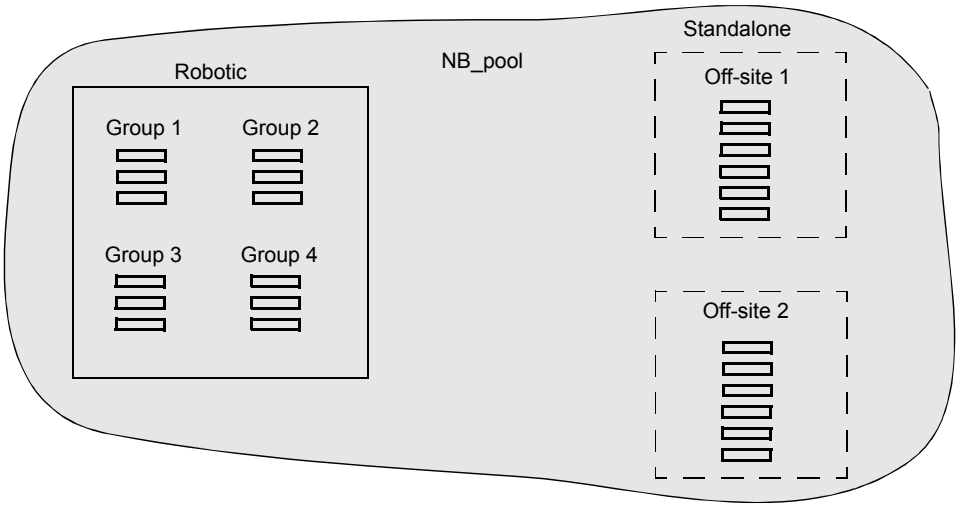
The following three examples show the relationship between volume pools and volume groups.

See Figure 5-2 on page 171. for an example of one volume pool (named NB_pool) and several volume groups.

You can move volumes between the groups in the robotic library and any groups that are off site. All volumes, however, remain in the same pool.

Media in the same volume pools are in different volume groups. Note that the data is stored on separate volumes by assigning different volume pools. The volumes in a pool can be in more than one physical location and in more than one volume group.

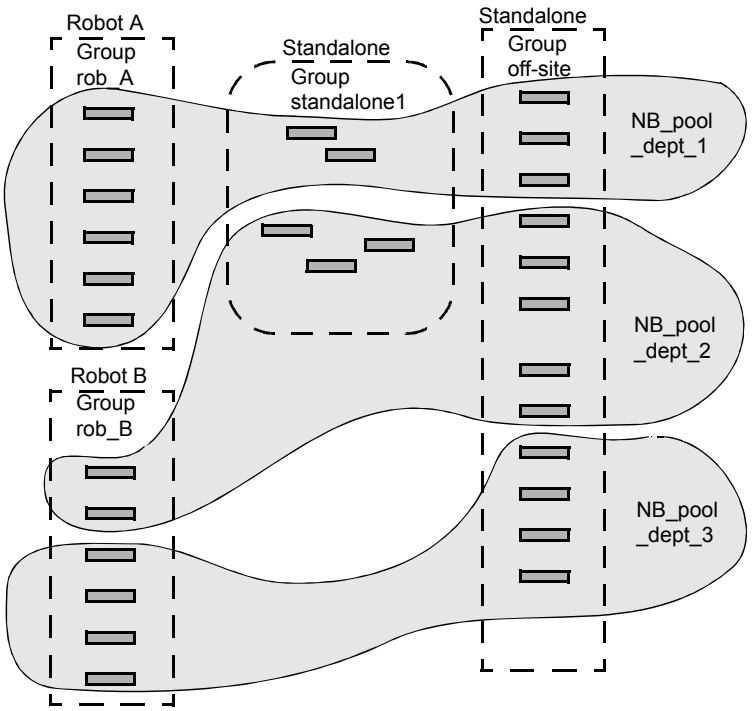
Figure 5-2 Volume pool with multiple volume groups



See Figure 5-3 on page 172. for examples of how the volumes in the pool NB_pool_dept_1 are spread among the rob_A, standalone1, and off-site volume groups.

These groups also have volumes from more than one pool (though the volumes in each group must all be the same type).You also can configure a scratch pool from which NetBackup can transfer volumes when a volume pool has no media available.

Figure 5-3 Volume groups with multiple volume pools

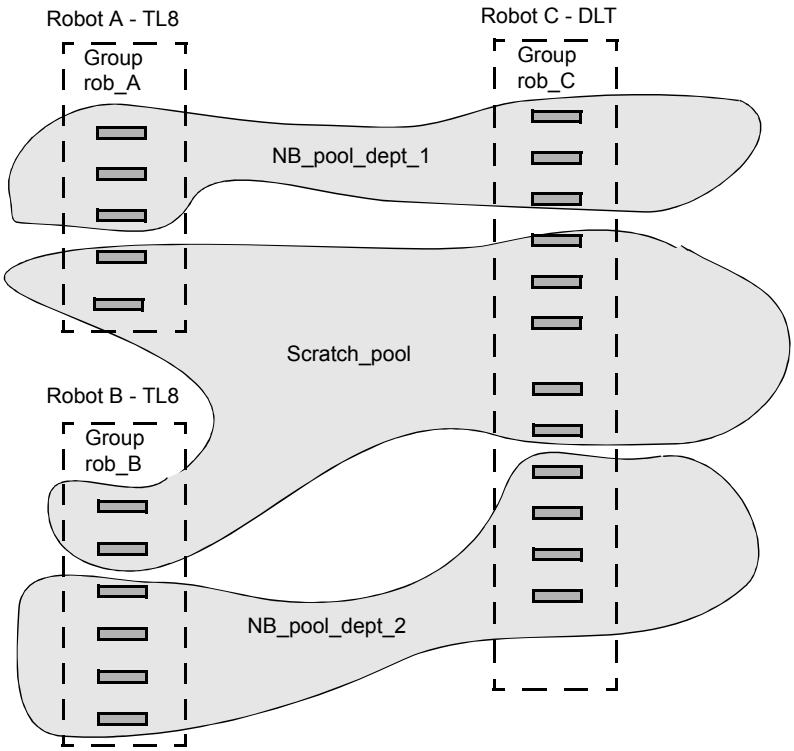


See Figure 5-4 on page 173. for an example where the scratch pool is named Scratch_pool. The three robots contain volumes from that pool in addition to those from other pools.

Assume the following sequence of events:

- A backup job requires a DLT volume, so NetBackup attempts to assign one from NB_pool_dept_1 in Robot C.
- Robot C has no unassigned volumes available in the NB_pool_dept_1 pool.
- NetBackup searches the scratch pool for an unassigned DLT volume in Robot C. If a volume is available, NetBackup moves it to NB_pool_dept_1. Otherwise, NetBackup logs a `media unavailable` status.

Figure 5-4 Scratch pool example



Media formats

NetBackup writes media in a format that allows the position to be verified before NetBackup appends new backups.

The following table shows the symbols that are used in the media format descriptions.

Table 5-10 Media format symbols

Symbol	Description
MH	Media header (1024 bytes).
*	Tape mark.
BH	Backup header (1024 bytes).

Table 5-10 Media format symbols *(continued)*

Symbol	Description
BH1 ... BH*n*	Backup headers (1024 bytes). One for each job that is part of the set of the jobs that are multiplexed.
Image	Data from the backup.
EH	Empty backup header, which is used for position validation.

The following table provides more information about how the media formats are used in different situations.

Table 5-11 Media format descriptions

Format	Description
Standard tape format	For all tape media except quarter-inch cartridge (QIC) and WORM, the format for the backups that are not multiplexed is as follows: MH * BH Image * BH Image * BH Image * EH * When a new backup image is added, the tape is positioned to the EH and the position is verified. The EH is overwritten by a BH and the backup proceeds. When complete, a new EH is written for future position validation. When NetBackup encounters the end of media during a write operation, it terminates the tape with two tape marks and does not write an EH.
QIC and WORM tape format	This format is used for quarter-inch cartridge (QIC) and WORM media. Unlike the standard tape format, NetBackup does not write empty backup headers (EH). The format is as follows: MH * BH Image * BH Image * BH Image * To append backup images to QIC media, NetBackup positions to the end of data (EOD) and then starts the next backup.

Table 5-11 Media format descriptions *(continued)*

Format	Description
Fragmented backup format	For fragmented backups, the media format is similar to the standard tape format. The difference is that NetBackup breaks the backup image into fragments of the size that are specified when the storage unit is configured. The following is an example: `MH * BH Image (frag 1)* BH Image (frag 2)* BH Image (frag n) * EH *` Fragmentation is intended primarily for storing large backup images on a disk type storage unit. For multiplexed backups, image fragmentation results in faster restores because NetBackup can advance to the specific fragment before it begins a search for the file. **Note:** If an error occurs in a backup, the entire backup is discarded and the backup restarts from the beginning. It does not restart from the fragment where the error occurred. Exception: checkpoint and restart backups resume from the last checkpoint fragment.
Multiplexing format	The tape format for multiplexed backups is as follows: MH * BH1 ... BH*n* Image ... By default, the data image is in 64-kilobyte blocks. Each block also contains 512 bytes that are reserved for multiplexing control information and to identify the backup to which the block corresponds. When a job ends or a new job is added to the multiplexing set, NetBackup writes a tape mark. NetBackup then starts multiplexing the revised set of jobs. The following is an example: MH * BH1 BH2 BH3 Image* BH2 BH3 Image* BH2 BH3 BH4 Image
Spanning tape format	By default, NetBackup spans a backup image to another tape if it encounters the end of media during a backup. The format is the same as described for fragmented backups. The first fragment on the next tape begins with the buffer of data where the end of media occurred. The following is the first tape format (NetBackup does not write an EH and terminates the tape with two tape marks): MH * ... *BHn Image (frag 1) * * The following is the second tape format: MH * BHn Image (frag2)* ... * EH *

Media and device management processes

Table Table 5-12 shows the NetBackup services and processes that control storage devices with removable media. NetBackup starts the processes as needed, but you can start some of them manually. The table also shows the commands that start each one.

These commands are located in the following directories:

UNIX `/usr/openv/volmgr/bin`

Windows *`install_path`*`\VERITAS\Volmgr\bin`

For detailed information about the commands, see the *NetBackup Commands Reference Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

Table 5-12 Starting services and processes

Command	Description
`acsd`	The Automated Cartridge System robotic process. The Device Manager `ltid` starts this process.
`avrd`	The Automatic Volume Recognition process. The Device Manager `ltid` starts this process.
`ltid`	Starts the NetBackup Device Manager service. Starting the Device Manager also starts the robotic, robotic control, Media Manager volume, and automatic volume recognition daemons. To stop the device, robotic, and robotic-control services, use the `stopltid` command.
`tl4d`	The tape library 4MM robotic process. The Device Manager `ltid` starts this process.
`tl8cd`	Starts the tape library 8MM robotic-control process. The Device Manager `ltid` starts this process.
`tl8d`	The tape library 8MM robotic process. The Device Manager `ltid` starts this process. To stop the tape library 8MM robotic-control process, use `tl8cd -t`.
`tldcd`	Starts the tape library DLT robotic-control process. The Device Manager `ltid` starts this process. To stop the tape library DLT robotic-control process, use `tldcd -t`.

Table 5-12 Starting services and processes *(continued)*

Command	Description
`tldd`	The tape library DLT robotic process. The Device Manager `ltid` starts this process.
`tlhcd`	Starts the tape library Half-inch robotic-control process. The Device Manager `ltid` starts this process. To stop the tape library Half-inch robotic-control process, use `tlhcd -t`.
`tlhd`	The tape library Half-inch robotic process. The Device Manager `ltid` starts this process.
`tlmd`	The tape library Multimedia process. The Device Manager `ltid` starts this process.
`vmd`	The NetBackup Volume Manager service. The Device Manager `ltid` starts this process.

On UNIX, you can use the `kill pid` command to stop the process for the daemon with the specified *pid* (process ID).

On Windows, you can start and stop services by using the **Services** tool available in **Administrative Tools** in the Microsoft Windows Control Panel. If they are started from the command line, some services occupy that NetBackup Console session until they are stopped.

For detailed information about most of the commands that are in the following tables, see the *NetBackup Commands Reference Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

About Tape I/O commands on UNIX

To troubleshoot or test Media Manager, use the commands that are described in the following sections to manipulate volumes. Similarly, if you do not use NetBackup, you can use these commands to mount and manipulate volumes.

About requesting tapes

The `tpreq` command lets you request a tape of a particular density and specify various options, such as the access mode. This command reserves a single drive and creates a file in the current working directory (unless a full path is specified). The file acts as a symbolic link to the tape and all subsequent access to the tape

is through this file name. Users do not have to be concerned with the full path to a specific device file.

For all types of tapes, the tape is mounted and assigned when you enter the `tpreq` command.

By default, NetBackup assigns drives that support DLT cartridge tapes. You can use the density option on `tpreq` to request a drive that supports another density. For a list of supported densities and drive types, see the `tpreq` man page.

The density for the physical write is not selected automatically on drives. It's requested, so an operator can satisfy the correct drive. One of two methods is used to determine the drive density: the `/dev` device name that was used when the drive was configured or by how the drive is configured physically.

A `tpreq` command must include a media ID and a file name. If the tape volume is associated with a volume pool, the name of the volume pool can also be specified by using the `-p` parameter. If you specify the pool name, the name is validated against the pool name that is associated with the media in the EMM database.

The NetBackup `tpreq` command runs the `drive_mount_notify` script (if it exists) immediately after media is mounted in a pre-selected, robotic drive.

See “drive_mount_notify script (on UNIX)” on page 139.

See the *NetBackup Commands Reference Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

About reading and writing tape files

Reading or writing tape files involves copying the file from tape to disk or from disk to tape. To perform read or write operations, use one of the UNIX commands that performs input and output operations, for example `tar` or `mt`.

Positioning tape files

The `mt` command positions tape files by skipping forward or backward according to tape marks.

The following options are available on the mt command for positioning tapes:

- `eof, weof`
  Writes an end-of-file tape mark at the current position on the tape according to the count option on `mt`.
- `fsf, bsf`
  Spaces forward or backward the number of tape marks on the count option.
- `fsr, bsr`
  Spaces forward and backward the number of records according to the count option on `mt. bsr` is only supported for the undefined record type.

The following example uses the `mt` command to skip forward three files on a tape:

```
mt -f tape1 fsf 3
```

Rewinding tape files

When a file is rewound, it is positioned to the beginning of the data. To rewind a tape file, you can use the `mt` command.

`tape1` is positioned to the beginning of the tape volume that is associated with the file.

The following command rewinds file `tape1`:

```
mt -f tape1 rewind
```

The count option is not used for the rewind operation. If you specify a count, `mt` ignores it.

About removing tape files

When you have completed reading or writing tape files, use the `/usr/openv/volmgr/bin/tpunmount` command to end the assignment of the tape file. This command removes from the directory the tape file you created by with `tpreq` and removes the tape volume from the tape drive. The `tpunmount` command is required for each file that the `tpreq` command creates.

See the *NetBackup Commands Reference Guide*, available at the following URL:

http://www.veritas.com/docs/DOC5332

On UNIX, the NetBackup `tpunmount` command runs the `drive_unmount_notify` script (if it exists) after media is unmounted.

See “drive_unmount_notify script (on UNIX)” on page 139.

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