VERITAS™

VERITAS NetBackup™ 5.1

System Administrator's Guide, Volume II

for Windows

N123168

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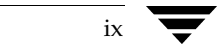


Preface

This guide describes how to configure and manage the operation of VERITAS NetBackup Server and VERITAS NetBackup Enterprise Server for Windows and applies to all supported platforms and operating systems. See the *NetBackup Release Notes* for a list of the hardware and operating system levels that NetBackup supports.

To determine the version of installed software, check the *install_path*\NetBackup\Version.txt file. Where *install_path* is the directory where NetBackup is installed (C:\Program Files\VERITAS by default).

This guide is intended for system administrators and assumes that the reader has a good working knowledge of the Windows operating system on the platform where the product is used. In this guide, a system administrator is defined as a person with system administrator privileges and responsibilities. A client user is defined as anyone that uses the client interfaces to back up, archive, or restore files.

What Is In This Manual

- Chapter 1, "Access Management," discusses how to install the VERITAS Security Subsystem (VxSS) component and configure your system to use NetBackup access control. Permission to perform specific actions within the NetBackup Administration Console is granted to defined user groups.
- Chapter 2, "Enhanced Authentication and Authorization," discusses configuring your system to use the enhanced authentication and authorization available in this release.
- Chapter 3, "Additional Configuration," explains how to configure features and parameters that seldom, if ever, require changing.
- Chapter 4, "Using bpadm," explains the tasks that can be performed with the bpadm interface.
- Chapter 5, "Reference Topics," provides further information about configuration that applies specifically to UNIX servers and clients.
- Chapter 6, "NetBackup Notify Scripts," provides information about scripts that collect information and provide notification of events.

- Chapter 7, “Using NetBackup With AFS,” provides information about using NetBackup to back up AFS clients.
- Chapter 8, “Intelligent Disaster Recovery,” explains how to use Intelligent Disaster Recovery for Windows.

Getting Help

VERITAS offers you a variety of support options.

Accessing the VERITAS Technical Support Web Site

The VERITAS Support Web site allows you to:

- obtain updated information about NetBackup, including system requirements, supported platforms, and supported peripherals
- contact the VERITAS Technical Support staff and post questions to them
- get the latest patches, upgrades, and utilities
- view the NetBackup Frequently Asked Questions (FAQ) page
- search the knowledge base for answers to technical support questions
- receive automatic notice of product updates
- find out about NetBackup training
- read current white papers related to NetBackup

The address for the VERITAS Technical Support Web site follows:

- http://support.veritas.com

Subscribing to VERITAS Email Notification Service

Subscribe to the VERITAS Email notification service to be informed of software alerts, newly published documentation, Beta programs, and other services.

Go to http://support.veritas.com. Select a product and click “E-mail Notifications” on the right side of the page. Your customer profile ensures you receive the latest VERITAS technical information pertaining to your specific interests.

Accessing VERITAS Telephone Support

Telephone support for NetBackup is only available with a valid support contract. To contact VERITAS for technical support, dial the appropriate phone number listed on the Technical Support Guide included in the product box and have your product license information ready for quick navigation to the proper support group.

▼ **To locate the telephone support directory on the VERITAS web site**

1. Open http://support.veritas.com in your web browser.
2. Click the **Phone Support** icon. A page that contains VERITAS support numbers from around the world appears.

Accessing VERITAS E-mail Support

▼ **To contact support using E-mail on the VERITAS web site**

1. Open http://support.veritas.com in your web browser.
2. Click the **E-mail Support** icon. A brief electronic form will appear and prompt you to:
   - Select a language of your preference
   - Select a product and a platform
   - Associate your message to an existing technical support case
   - Provide additional contact and product information, and your message
3. Click **Send Message**.

Contacting VERITAS Licensing

For license information call 1-800-634-4747 option 3, fax 1-650-527-0952, or e-mail amercustomercare@veritas.com.

NetBackup Manuals

The following manuals, along with the online help, comprise the NetBackup documentation set. The manuals are provided in Adobe Portable Document Format (PDF) on the NetBackup CD-ROM.

- *NetBackup Release Notes for UNIX and Windows*

Provides important information about NetBackup Server and Enterprise Server products on UNIX- and Windows-based servers, such as the platforms and operating systems that are supported and operating notes that may not be in the NetBackup manuals or the online help.

- *NetBackup Installation Guide for Windows*

  Explains how to install NetBackup Server and Enterprise Server software on Windows-based platforms.

- *VERITAS Security Services Installation Guide*

  Explains install and configure the VERITAS Security Services. This manual is found on the VERITAS Security Services CD-ROM.

- *NetBackup Media Manager System Administrator's Guide for Windows*

  Explains how to configure and manage the storage devices and media on Windows servers running NetBackup Server and Enterprise Server. Media Manager is part of NetBackup.

- *NetBackup Backup, Archive, and Restore Getting Started Guide*

  Explains how to use the NetBackup Backup, Archive, and Restore interface to perform basic backup and restore operations for UNIX and Windows systems.

- *VERITAS Security Services Administrator's Guide*

  Explains how to configure and manage core security mechanisms, including authentication, protected communications, and authorization. This manual is found on the VERITAS Security Services CD-ROM.

- *NetBackup Vault System Administrator's Guide for UNIX and Windows*

  Describes how to configure and use logical vaults and profiles to duplicate backups, perform catalog backups, eject media, and generate reports.

- *NetBackup Vault Operator's Guide for UNIX and Windows*

  Describes procedures for sending tapes offsite, receiving tapes on site, and running reports on offsite media and vault jobs.

- *NetBackup Commands for Windows*

  Describes NetBackup commands and processes that can be run from a Windows command prompt.

- *NetBackup Troubleshooting Guide for UNIX and Windows*

  Provides troubleshooting information for UNIX- and Windows-based NetBackup Server and Enterprise Server, including Media Manager.

Glossary

If you encounter unfamiliar terminology, consult the NetBackup online glossary. The glossary contains terms and definitions for NetBackup and all additional NetBackup options and agents.

The NetBackup online glossary is included in the NetBackup help file.

▼ **To access the NetBackup online glossary**

1. In the NetBackup Administration Console, click **Help** > **Help Topics**.
2. Click the **Contents** tab.
3. Click **Glossary of NetBackup Terms**.

Use the scroll function to navigate through the glossary.

Accessibility Features

The NetBackup interface can be used by people who are vision impaired and by people who have limited dexterity. Accessibility features include the following:

- Using the Keyboard to Navigate in NetBackup
- Accessing Online Documentation

Note Text that appears in the NetBackup interface is accessible through an application programmer's interface (API) to assistive technologies such as voice or assistive device input products and to speech output products.

Using the Keyboard to Navigate in NetBackup

You can use your keyboard to navigate in the NetBackup interface:

- Press window navigation keys to move from one window element to another. For example, press **Tab** to move from one pane to another.
- Perform common actions quickly using accelerator keys. Accelerator keys let you initiate actions without first accessing a menu. For example, press **Ctrl+n** to create a new policy.
- Press mnemonic keys to select items using only the keyboard. Mnemonic keys are indicated by an underlined letter. For example, press **Alt+h** to access the **Help** menu.

- You can also use the keyboard to select control options in a dialog.

Navigating in a NetBackup Tree View

Use the following keys or key combinations to navigate through the NetBackup Console window.

Keyboard Input	Result
Tab or **F6**	Moves to the next (right or down) pane in the active NetBackup window.
Shift+Tab or **Shift+F6**	Moves to the previous (left or up) pane in the active NetBackup window.
Ctrl+Tab or **Ctrl+F6**	Moves to the next (right or down) NetBackup window.
Ctrl+Shift+Tab or **Ctrl+Shift+F6**	Moves to the previous (left or up) NetBackup window.
Plus Sign (**+**) on the numeric keypad	Expands the highlighted item.
Minus Sign (**-**) on the numeric keypad	Collapses the highlighted item.
Asterisk (*) on the numeric keypad	Expands the entire tree below the first item in the active NetBackup window.
Up Arrow	Gives focus to the next item up in the pane.
Down Arrow	Gives focus to the next item down in the pane.
Shift+Up Arrow	Selects the next item up in the pane.
Shift+Down Arrow	Selects the next item down in the pane.
Page Up	Moves to the top item visible in a pane.
Page Down	Moves to the bottom item visible in a pane.
Home	Moves to the first item (whether visible or not) in a pane.
End	Moves to the last item (whether visible or not) in a pane.

Keyboard Input	Result
Right Arrow	Expands the highlighted item. If the highlighted item does not contain hidden items, using the **Right Arrow** has the same effect as using the **Down Arrow**.
Left Arrow	Collapses the highlighted item. If the highlighted item does not contain expanded items, using the **Left Arrow** has the same effect as using the **Up Arrow**.
Alt+Right Arrow	Moves to the next (right or down) option control in the interface.
Alt+Left Arrow	Moves to the previous (left or up) option control in the interface.
Alt+Spacebar	Displays the NetBackup window menu.

Using Accelerator Keys

Accelerator keys let you use NetBackup from the keyboard, rather than using the mouse. Accelerator keys are either a single keystroke or two or more keystrokes that can be pressed in succession (rather than holding them simultaneously). If available, accelerator keys are shown to the right of the menu item they perform.

For example, to refresh the information in the window, press **F5**.

Using Mnemonic Keys

A mnemonic key is a keyboard equivalent for a mouse click that is used to activate a component such as a menu item. To select a menu item, press the **Alt** key to initiate menu pull-down mode, then press a mnemonic key to open a menu, and another mnemonic key to select a menu item.

Mnemonics are case-insensitive. Keys can be pressed either sequentially or simultaneously.

For example, to change the Master Server, press **Alt** to initiate menu pull-down mode, press the **f** key to pull down the File menu, and press the **c** key to invoke the **Change Server** menu option.

Using the Keyboard in Dialogs

To select or choose controls that have an underlined letter in their titles, type **Alt+***underlined_letter* at any time when the dialog is active. For example, typing **Alt+O** is the same as clicking the OK button in a dialog.

To move forward (right or down) from one control to the next, press **Tab**. To reverse the direction (for example, from moving right to moving left), press **Tab** and **Shift**.

To move within a list box, groups of option controls, or groups of page tabs, press the arrow key that points the direction you want to move.

Options that are unavailable appear dimmed and cannot be selected.

The following conventions are typically used in NetBackup dialogs:

- Command buttons (also known as push buttons)

  Command buttons initiate an immediate action. One command button in each dialog carries out the command you have chosen, using the information supplied in the dialog. This button is generally labeled **OK**. Other command buttons let you cancel the command or choose from additional options.

- Command buttons containing an ellipsis (...)

  Command buttons containing an ellipsis (...) open another dialog so you can provide more information or confirm an action. Command buttons marked with an arrow display a menu.

- Command buttons outlined by a dark border

  A dark border around a button initially indicates the default button. Press **Enter** or the **Spacebar** at any time to choose the button with a dark border. If there is a **Cancel** button, press **Esc** at any time to cancel immediately. Press **Tab** to move the keyboard focus to the next control. When you change focus to a command button, it temporarily has the dark border. If the focus is not on a control, the dark border returns to the default command button in the pane.

- Check boxes

  Check boxes may be selected or cleared to turn an option on or off. Check boxes can have two states (checked and unchecked) or three states (checked, unchecked, and indeterminate).

  Press **Tab** to move from one checkbox to another and the **Spacebar** to change the check box to the next state. Typing the mnemonic key for a check box also moves the focus to the box and changes its state.

- Option controls (also known as radio buttons)

  Option controls are used to select only one option from a group of options. (Option buttons may represent two or three states, as checkboxes do.) Press the arrow keys to select the next or previous buttons within the group.Type the mnemonic key for an option control to move the focus to the control and select it.

- Tabbed pages

Tabbed pages are used to fit many options into a single dialog. Each page contains separate groups of controls such as check boxes or option controls. Press **Tab** to move the focus to the page tab for the currently visible page. Type the mnemonic key for a page tab to move the focus to the page tab and display it.

Accessing Online Documentation

In addition to online help, NetBackup provides copies of related NetBackup manuals in Adobe Portable Document Format (PDF) on the NetBackup CD-ROM (or as an option for downloading if the release is available from the Web). For a complete list of NetBackup documents, see the NetBackup release notes.

Conventions

The following conventions apply throughout the documentation set.

Product-Specific Conventions

The following term is used in the NetBackup ***version*** documentation to increase readability while maintaining technical accuracy.

- Microsoft Windows, Windows

  Terms used to describe a specific product or operating system developed by Microsoft, Inc. Some examples you may encounter in NetBackup documentation are, Windows servers, Windows 2000, Windows Server 2003, Windows clients, Windows platforms, or Windows GUI.

  When Windows or Windows servers is used in the documentation, it refers to all of the currently supported Windows operating systems. When a specific Windows product is identified in the documentation, only that particular product is valid in that instance.

  For a complete list of Windows operating systems and platforms that NetBackup supports, refer to the *NetBackup Release Notes for UNIX and Windows* or go to the VERITAS support web site at `http://www.support.veritas.com`.

Typographical Conventions

Here are the typographical conventions used throughout the manuals:

Conventions

Convention	Description
GUI Font	Used to depict graphical user interface (GUI) objects, such as fields, listboxes, menu commands, and so on. For example: Enter your password in the **Password** field.
Italics	Used for placeholder text, book titles, new terms, or emphasis. Replace placeholder text with your specific text. For example: Replace *filename* with the name of your file. Do *not* use file names that contain spaces. This font is also used to highlight NetBackup server-specific or operating system-specific differences. For example: *This step is only applicable for NetBackup Enterprise Server.*
`Code`	Used to show what commands you need to type, to identify pathnames where files are located, and to distinguish system or application text that is displayed to you or that is part of a code example.
Key+Key	Used to show that you must hold down the first key while pressing the second key. For example: Ctrl+S means hold down the Ctrl key while you press S.

You should use the appropriate conventions for your platform. For example, when specifying a path, use backslashes on Microsoft Windows and slashes on UNIX. Significant differences between the platforms are noted in the text.

Tips, notes, and cautions are used to emphasize information. The following samples describe when each is used.

Tip Used for nice-to-know information, like a shortcut.

Note Used for important information that you should know, but that shouldn't cause any damage to your data or your system if you choose to ignore it.

Caution Used for information that will prevent a problem. Ignore a caution at your own risk.

Command Usage

The following conventions are frequently used in the synopsis of command usage.

brackets [ ]

The enclosed command line component is optional.

Vertical bar or pipe (|)

Separates optional arguments from which the user can choose. For example, when a command has the following format:

```
command arg1|arg2
```

In this example, the user can use either the *arg1* or *arg2* variable.

Navigating Multiple Menu Levels

When navigating multiple menu levels, a greater-than sign (>) is used to indicate a continued action.

The following example shows how the > is used to condense a series of menu selections into one step:

- Select **Start** > **Programs** > **VERITAS NetBackup** > **NetBackup Administration Console**.

The corresponding actions could be described in more steps as follows:

1. Click **Start** in the task bar.
2. Move your cursor to **Programs**.
3. Move your cursor to the right and highlight **VERITAS NetBackup**.
4. Move your cursor to the right. First highlight and then click **NetBackup Administration Console**.

Access Management 1

Access to NetBackup can be controlled by defining user groups and granting explicit permissions to these groups. Configuring user groups and assigning permissions is done using **Access Management** in the NetBackup Administration Console.

This chapter discusses how to set up and manage access to NetBackup. It contains the following sections:

Note *Access Management* and *Enhanced Authorization and Authentication* (see Chapter 2) are independent methods of Access Control. Access Management is the newest and will be the preferred method in future NetBackup releases. If both Access Management and Enhanced Authorization and Authentication are configured, Access Management takes precedence.

NetBackup Access Management Components

NetBackup uses the VERITAS Security Services (VxSS) to help implement core security. VxSS is a set of shared VERITAS infrastructure services, installed from the VxSS installation CD. The CD is packaged as part of NetBackup.

Note NetBackup Access Management relies on the use of home directories. Please see the documentation for your operating system for more information on home directories.

VxSS Components

When you install VxSS, you're installing and configuring the following services and client software:

- Authentication (At Server, At Client)

  Authentication is the process of proving your identity to the VxSS system. Authentication is accomplished by communicating with the service which, in turn, validates your identity with the operating system.

  For more information on authentication or the authentication service (`vxatd`), see the *VERITAS Security Services Administrator's Guide* found on the VxSS installation CD.

- Authorization (Az Server, Az Client)

  Authorization is the process of verifying that an identity has permission to perform the desired action. NetBackup verifies permissions with the authorization service for most actions. In many cases, NetBackup alters what information is accessible from the command line and Administration Console.

  For more information on authorization or the authorization service (`vxazd`), see the *VERITAS Security Services Administrator's Guide* found on the VxSS installation CD.

Root Broker

A Root Broker is a NetBackup server that has VxSS Authentication Server and Authorization Server installed and is configured to be a Root Broker. There is always one Root Broker in every NetBackup Access Management configuration.

The Root Broker acts as the most trusted certification authority, implementing a registration authority for Authentication Brokers, as well as itself.

While a Root Broker can authenticate an Authentication Broker, an Authentication Broker cannot authenticate a Root Broker.

In many cases, the Root Broker will also be an Authentication Broker. This chapter describes installing VxSS services, then it describes configuring the NetBackup server to be a Root Broker and an Authentication Broker (Root Broker + AB). For more information on the authentication Root Broker, see the *VERITAS Security Services Administrator's Guide*.

Authentication Brokers

An Authentication Broker is a server that has VxSS Authentication Server and Authorization Server installed. This machine is part of the Root Broker's private Access Management domain. An Authentication Broker can authenticate clients, but not other brokers.

The member of the NetBackup Security Administrator user group can choose which Authentication Broker a client should contact for authentication. (See "Configuration Containing Windows Systems Only" on page 25 and "Configuration Containing UNIX Systems Only" on page 31 for a depiction of this configuration.)

For example:

- A Windows 2000 client uses a Windows Authentication Broker for authentication.
- A UNIX client uses a UNIX Authentication Broker for authentication.
- For more information on authentication brokers, see the *VERITAS Security Services Administrator's Guide*.

Security Administrator

The user who installs and configures VxSS software for use with NetBackup Access Management is, by default, a member of the *NBU_Security Admin* user group. This chapter will refer to a member of the *NBU_Security Admin* group as a Security Administrator. Users can be added to the group, but there are usually few members.

Members of the *NBU_Security Admin* user group are the only users who can view the contents of **Access Management** > **Users** and **Access Management** > **NBU User Groups** in the NetBackup Administration Console. Security Administrators are the only users allowed to create user groups, assign users to the groups, and define permissions for the groups. However, Security Administrators, by default, do not have permission to perform any other NetBackup administration activities. (See "Security Administrator (NBU_Security Admin)" on page 54.)

Note The administrator group (Windows) or `root` (UNIX) is always a member of the *NBU_Security Admin* group on the system where the Authorization service runs. See the *VERITAS Security Services Administrator's Guide* for information on this special identity.

Installation Overview

For a detailed installation description, see "Installing and Configuring Access Control for Master Servers" on page 5.

Order of Installation or Upgrade

1. Complete all NetBackup master server installations or upgrades.
   a. Complete Root + AB installation of VxSS Authentication server.
   b. Complete VxSS Authorization server installation.
   c. Configure master servers for NetBackup Access Control.
2. Complete all NetBackup media server installations or upgrades, then configure media servers for NetBackup Access Control.
3. Complete all NetBackup client installations or upgrades, then configure clients for NetBackup Access Control. See "Installing and Configuring Access Control for Clients" on page 12.

VxSS Component Distribution

The VxSS components can be distributed throughout a configuration, just as NetBackup can distribute master servers, media servers and clients.

Note Although the Authentication broker and Authorization broker can technically be placed on any machine, VERITAS currently recommends that the root Authentication broker and Authorization broker be placed on the NetBackup master server. At a minimum, the root Authentication broker must reside on the master server.

For specific VxSS installation information, refer to the *VERITAS Security Services Installation Guide*, found on the VxSS installation CD.

NetBackup Installation	Required Authentication Component	Required Authorization Component
Master server	At server	Az server
Media server	At client	Az client

NetBackup Installation	Required Authentication Component	Required Authorization Component
Client	At client	None
Windows Remote Administration Console (only)	At client	Az client
Java Windows Display Console (only)	None	None

The following sections describe some actions you can take to verify that the components are correctly installed in a mixed environment:

- "Windows Verification Points" on page 24
- "UNIX Verification Points" on page 31
- "Verification Points in a Mixed Environment with a UNIX Master Server" on page 37
- "Verification Points in a Mixed Environment with a Windows Master Server" on page 42

Installing and Configuring Access Control for Master Servers

The following steps describe configuring NetBackup Access Control for the master server in a NetBackup configuration. A master server requires Authentication Server and Client software and Authorization Server and Client software.

Throughout this chapter, in the configuration examples we'll refer to the following host names:

	Windows	UNIX
Master Servers	win_master	unix_master
Media Servers	win_media	unix_media
Clients	win_client	unix_client

1. Complete all NetBackup master server installations or upgrades.

2. Using the VxSS installation CD, install both the VxSS Authentication Server and Client software on the master server. This master server will be a Root + AB (Authentication Broker). (To install these on a Windows system, a custom installation is required.)

   See "Installing the Authentication Service Root Broker (Root + AB)" on page 14 and the *VERITAS Security Services Installation Guide* on the VxSS installation CD.

3. Using the VxSS installation CD, install the VxSS Authorization Server and Client software on the master server. To do this, you must perform a custom installation.

   See "Installing the Authorization Server" on page 17 and the *VERITAS Security Services Installation Guide* on the VxSS installation CD.

4. Create a machine account for the master server. Make sure that the Authentication and the Authorization services are running. See "UNIX Verification Points" on page 31 or "Windows Verification Points" on page 24.

   The command in this step must be run as either `root` (UNIX) or as a member of the local Administrator group (Windows) on the Root+AB Authentication broker. For more information about this step, see "Configuring Authentication on the Root Broker for Use with NetBackup" on page 15.

   `bpnbat` is located in directory `<install_path>\NetBackup\bin\`

   ```
   bpnbat -addmachine
   Does this machine use Dynamic Host Configuration Protocol (DHCP)?
   (y/n) n
   Authentication Broker: win_master
   Authentication port[ Enter = default]:
   Machine Name: win_master
   Password: *******
   Password: *******
   Operation completed successfully.
   ```

5. Log in to the machine account for the master server.

   For more information about this step, see "Configuring Authentication on the Root Broker for Use with NetBackup" on page 15.

   ```
   bpnbat -LoginMachine
   Does this machine use Dynamic Host Configuration Protocol (DHCP)?
   (y/n) n
   Authentication Broker: win_master
   Authentication port[ Enter = default]:
   Machine Name: win_master
   Password: *******
   ```

```
Operation completed successfully.
```

Note Repeat this step for each alias used by NetBackup.

6. Create the first Security Administrator (bootstrapping security).

   For more information about this step, see "Configuring the Authorization Server" on page 17.

   bpnbaz is located in directory *<install_path>*\NetBackup\bin\admincmd

```
bpnbaz -setupsecurity win_master
Please enter the login information for the first Security
Administrator other than root/Administrator. This identity
will be added to the security administrators group
(NBU_Security Admin), and to the netbackup administrators
group (NBU_Admin). It will also be used to build the initial
security information.

Authentication Broker: win_master
Authentication port[ Enter = default]:
Authentication type (NIS, NIS+, NT, vx, UNIXpwd: nt
Domain: domain1
Login Name: admin1
Password: ******
Processing - please be patient
Operation completed successfully.
```

7. Add the master server as a host authorized to perform Authorization checks.

   For more information about this step, see "Configuring the Authorization Server" on page 17.

```
bpnbaz -AllowAuthorization win_master
Operation completed successfully.
```

8. Configure the Access Control host properties of the master server.

   For more information about this step, see "Configuring Access Control Host Properties" on page 19.

   - Set VERITAS Security Services to **Automatic** or **Required**. (If some clients will not use NetBackup Access Control, set to **Automatic**.)
   - On the VxSS tab, add the host to the VxSS network (*win_master)*. (If the VxSS property is set to **Required**, this tab is not available.)
   - On the Authentication Domain tab, add authentication domain(s) and the host that will act as the broker for the domain (*domain1)*.

The broker is a machine using an operating system supporting the domain type that has the VxSS Authentication service installed on it.

- On the Authorization Service tab, specify the master server on which you installed the VxSS Authorization service (*win_master)*.

After changing the host properties, recycle the server daemons for the changes to take effect.

Installing and Configuring Access Control for Media Servers

The following steps describe configuring NetBackup Access Control for a media server in a NetBackup configuration. A media server requires Authentication Client software and Authorization Client software.

1. Complete all NetBackup media server installations or upgrades.

2. Using the VxSS installation CD, install Authentication Client software on the system.

3. Using the VxSS installation CD, install the Authorization Client software on the media server.

4. On the master server, create a machine account for the media server. Make sure that the Authentication and the Authorization services are running. See "UNIX Verification Points" on page 31 or "Windows Verification Points" on page 24.

   The command in this step must be run as either `root` (UNIX) or as a member of the local Administrator group (Windows) on the Root+AB Authentication broker. For more information about this step, see "Configuring Authentication on the Root Broker for Use with NetBackup" on page 15.

   `bpnbat` is located in directory *<install_path>*`\NetBackup\bin`

   On the master server, run:

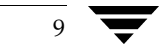
   ```
   bpnbat -addmachine
   Does this machine use Dynamic Host Configuration Protocol (DHCP)?
   (y/n) n
   Authentication Broker: win_master
   Authentication port[ Enter = default]:
   Machine Name: win_media
   Password: *******
   Password: *******
   Operation completed successfully.
   ```

5. Log in to the machine account for the media server.

   For more information about this step, see "Configuring Authentication on the Root Broker for Use with NetBackup" on page 15.

   On the media server, run:

   ```
   bpnbat -LoginMachine
   Does this machine use Dynamic Host Configuration Protocol (DHCP)?
   (y/n) n
   Authentication Broker: win_master
   ```

```
Authentication port[ Enter = default]:
Machine Name: win_media
Password: *******
Operation completed successfully.
```

Note Repeat this step for each alias used by NetBackup.

6. Add the media server as a host authorized to perform Authorization checks.

   For more information about this step, see "Configuring the Authorization Server" on page 17.

   `bpnbaz` is located in directory `<install_path>\NetBackup\bin\admincmd`

   On the master server, run:

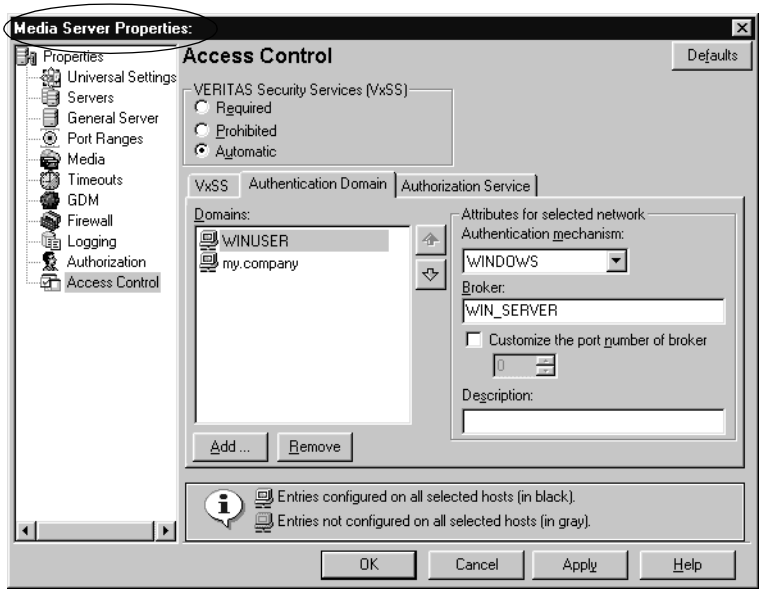
   ```
   bpnbaz -AllowAuthorization win_media
   Operation completed successfully.
   ```

7. Set up the proper Access Control host properties for the media server. The properties are described in "Configuring Access Control Host Properties" on page 19.

   a. Open Access Control host properties for the media server *(win_media)* through the master server. In the NetBackup Administration Console, select **NetBackup Management** > **Host Properties** > **Media Server** > *Select media server win_media* > **Access Control**.

      - Set VxSS mode to **Required**. If some clients will not use NetBackup Access Control, set to **Automatic**.

- Add authentication domains based on the systems where you have installed Authentication servers and the Authentication methods supported.
  For example, given a Windows system configured for Authentication using domain `WINUSER`, and a UNIX system configured for Authentication using the NIS domain `my.min.com`, the tab would look like the following:



- On the Authorization Services tab, indicate the host that will perform authorization for this media server.

b. Configure Access Control on the master server *(win_master)* for the media server:

On the VxSS tab, add win_media.min.com to the **VxSS Network** list as **Required**.

Installing and Configuring Access Control for Clients

The following steps describe configuring NetBackup Access Control for a client in a NetBackup configuration. A client requires Authentication Client software.

1. Install NetBackup client software on the system.

2. Using the VxSS installation CD, install Authentication client software on the system.

   Using `bpnbat`, register the client with the Authentication Broker, as described in step 2 on page 15.

   For example, if registering a machine *(win_client)* with the Authentication Broker *(win_master)*, run the following command on the At server *(win_master)*.

   a. **To add the client locally to the private domain, run the following command on the master server:**

```
bpnbat -AddMachine
Does the machine use Dynamic Host Configuration Protocol (DHCP)?
(y/n) n
Authentication Broker: win_master.min.com
Authentication Port: [Enter = Default]:
Name: win_client.min.com
Password:  [any password]
Password:  [enter password again]
Operation completed successfully.
```

   b. **To create a credential for the client, run the following command on the client:**

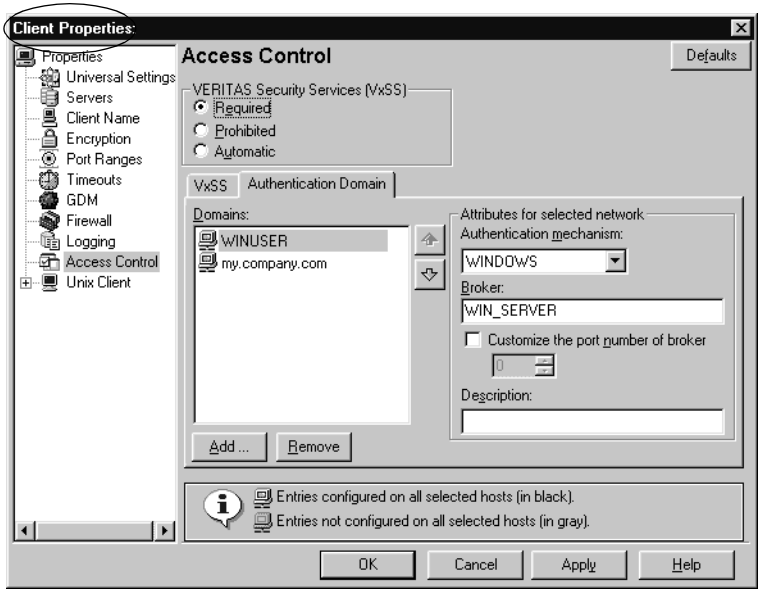
   Run the following command on the At client *(win_client)*.

```
bpnbat -loginmachine
Does this machine use Dynamic Host Configuration Protocol (DHCP)?
(y/n) n
Authentication Broker: win_master.min.com
Authentication port[ Enter = default]:
Name: win_client.min.com
Password: [same password as in step a]
Operation completed successfully.
```

3. Set up the proper Access Control host properties for the client. The properties are described in "Configuring Access Control Host Properties" on page 19.

a. Open Access Control host properties for the client *(win_client)* through the master server. In the NetBackup Administration Console, select **NetBackup Management** > **Host Properties** > **Clients** > *Select client win_master* > **Access Control**.

- Set VxSS mode to **Required**.
- Add authentication domains based on the systems where you have installed Authentication servers and the Authentication methods supported.
  For example, given a Windows system configured for Authentication using domain `WINUSER`, and a UNIX system configured for Authentication using the NIS domain `my.min.com`, the tab would look like the following:



b. Set up Access Control on the master server *(win_master)* for the client:

On the VxSS tab, add win_client.min.com to the **VxSS Network** list as **Required**.

Installing the Authentication Service Root Broker (Root + AB)

Before installing the VxSS services that will create a Root Broker that is also an Authentication Broker, check that the following conditions are true:

- Make sure that you are administrator on the system where you plan to install the VxSS Root Broker software.
- If NetBackup is currently installed, shut down all NetBackup services before installing VxSS software.

Install the VxSS Root Broker software from the VxSS installation CD according to the instructions in the *VERITAS Security Services Installation Guide*. The manual is found on the VxSS installation CD.

NetBackup recommends placing the Root + AB broker on the NetBackup master server. This allows for more centralized administration of the NetBackup server and can facilitate upgrading to NetBackup Access Management.

After installing the Authentication Server software, reboot the system and configure the VxSS Root Broker as described in "Configuring Authentication on the Root Broker for Use with NetBackup" on page 15.

Configuring Authentication on the Root Broker for Use with NetBackup

Configure the Root Broker using the NetBackup command, `bpnbat` located in directory `<install_path>\VERITAS\NetBackup\bin\`

1. **Shut down NetBackup on the master server and start the At service, then the Az service:**

   After shutting down NetBackup services, check that the VxSS services have been started. If needed, start Authentication (`vxatd`) first, then Authorization (`vrtsaz`). Use the Services utility that Windows provides, since these services do not appear in the NetBackup Activity Monitor. Depending on how you are configured, At and At may already be active.

2. **Allow the machines to communicate with one another:**

Note The steps below require a password that should not be a user or administrator password. The password must be at least five characters long, and match one another in both steps. However, it is not necessary to use the same password each time the two steps are run for a new machine in the domain.

   a. **To add a machine locally to the private domain:**

   In order for the NetBackup master servers, media servers, and clients to communicate, this machine needs to be added to the private database of the Authentication Broker or to the local disk by running the following command on the At server:

```
bpnbat -AddMachine
Does this machine use Dynamic Host Configuration Protocol (DHCP)?
(y/n) n
Authentication Broker: broker
Authentication port[ Enter = default]: broker_port
Name: machine_name
Password: any_password
Password: Re-enter password
Operation completed successfully.
```

   Where:

   broker is the fully qualified name of the machine that will act as the Authentication Broker for this machine. In this case, since this machine is Root Broker + AB, enter the name of this machine.

   broker_port is a specified port number. To use the default At port number (2821), press **Enter**.

machine_name is the fully qualified name of this machine.

any_password may be a unique password (at least five characters long) used only for the purpose of registering this machine. However, the same password *must* be used in both this step, when registering the machine locally in the private domain, *and* the next step, when registering the machine, but not in the private domain.

b. To create a credential for a machine:

In order to log the machine into the specified Authentication Broker, enter the following command on the machine that needs to be logged in:

```
bpnbat -loginmachine
Does this machine use Dynamic Host Configuration Protocol (DHCP)?
(y/n) n
Authentication Broker: broker
Authentication port[ Enter = default]: broker_port
Name: machine_name
Password: same password as in step a
You do not currently trust the server: server_name
Do you wish to trust it? (y/n) y
Operation completed successfully.
```

Continue to the next section for instructions on configuring authorization on the Root Broker.

Installing the Authorization Server

Install the VxSS Authorization software from the VxSS installation CD according to the instructions in the *VERITAS Security Services Installation Guide*.

NetBackup recommends installing the Authorization server on the master server. This ensures that the master and media servers are able to communicate with the Authentication server at all times.

After installing the Authentication Server software, reboot the system.

Configuring the Authorization Server

The `bpnbaz` command is used during Authorization setup to perform two functions necessary for Access Management:

- Create the object hierarchy that appears in the NetBackup Administration Console under **Access Management**.
- Set up user groups and add the first identity to the security administration group (NBU_Security Admin).

bpnbaz is located in directory `<install_path>\NetBackup\bin\admincmd`

Before running `bpnbaz` commands, check that both the Authentication service (`vxatd`) and the Authorization service (`vxazd`) are running. If necessary, start the At service first, then the Az service. Use the Window Services since these do not appear in the NetBackup Activity Monitor.

Note The user named in the following command will be set up as the first NetBackup security administrator.

1. On the machine where the VxSS Authorization server software is installed and contains the Authorization server, run:

   `bpnbaz -SetupSecurity master_server [-server AZ_server]`

   Where:

   `master_server` is the fully qualified name of the NetBackup master server.

   `AZ_server` is the fully qualified name of the machine where Authorization server software is installed.

Note `bpnbaz -SetupSecurity` must be run by `root` (UNIX) or Administrator (Windows).

   This process may take a number of minutes.

See step 6 on page 7 for an example of this command.

2. **Allow authorization:**

   Run the following command on the Authorization server. If configuring the Root Broker, the machine being added and the Az server will be the same:

   `bpnbaz -AllowAuthorization AZ_server`

Note `bpnbaz -AllowAuthorization AZ_server` must be run by `root` (UNIX) or Administrator (Windows).

   Where:

   AZ_server is the fully qualified name of the machine where Authorization server software is installed.

   If adding a different machine, the command would be run on the Az server, then a new machine would be named:

   `bpnbaz -AllowAuthorization AZ_client`

   AZ_client is the fully qualified name of the machine where Authorization client software is installed.

   This command must be run on the Az server for each master or media server that will utilize NetBackup Access Control.

3. **Start NetBackup services on the machine(s).**

4. Continue with "Configuring Access Control Host Properties" on page 19 for instructions on configuring NetBackup Access Control host properties for the master server (Root Broker).

Configuring Access Control Host Properties

Until host properties configuration on the master server is complete, NetBackup Access Control is not enforced. As such, UNIX users must temporarily load the Java NetBackup Administration Console (`jnbSA`) as `root` and Windows users must load the NetBackup Administration Console as Administrator.

Note VERITAS recommends setting master server VxSS property to **Automatic** until the clients are configured for Access Control. Then, if desired, change the VxSS property on the master server to **Required**.

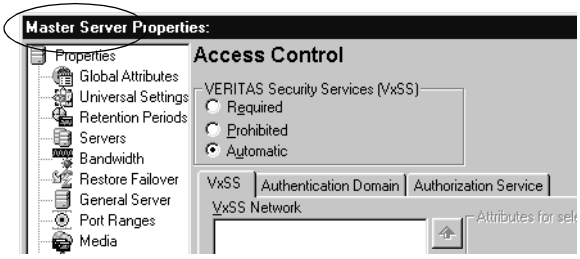
Master Server (Root Broker) Host Properties

The Access Control host properties are described fully in "Access Control Properties" on page 318, but here are some points to double-check.

Access Control Host Properties Dialog

Host properties of the master server (Root Broker):

Set the **VERITAS Security Services** to either **Required** or **Automatic**. A setting of **Automatic** takes into account that there may be hosts within the configuration that are not upgraded to NetBackup version 5.0 or higher. The server will attempt to negotiate the most secure connection possible when talking to other NetBackup systems.



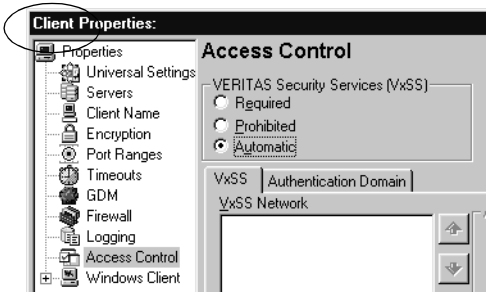
Note VERITAS recommends setting the master server VxSS property to **Automatic** until the clients are configured for Access Control. Then, if desired, change the VxSS on the master server to **Required**.

When using **Automatic**, you may specify machines or domains requiring VxSS or **Prohibited** from using VxSS.

Host properties of the Az client:

Select the Az client in the host properties. (On the master server, in the NetBackup Administration Console, open **NetBackup Management** > **Host Properties** > **Clients** > *Selected clients* > **Access Control**.

Set the **VERITAS Security Services** to **Required**.



VxSS Tab

Host properties of the master server (Root Broker):

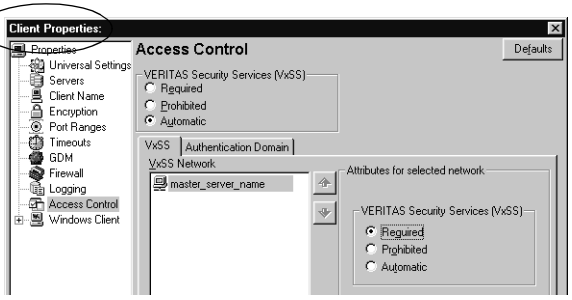
Within the **Access Control** host properties, on the **VxSS** tab, add the master server to the VxSS Network list and set **VERITAS Security Services** to **Required**.

Each new NetBackup client or media server (version 5.0 or higher), added to the NetBackup master, needs to have the Access Control properties configured on both itself and the master. This can be done through the host properties on the master server.

Note VERITAS recommends setting the master server VxSS property to **Automatic** until the clients are configured for Access Control. Then, if desired, change the VxSS on the master server to **Required**.

Host properties of the Az client:

Select the Az client in the host properties. Set the **VERITAS Security Services** to **Required**.



Authentication Domain Tab

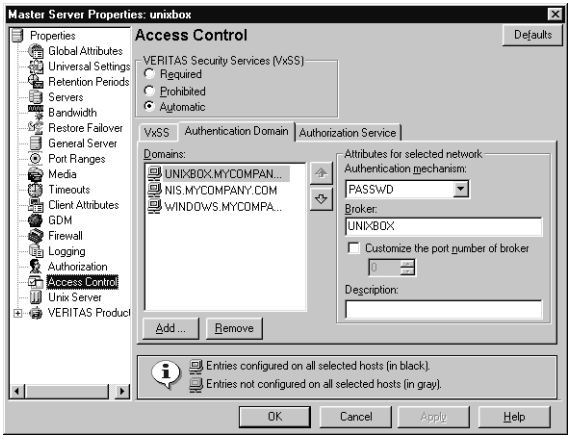
The Authenticaiton Domain tab is used to define the following:

- which Authentication servers support which authentication mechanisms, and
- what domains each supports.

The following examples contain three authentication domains and three authentication types, all hosted on the authentication server *UNIXBOX*.

A UNIX domain `UNIXBOX.MYCOMPANY.COM` on the Authentication server *UNIXBOX*.

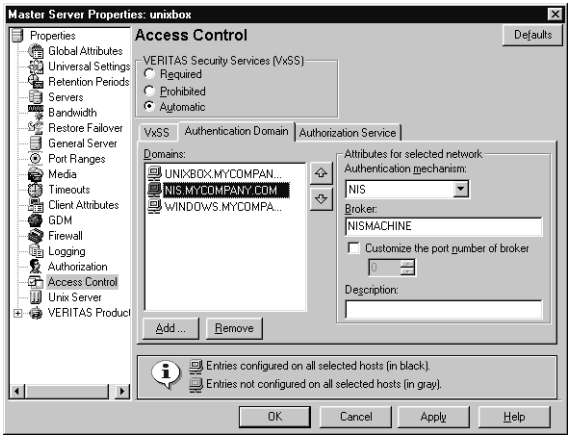
Notice that the authentication mechanism for this domain is PASSWD.



Note If using a UNIX authentication domain, enter the fully qualified domain name of the host performing the authentication.

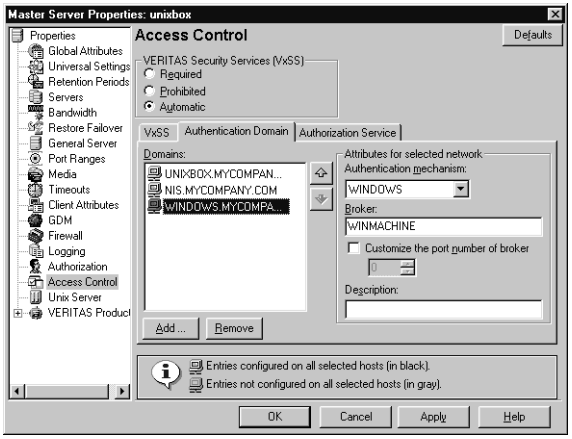
A NIS domain `NIS.MYCOMPANY.COM` on the Authentication server *NISMACHINE*.

Notice that the authentication mechanism for this domain is NIS.



A Windows AD/PDC (Active Directory/Primary Domain Controller) domain `WINDOWS.MYCOMPANY.COM` on the Authentication server *WINMACHINE*:

Notice that the authentication mechanism for this domain is WINDOWS.



Host properties of the master server (Root Broker):

Within the **Access Control** host properties, on the **Authentication Domain** tab, add the domain in which the Authentication server resides and select the proper authentication mechanism.

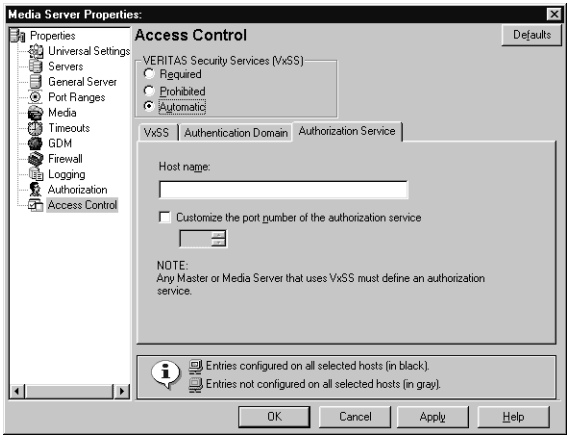
Host properties of the Az client:

Within the **Access Control** host properties, on the **Authentication Domain** tab, add the domain in which the Az client resides and select the proper authentication mechanism.

Authorization Service Tab

Within the **Access Control** host properties, on the **Authorization Service** tab, complete the properties for the Authorization server. Specify the fully qualified domain name for the system running the Authorization service (typically the master). If needed, specify the alternate port for which this service has been configured. The default listening port for the Authorization service is 4032.

After making any changes to the host properties, restart the services.



Note If configuring this tab for a media server using Access Control, you must define the host that will perform authorization.

Verifying Master Server Settings

Running `bpnbat -whoami` tells in what domain a host is registered and the name of the machine the certificate represents (*win_master.min.com*).

```
bpnbat -whoami -cf
"e:\program
Files\veritas\netbackup\var\vxss\credentials\win_master"
Name: win_master
Domain: NBU_Machines@win_master.min.com
Issued by: /CN=broker/OU=root@win_master.min.com/O=vx
Expiry Date: Nov  5 20:17:51 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

If the domain listed is not NBU_Machines@win_master.min.com, consider running `bpnbat -addmachine` for the name in question *(win_master)* on the machine that is serving the NBU_Machines domain *(win_master)*.

Then, on the machine where we want to place the certificate, run:
`bpnbat -loginmachine`

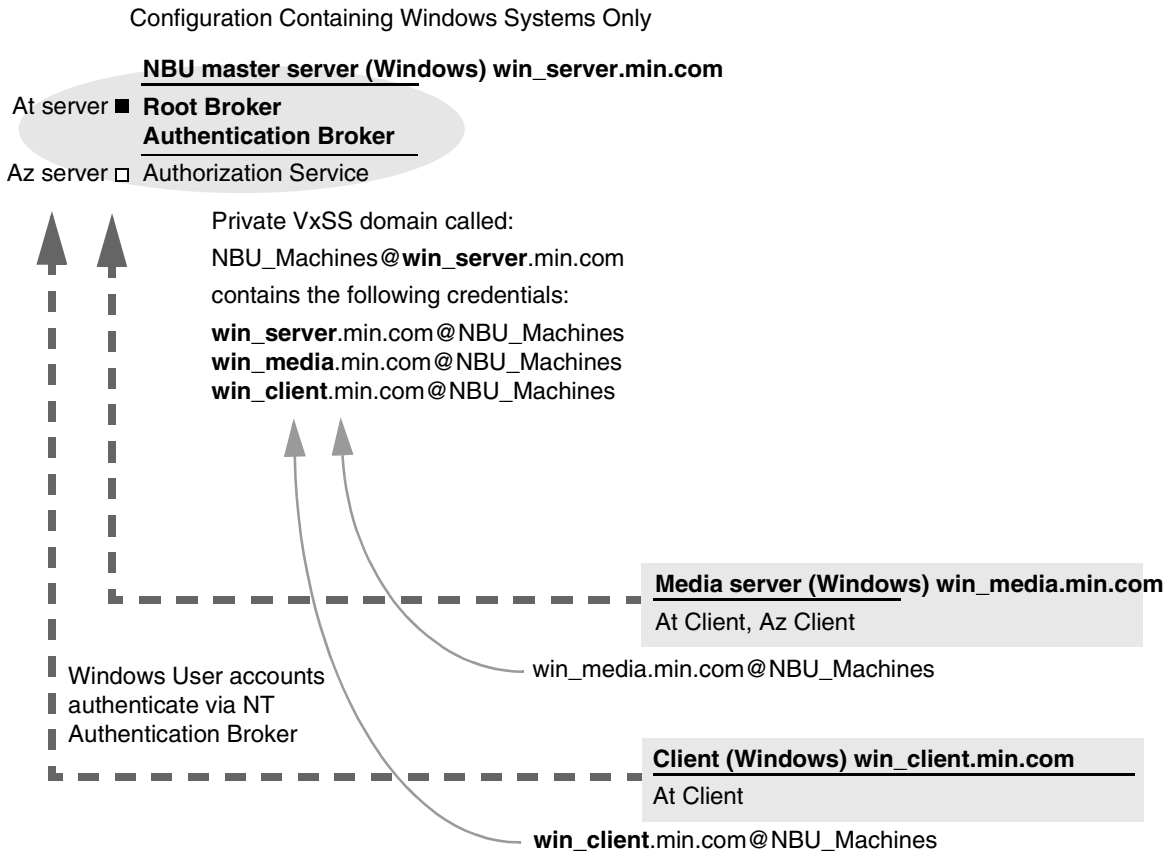
Access Management Troubleshooting Guidelines

In the configuration examples we'll refer to the following host names:

	Windows	UNIX
Master Servers	win_master	unix_master
Media Servers	win_media	unix_media
Clients	*win_client*	unix_client

Windows Verification Points

There are procedures that help you verify that the master server, media server and client are configured correctly for Access Control.



Note:
Each machine has a private domain account created for it. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.

Master Server Verification Points

The following sections describe procedures for Windows master server verification.

Verify Windows Master Server Settings

To determine in what domain a host is registered (where the primary Authentication broker resides), and the name of the machine the certificate represents, run `bpnbat` with `-whoami`. For example:

```
bpnbat -whoami -cf
"e:\program
Files\veritas\netbackup\var\vxss\credentials\win_master"
Name: win_master.min.com
Domain: NBU_Machines@win_master.min.com
Issued by: /CN=broker/OU=root@win_master.min.com/O=vx
Expiry Date: Nov  5 20:17:51 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

If the domain listed is not NBU_Machines@win_master.min.com, consider running `bpnbat -addmachine` for the name in question *(win_master)* on the machine that is serving the NBU_Machines domain *(win_master)*.

Then, on the machine where we want to place the certificate, run:
`bpnbat -loginmachine`

Note When determining if a user's credentials have expired, keep in mind that the output displays the expiration time in GMT, not local time.

Note For the remaining procedures in this verification section, we assume that the commands are performed from an operating system window in which the user identity in question has run `bpnbat -login` using an identity that is a member of NBU_Security Admin. This is usually the first identity with which the security was set up.

Verify which Machines are Permitted to Perform Authorization Lookups

Logged in as a member of the Administrators group run the following command:

`bpnbaz -ShowAuthorizers`

This command shows that *win_master* and *win_media* (media server) are permitted to perform Authorization lookups. Note that both servers are authenticated against the same vx (VERITAS Private Domain) Domain, NBU_Machines@win_master.min.com.

```
bpnbaz -ShowAuthorizers
```

```
==========
Type: User
Domain Type: vx
Domain:NBU_Machines@win_master.min.com
Name: win_master.min.com
==========
Type: User
Domain Type: vx
Domain:NBU_Machines@win_master.min.com
Name: win_media.min.com
Operation completed successfully.
```

If a master or media server is missing from the list of Authorized machines, run `bpnbaz -allowauthorization` to add the missing machine.

Verify that the Database is Configured Correctly

To make sure that the database is configured correctly, run `bpnbaz -listgroups`:

```
bpnbaz -listgroups
NBU_User
NBU_Operator
NBU_Security Admin
Vault_Operator
NBU_Admin
Operation completed successfully.
```

If the groups do not appear, or if `bpnbaz -listmainobjects` does not return data, run `bpnbaz -SetupSecurity`.

Verify that the vxatd and vxazd Processes are Running

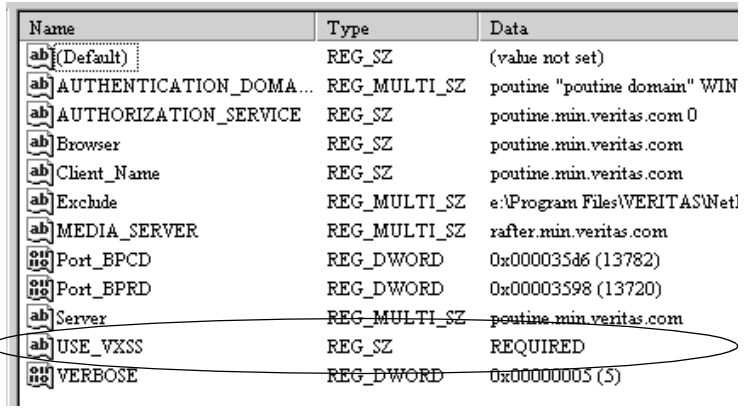
Use the Windows Task Manager to make sure that vxatd.exe and vxazd.exe are running on the designated host. If necessary, start them.

Verify that the Host Properties are Configured Correctly

In the Access Control host properties, verify that the **VERITAS Security Services** property is set correctly. (The setting should be either **Automatic** or **Required**, depending on whether all machines are using VxSS or not. If all machines are not using VxSS, set it to **Automatic**.

This can also be verified by viewing USE_VXSS in the registry at:

```
HKEY_LOCAL_MACHINE\Software\VERITAS\NetBackup\CurrentVersion\config
```



Name	Type	Data
(Default)	REG_SZ	(value not set)
AUTHENTICATION_DOMA...	REG_MULTI_SZ	poutine "poutine domain" WIN
AUTHORIZATION_SERVICE	REG_SZ	poutine.min.veritas.com 0
Browser	REG_SZ	poutine.min.veritas.com
Client_Name	REG_SZ	poutine.min.veritas.com
Exclude	REG_MULTI_SZ	e:\Program Files\VERITAS\Net
MEDIA_SERVER	REG_MULTI_SZ	rafter.min.veritas.com
Port_BPCD	REG_DWORD	0x000035d6 (13782)
Port_BPRD	REG_DWORD	0x00003598 (13720)
Server	REG_MULTI_SZ	poutine.min.veritas.com
USE_VXSS	REG_SZ	REQUIRED
VERBOSE	REG_DWORD	0x00000005 (5)

In the Access Control host properties, verify that the authentication domains listed are spelled correctly and point to the proper servers (valid Authentication brokers). If all domains are Windows-based, they should point to a Windows machine running the At broker.

Media Server Verification Points

The following sections describe procedures for Windows media server verification.

Verify the Media Server

To determine which Authentication broker the media server is authenticated against, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf "c:\program
files\veritas\netbackup\var\vxss\credentials\win_media.min.com"
Name: win_media.min.com
Domain: NBU_Machines@win_master.min.com
Issued by: /CN=broker/OU=root@win_master.min.com/O=vx
Expiry Date: Nov  5 20:11:40 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

Verify that the Server has Access to the Authorization Database

To make sure that the media server is able to access the Authorization database as it needs, run `bpnbaz -ListGroups -CredFile "`*`directory_containing_AZ_db`*`"`

For example:

```
bpnbaz -ListGroups -CredFile "C:\Program
Files\VERITAS\NetBackup\var\vxss\credentials\win_media.min.com"
NBU_User
NBU_Operator
NBU_Security Admin
Vault_Operator
NBU_Admin
Operation completed successfully.
```

If this command fails, run `bpnbaz -AllowAuthorization` on the master server that is the Authorization broker *(win_master.min.com).*

Unable to Load Library Message

Verifying the media server and verifying that the media server has access to the proper database indirectly informs us that the VxSS client libraries for both At and Az are properly installed. If either of these procedures fail with messages pertaining to "unable to load libraries," check to make certain the Authentication and Authorization client libraries are installed. See the *VERITAS Security Services Installation Guide* on the VxSS installation CD for proper installation procedures.

You may also verify that the Authentication domains are correct by viewing the Access Control host properties for this media server, or by using `regedit` directly on the media server.

Client Verification Points

The following sections describe procedures for Windows client verification.

Verify the Credential for the Client

To check that the credential for the client is indeed for the correct client and comes from the correct domain, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf "c:\program
files\veritas\netbackup\var\vxss\credentials\win_client.min.com"
Name: win_client.min.com
Domain: NBU_Machines@win_master.min.com
Issued by: /CN=broker/OU=root@win_master.min.com/O=vx
Expiry Date: Nov  5 20:11:45 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```


Verify that the VxSS Authentication Client Libraries are Installed

Run `bpnbat -login` on the client to verify that the VxSS authentication client libraries are installed.

```
bpnbat -login
Authentication Broker: win_master
Authentication port[ Enter = default]:
Authentication type (NIS, NIS+, NT, vx, UNIXpwd): NT
Domain: ENTERPRISE
Name: Smith
Password:
Operation completed successfully.
```

This can also be done by looking at the Windows Add/Remove Programs.

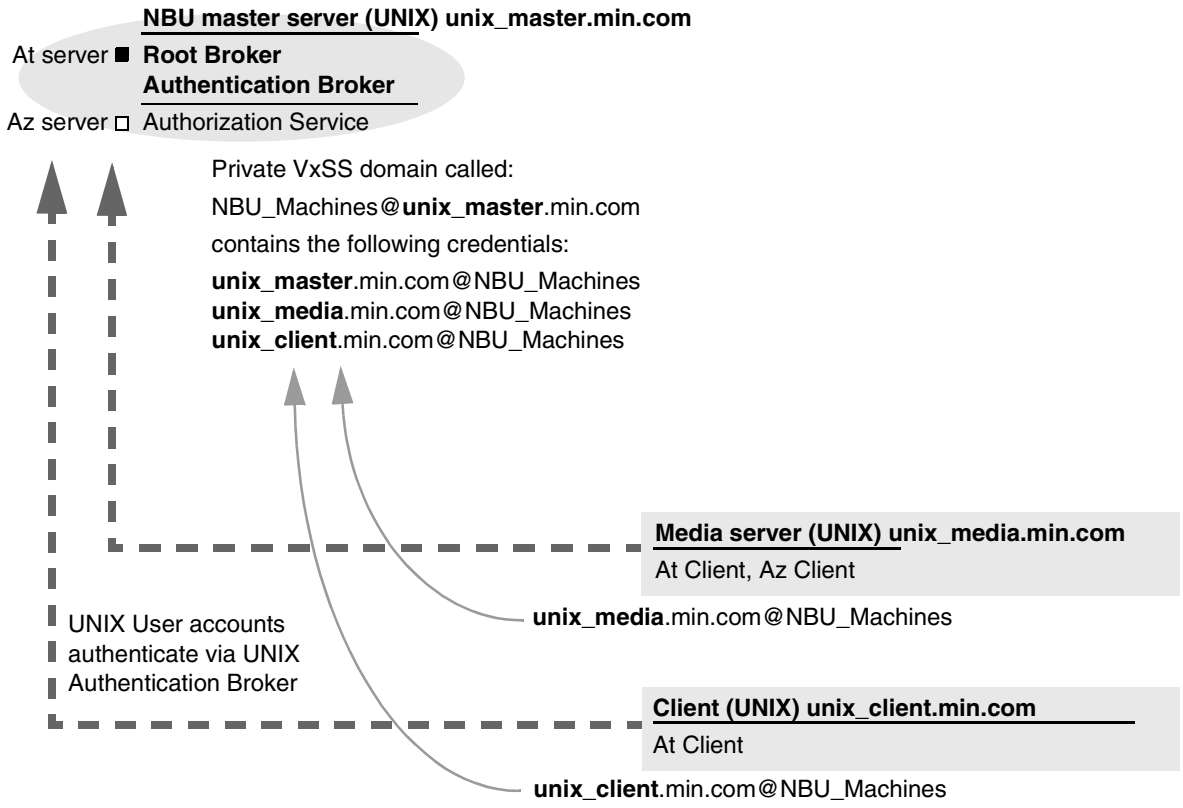
Verify Correct Authentication Domains

In the Access Control host properties or by using `regedit`, check that any defined authentication domains for the client are correct. Make certain the domains are spelled correctly, and that the authentication brokers listed for each of the domains is valid for that domain type.

UNIX Verification Points

These are the procedures that help you verify that the UNIX master server, media server and client are configured correctly for Access Control.

Configuration Containing UNIX Systems Only



Note:
Each machine has a private domain account created for it. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.

Master Server Verification Points

The following sections describe procedures for UNIX master server verification.

Verify UNIX Master Server Settings

To determine in what domain a host is registered (where the primary Authentication broker resides), and the name of the machine the certificate represents, run `bpnbat` with `-whoami`. For example:

```
bpnbat -whoami -cf
/usr/openv/var/vxss/credentials/unix_master.min.com
Name: unix_master.min.com
Domain: NBU_Machines@win_master
Issued by: /CN=broker/OU=root@win_master/O=vx
Expiry Date: Nov 13 15:44:30 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

If the domain listed is not NBU_Machines@unix_master.min.com, consider running `bpnbat -addmachine` for the name in question *(unix_master)* on the machine that is serving the NBU_Machines domain *(unix_master)*.

Then, on the machine where we want to place the certificate, run:
`bpnbat -loginmachine`

Note When determining if a user's credentials have expired, keep in mind that the output displays the expiration time in GMT, not local time.

Note For the remaining procedures in this verification section, we assume that the commands are performed from an operating system window in which the user identity in question has run `bpnbat -login` using an identity that is a member of NBU_Security Admin. This is usually the first identity with which the security was set up.

Verify which Machines are Permitted to Perform Authorization Lookups

Logged in as root on the Authorization broker, run the following command:

`bpnbaz -ShowAuthorizers`

This command shows that *unix_master* and *unix_media* are permitted to perform Authorization lookups. Note that both servers are authenticated against the same vx (VERITAS Private Domain) Domain, NBU_Machines@unix_master.min.com.

```
bpnbaz -ShowAuthorizers
==========
```

```
Type: User
Domain Type: vx
Domain:NBU_Machines@unix_master.min.com
Name: unix_master.min.com

==========
Type: User
Domain Type: vx
Domain:NBU_Machines@unix_master.min.com
Name: unix_media.min.com

Operation completed successfully.
```

If a master or media server is missing from the list of Authorized machines, run `bpnbaz -allowauthorization` to add the missing machine.

Verify that the Database is Configured Correctly

To make sure that the database is configured correctly, run `bpnbaz -listgroups`:

```
bpnbaz -listgroups
NBU_User
NBU_Operator
NBU_Admin
NBU_Security Admin
Vault_Operator
Operation completed successfully.
```

If the groups do not appear, or if `bpnbaz -listmainobjects` does not return data, run `bpnbaz -SetupSecurity`.

Verify that the vxatd and vxazd Processes are Running

Run the `ps` command to ensure that `vxatd` and `vxazd` are running on the designated host. If necessary, start them. For example:

```
ps -fed |grep vx
root 10716     1  0   Nov 11 ?        0:02 /opt/VRTSat/bin/vxatd
root 10721     1  0   Nov 11 ?        4:17 /opt/VRTSaz/bin/vxazd
```

See the *VERITAS Security Services Administrator's Guide* for more details on how to start `vxatd` and `vxazd`.

Verify that the Host Properties are Configured Correctly

In the Access Control host properties, verify that the **VERITAS Security Services** property is set correctly. (The setting should be either **Automatic** or **Required**, depending on whether all machines are using VxSS or not. If all machines are not using VxSS, set it to **Automatic**.

In the Access Control host properties, verify that the authentication domains listed are spelled correctly and point to the proper servers (valid Authentication brokers). If all domains are UNIX-based, they should point to a UNIX machine running the At broker.

This can also be verified in `bp.conf` using `vi`.

```
cat bp.conf
SERVER = unix_master
SERVER = unix_media
CLIENT_NAME = unix_master
AUTHENTICATION_DOMAIN = min.com "default company NIS namespace" NIS
unix_master 0
AUTHENTICATION_DOMAIN = unix_master "unix_master password file"
PASSWD unix_master 0
AUTHORIZATION_SERVICE = unix_master.min.com 0
USE_VXSS = REQUIRED
#
```

Media Server Verification Points

The following sections describe procedures for UNIX media server verification.

Verify the Media Server

To determine which Authentication broker the media server is authenticated against, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf
/usr/openv/var/vxss/credentials/unix_media.min.com
Name: unix_media.min.com
Domain: NBU_Machines@unix_master.min.com
Issued by: /CN=broker/OU=root@unix_master.min.com/O=vx
Expiry Date: Nov  9 14:48:08 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

Verify that the Server has Access to the Authorization Database

To make sure that the media server is able to access the Authorization database as it needs, run `bpnbaz -ListGroups -CredFile "`*`directory_containing_AZ_db`*`"`

For example:

```
bpnbaz -ListGroups -CredFile
/usr/openv/var/vxss/credentials/unix_media.min.com
NBU_User
NBU_Operator
NBU_Admin
NBU_Security Admin
Vault_Operator
Operation completed successfully.
```

If this command fails, run `bpnbaz -AllowAuthorization` on the master server that is the Authorization broker *(unix_master)*.

Unable to Load Library Message

Verifying the media server and verifying that the media server has access to the proper database indirectly informs us that the VxSS client libraries for both At and Az are properly installed. If either of these procedures fail with messages pertaining to "unable to load libraries," check to make certain the Authentication and Authorization client libraries are installed. See the *VERITAS Security Services Installation Guide* on the VxSS installation CD.

You may also verify that the Authentication domains are correct by viewing the Access Control host properties for this media server, or by using `cat(1)ing` the `bp.conf` file.

Client Verification Points

The following sections describe procedures for UNIX client verification.

Verify the Credential for the Client

To check that the credential for the client is indeed for the correct client and comes from the correct domain, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf
/usr/openv/var/vxss/credentials/unix_client.min.com
Name: unix_client.min.com
Domain: NBU_Machines@unix_master.min.com
Issued by: /CN=broker/OU=root@unix_master.min.com/O=vx
Expiry Date: Nov  9 14:49:00 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```


Verify that the VxSS Authentication Client Libraries are Installed

Run `bpnbat -login` on the client to verify that the VxSS authentication client libraries are installed.

```
bpnbat -login
Authentication Broker: unix_master.min.com
Authentication port[ Enter = default]:
Authentication type (NIS, NIS+, NT, vx, UNIXpwd): NIS
Domain: min.com
Name: Smith
Password:
Operation completed successfully.
```

This can also be done by looking at `/etc/vx/vss/*.loc` to see where the libraries are installed, and verify they are in the location indicated:

```
cat /etc/vx/vss/*.loc
ProductInstallDir=/opt/VRTSat
ProductInstallDir=/opt/VRTSaz
ls -l /opt/VRTSat/*/opt/VRTSaz/*
```

Verify Correct Authentication Domains

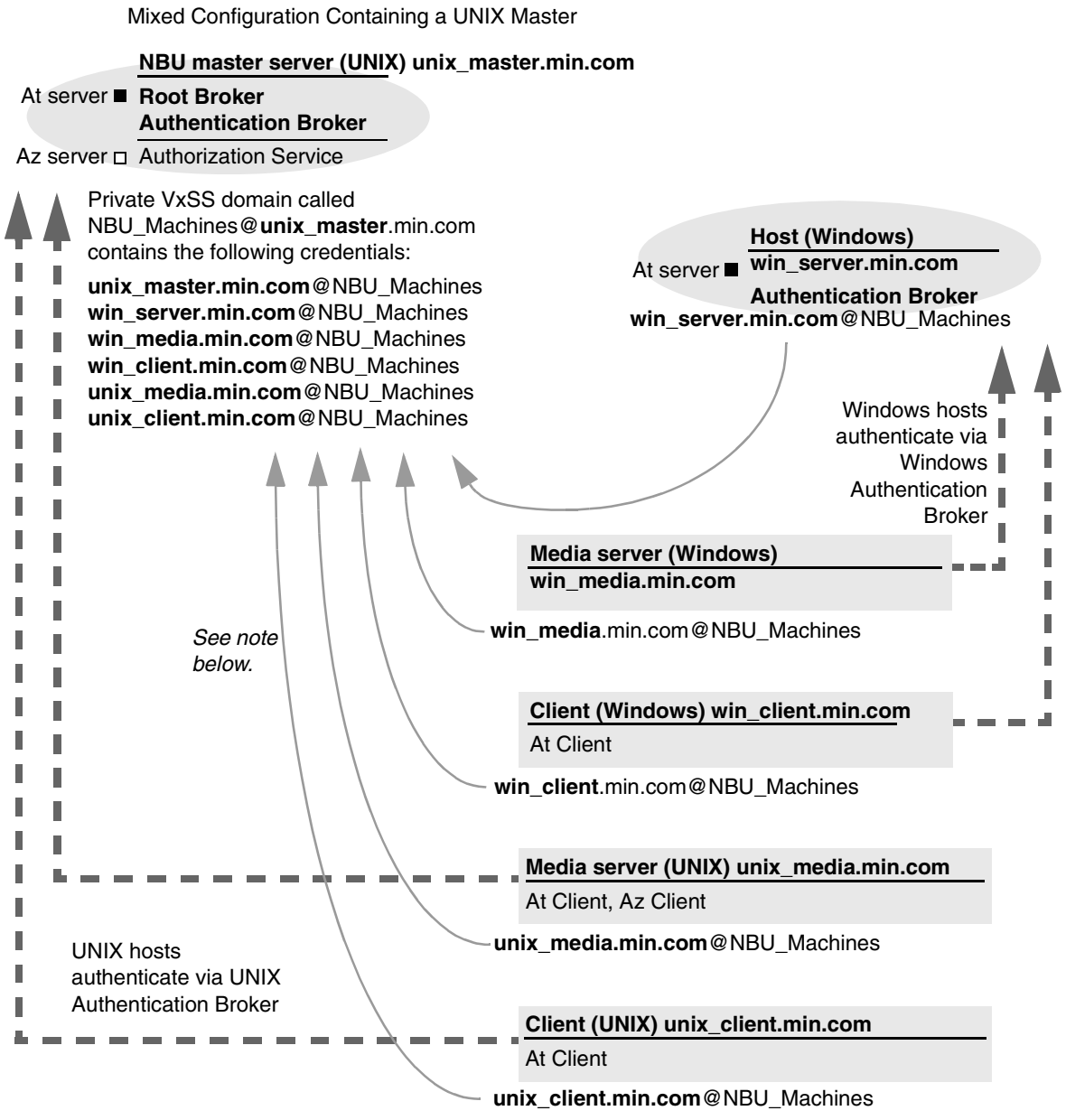
In the Access Control host properties or by using `vi`, check that any defined authentication domains for the client are correct. Make certain the domains are spelled correctly, and that the authentication brokers listed for each of the domains is valid for that domain type.

This can also be verified in `bp.conf` using `vi`.

```
cat bp.conf
SERVER = unix_master
SERVER = unix_media
CLIENT_NAME = unix_master
AUTHENTICATION_DOMAIN = min.com "default company NIS namespace" NIS
unix_master 0
AUTHENTICATION_DOMAIN = unix_master "unix_master password file"
PASSWD unix_master 0
AUTHORIZATION_SERVICE = unix_master.min.com 0
USE_VXSS = REQUIRED
```

Verification Points in a Mixed Environment with a UNIX Master Server

The following procedures can help you verify that the master server, media server and client are configured correctly for a heterogeneous NetBackup Access Control environment, where the master server is a UNIX machine.



Note:
Each machine has a private domain account created for it. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.

Master Server Verification Points

Follow the same procedures as those listed in "Master Server Verification Points" on page 32.

Media Server Verification Points

Verify the UNIX Media Server

For UNIX media servers, follow the same procedures as those listed in "Media Server Verification Points" on page 34.

Verify the Windows Media Server

Check the machine certificate comes from the root Authentication broker, which is found on the UNIX master server *(unix_master)*.

If the certificate is missing, run the following commands to correct the problem:

- `bpnbat -addmachine` on the root Authentication broker (in this example, *unix_master*)
- `bpnbat -loginmachine` (in this example, *win_media*)

For example:

```
bpnbat -whoami -cf "C:\program
files\veritas\netbackup\var\vxss\credentials\win_media.min.com"
Name: win_media.min.com
Domain: NBU_Machines@unix_master.min.com
Issued by: /CN=broker/OU=root@unix_master.min.com/O=vx
Expiry Date: Nov 13 20:11:04 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

Verify that a Media Server is Permitted to Perform Authorization Lookups

Make sure the media server is allowed to perform authorization checks by running `bpnbaz -listgroups -CredFile`. For example:

```
bpnbaz -listgroups -CredFile "C:\program
files\veritas\netbackup\var\vxss\credentials\win_media.min.com"
NBU_User
NBU_Operator
NBU_Admin
NBU_Security Admin
Vault_Operator
Operation completed successfully.
```


If the media server is not allowed to perform authorization checks, run `bpnbaz -allowauthorization` on the master server for the media server name in question.

Unable to Load Library Message

Verifying the Windows media server and verifying that the media server is permitted to perform authorization checks indirectly informs us that the VxSS client libraries for both At and Az are properly installed. If either of these procedures fail with messages pertaining to "unable to load libraries," check to make certain the Authentication and Authorization client libraries are installed. See the *VERITAS Security Services Installation Guide* on the VxSS installation CD.

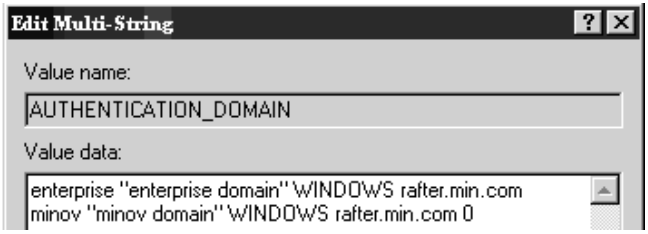
Verify Authentication Domains

You may also verify that the Authentication domains are correct by viewing the Access Control host properties for this media server, or by using `regedit` directly on the media server in the following location:

```
HKEY_LOCAL_MACHINE\Software\VERITAS\NetBackup\CurrentVersion\config\
AUTHENTICATION_DOMAIN
```

Cross Platform Authentication Domains

Take extra care in mixed environments to ensure that the appropriate domain types point to the correct authentication brokers. In the example below, note that the WINDOWS domains point to win_media.min.com.



Client Verification Points

For UNIX client machines, follow the same procedures as those listed in "Client Verification Points" on page 35.

For Windows clients:

Verify the Credential for the Windows Client

To check that the credential for the client is indeed for the correct client and comes from the correct domain, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf "e:\program
files\veritas\netbackup\var\vxss\credentials\win_master.min.com"
Name: win_master.min.com
Domain: NBU_Machines@unix_master.min.com
Issued by: /CN=broker/OU=root@unix_master.min.com/O=vx
Expiry Date: Nov 13 19:50:50 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

Verify that the VxSS Authentication Client Libraries are Installed

Run `bpnbat -login` on the client to verify that the VxSS authentication client libraries are installed. For example:

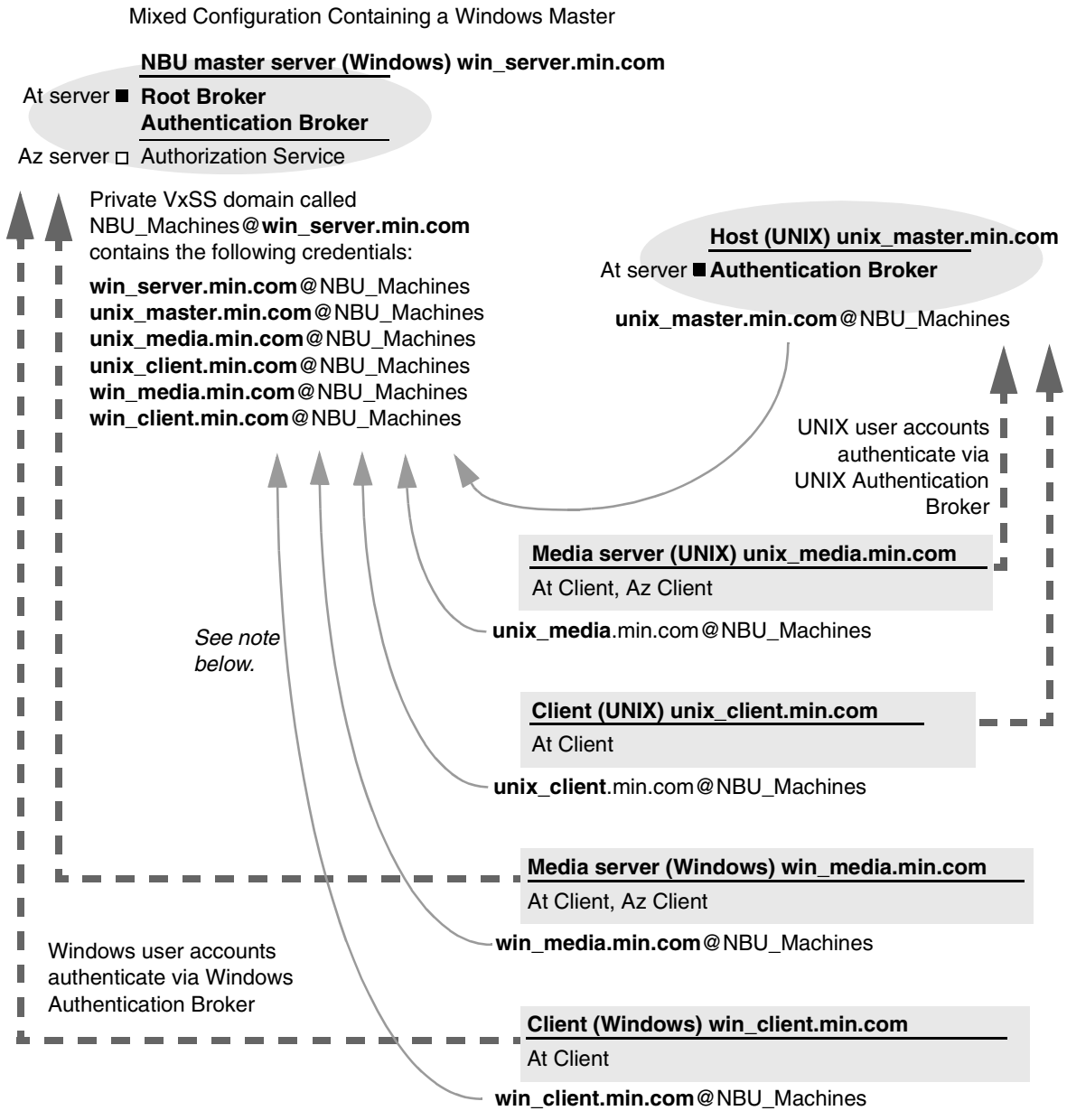
```
bpnbat -login
Authentication Broker: unix_master.min.com
Authentication port[ Enter = default]:
Authentication type (NIS, NIS+, NT, vx, UNIXpwd): NIS
Domain: min.com
Name: Smith
Password:
Operation completed successfully.
```

Verifying the Windows Authentication Broker

Make sure that the Windows Authentication broker either has mutual trust with the main UNIX Authentication broker, or is using the UNIX broker as its root broker. See the *VERITAS Security Services Installation Guide* on the VxSS installation CD for more information regarding these scenarios.

Verification Points in a Mixed Environment with a Windows Master Server

The following procedures can help you verify that the master server, media server and client are configured correctly for a heterogeneous NetBackup Access Control environment, where the master server is a Windows machine.



Note:
Each machine has a private domain account created for it. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.

Master Server Verification Points

Follow the same procedures as those listed in “Master Server Verification Points” on page 26.

Media Server Verification Points

Verify the Windows Media Server

For Windows media servers, follow the same procedures as those listed in “Media Server Verification Points” on page 28.

Verify the UNIX Media Server

Check that the machine certificate is issued from the root Authentication broker, found on the Windows master server *(win_master)*. To determine which Authentication broker the media server is authenticated against, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf
/usr/openv/var/vxss/credentials/unix_media.min.com
Name: unix_media.min.com
Domain: NBU_Machines@win_master.min.com
Issued by: /CN=broker/OU=root@win_master.min.com/O=vx
Expiry Date: Nov  9 14:48:08 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

Verify that the Server has Access to the Authorization Database

To make sure that the media server is able to access the Authorization database as it needs to perform authorization checks, run `bpnbaz -ListGroups -CredFile "`*`/usr/openv/var/vxss/credentials/<hostname>`*`"`

For example:

```
bpnbaz -ListGroups -CredFile\
/usr/openv/var/vxss/credentials/unix_media.min.com
NBU_User
NBU_Operator
NBU_Admin
NBU_Security Admin
Vault_Operator
Operation completed successfully.
```

If the media server is not allowed to perform authorization checks, run `bpnbaz -allowauthorization` on the master server for the media server name in question.

Unable to Load Library Message

Verifying the media server and verifying that the media server has access to the proper database indirectly informs us that the VxSS client libraries for both At and Az are properly installed. If either of these procedures fail with messages pertaining to "unable to load libraries," check to make certain the Authentication and Authorization client libraries are installed. See the *VERITAS Security Services Installation Guide* on the VxSS installation CD.

Cross Platform Authentication Domains

You may also verify that the Authentication domains are correct by viewing the Access Control host properties for this media server, or by using `cat(1)ing` the `bp.conf` file.

Take extra care in mixed environments to ensure that the appropriate domain types point to the correct authentication brokers. In the example below, note that the PASSWD and NIS domains point to unix_media.min.com, which, in this example, is the UNIX Authentication broker:

```
cat bp.conf
SERVER = win_master.min.com
MEDIA_SERVER = unix_media.min.com
CLIENT_NAME = unix_media
AUTHENTICATION_DOMAIN = win_master "win_master domain" WINDOWS
win_master.min.com
 0
AUTHENTICATION_DOMAIN = enterprise "enterprise domain" WINDOWS
win_master.min.com 0
AUTHENTICATION_DOMAIN = unix_media.min.com "local unix_media
domain" PASSWD unix_media.min.com 0
AUTHENTICATION_DOMAIN = min.com "NIS domain" NIS
unix_media.min.com 0
AUTHORIZATION_SERVICE = win_master.min.com 0
USE_VXSS = REQUIRED
```

Client Verification Points

Verify the Credential for the Windows Client

For Windows clients, follow the same procedures as those listed in "Client Verification Points" on page 29.

Verify the Credential for the UNIX Client

To check that the credential for the client is indeed for the correct client and comes from the correct domain, run `bpnbat -whoami`. For example:

```
bpnbat -whoami -cf \
"/usr/openv/var/vxss/credentials/unix_client.min.com"
Name: unix_client.min.com
Domain: NBU_Machines@win_master.min.com
Issued by: /CN=broker/OU=root@win_master.min.com/O=vx
Expiry Date: Nov  6 21:16:01 2004 GMT
Authentication method: VERITAS Private Security
Operation completed successfully.
```

Verify that the VxSS Authentication Client Libraries are Installed

Run `bpnbat -login` on the client to verify that the VxSS authentication client libraries are installed.

```
bpnbat -login
Authentication Broker: unix_media.min.com
Authentication port[ Enter = default]:
Authentication type (NIS, NIS+, NT, vx, UNIXpwd): NIS
Domain: min.com
Name: Smith
Password:
You do not currently trust the server: unix_media.min.com, do you
wish to tr
ust it? (y/n):
y
Operation completed successfully.
```

Verify the UNIX Authentication Broker

Make sure that the UNIX Authentication broker either has mutual trust with the main Windows Authentication broker, or is using the Windows broker as its root broker. See the *VERITAS Security Services Installation Guide* on the VxSS installation CD for more information regarding this scenario.

Other Troubleshooting Topics

The following sections describe topics that may be helpful when configuring VxSS with NetBackup.

Expired Credentials Message

If your credential has expired or is incorrect, you may receive the following message while running a `bpnbaz` or `bpnbat` command:

```
Supplied credential is expired or incorrect. Please reauthenticate and
try again.
```

Run `bpnbat -Login` to update an expired credential.

Useful Debug Logs

The following logs are useful when debugging NetBackup Access Control:

On the master: `admin`, `bpcd`, `bprd`, `bpdbm`, `bpjobd`, `bpsched`

On the client: `admin`, `bpcd`, `bprd`, `bpdbjobs`

See the *NetBackup Troubleshooting Guide* for instructions on implementing proper logging.

If Uninstalling VxSS

On UNIX:

Using `installvss`, select the option for uninstalling Authentication and Authorization. The following directories should be empty after uninstalling:

```
/opt
/etc/vx/vss
/var/
```

On Windows:

Use the Windows **Add/Remove Programs** panel from the Control Menu to uninstall Authentication and Authorization. The `\Veritas\Security` directory should be empty after uninstalling.

Where Credentials Are Stored

NetBackup VxSS credentials are stored in the following UNIX directories:

User credentials: `$HOME/.vxss`

Machine credentials: `/usr/openv/var/vxss/credentials/`

VxSS Ports

VxSS services listen at the following ports:

Authentication:

```
netstat -a -n | find "2821"
```

Authorization:

```
netstat -a -n | find "4032"
```

Stopping VxSS Services

When stopping the VxSS services, stop Az first, then stop At.

When stopping the VxSS services, stop Authorization first, then stop Authentication.

UNIX: Use the following commands.

To stop Az: `/opt/VRTSaz/bin/vrtsaz -stop`

To stop At: Use the term signal as shown in the example below:

```
# ps -fed |grep vxatd
    root 16018     1  4 08:47:35 ?        0:01 ./vxatd
    root 16019 16011  0 08:47:39 pts/2    0:00 grep vxatd
# kill 16018
# ps -fed |grep vxard
    root 16021 16011  0 08:47:48 pts/2    0:00 grep vxard
```

Windows:

Use the Services utility that Windows provides, since these services do not appear in the NetBackup Activity Monitor.

If You Lock Yourself Out of NetBackup

It is possible to lock yourself out of the NetBackup Administration Console if Access Control is incorrectly configured.

If this occurs, use `vi` to read the bp.conf entries (UNIX) or `regedit` (Windows) to view the Windows registry in the following location:

`HKEY_LOCAL_MACHINE\Software\VERITAS\NetBackup\CurrentVersion\config`

You'll look to see if he following entries are set correctly: AUTHORIZATION_SERVICE, AUTHENTICATION_DOMAIN, and USE_VXSS.

If the administrator does not wish to use NetBackup Access Control or does not have the VxSS libraries installed, make certain that the USE_VXSS entry is set to **Prohibited**, or is deleted entirely.

nbac_cron Utility

Use the `nbac_cron.exe` utility to create identities under which to run *cron* or *at* jobs.

`nbac_cron.exe` is found in the following location:

UNIX: `/opt/openv/netbackup/bin/goodies/nbac_cron`

Windows: `<install_path>\netbackup\bin\goodies\nbac_cron.exe`

nbac_cron options:

- `-SetupAt [-Port #]`
  `-SetupCron [-Port #]`

  Either option sets up an Authentication account. Optionally, specify a port number to use for authentication.

- `-AddAt`

  Create an *at* account for a user.

- `-AddCron`

  Create a *cron* account for a user.

Using the Access Management Utility

Users assigned to the NetBackup Security Administrator user group have access to **Access Management**. Users assigned to any other user group, including NetBackup Administrator, can see the Access Management node in the NetBackup Administration Console, but cannot expand it.

If a user other than a Security Administrator tries to select **Access Management**, an error message displays. Toolbar buttons and menu items specific to **Access Management** are not displayed.

Upon successful completion, the default NetBackup user groups should display in the NetBackup Administration Console under **Access Management** > **NBU User Groups**.

To list the groups on the command line, run `bpnbaz -ListGroups` on the machine where the VxSS Authorization server software is installed.

`bpnbaz` is located in directory *<install_path>*`\NetBackup\bin\admincmd`

(You must be logged in as the Security Administrator by using `bpnbat -login`)

```
bpnbaz -ListGroups
NBU_User
NBU_Operator
NBU_Admin
NBU_Security Admin
Vault_Operator
Operation completed successfully.
```

The NetBackup user groups are listed. This verifies that the Security Administrator can access the user groups.

Access Management Menus

The Menu bar consists of the following menu items:

Option	Description
File	Options **Change Server**, **New Console**, **New Window from Here**, **Login as New User**, **Backup, Archive, and Restore**, **Print Setup**, **Print Preview**, **Print**, **Send**, **Export**, **Close**, and **Exit** are described in Chapter 1 of the *NetBackup System Administrator's Guide for Windows, Volume I*.

Option	Description
Edit	Options **Undo**, **Cut**, **Copy**, **Paste**, **New**, **Change**, **Delete**, **Find**, **Find Next**, **Find Previous**, and **Find All** are described in Chapter 1 of *NetBackup System Administrator's Guide for Windows, Volume I*. The **Change** option is available when a user or NBU user group is selected in the details pane.
View	Options **Toolbar**, **Status Bar**, **Tree**, **Previous Pane**, **Next Pane**, **Customize**, **Options**, **Refresh**, **Refresh All**, **Large Icons**, **Small Icons**, **List**, **Details**, **Columns**, **Sort**, **Filter**, and **Clear Filter** are described in Chapter 1 of *NetBackup System Administrator's Guide for Windows, Volume I*.
Actions	The Actions menu contains the following options when **Access Management** is selected: • **New Group:** Click to create a new NetBackup user group. • **Copy to New Group:** Use to create a new user group based on an existing user group. Users and permissions can be changed as needed for the new user group.
Help	Options **Help Topics**, **Troubleshooter**, **VERITAS Web Page**, **License Keys**, **Current NBAC User**, and **About NetBackup Administration Console** are described in Chapter 1 of *NetBackup System Administrator's Guide for Windows, Volume I*.

Determining Who Can Access NetBackup

Access Management allows only one user group, by default, the *NBU_Security Admin* user group, to define the following aspects of NetBackup Access Management:

- The permissions of individual users.
- The creation of user groups.

First, determine which NetBackup resources your users will need to access. (See "Permissions for Default NetBackup User Groups" on page 61 for resources and associated permissions.)

The Security Administrator may want to first consider what different users have in common, then create user groups with the permissions that these users require. User groups generally correspond to a role, such as administrators, operators, or end-users.

Consider basing user groups on one or more of the following criteria:

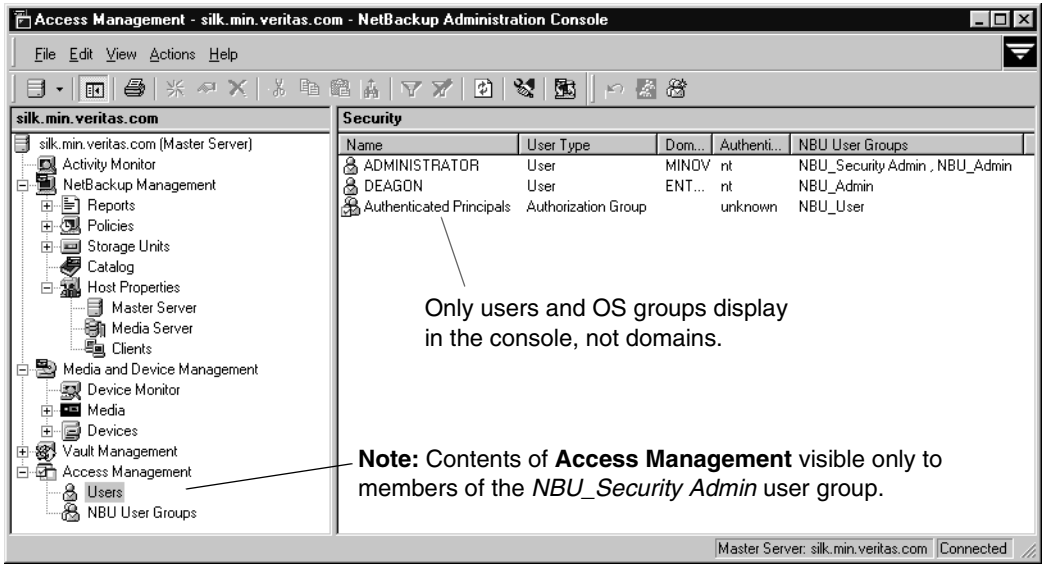
- Functional units in your organization (UNIX administration, for example)
- NetBackup resources (drives, policies, for example)
- Location (East Coast or West coast, for example)
- Individual responsibilities (tape operator, for example)

Individual Users

NetBackup Access Management uses your existing OS-defined users, groups, and domains. As such, Access Management maintains no list of users and passwords. When defining members of groups, the Security Administrator is specifying existing OS level users as members of user groups.

Every authenticated user belongs to at least one authorization user group. By default, every user belongs to the user group *NBU_Users*, which contains all authenticated users.

There are two types of users that are implicit members of groups:



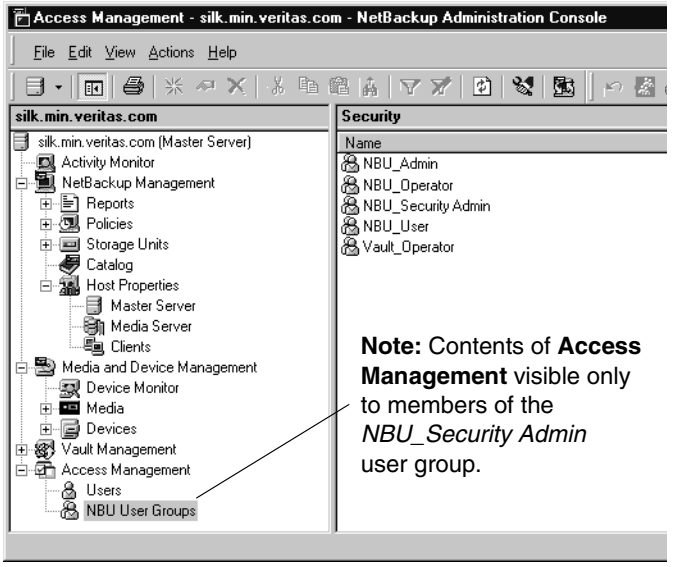
- On the server hosting the Authorization services, members of the Administrator group are implicit members of the *NBU_Security Admin* user group
- All authenticated users are implicit members of the *NBU_Users* user group

All other groups must have members defined explicitly. The NetBackup Security Administrator can delete members added manually to other groups; however, the Security Administrator may not delete the predefined implicit members of the *NBU_Users* and *NBU_Security Admin* groups. OS groups and OS users may be added to an authorization group.

Note Although *root* (UNIX) or *administrator* (Windows) on the master server are added to the NetBackup Administrators user group and get NetBackup Administrator permissions, *root* and *administrator* are not predefined users.)

User Groups

Rather than assigning permissions directly to individual users, NetBackup Access Management is configured by assigning permissions to user groups, then assigning users to the user groups.



Upon successful installation, NetBackup provides five default user groups that complement how sites often manage the duties of NetBackup operation. The user groups are listed under **Access Management** > **User Groups**. Keep in mind that the contents of **Access Management** are visible to members of the *NBU_Security Admin* group only.

The Security Administrator may choose to use the default NetBackup user groups, or may choose to create custom user groups.

Default User Groups

The permissions granted to users in each of the five default user groups correlate to the group name. Essentially, an authorization object correlates to a node in the NetBackup Administration Console tree.

The following sections describe each NetBackup default user group:

Security Administrator (*NBU_Security Admin*)

There are usually very few members in the *NBU_Security Admin* user group. The only permission that the Security Administrator possesses by default is that of configuring Access Control within **Access Management**. Configuring Access Control includes the following permissions:

- Ability to see the contents of **Access Management** in the NetBackup Administration Console
- Ability to create, modify and delete users and user groups
- Ability to assign users to user groups

- Ability to assign permissions to user groups

Administrator (*NBU_Admin*)

By default, members of the *NBU_Admin* user group have full permission to access, configure, and operate any NetBackup authorization object. In other words, members have all the capabilities that are currently available to administrators without Access Management in place. However, as members of this group, it is not necessary to log on as root or administrator at the OS level.

Note Members of the *NBU_Admin* user group cannot see the contents of **Access Management**, and therefore, cannot ascribe permissions to other user groups.

Operator (*NBU_Operator*)

The main task of the *NBU_Operator* user group is to monitor jobs. For example, members of the *NBU_Operator* user group might monitor jobs and notify a NetBackup administrator if there is a problem so the problem can be addressed by the administrator. Using the default permissions, a member of the *NBU_Operator* user group would probably not have enough access to be address larger problems.

Members of the *NBU_Operator* user group have permissions that allow them to perform some tasks such as moving tapes, operating drives, and inventorying robots.

Default User (*NBU_User*)

The *NBU_User* user group is the default NetBackup user group with the fewest permissions. Members of the *NBU_User* user group can only backup, restore, and archive files. *NBU_User* user group members have access to the functionality of the NetBackup client interface (BAR).

Vault Operator (*Vault_Operator*)

The *Vault_Operator* user group is the default user group that contains permissions to perform the operator actions necessary for the Vault process.

Additional User Groups

The Security Administrator (member of *NBU_Security Admin* or equivalent) can create user groups as needed. Although the default user groups can be selected, changed and saved, NetBackup recommends that the groups be copied, renamed, then saved in order to retain the default settings for future reference.

User Group Configuration

The Security Administrator can create a new user groups by clicking **Actions** > **New Group** or by selecting an existing user group and selecting **Actions** > **Copy to New Group**.

▼ To create a new user group

1. As a member of the *NBU_Security Admin* user group (or equivalent), expand **Access Management** > **NBU User Groups**.
2. Select **Actions** > **New Group**. The New Group dialog displays, opened to the **General** tab.
3. Type the name of the new group in the **Name** field, then click the **Users** tab. For more on users, see "Users Tab" on page 57.
4. Select the defined users that you wish to assign to this new user group, then click **Assign**. Or, to include all the defined users in the group, click **Assign All**. To remove users from the assigned users list, select the user name, then click **Remove**.
5. Click the **Permissions** tab. For more on permissions, see "Permissions Tab" on page 59.
6. Select an Authorization Object, then select the permissions for the object.
7. Click **OK** to save the user group and the group permissions.

▼ To create a new user group by copying an existing user group

1. As a member of the *NBU_Security Admin* user group (or equivalent), expand **Access Management** > **NBU User Groups**.
2. Select an existing user group in the Details pane. (The pane on the left side of the NetBackup Administration Console.)
3. Select **Actions** > **Copy to New Group**. A dialog based on the selected user group displays, opened to the **General** tab.
4. Type the name of the new group in the **Name** field, then click the **Users** tab.
5. Select the defined users that you wish to assign to this new user group, then click **Assign**. Or, to include all the defined users in the group, click **Assign All**. To remove users from the assigned users list, select the user name, then click **Remove**.

6. Click the **Permissions** tab.

7. Select an Authorization Object, then select the permissions for the object.

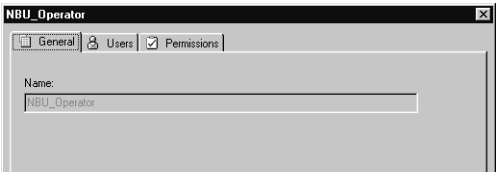
8. Click **OK** to save the user group and the group permissions. The new name for the user group appears in the Details pane.

Renaming User Groups

Once a NetBackup user group has been created, the user group cannot be renamed. The alternative to directly renaming a user group is to copy the user group, give the copy a new name, ensure the same membership as the original, then delete the original NetBackup user group.

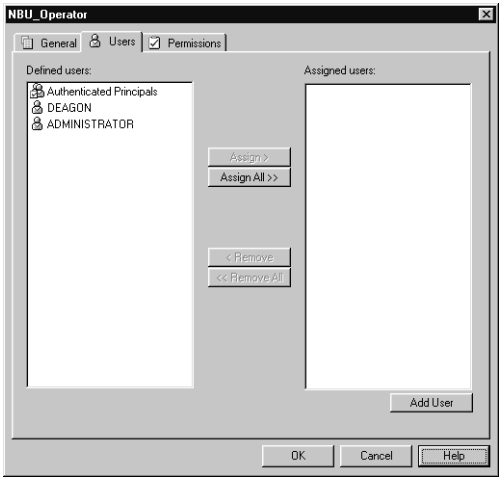
General Tab

The General tab contains the name of the user group. If creating a new user group, the **Name** field can be edited.



Users Tab

The Users tab contains controls to assign and remove users from user groups.



Defined Users

The Defined Users list is a list of all users defined manually within other groups.

- **Assign** button: Select a user in the Defined User list and click **Assign** to assign that user to a user group.
- **Assign All** button: Click **Assign All** to add all defined users to the user group.

Assigned Users

The **Assigned Users** list contains defined users who have been added to the user group.

- **Remove** button: Select a user in the Assigned Users list and click **Remove** to remove that user from the user group.
- **Remove All** button: Click **Remove All** to remove all assigned users from the Assigned User list.

Add User

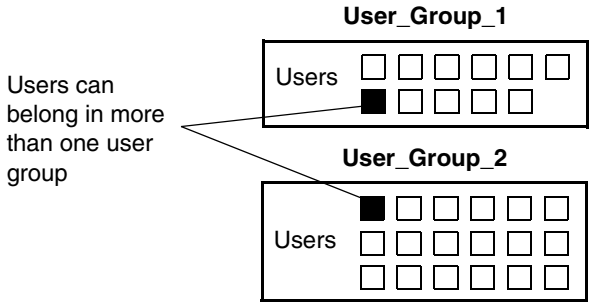
Click **Add User** to add a user to the **Defined Users** list. After adding a user, the name appears in the **Defined Users** list and the Security Administrator can assign the user to the user group. (See "To add a new user to a user group" on page 59.)

Defining Users Groups and Users

NetBackup authenticates existing users of the operating system rather than requiring that NetBackup users be created with a NetBackup password and profile.

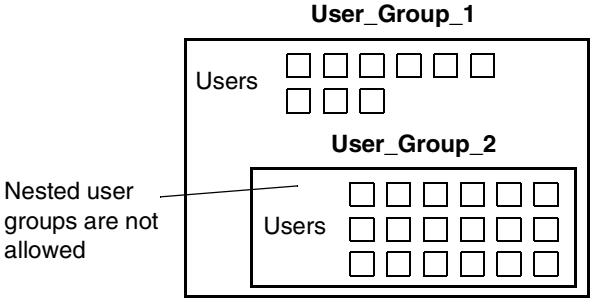
Defining a User Group

Users can belong to more than one user group and have the combined access of both groups.



While users can be members of multiple user groups simultaneously, NetBackup does not allow user groups to be nested.

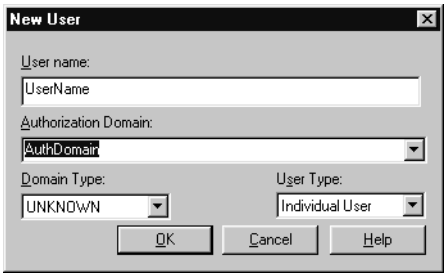
For example, while members of a user group can belong to more than one user group, a user group cannot belong to another user group.



Logging in as a New User

The **File** > **Login as New User** option is available on systems configured for Access Control. Logging into NetBackup as a different user is useful when, for example, a member of the *NBU_Admin* user group has finished administrative activities and needs to log in again as a Security Administrator to administer **Access Management**.

▼ To add a new user to a user group



1. As a member of the *NBU_Security Admin* user group (or equivalent), expand **Access Management** > **NBU User Groups**.
2. Double-click on the user group to which you wish to add a user.
3. Select the **Users** tab and click **Add User**.
4. Enter the user name and the authentication domain. Select the domain type of the user: NIS, NIS+, PASSWD, NT or Vx. See the *VERITAS Security Services Administrator's Guide* for more information on domain types.

   For the **User Type**, select whether the user is an individual user or an OS domain.
5. Click **OK**. The name is added to the Assigned Users list.

Permissions Tab

The **Permissions** tab contains a list of NetBackup authorization objects and configurable permissions associated with each object.

Authorization Objects and Permissions List

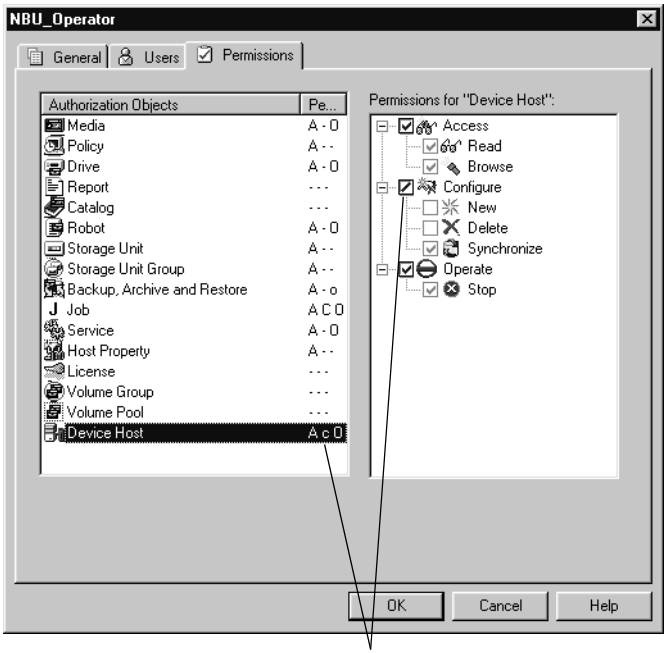
In general, an authorization object correlates to a node in the NetBackup Administration Console tree.

The *Authorization Object* column contains the NetBackup objects to which permissions can be granted.

The *Perms* column indicates the permission sets for which the selected user group is configured. An authorization object may be granted one of three permission sets:

- Access (A)
- Configure (C)
- Operate (O)

A lowercase letter in the *Perms* column indicates that only some, but not all, of the permissions in a permission set have been granted for the object.



Lowercase *c* indicates that full configure access has not been granted to members of the *NBU_ Operator* user group

Permissions List

Select an authorization object, then place a check in front of a permission that you want to grant the members of the user group currently selected.

When a user group is copied to create a new user group, the permission settings are copied as well.

Permissions for Default NetBackup User Groups

The permissions granted to users in each of the five default user groups correlate to the name of the user group.

Backup, Archive, and Restore (BAR) Client Interface

The table below shows the permissions associated with the BAR authorization object for the five default NetBackup user groups. BAR includes only Access and Operate permission sets, and does not include a Configure permission set.

In the NetBackup Administration Console, BAR is accessed by selecting **File** > **Backup, Archive, and Restore**.

Backup, Archive, and Restore Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read	---	X	X	X	X
	Browse	---	X	X	X	X
Operate	Backup	---	X	X	X	X
	Restore	---	X	X	---	---
	Alternate client	---	X	X	---	---
	List	---	X	X	X	X
	DB Agent	---	X	---	---	---
	Admin Access	---	X	---	---	---

License Permissions

The table below shows the permissions associated with the License authorization object for the five default NetBackup user groups.

In the NetBackup Administration Console, the license dialog is accessed by selecting **Help** > **License Keys**.

License Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read license	---	X	---	---	---
	Browse license	---	X	---	---	---
Configure	New	---	X	---	---	---
	Delete	---	X	---	---	---
Operate	Assign license	---	X	---	---	---

Jobs Tab in the Activity Monitor Permissions

The table below shows the permissions associated with the Jobs tab authorization object for the five default NetBackup user groups.

The Jobs tab is found in the NetBackup Administration Console under **NetBackup Management** > **Activity Monitor** > **Jobs** tab.

Jobs Tab Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read job	---	X	X	---	---
	Browse job	---	X	X	---	---
Configure	Delete job	---	X	X	---	---
	New job	---	X	X	---	---
Operate	Suspend job	---	X	X	---	---
	Resume job	---	X	X	---	---
	Restart job	---	X	X	---	---
	Cancel job	---	X	X	---	---

Drives Tab Permissions in the Activity Monitor

The table below shows the permissions associated with the Drives tab authorization object for the five default NetBackup user groups.

The Drives tab is found in the NetBackup Administration Console under **NetBackup Management** > **Activity Monitor** > **Drives** tab.

Drives Tab Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read device host	---	X	X	---	---
	Browse device host	---	X	X	---	---
Configure	New	---	X	---	---	---
	Delete	---	X	---	---	---
Operate	Up drive	---	X	X	---	---
	Down drive	---	X	X	---	---
	Reset drive	---	X	X	---	---

Service Tab Permissions in the Activity Monitor

The table below shows the permissions associated with the Service tab authorization object for the five default NetBackup user groups. The Service tab includes only Access and Operate permission sets, and does not include a Configure permission set.

The Service tab is found in the NetBackup Administration Console under **NetBackup Management** > **Activity Monitor** > **Service** tab.

Service Tab Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read	---	X	X	---	---
	Browse	---	X	X	---	---
Operate	Stop service	---	X*	X	---	---

* If a user is *not* a member of the NBU_Admin user group, but *is* logged on as an OS administrator (Administrator), then:

- The user will be able to restart a service from within the NetBackup Administration Console or from the command line.
- The user will be able to stop a service from within the NetBackup Administration Console but not from the command line.

If a user is a member of the NBU_Admin user group, but *is not* logged on as an OS administrator (Administrator), then:

- The user will *not* be able to restart a service from within the NetBackup Administration Console or from the command line.
- The user will *not* be able to stop a service from within the NetBackup Administration Console but the user can use the command line.
  (For example, `bprdreq -terminate`, `bpdbm -terminate`, or `stopltid`.)

Reports Permissions

The table below shows the permissions associated with the Reports authorization object for the five default NetBackup user groups. Reports includes only the Access permission set, and does not include a Configure or Operate permission set.

Reports is found in the NetBackup Administration Console under **NetBackup Management** > **Reports**.

Reports Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read report	---	X	---	---	X
	Browse report	---	X	---	---	X

Policy Permissions

The table below shows the permissions associated with the Policy authorization object for the five default NetBackup user groups.

Policy is found in the NetBackup Administration Console under **NetBackup Management** > **Policies**.

Policy Permission Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read policy	---	X	X	---	---
	Browse policy	---	X	X	---	---
Configure	New policy	---	X	---	---	---
	Delete policy	---	X	---	---	---
Operate	Activate policy	---	X	---	---	---
	Deactivate policy	---	X	---	---	---
	Backup (manually)	---	X	X	---	---

Storage Units Permissions

The table below shows the permissions associated with the Storage Unit authorization object for the five default NetBackup user groups.

Storage Units is found in the NetBackup Administration Console under **NetBackup Management** > **Storage Units**.

Storage Unit Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read storage unit	---	X	---	---	---
	Browse storage unit	---	X	---	---	---
Configure	New storage unit	---	X	---	---	---
	Delete storage unit	---	X	---	---	---
Operate	Assign storage unit	---	X	---	---	---

Storage Unit Groups Permissions

The table below shows the permissions associated with the Storage Unit Groups authorization object for the five default NetBackup user groups.

Storage Unit Groups is found in the NetBackup Administration Console under **NetBackup Management** > **Storage Unit Groups**.

Storage Unit Groups Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read storage unit group	---	X	---	---	---
	Browse storage unit group	---	X	---	---	---
Configure	New storage unit group	---	X	---	---	---
	Delete storage unit group	---	X	---	---	---
Operate	Assign storage unit group	---	X	---	---	---

Catalogs Permissions

The table below shows the permissions associated with the Catalog authorization object for the five default NetBackup user groups.

Catalogs is found in the NetBackup Administration Console under **NetBackup Management** > **Catalogs**.

Catalogs Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Accesss	Read catalog	---	X	---	---	---
	Browse catalog	---	X	---	---	---
Configure	New	---	X	---	---	---
	Delete	---	X	---	---	---
	Expire	---	X	---	---	---
Operate	Verify catalog	---	X	---	---	---
	Duplicate catalog	---	X	---	---	---
	Import catalog	---	X	---	---	---
	Set Primary Copy	---	X	---	---	---
	Backup	---	X	---	---	---
	Restore	---	X	---	---	---
	Read configuration	---	X	---	---	---
	Set configuration	---	X	---	---	---

Host Properties Permissions

The table below shows the permissions associated with the Host Properties authorization object for the five default NetBackup user groups.

Host Properties is found in the NetBackup Administration Console under **NetBackup Management** > **Host Properties**.

Host Properties Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read host properties	---	X	X	---	---
	Browse host properties	---	X	X	---	---
Configure	New host properties	---	X	---	---	---
	Delete host properties	---	X	---	---	---

Media Permissions

The table below shows the permissions associated with the Media authorization object for the five default NetBackup user groups.

Media is found in the NetBackup Administration Console under **Media and Device Management** > **Media**.

Media Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read media	---	X	X	---	X
	Browse media	---	X	X	---	X
Configure	New media	---	X	---	---	---
	Delete media	---	X	---	---	---
	Expire media	---	X	---	---	---
Operate	Update barcode	---	X	---	---	X
	Inject media	---	X	X	---	X
	Eject media	---	X	X	---	X
	Move media	---	X	X	---	X
	Assign media	---	X	X	---	X
	Deassign media	---	X	X	---	X
	Update database	---	X	X	---	X

Volume Group Permissions

The table below shows the permissions associated with the Volume Group authorization object for the five default NetBackup user groups.

Volume Group is found in the NetBackup Administration Console under **Media and Device Management** > **Media** > **Volume Groups**.

Volume Group Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read volume group	---	X	---	---	---
	Browse volume group	---	X	---	---	---
Configure	New volume group	---	X	---	---	---
	Delete volume group	---	X	---	---	---

Volume Pools Permissions

The table below shows the permissions associated with the Volume Pools authorization object for the five default NetBackup user groups.

Volume Pools is found in the NetBackup Administration Console under **Media and Device Management** > **Media** > **Volume Pools**.

Volume Pools Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read volume pool	---	X	---	---	---
	Browse volume pool	---	X	---	---	---
Configure	New volume pool	---	X	---	---	---
	Delete volume pool	---	X	---	---	---
Operate	Assign volume pool	---	X	---	---	---

Robots Permissions

The table below shows the permissions associated with the Robots authorization object for the five default NetBackup user groups.

Robots is found in the NetBackup Administration Console under **Media and Device Management** > **Media** > **Robots**.

Volume Robots Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read robot	---	X	X	---	X
	Browse robot	---	X	X	---	X
Configure	New robot	---	X	---	---	---
	Delete robot	---	X	---	---	---
Operate	Inventory robot	---	X	X	---	X

Device Host Permissions

The table below shows the permissions associated with the Device Host authorization object for the five default NetBackup user groups.

Device Host is found in the NetBackup Administration Console under **Media and Device Management** > **Devices** > **Hosts**.

Device Host Permission Set Defaults

Set	Activity	Sec Admin	NBU_Admin	NBU_Operator	NBU_User	Vault_Operator
Access	Read device host	---	X	X	---	---
	Browse device host	---	X	X	---	---
Configure	New device host	---	X	---	---	---
	Delete device host	---	X	---	---	---
	Synchronize device host	---	X	X	---	---
Operate	Stop device host	---	X	X	---	---

Enhanced Authentication and Authorization 2

Enhanced *authentication* allows each side of a NetBackup connection to verify the host and user on the other side of the connection. By default, NetBackup runs without enhanced authentication.

Enhanced *authorization* determines if authenticated users (or groups of users) have NetBackup administrative privileges. By default, NetBackup provides administrative privileges to UNIX `root` administrators or Windows system administrators on NetBackup servers. In order to use the enhanced authorization, you must configure and enable it.

This chapter contains the following sections:

Note Access Management and Enhanced Authorization and Authentication are independent methods of access control. Access Management is the newest and will be the preferred method in future NetBackup releases. If both Access Management and Enhanced Authorization and Authentication are configured, Access Management takes precedence.

Common Configuration Elements

The following sections describe elements involved in configuring enhanced authentication and enhanced authorization.

Configuration Files

The following configuration files are used by enhanced authentication, enhanced authorization, or both of these files. Some may need to be modified during configuration.

Location of Configuration Files

Option	File	Master or Media Server Platform	Path to Directory
Enhanced Authentication and Enhanced Authorization	methods.txt template.methods.txt* methods_allow.txt template.methods_allow.txt* methods_deny.txt template.methods_deny.txt* names_allow.txt template.names_allow.txt* names_deny.txt template.names_deny.txt*	UNIX	`/usr/openv/var/auth`
		Windows	*`install_path`*`\NetBackup\var\auth`
Enhanced Authorization	authorize.txt	UNIX	`/usr/openv/var/`
		Windows	*`install_path`*`\NetBackup\var\`

* If it is necessary to create a new .txt file, base the new .txt file on the template file.

methods.txt

The `methods.txt` file is an essential file which defines the supported enhanced authentication methods.

By default, `methods.txt` lists the two supported methods:

- `vopie`: one-time password authentication. The `vopie` method authenticates user name, host names, and group/domain names.

- `noauth` authentication: The `noauth` method exchanges user name, host names, and group/domain names, but makes no attempt to verify that the information is correct.

Each method is listed on a separate line in the file, and shows the method number, method name, and the path to a shared library:

Entries in methods.txt File

Platform	Line in methods.txt
UNIX (except HP-UX)	`128 vopie /usr/openv/lib/libvopie.so` `0 noauth /usr/openv/lib/libvnoauth.so`
UNIX (HP-UX only)	`128 vopie /usr/openv/lib/libvopie.sl` `0 noauth /usr/openv/lib/libvnoauth.sl`
Windows	`128 vopie` *`install_path`*`\NetBackup\lib\libvopie.dll` `0 noauth` *`install_path`*`\NetBackup\lib\libvnoauth.dll`

The order in which the methods are listed in the file is important: The method listed first indicates that it is preferred to the second method.

Syntax rules for `methods.txt`

- Empty lines are ignored
- The # character and all following characters on a line are ignored.

methods_allow.txt

The `methods_allow.txt` file defines the authentication methods that NetBackup servers and clients can use.

When a client or server attempts a connection, it specifies the authentication method it is using. The other server or client then checks its `methods_allow.txt` file to determine if that method is allowed for the system that is attempting the connection. If an entry in this file matches the host and method, the method is allowed. Otherwise, NetBackup checks the `methods_deny.txt` file.

Example methods_allow.txt File

```
# All hosts in the ourcompany.com domain and host name
# bob.theircompany.com can use the vopie method.
vopie : .ourcompany.com, bob.theircompany.com
#
```


```
# Hosts with IP addresses in the 12.123.56 network and IP address
# 2.123.57.23 can use all methods.
ALL : 12.123.56.
ALL : 12.123.57.23
```

The keyword `ALL` is used to specify all valid methods, as in the previous example, or all possible hosts.

The default file is empty.

- Each entry must be on a separate line.
- Empty lines are ignored.
- The # character and all following characters on a line are ignored.
- If a domain name is preceded by a dot (.), all hosts in that domain will match.
- If a network number is followed by a dot (.), all IP numbers in that network will match.
- A comma-separated list of domain name patterns and network number patterns can be specified on a single line.

methods_deny.txt

The `methods_deny.txt` file defines the authentication methods that NetBackup servers and clients *cannot* use.

NetBackup checks this file only if the `methods_allow.txt` file does not have a matching entry for the host and method. If a matching entry is found in `methods_deny.txt` the method is not allowed and authentication is not used. Otherwise, the method is used and authentication proceeds.

Example methods_deny.txt File

```
# All hosts in the ourcompany.com domain cannot use the vopie method.
vopie : .ourcompany.com
#
# Hosts with IP addresses in the 12.123.56 network cannot use all
# methods.
ALL : 12.123.56.
```

The default file contains only the following entry:

```
ALL : ALL
```

This means that all methods are denied for all hosts, unless it is specified otherwise in the `methods_allow.txt` file.

Syntax Rules for methods_deny.txt

The syntax rules for `methods_deny.txt` are the same as for `methods_allow.txt`.(See "Syntax rules for `methods.txt`" on page 73.)

names_allow.txt

The `names_allow.txt` file defines the network host names that a NetBackup client or server can use when establishing connections. This file is required when NetBackup client or server names do not correlate to their host names and IP addresses.

For example, when:

- NetBackup clients are using DHCP or another dynamic addressing scheme. Here, a client probably uses a different IP address each time it attempts a connection.
- A NetBackup server or client has more than one network interface. Here, the host name associated with the IP address can be different than the NetBackup server or client name.
- A NetBackup server or client connects through a gateway. Here, the peername for the gateway can be different than the NetBackup server or client name.

In the above instances, when a client or server attempts a connection, NetBackup checks the `names_allow.txt` file to determine if the network-host name for the connection correlates to a NetBackup name. If a match is found, the connection is allowed. Otherwise, NetBackup checks the `names_deny.txt` file.

If NetBackup client and server names correlate to their host names and IP addresses, then neither the `names_allow.txt` file or the `names_deny.txt` file are used.

Each line in `names_allow.txt` contains a logical name (usually, a NetBackup client name) followed by a colon and then a list of comma-separated host names or IP addresses.

Example names_allow.txt File

```
# The next three client entries can match IP numbers in the
# 123.123.56 network.
client1 : 123.123.56.
client2 : 123.123.56.
client3 : 123.123.56.
#
# The entry below permits the name fred to be used for hosts
# dhcp0 and dhcp1 in the ourcompany.com domain.
fred : dhcp0.ourcompany.com, dhcp1.ourcompany.com
```

The default file is empty.

Syntax Rules for names_allow.txt

The syntax rules for `names_allow.txt` are the same as for `methods_allow.txt`. The only variation is the `ALL` keyword, which in this case specifies all valid names or all possible hosts. (See "Syntax rules for `methods.txt`" on page 73.)

names_deny.txt

The `names_deny.txt` file defines the NetBackup client or server names that hosts cannot use. NetBackup checks this file only if the `names_allow.txt` file does not have a matching entry for the host and name. If a matching entry is found in `names_deny.txt` the name is not allowed and authentication fails. Otherwise, the name is used and authentication proceeds.

Example names_deny.txt File

```
# The entry below prevents the name fred to be used for hosts
# in the theircompany.com domain.
fred : .theircompany.com
#
# The entry below prevents any names from being used for hosts
# with IP addresses in the 12.123.53 network.
ALL : 123.123.53.
```

The default file contains only the following entry:

```
ALL : ALL
```

This means that all names are denied for all hosts, unless it is specified otherwise in the `names_allow.txt` file.

Syntax Rules for names_deny.txt

The syntax rules for `names_deny.txt` are the same as for `names_allow.txt` (See "Syntax rules for `methods.txt`" on page 73.)

authorize.txt

The `authorize.txt` file is created when a user is added to the list of authorized users. (See "To create a list of authorized users" on page 95.)

File Location of authorize.txt

Platform	Path
UNIX	`/usr/openv/var/authorize.txt`

File Location of authorize.txt	
Windows	*install_path*\NetBackup\var\authorize.txt

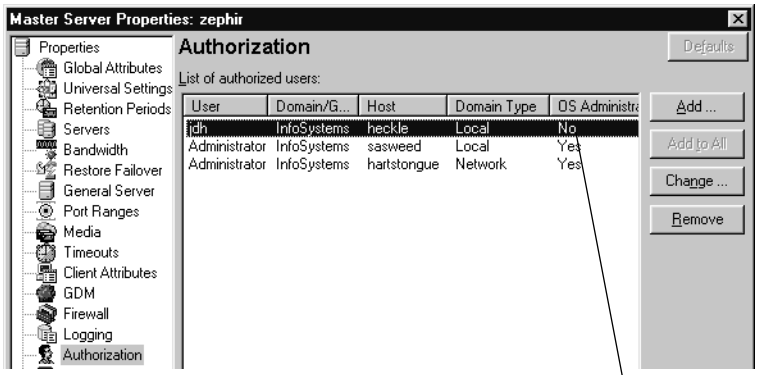
authorize.txt File Format

Use the following format for authorization entries in the `authorize.txt` file:

host_name:user_name:domain_group_name`[:local[:operator:][:userok]]]`

The figure below compares Authorization property tab entries with the corresponding `authorize.txt` file.

Comparing Authorization Property Tab Entries and authorize.txt Entries



If the NetBackup Administration Console is UNIX:

- *host_name* is the remote NetBackup Administration Console name, or * for all hosts.
- *user_name* is the UNIX user name, or * for all users.
- *domain_group_name* is a netgroup name or a local group name, or * for all groups. For information about netgroups refer to the `netgroup` man page.
- `local` (if specified) indicates that the *domain_group_name* is a local group name.
- `operator` is not in use for this release.
- `userok` (if specified) indicates that the user does not need to be an OS administrator.

Use * in the *user_name* and *host_name* fields to authorize all users and/or hosts. For comments, use a # symbol.

If the NetBackup Administration Console is Windows:

- *user_name* is the Windows Administrator name, or * for all users.
- *host_name* is the remote NetBackup Administration Console host name, or * for all hosts.
- *domain_group_name* is the Windows domain and group name in the form *domain\group*. Or, use * to indicate all domains/groups.
- `local` (if specified) indicates the group is not a domain group, but is local to the host specified by *host_name*.
- `operator` is not in use for this release.
- `userok` (if specified) indicates that the user does not need to be an OS administrator.

For comments, use a # symbol.

Example authorize.txt File Entries

```
# Authorize 'root' with a local group name
# of 'admin' on the UNIX server
root:dog:admin:local
#
# Authorize all NT Administrators that are
#members of NETBACKUP\Domain Admins
*:*:NETBACKUP\Domain Admins
```

Library Files

The library files that are required for authentication depend on the platform. (See "methods.txt" on page 72.)

Commands

The following commands are used to configure and manage authentication. For more information on these commands, see the *NetBackup Commands for Windows* guide.

bpauthorize

Use `bpauthorize` to manage the `authorize.txt` files on remote machines for enhanced authorization. Or, make changes in the NetBackup Administration Console of the master server. (See "To create a list of authorized users" on page 95.)

bpauthsync

Run `bpauthsync` on the master server to set up enhanced authentication for one or more clients and media servers. `bpauthsync` ensures that the hashed and unhashed files contain the correct information.

Location of bpauthsync and bpauthorize commands

Platform	Path
UNIX	`/usr/openv/netbackup/bin/admincmd/`
Windows	*`install_path`*`\NetBackup\bin\admincmd\`

vopie_util

Run `vopie_util` on NetBackup servers and clients to update the hashed (public) and unhashed (secret) key files for the vopie authentication method on the local system. Typically, `vopie_util` is used to synchronize the `vopie` key files between two systems.

Location of vopied_util command

Platform	Path
UNIX	`/usr/openv/bin/`
Windows	*`install_path`*`\NetBackup\bin\`

Processes

vopied Daemon

The `vopied` daemon manages the authentication of nonroot users on Windows and UNIX clients and servers. By default, NetBackup configures the system to automatically start `vopied` when the system is started.

To start `vopied` directly, run `vopied` from the following directory on the client or server:

Location of vopied Daemon

Platform	Path
UNIX	`/usr/openv/bin/vopied`

Location of vopied Daemon

Windows	*install_path*\NetBackup\bin\vopied

Files

vopie Files

The vopie processes use the following files during authentication.

hashed (public key) Files

The hashed files contain the authentication challenges that the local system presents to remote systems.

Location of hashed Files

Platform	Path
UNIX	/usr/openv/var/auth/vopie/hashed/*localhost*/*remotehost*.txt
Windows	*install_path*\NetBackup\var\auth\vopie\hashed\ *localhost**remotehost*.txt

- The *localhost* is the host name of the local system. There will be a local host directory for every possible local host name.
- The *remotehost* contains the hashed or public key for the remote system named *remotehost*.

There is a *remotehost*.txt file for each remote system that can be authenticated. Only root on the local system can read or write these files.

unhashed (secret key) Files

The unhashed files contains the secret key that NetBackup uses when it responds to challenges from remote systems.

Location of Unhashed Files

Platform	Path

Location of Unhashed Files	
UNIX	/usr/openv/var/auth/vopie/unhashed/*localhost*/*remotehost*.txt
Windows	*Install_path*\NetBackup\var\auth\vopie\unhashed*localhost**remotehost*.txt

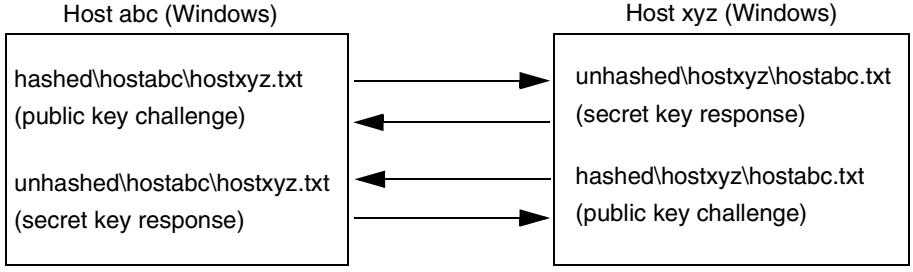
Where:

- *localhost* is the local system.
- *remotehost*.txt contains the responses for the remote system named *remotehost*.

There is a *remotehost*.txt file for each remote system that can request authentication. These files are created during installation and only root on the local system can read or write these files.

Caution Protect the unhashed files by allowing access only by the administrator on the local system. Also, do not NFS-mount them on UNIX or place them on a network drive on Windows.

The bpauthsync command synchronizes the information between the hashed files on one system with the unhashed files on another system. This enables the remote host to offer the correct response when it is challenged. The following figure illustrates this exchange between Windows systems.



temp File

On a Windows or UNIX system, the `vopie` daemon, `vopied`, creates a temporary file where it stores the challenges and responses required to authenticate nonroot users. This is necessary because nonroot users cannot access the files in the `hashed` and `unhashed` directories. The temporary files are valid for only one connection and are automatically deleted.

Location of Temporary Files

Platform	Path
UNIX	`/usr/openv/var/auth/vopie/temp/`*`username`*`/`*`tempname`*`.txt`
Windows	*`install_path`*`\NetBackup\var\auth\vopie\temp\`*`username`*`\` *`tempname`*`.txt`

Enhanced Authentication

The standard authentication that NetBackup uses is based on the network address of the connecting machine. NetBackup trusts that the connecting machine is who it says it is.

Enhanced authentication is additional authentication for NetBackup programs that communicate through sockets. It allows each side of a NetBackup connection to verify the host and user on the other side of the connection, taking place after a NetBackup connection has been established, but before any NetBackup transactions have taken place. For example, enhanced authentication could be enforced when a backup or restore operation is started from a client or during remote administration.

Enhanced authentication is performed through a series of challenges and responses that require the exchange of secret password information. Passwords are defined during installation and configuration so users do not have to enter passwords each time they start a backup, archive, or restore.

Note Enhanced authentication can be used without enhanced authorization.

There are two supported enhanced authentication methods:

- `vopie` – (VERITAS One-time Passwords In Everything)
  The `vopie` method authenticates user name, host names, and group/domain names.
- `noauth` authentication – ("No authorization" authorization)
  The `noauth` method exchanges user name, host names, and group/domain names, but makes no attempt to verify that the information is correct.

Using vopie Enhanced Authentication

`vopie` authenticates at two levels:

- At the host level: The hosts authenticate one another.
- At the user level: If the user attempting the connection is a nonroot user on UNIX or a non-administrator on Windows, the user is authenticated as well.

▼ To use the vopie enhanced authentication method

1. Install NetBackup on each system requiring authentication.

   The NetBackup installation process installs the necessary files and commands. The administrator then uses commands to set up the files so they contain the proper authentication information.

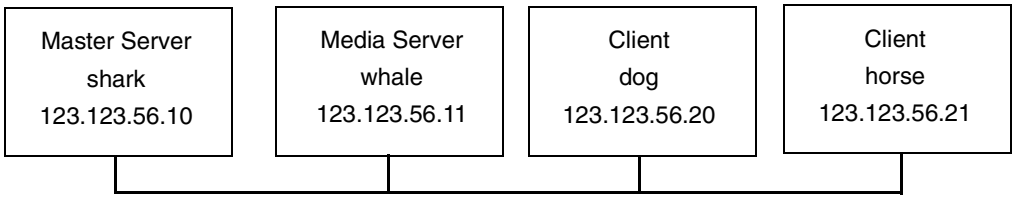
2. Configure NetBackup policies and add clients to the policies.

3. Run:
   install_path\NetBackup\bin\admincmd\bpauthsync on the master server. (See the following section to determine which options to use.)

   bpauthsync sets up authentication files on the NetBackup servers and clients. See the guide, *NetBackup Commands for Windows*, for information on all NetBackup commands.

vopie Enhanced Authentication Examples

The examples in this section are based on the following configuration:



vopie Example 1: Typical Configuration

Assume that you want to configure vopie authentication for all systems in the figure below. NetBackup server and client software has already been installed.

1. Configure NetBackup policies and add clients to the policies.

2. Run the following command on the master server (all on one line):

   install_path\NetBackup\bin\admincmd\bpauthsync -vopie -servers -clients

   This synchronizes the key files on all the systems.

3. On the master server, copy the methods_allow.txt to a temporary file. For example, C:\tmp\ma.txt.

4. To the temporary file, add an entry for each host that requires authentication:

   ```
   vopie : shark
   vopie : whale
   vopie : dog
   vopie : horse
   ```

5. Synchronize the methods_allow.txt files on the servers and the clients by running the following on the master server (all on one line):

```
install_path\NetBackup\bin\admincmd\bpauthsync -methods
-methods_allow C:\tmp\ma.txt -servers -clients
```

The information in `C:\tmp\ma.txt` is written in the `methods_allow.txt` files on the servers and clients.

vopie Example 2: Disable Authentication for a Client

To disable authentication for client horse in the previous figure:

1. Push an empty `methods_allow.txt` file to the client by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -methods_allow /dev/null -clients horse
   ```

   This disables authentication on the client.

2. On the master server, remove the entry for horse from the *install_path*`\NetBackup\var\auth\methods_allow.txt` file.

3. Synchronize the methods files on all servers by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -servers
   ```

   Authentication is no longer performed when communicating with client horse.

vopie Example 3: Adding a Client

Assume that all systems are configured for authentication, except for client horse.

To add authentication for client horse:

1. On the master server, copy the `methods_allow.txt` to a temporary file. For example, `C:\tmp\ma.txt`.

2. Add an entry for the new client to the temporary file:

   ```
   vopie : horse
   ```

3. Synchronize the methods files on the servers and the new client by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -vopie -methods
   -methods_allow C:\tmp\ma.txt -servers -clients horse
   ```


The information in `C:\tmp\ma.txt` is written in the `methods_allow.txt` files on the servers and the client.

vopie Example 4: Restoring Authentication After Client Disk Crash

Assume that horse was configured for authentication and the disk failed.

To restore authentication so all files can be recovered:

1. On the master server, copy the current `methods_allow.txt` file to another file. For example, copy it to:

   `C:\`*`install_path`*`\NetBackup\var\auth\methods_allow.txt.save`

2. Remove the entry for the failed client from `methods_allow.txt` on the master server.

3. Push the modified `methods_allow.txt` file to the other servers by running the following (all on one line):

   `install_path``\NetBackup\bin\admincmd\bpauthsync -methods -servers`

   This disables authentication for the failed client so the servers can communicate with it during recovery.

4. Reinstall the operating system (Windows or UNIX) and NetBackup on the failed client by following the instructions in the *Troubleshooting Guide for UNIX and Windows*. However, do not restore any NetBackup or user files at this time.

5. On the master server, run the following command to synchronize and push the original methods to the servers and the failed client. The command is on one line:

   `install_path``\NetBackup\bin\admincmd\bpauthsync -vopie -methods -servers -clients horse -methods_allow`

   `install_path``\NetBackup\var\auth\methods_allow.txt.save`

   The information in `methods_allow.txt.save` is written in the `methods_allow.txt` files on servers and the client. The original authentication methods are now restored.

Note Do not restore the files in the *`install_path`*`\NetBackup\var\auth` directory on the client or authentication will have to be resynchronized.

6. Complete the client recovery by restoring the original NetBackup and user files as explained in the *NetBackup Troubleshooting Guide for UNIX and Windows*.

vopie Example 5: Restoring Authentication on NetBackup Master Server

Assume that authentication was configured on all servers and clients and the disk fails on the master server shark.

If the NetBackup catalog backup was written to a storage unit on the master server shark:

1. On the master server, recover the disk as explained in *NetBackup Troubleshooting Guide for UNIX and Windows* and reinstall NetBackup.

2. Restore all files to the master server.

3. Synchronize all clients and servers by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -vopie -servers
   -clients
   ```

If the NetBackup catalog backup was written to a storage unit on whale, shark cannot recover the catalogs because the two servers cannot authenticate one another. In this instance, the following steps are required:

1. Install NetBackup on the master server (do not restore any files at this time).

2. Disable authentication between the master server and the media server where the catalog backup was written, by modifying their `methods_allow.txt` files:

   a. On the master server, remove the entry for the media server from the `methods_allow.txt` file (if an entry is present).

   b. On the media server, remove the entry for the master server from the `methods_allow.txt` file.

3. On the master server, run `bprecover` to restore the catalog files.

4. Restore all files to the master server, including those in the `\NetBackup\var\auth` directory.

5. On the media server, add back the entry for the master server from the `methods_allow.txt` file.

6. Synchronize all servers and clients by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -vopie -servers
   -clients
   ```

   The original configuration is now restored.

Using noauth Rather than vopie Authentication

The noauth method exchanges user name, host names, and group/domain names, but makes no attempt to verify that the information is correct.

The noauth method is easier to configure than the vopie method. Consider using the noauth method rather than the vopie method if full authentication is not necessary, yet you want to use the Enhanced Authorization feature described in "Enhanced Authorization" on page 92.

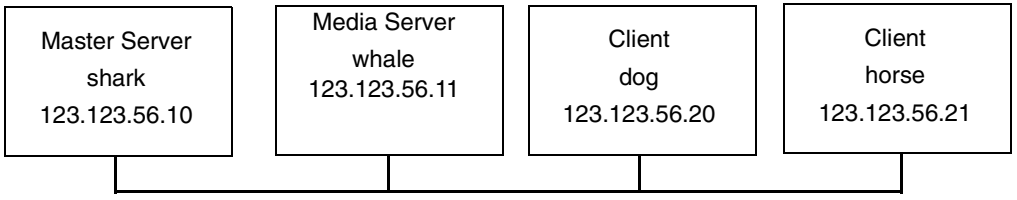
Configuring for the noauth method is similar to configuring for the vopie method with these exceptions:

- Do not run the bpauthsync command with the -vopie argument
- Use string noauth instead of vopie in the methods_allow.txt file

Note The noauth method is not supported for Sequent systems.

noauth Authentication Examples

The examples in this section are based on the following configuration:



noauth Example 1: Typical Configuration

Assume that this is an initial installation and you want to configure authentication for all systems. NetBackup server and client software has already been installed.

1. On the master server, copy the methods_allow.txt to a temporary file. For example, C:\tmp\ma.txt.

2. To the temporary file, add an entry for each host that requires noauth authentication:

```
noauth : shark
noauth : whale
noauth : dog
noauth : horse
```

3. Synchronize the `methods_allow.txt` files on the servers and the clients by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -methods_allow C:\tmp\ma.txt -servers -clients
   ```

   The information in `C:\tmp\ma.txt` is written to `methods_allow.txt` on the servers and clients.

noauth Example 2: Authentication for a Client

To disable authentication for client horse:

1. Push an empty `methods_allow.txt` file to the client by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -methods_allow /dev/null -clients horse
   ```

   This disables authentication on the client.

2. On the master server, remove the entry for horse from the *install_path*`\NetBackup\var\auth\methods_allow.txt` file.

3. Synchronize the methods files on all servers by running the following on the master server (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -servers
   ```

   Authentication is no longer performed when communicating with this client.

noauth Example 3: Adding a Client

Assume that all systems are configured for authentication, except for client horse.

To add authentication for client horse:

1. On the master server, copy the `methods_allow.txt` to a temporary file. For example, `C:\tmp\ma.txt`.

2. Add an entry for the new client to the temporary file:

   ```
   noauth : horse
   ```

3. Synchronize the `methods_allow.txt` files on the servers and the new client by running the following on the master server (all on one line):

```
install_path\NetBackup\bin\admincmd\bpauthsync -methods
-methods_allow.txt C:\tmp\ma.txt -servers -clients horse
```

The information in `C:\tmp\ma.txt` is written to `methods_allow.txt` files on the servers and the client.

noauth Example 4: Restoring Authentication after Client Disk Crash

Assume that client horse was configured for authentication and the disk failed.

To restore authentication so all files can be recovered:

1. On the master server, copy the current `methods_allow.txt` file to another file. For example, copy it to `C:\install_path\NetBackup\var\auth\methods_allow.txt.save`

2. Remove the entry for the failed client from `methods_allow.txt` on the master server.

3. Push the modified `methods_allow.txt` file to the other servers by running the following (all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -servers
   ```

   This disables authentication for the failed client so the servers can communicate with it during recovery.

4. Reinstall the operating system (Windows or UNIX) and NetBackup on the failed client by following the instructions in the *NetBackup Troubleshooting Guide for UNIX and Windows*. However, do not restore any NetBackup or user files at this time.

5. On the master server, run the following command to push the original methods to the servers and the failed client (the command is all on one line):

   ```
   install_path\NetBackup\bin\admincmd\bpauthsync -methods
   -servers -clients horse -methods_allow
   install_path\NetBackup\var\auth\methods_allow.txt.save
   ```

   The information in `methods_allow.txt.save` is written in `methods_allow.txt` on the servers and the client. The original authentication methods are restored.

6. Complete the client recovery by restoring the original NetBackup and user files as explained in the *NetBackup Troubleshooting Guide for UNIX and Windows*.

noauth Example 5: Restoring Authentication on NetBackup Master Server

Assume that authentication was configured on all servers and clients and the disk fails on master server shark.

If the NetBackup catalog backup was written to a storage unit on the master server shark:

1. On the master server, recover the disk as explained in the *NetBackup Troubleshooting Guide for UNIX and Windows* and reinstall NetBackup.

2. Restore all files to the master server.

3. Synchronize all clients and servers by running the following on the master server (all on one line):

   install_path\NetBackup\bin\admincmd\bpauthsync -servers -clients

If the NetBackup catalog backup was written to a storage unit on whale, shark cannot recover the catalogs because the two servers cannot authenticate one another. In this instance, the following steps are required:

1. Install NetBackup on the master server (do not restore any files at this time).

2. Disable authentication between the master server and the media server where the catalog backup was written, by modifying their `methods_allow.txt` files:

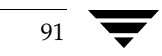
   a. On the master server, remove the entry for the media server from the `methods_allow.txt` file (if an entry is present).

   b. On the media server, remove the entry for the master server from the `methods_allow.txt` file.

3. On the master server, run `bprecover` to restore the catalog files.

4. Restore all files to the master server, including those in the *install_path*\NetBackup\var\auth directory.

5. On the media server, add back the entry for the master server from the `methods_allow.txt` file.



Troubleshooting Authentication

If you have problems with authentication, perform the following steps:

1. Look for status code 160 (authentication failed). If you see this status code, go to the *NetBackup Troubleshooting Guide for UNIX and Windows* for corrective actions.

2. Create debug log directories for the processes involved in communication between NetBackup systems. These include:
   - On the server, create debug log directories for `bprd`, `bpdbm`, `bpcd` and `vopied` (`/usr/openv/logs/vopied`)
   - On the client, create debug log directories for `bpcd`, `bpbackup`, `bprestore`, `bplist` and `vopied` (`/usr/openv/logs/vopied`)

3. Retry the operation and check the logs.

Enhanced Authorization

The standard authorization that NetBackup runs is based on listing the connecting server in the server list, and the user having `root` or administrator privileges.

Enhanced authorization provides a platform-independent mechanism for selected users (or groups of users) to administer a NetBackup server from a remote NetBackup Administration Console.

The user(s) can be given privileges to act as a NetBackup administrator, while not having system administrator or UNIX `root` privileges. Using enhanced authorization, a user can be given the following roles:

- NetBackup administrator on a NetBackup server with administration privileges
- Non-administrator with no administrative privileges

Note Enhanced authorization can only be used with enhanced authentication.

Enhanced Authorization Process

The following describes the flow for a request from a remote NetBackup Administration Console to a NetBackup master server.

Gaining Access to a Server

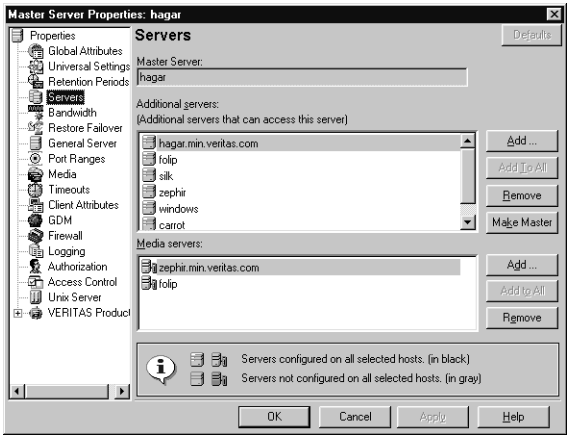
When an administrator on a remote NetBackup Administration Console makes a request to a NetBackup server, and enhanced authentication is enabled between the two systems, the *user_name*, *host_name*, *domain_group_name*, and `local` flag are passed from the requesting NetBackup Administration Console to the NetBackup master server accepting the request.

After passing authentication, the accepting NetBackup master server checks for the existence of the `authorize.txt` file and for an entry in the file that matches the information passed by requester.

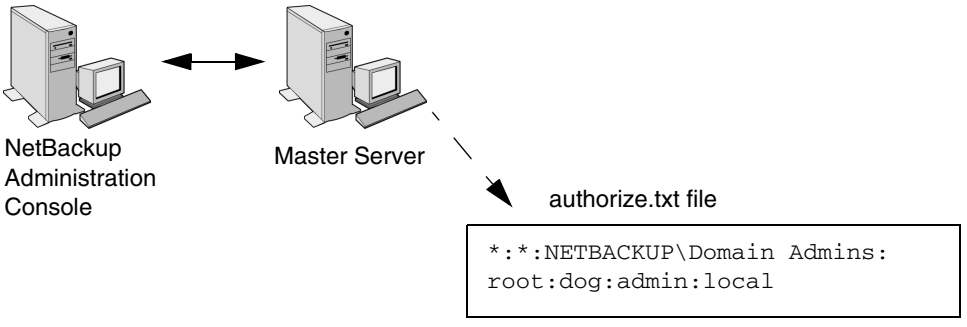
If a match exists, the request is authorized (allowed). If the request is not authorized, the request can proceed only if the NetBackup Administration Console making the request contains:

- On UNIX servers:
  `SERVER = server_name` entry in the `bp.conf` file of the accepting server. This is the host where the console runs.
- On Windows servers:
  The server must be among those listed under **Additional Servers** on the Servers properties tab.

  (See the *NetBackup System Administrator's Guide for Windows, Volume I*.)



If the server name is not in the server list, the request fails, indicating a `request from invalid server`. You also need an entry in the `vm.conf` file in order to use Media Manager applications (see the *Media Manager System Administrator's Guide*).

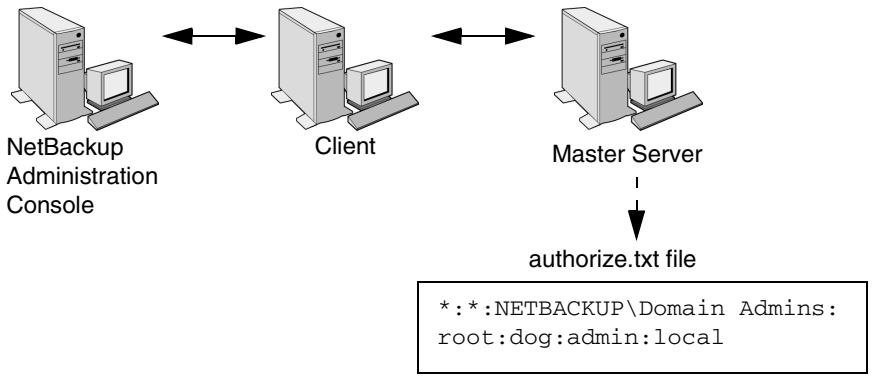


Gaining Access to a Client

Some requests, such as client configuration, are made directly to a client. These types of requests do not require an `authorize.txt` file on the client. The following describes the flow for a request from a remote NetBackup Administration Console to a NetBackup client.

When an administrator on a remote NetBackup Administration Console makes a request to a NetBackup client, and enhanced authentication is enabled between the two systems, the *`user_name`*, *`host_name`*, *`domain_group_name`*, and `local` flag are passed from the requesting NetBackup Administration Console to the NetBackup client accepting the request.

If the requesting host is not in the client's server list, the client requests authorization from its master server (the first server listed in the server list). The NetBackup Administration Console authorization information is passed to the master server. The master server checks for the existence of the `authorize.txt` file and for an entry in the file that matches the information passed. If a match exists, authorization is granted, otherwise authorization is denied.



Configuring NetBackup Enhanced Authorization

The process of configuring NetBackup enhanced authorization can be broken down into four steps:

1. Add NetBackup servers to one another's server lists. (See "Adding a NetBackup Server to a Server List" on page 439.)

2. Enable NetBackup authentication. (See "Enabling NetBackup Enhanced Authentication" on page 95.)

3. Add an authorized user (creating an `authorize.txt` file). (See "Adding an Authorized User" on page 95.)

4. Optionally, specify the preferred group. (See "Using the Administration Console to Specify Preferred Groups (Optional)" on page 96.)

Enabling NetBackup Enhanced Authentication

To use enhanced authorization, first enable NetBackup enhanced authentication between NetBackup Administration Consoles and the NetBackup servers to be administered. To perform administrative tasks on clients, such as client configuration, you must also enable NetBackup enhanced authentication between the clients and NetBackup Administration Consoles.

For more on authentication, see "Enhanced Authentication" on page 83 and "Media Manager Security" in the *Media Manager System Administrator's Guide*.

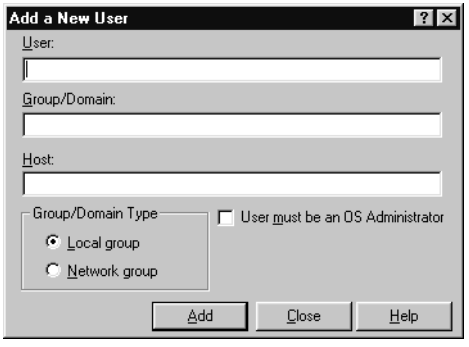
Adding an Authorized User

To enable enhanced authorization, create a list of authorized users.

▼ To create a list of authorized users

1. Expand **NetBackup Management** > **Host Properties** > **Master Server** (or **Media Servers**) > *Selected master or media server* > **Authorization**.

2. Click **Add**. The **Add a New User** dialog appears.



3. Type the user name that will have access to this server. To allow any user, type: *

4. Type the domain or group name to which the user belongs. To allow any domain group, type: *

5. Select whether the domain is local or on a network.

6. Type the host name that will be accessing the selected master or media server. To allow any host, type: *

7. Select to allow users onto the machine to administrate NetBackup who are not system administrators or logged on as UNIX `root`.

8. Click **OK**.

Upon the addition of the first user to the list of authorized users, the `authorize.txt` is created. After the creation of `authorize.txt`, the server requires authorization from any NetBackup Administration Console that attempts remote administration.

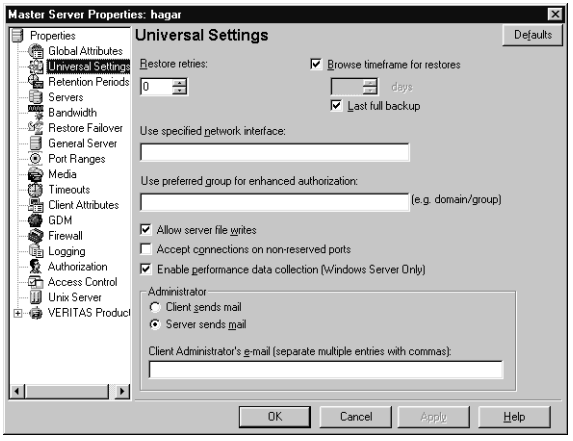
Using the Administration Console to Specify Preferred Groups (Optional)

You can specify a preferred group of administrative users in the NetBackup Administration Console. The preferred group entry is intended specifically for use with NetBackup enhanced authorization and determines the *`domain_group_name`* that is sent to the NetBackup server.

Some NetBackup processes also use the preferred group entry for Media Manager authorization. For more information on this subject, see "Media Manager Configuration File (vm.conf)" in the *NetBackup Media Manager System Administrator's Guide*.

▼ To specify a preferred group

1. Expand **NetBackup Management** > **Host Properties** > **Master Server** (or **Media Servers**) > *Selected master or media server* > **Universal Settings**.



Note To facilitate a platform-independent implementation, the string in the preferred group entry is case sensitive for both UNIX and Windows.

Adding a **Preferred Group** in the NetBackup Administration Console has the following effect on UNIX and Windows systems.

On UNIX

The `PREFERRED_GROUP` entry is added to the `bp.conf` file:

```
PREFERRED_GROUP = netgroup name
```

- If the `bp.conf` configuration file has a `PREFERRED_GROUP` entry, the `innetgr()` function is used to determine if the user is in the netgroup (for further details refer to the `innetgr` man page).

- If the PREFERRED_GROUP entry does not exist or the user is not a member of the netgroup, the local group name is obtained.

Note Netgroups are not supported for Sequent systems.

On Windows

The PREFERRED_GROUP NetBackup configuration is added to the KEY_LOCAL_MACHINE\SOFTWARE\VERITAS\NetBackup\CurrentVersion\Config registry key.

A check is made to determine if the user is a member of domain\group. This check is limited to NT global groups. In other words, if PREFERRED_GROUP is set to a domain local group, a match will not occur and the user's primary domain\group will be used.

If the PREFERRED_GROUP configuration option does not exist or the user is not a member of the domain\group, the user's primary domain\group is obtained. When the domain name is an empty string or is the name of the local machine, it is considered to be local.

2. Click **OK**.

Additional Configuration 3

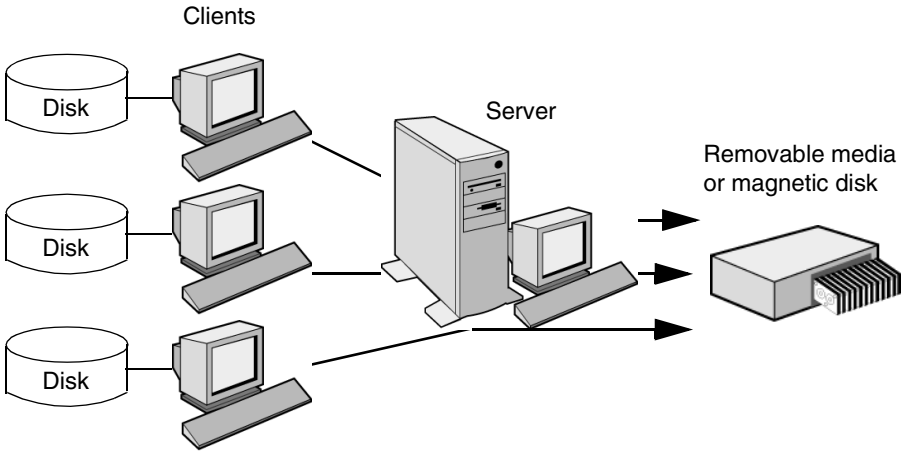
The previous chapters describe the setup that you must complete for all installations. This chapter explains settings that, in many instances, are optional either because the default is appropriate or a site does not use the feature.

The topics included here are:

Multiplexing

NetBackup multiplexing sends concurrent backups from one or several clients to a single storage device (see figure below). NetBackup multiplexes the backups sequentially onto the media. Multiplexed and unmultiplexed backups can reside on the same volume. It is not necessary to create separate volume pools or media IDs.

No special action is required to restore a multiplexed backup. NetBackup finds the media and restores the requested backup.



When to Use Multiplexing

Multiplexing is generally used to reduce the amount of time required to complete backups. The following are situations where multiplexing can improve backup performance.

- Slow clients. This includes instances where NetBackup is using software compression, which normally reduces client performance.
- Multiple slow networks. The parallel data streams take advantage of whatever network capacity is available.
- Many short backups (for example, incrementals). In addition to providing parallel data streams, multiplexing reduces the time each job spends waiting for a device to become available, and therefore better utilizes the transfer rate of storage devices.

Multiplexing reduces performance on restores because it uses extra time to read the images.

Note To reduce the impact of multiplexing on restore times, set maximum fragment size for the storage units to a value smaller than the largest allowed value.

How to Configure Multiplexing

Multiplexing must be set in two places in the NetBackup configuration:

- Storage unit
- Schedule

Note If you change these values, it does not take effect until the next time a schedule runs.

Maximum Multiplexing Per Drive for Storage Unit

The **Maximum Multiplexing Per Drive** setting for a storage unit specifies how many backups NetBackup can multiplex onto any single drive in the storage unit. You set this value for each storage unit. (See "Maximum Multiplexing per Drive" on page 52 in the *System Administrator's Guide, Volume I*.) The number can range from 1 through 32, where 1 is the default and specifies no multiplexing.

Choose a value based on the ability of your central processing unit to handle parallel jobs. Because extra buffers are required, memory is also important. If the server cannot perform other tasks or runs out of memory or processes, reduce the **Maximum Multiplexing Per Drive** setting for the storage unit. Consider the following when estimating the load that multiplexing can potentially put on your central processing unit:

- The maximum number of concurrent backup jobs that NetBackup is allowed to attempt is equal to the sum, for all storage units, of the concurrent backup jobs that can run on each storage unit.
- The maximum number of concurrent backup jobs that can run on a single storage unit is equal to the Maximum Multiplexing per drive, multiplied by the number of drives.

Media Multiplexing for a Schedule

In addition to the **Maximum Multiplexing Per Drive** setting for a storage unit, you specify a **Media Multiplexing** value for each schedule. This setting is discussed in the section "Media Multiplexing" on page 170 in the *System Administrator's Guide, Volume I.* This setting specifies the maximum number of backups from the schedule that you can multiplex onto any single drive in the configuration.

The Media multiplexing setting can range from 1 through 32, where 1 is the default and specifies no multiplexing. Regardless of the setting on a schedule, the maximum jobs that NetBackup starts never exceeds the storage unit's **Maximum Multiplexing Per Drive**. When adding jobs to drives, NetBackup attempts to add multiplex jobs to drives that are already using multiplexing. This leaves other drives available for non-multiplex jobs.

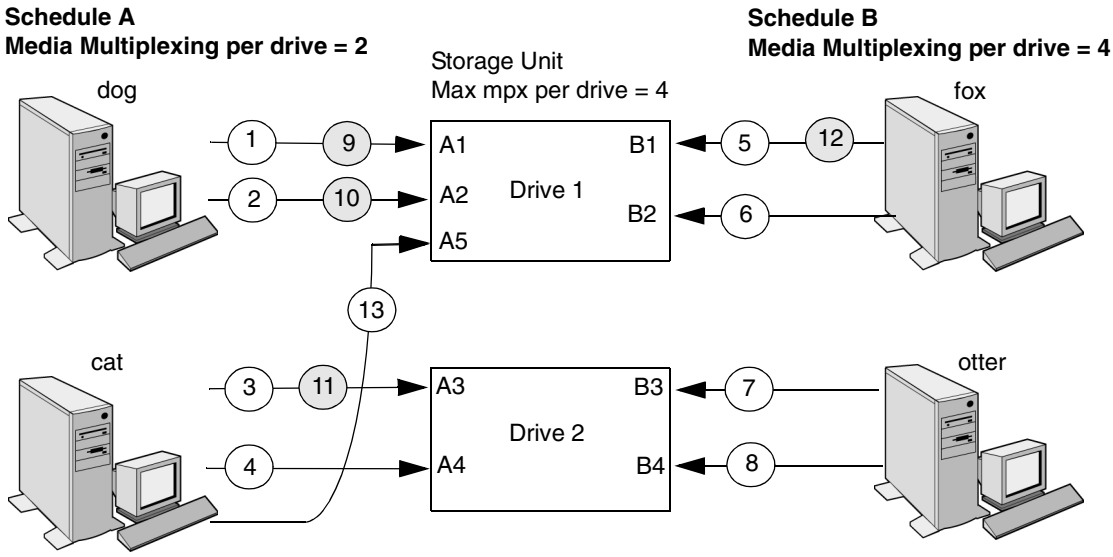
When NetBackup multiplexes jobs, it continues to add jobs to a drive until the number of jobs on the drive matches either of the following:

- This schedule's **Media Multiplexing** setting.

  If the limit is reached for a drive, NetBackup starts sending jobs to another drive. In the following figure, when the Schedule A limit is reached on Drive 1, NetBackup starts adding Schedule A jobs to Drive 2.

- The storage unit's **Maximum multiplexing per drive** setting. NetBackup can add jobs from more than one schedule to a drive.

  In the following figure, unshaded numbers denote job starting. Shaded numbers denote job completion. For example, ① denotes the start of job A1 on Drive 1. ⑨ denotes the completion of job A1 on Drive 1.



Assume schedule A begins first (note that the schedules can be in the same or different policies). Also, assume that Allow Multiple Data Streams is enabled, so a client can have multiple data streams.

(1) (2) Jobs A1 and A2 from client dog start on drive 1. Schedule A Media Multiplexing limit of 2 is reached for this drive.

(3) (4) Jobs A3 and A4 from client cat start on drive 2. Schedule A Media Multiplexing limit of 2 is reached for this drive.

(5) (6) Jobs B1 and B2 for client fox start on drive 1. Storage unit max mpx is reached for this drive.

(7) (8) Jobs B3 and B4 from client otter start on drive 2. All jobs are now running for schedule B. Storage Unit Max mpx is reached for drive 2.

(9) (10) Jobs A1 and A2 from client dog finish on drive 1. However, jobs B1 and B2 for client fox are still running, so Schedule A Media Multiplexing limit of 2 still prevents job A5 from starting on drive 1.

(11) (12) Job A3 from client cat finishes on drive 2 and job B1 from client fox finishes on drive 1. Job B2 is the only job currently running on drive 1.

(13) Job A5 from client cat starts on drive 1. This is the last job for schedule A. Schedule A Media Multiplexing limit of 2 prevents job A5 from starting on Drive 2. Therefore, job A5 starts on Drive 1. When adding jobs to drives, NetBackup attempts to add multiplex jobs to drives that are already using multiplexing. This leaves other drives available for non-multiplex jobs.

Note If the backup window closes before NetBackup can start all the jobs in a multiplexing set, NetBackup completes only the jobs that have actually started. For example, on the figure above, assume that the Activity Monitor shows A1 through A5 as queued and active. If only A1 and A2 start before the window closes, NetBackup does not perform the other jobs that are in the set. If the window closes before any jobs have started, then only the first queued and active job starts and completes. (A1 in this example.)

Other Configuration Settings to Consider Using Multiplexing

Limit Jobs per Policy

Set **Limit Jobs Per Policy** high enough to support the specified level of multiplexing. (See "Limit Jobs Per Policy" on page 88 in the *System Administrator's Guide, Volume I*.)

Maximum Jobs per Client

The **Maximum Jobs Per Client** global attribute limits the number of backup jobs that can run concurrently on any NetBackup client. Usually, its setting does not affect multiplexing. However, to illustrate its effect, consider a case where there are jobs from different schedules on the same client and all are going to the same storage unit. In this case, it is possible for the maximum number of jobs permitted on the client to be reached before the multiplexing limit is reached for the storage unit. If this occurs, it prevents NetBackup from fully utilizing the storage unit's multiplexing capabilities.

Maximum Jobs this Client

You can also set the maximum number of jobs that are allowed on a specific client without affecting other clients. (See "Maximum Data Streams" on page 334 in the *System Administrator's Guide, Volume I*.)

MPX Restore Delay

The NetBackup configuration option, **Delay On Multiplexed Restores**, applies to multiplexed restores. The option specifies how long (in seconds) the server waits for additional restore requests of files and (or) raw partitions that are in a set of multiplexed images on the same tape. The **Delay On Multiplexed Restores** option appears on the General Server properties dialog.

Demultiplexing

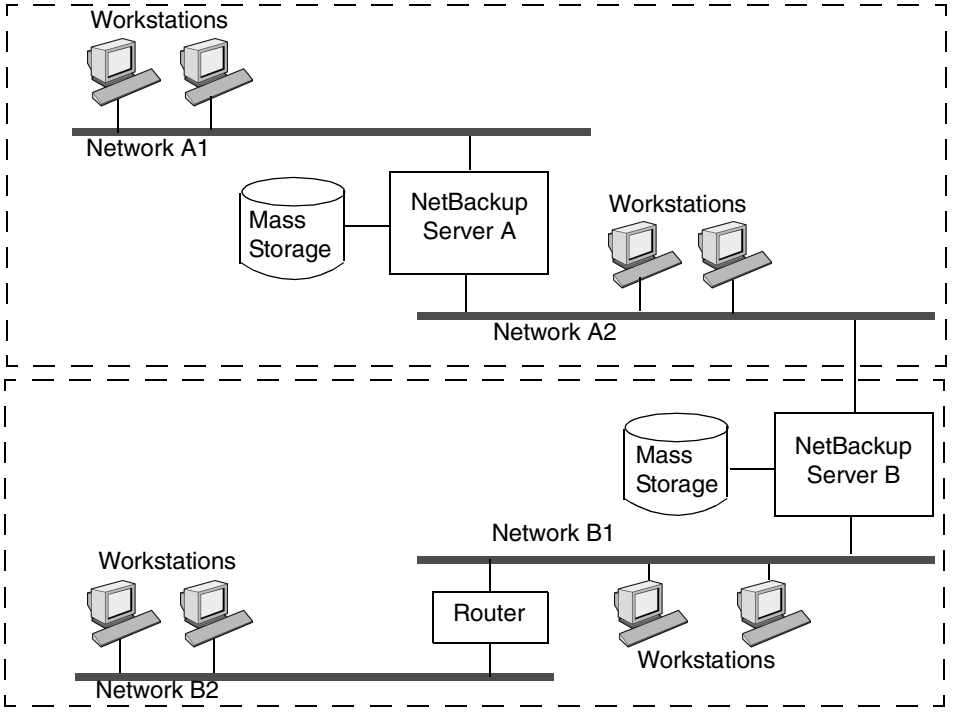
Demultiplexing speeds up future restores and is also useful for creating a copy for off-site storage. Use duplication to demultiplex a backup. Duplication lets you copy one multiplexed backup at a time form the source media to the target media. When duplication is complete, the target contains a single demultiplexed copy of each duplicated backup. (The target can also have other backups.) If desired, you can make the duplicate copy the primary copy. Do not select Preserve Multiplexing when duplicating the backups.

Note If you use the `bpduplicate` command instead of the NetBackup Administration Console, do not include the `-mpx` option on that command.

Using Multiple NetBackup Servers

A large site that has more than one master server can divide the clients between the servers as necessary to optimize the backup loads. The figure below shows a multiple-server configuration where the two sets of networks (A1/A2 and B1/B2) each

have enough clients to justify separate servers. 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.



Configuring a Master and Media Server Grouping

NetBackup lets you set up a group of NetBackup servers where one server is the master and the others are used only as media servers and have peripherals to provide additional storage. The master server controls all backup scheduling and the other media servers provide additional storage.

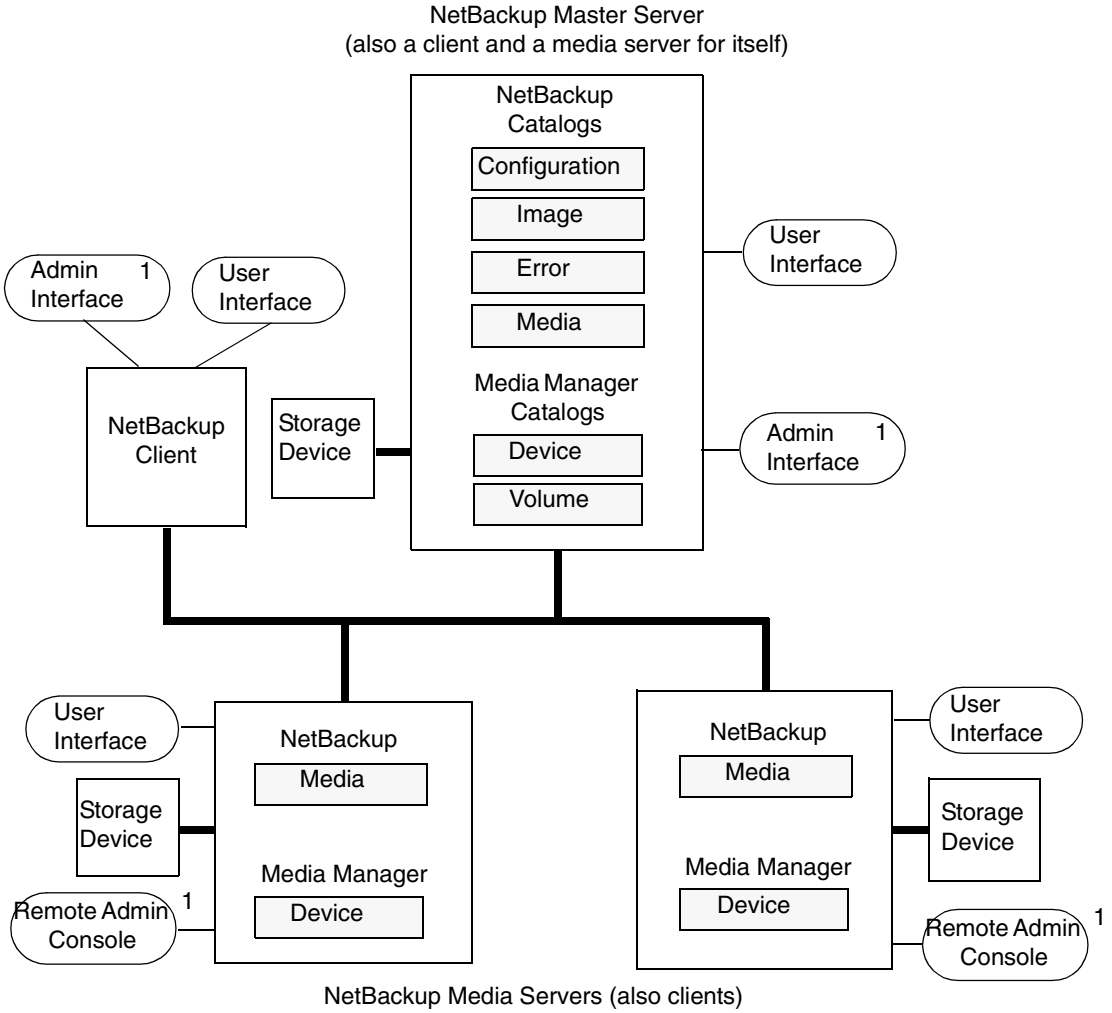
Grouping refers collectively to the master and its media servers. In a grouping of NetBackup servers, a client can have its backup directed to any device on any server in the grouping.

A common strategy is to install extra peripherals on clients that produce large amounts of data and make them media servers. The data from the client is then directed to the client's own peripherals. This reduces network traffic by allowing the data to be backed up without transferring it over the network. It also distributes the backup load between the master and the media servers.

Two important points to remember about master and media servers:

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

The following figure shows where software is installed and where the NetBackup catalogs are located. The following topics provide more details on master and media servers along with a procedure to configure them.



NOTES

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

Software on Each Server

Applies to NetBackup Enterprise Server only.

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

NetBackup Catalogs

Applies to NetBackup Enterprise Server only.

The master server has a complete set of NetBackup and Media Manager catalogs (the media and device catalogs contain information for only the master server). Additional media servers have only two catalogs:

- Media: Contains information on media used for backups on the drives attached to the media server.
- Device: Contains information on drives and robots configured on the media server.

Special Note on Configuring Volumes

To simplify administration, it is recommended that you use only one server as a volume database host and add all your volumes on that host. Multiple configurations make administration more complicated and it is not possible to merge the volume information later.

Note Regardless of which server is the volume database host, the one that has the drive always requests the media. If the media isn't available, the mount request shows up on the server with the drive.

NetBackup Services

Applies to NetBackup Enterprise Server only.

The NetBackup Database Manager service is not used on media servers.

▼ To add media servers

Applies to NetBackup Enterprise Server only.

1. Install the following software packages on the media server as explained in the vendor's documentation:
   - Any software required to drive the storage devices. This refers to software that the storage-device vendor provides.
   - NetBackup server software as explained in the *NetBackup Installation Guide for Windows*.
2. On a Windows media server, configure the drives and robots as explained in the *Media Manager System Administrator's Guide for Windows*.

Note Use only one server as a volume database host and add all your volumes on that host. Multiple volume database hosts complicate administration and it is not possible to merge the volume information later.

3. Add the volumes for each robot or nonrobotic drive configured in step 2.

   Always add the volumes on the server that you specified as the volume database host for the devices in step 2. See the *Media Manager System Administrator's Guide for Windows* for instructions on adding volumes.

Note Defining a separate volume pool for volumes used on the media server can simplify administration.

4. On the master server, make the following changes to the NetBackup configuration:
   a. Add the media server's storage units.

      Remember, when adding the storage units, always specify the media server as the media server for the storage unit.

   b. Add the catalog paths for the media server to the NetBackup catalog backup configuration. (See "Configuring Catalog Backups" on page 203 in the *System Administrator's Guide, Volume I*.)

      Paths on a Windows media server:

      media_server_name:*install_path*\NetBackup\db

      media_server_name:*install_path*\Volmgr\database

      Where *install_path* is the directory where the NetBackup software is installed on the media server.

   c. Configure the NetBackup policies and schedules that use the storage units you configured on the media server.

d. Add the media server to the server list on the master server.

Note The server list entries MUST be the same on all servers in a master and media server grouping. It is also recommended (but not mandatory) that all other configuration options (except the client name) match on all NetBackup servers. (See "Servers Properties" on page 403 in the *System Administrator's Guide, Volume I*.)

5. On each client, add a server list entry for the new media server. The location of the server list depends on the client:

   - On Windows clients (and NetWare NonTarget clients), start the Backup, Archive and Restore client interface. Click **File** > **Specify NetBackup Machines and Policy Type** and select the **Servers** tab.
   - On NetWare target clients, add a `SERVER` entry to the `bp.ini` file.

   For more information, see the NetBackup user guide for the client. You can also modify the server list by using the NetBackup Administration Console on the master server. (See "Servers Properties" on page 403 in the *System Administrator's Guide, Volume I*.)

Note Ensure that the host names match throughout your network's TCP/IP configuration or you will encounter problems with NetBackup.

6. On the master server, stop and then restart the NetBackup Request Manager and Database Manager services.

7. Test your configuration by performing a user backup or a manual backup that uses a schedule specifying a storage unit on the media server.

Dynamic Host Name and IP Addressing

By default, a NetBackup server assumes that a NetBackup client name is the same as the network host name of the client machine. This makes it difficult to back up clients that have network host names that might change; examples of this are portable machines that plug into a LAN and obtain IP addresses from a DHCP server or remote machines that dial into a PPP server. NetBackup dynamic host name and IP addressing allows you to define NetBackup clients that do not have fixed IP addresses and host names.

Note If you use dynamic addressing, remember that the NetBackup servers still require fixed IP addresses and host names.

Note All clients configured to use dynamic addressing and host names must trust each other in a way similar to that provided by the NetBackup altnames feature.

The following steps are required to support configurations that use dynamic IP addressing for NetBackup. Read all sections of this topic prior to making any changes to your configuration.

1. Configure your network to use a dynamic IP addressing protocol like DHCP.

   NetBackup requires that IP addresses of clients have a network host name. Be sure to define network host names for the range of dynamic IP addresses in the `hosts` file and (or) DNS on your network.

2. Determine the NetBackup client names for the machines that have dynamic IP addresses and network host names.

   You will use these NetBackup client names in step 3 and step 5 of this procedure. Each NetBackup client must have a unique NetBackup client name. The NetBackup client name assigned to a client is permanent—do not change it.

3. Make changes on the master server:

   a. Create NetBackup policies with client lists that include the names from step 2.

   b. Create entries in the NetBackup client database for the client names from step 2.

      Create the entries by using the `bpclient` command.

4. Make changes on each dynamic NetBackup Windows client:

   a. Start the user interface on the client and select **File** > **NetBackup Client Properties**. The NetBackup Client Properties dialog appears. Select the **General** tab. Change the **Client Name** to the correct NetBackup client name for the machine.

   b. In the registry, modify the NetBackup configuration option, `Announce_DHCP_Interval`, so it contains a value other than 0. This option is in the following registry key on the client:

      ```
      HKEY_LOCAL_MACHINE\SOFTWARE\VERITAS\NetBackup\CurrentVersion
      \Config
      ```

5. Make changes on each dynamic NetBackup UNIX client:

a. Modify the `bp.conf` file to include a `CLIENT_NAME` entry with the correct NetBackup client name for the machine.

b. Configure the system to notify the master server of the machine's NetBackup client name and current network host name during startup. The `bpdynamicclient` command is used to notify the master server.

c. Configure the system to periodically notify the master server of the machine's NetBackup client name and current network host name.

Setting up Dynamic IP Addresses and Host Names

Configure your network to use a dynamic IP addressing protocol. A protocol like DHCP will have 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 could be assigned to NetBackup clients has a network host name defined in the `host` file, NIS, and (or) DNS on your network.

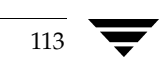
As an example, suppose that you have 10 dynamic IP addresses and host names available. The dynamic IP addresses and host names might be:

```
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 assigned to a client is permanent and should not be changed. The client name assigned to NetBackup clients with dynamic IP addressing must not be the same as any network host names on your network. If the NetBackup client names are changed or are not unique, backup and restore results are unpredictable.

For example, suppose you have 20 machines that will share the IP addresses defined above. If you want these machines to be NetBackup clients, you might assign them these NetBackup client names as follows:

```
nbclient01
nbclient02
```

```
nbclient03
nbclient04
.
.
.
nbclient20
```

Configuring the NetBackup Master Server

On the master server, create your NetBackup backup policies as you would otherwise. For client name lists, use the NetBackup client names (for example, nbclient01) rather than the dynamic network host names (for example, `dynamic01`).

Next, create the client database on the master server. The client database consists of directories and files in the following directory:

install_path\NetBackup\db\client

You can create, update, list, and delete client entries with the `bpclient` command. The `bpclient` command is in the following directory:

install_path\NetBackup\bin\admincmd

- To create a dynamic client entry:

  `bpclient.exe -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. You can create entries with `-dynamic_address 0` for static IP addressing, but that is unnecessary and will adversely affect performance.

- To delete a client entry:

  `bpclient.exe -delete -client` *client_name*

- To list a client entry:

  `bpclient.exe -L -client` *client_name*

- To list all client entries:

  `bpclient.exe -L -All`

In our example, you can enter these commands to create the 20 clients:

```
cd install_path\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
```

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

```
install_path\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
```

After the NetBackup client notifies the NetBackup server of its NetBackup client name and network host name, the Current Host, Hostname, and IP Address fields will display the values for that NetBackup client.

Configuring a Dynamic Microsoft Windows Client

If it is not already installed, install NetBackup on the Windows client.

Start the Backup, Archive, and Restore user interface on the client and select **File** > **NetBackup Client Properties**. The NetBackup Client Properties dialog appears. Select the **General** tab. Change the **Client Name** to specify the NetBackup client name for the Windows client.

In the NetBackup Administration Console, set **Announce DHCP Interval** to specify how many minutes the client waits before announcing that it is using a different IP address. (See "Announce DHCP Interval" on page 390 in the *System 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.

On the client, stop and restart the NetBackup Client service to have the changes take effect.

Configuring a Dynamic UNIX NetBackup Client

If not already installed, install the NetBackup client software.

Edit the `/usr/openv/netbackup/bp.conf` file. Use the `CLIENT_NAME` entry to specify the NetBackup client name for the machine, as follows:

```
CLIENT_NAME = nbclient00
```

You must run the `bpdynamicclient` command once when the system first starts up. `bpdynamicclient` notifies the NetBackup server of the machine'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`* does exist, `bpdynamicclient` determines if the host name written in the file is the same as the current network host name of the machine. 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, on a Solaris system, you can create a script in the `/etc/rc2.d` directory:

```
# 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 machine obtains its IP address.

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

If you are using DHCP, a good interval to use between calls to `bpdynamicclient` is one-half of the lease period.

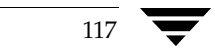
Bandwidth Limiting

Bandwidth limiting allows you to restrict the amount of network bandwidth consumed by one or more NetBackup clients on a network. The actual limiting occurs on the client side of the backup connection.

Bandwidth limiting only restricts bandwidth during backups. Restores are unaffected.

Read This First

- NetBackup does not currently support bandwidth limiting on NetBackup for Microsoft SQL-Server clients
- Bandwidth limiting has no effect on a local backup (where the server is also a client and data does not go over the network).
- Bandwidth limiting restricts maximum network usage and does not imply required bandwidth. For example, if you set the bandwidth limit for a client to 500 kilobytes per second, the client can use up to that limit. It does not mean, however, that the client requires 500 kilobytes per second.
- You cannot use bandwidth limiting to load-balance active backups by having NetBackup pick the most-available network segment. NetBackup does not pick the next client to run based on any configured bandwidth limits.



How Bandwidth Limiting Works

When a backup starts, NetBackup reads the bandwidth limit configuration and then determines the appropriate bandwidth value and passes it to the client. NetBackup computes the bandwidth limit based on the current set of active backups on the subnet (if any) and the new backup that is starting. Backups that start later are not considered. NetBackup also does not include local backups in its calculations.

The NetBackup client software enforces the bandwidth limit. Prior to each write of a buffer to the network, client software calculates the current value for kilobytes per second and adjusts its transfer rate if necessary.

As the number of active backups increase or decrease on a subnet, NetBackup dynamically adjusts the bandwidth limiting on that subnet. If additional backups are started, the NetBackup server instructs the other NetBackup clients running on that subnet to decrease their bandwidth setting. Similarly, bandwidth per client is increased if the number of clients decreases. Changes to the bandwidth value occur on a periodic basis rather than as backups stop and start. This can reduce the number of bandwidth value changes that are required.

Configuration

Configure bandwidth settings in **NetBackup Management** > **Host Properties** > **Master Servers** > **Bandwidth**. (See "Bandwidth Properties" on page 328 in the *System Administrator's Guide, Volume I*.)

Or, add one or more `LIMIT_BANDWIDTH` entries to the registry on the master server or the host property settings. These entries let you designate bandwidth values and the IP addresses of the clients and networks to which they apply.

Rules for IP Address Ranges

The IP address ranges can specify individual clients or entire subnets. The following are some specific rules on addresses:

- An IP address can have any one of the following forms:
  - `a.b.c.d`

    Where `a`, `b`, `c`, and `d` are integers in the range 0-255.
  - `128.net.host`

    Policy B address (16-bit host).
  - `net.host`

    Policy A address (24-bit host).

- a

  A 32-bit integer, representing the full IP address in network byte order (that is, big endian, the most significant byte is first on the wire).

- You can enter IP addresses as decimal, octal or hexadecimal numbers. Numbers beginning with 0 are assumed to be octal, numbers beginning with 0x are hexadecimal and all others are assumed to be decimal.
- Neither the net nor the host part of an IP address can be zero.
- Only ordinary IP addresses are accepted (policy A, B & C, no multicast or reserved addresses).
- Do not create multiple entries that specify the same range of IP addresses. If you do, NetBackup uses the last one it finds. In the following example, NetBackup uses the second entry.

  ```
  LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 500
  LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 200
  ```

  This rule also applies to multiple entries that specify an exact client address:

  ```
  LIMIT_BANDWIDTH = 111.222.333.111 111.222.333.111 200
  LIMIT_BANDWIDTH = 111.222.333.111 111.222.333.111 100
  ```

- Do not specify IP address ranges that overlap one another. Consider the following:

  ```
  LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 500
  LIMIT_BANDWIDTH = 111.222.333.5 111.222.333.255 500
  ```

  The ranges overlap, and bandwidth limiting results are unpredictable.

- You can specify a range of addresses in one entry and an address for a specific client in other entries.

  If a client is covered by an entry that specifies its exact IP address and by another entry that specifies a range of IP addresses, NetBackup uses the bandwidth value in the entry with the exact IP address.

  The following sets the bandwidth for a range of IP addresses:

  ```
  LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 500
  ```

  The following sets the bandwidth for a specific address that is within the above range.

  ```
  LIMIT_BANDWIDTH = 111.222.333.111 111.222.333.111 200
  ```

  In this case, NetBackup uses the specific entry (bandwidth of 200) for the client whose address is 111.222.333.111. You can also use this capability to exclude specific clients from bandwidth limiting (see Example 3 below). The order in which the range and specific address entries appear in the registry is not significant.

Rules for Setting Bandwidth Values

When setting bandwidth values for individual clients, you must set it to either:

- 0 (no bandwidth limiting), or
- Less than or equal to any value set for the IP address range containing the IP address for the client.

  For example, the following is valid:

```
LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 500
LIMIT_BANDWIDTH = 111.222.333.111 111.222.333.111 300
```

If you set the bandwidth higher for an individual client than it is for the range, NetBackup ignores that setting and uses the value for the range. In this case, the client gets its share of the bandwidth specified for the network.

If the bandwidth limit for an individual client is equal to or lower than the value for the range, the client uses one of the following, whichever is lower:

- Its share of the network bandwidth value
- Its individual bandwidth value

The bandwidth value that NetBackup uses for a client will always be at least one kilobyte per second.

Examples

Example 1

Configure a bandwidth limit of 500 kilobytes per second for all machines on the subnet 111.222.333 as follows:

```
LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 500
```

Example 2

Configure a bandwidth limit of 700 kilobytes per second for a particular client (111.222.333.111) as follows:

```
LIMIT_BANDWIDTH = 111.222.333.111 111.222.333.111 700
```

Example 3

To disable bandwidth limiting for a client in a subnet that has a bandwidth limit, specify 0 for the kilobytes per second:

```
LIMIT_BANDWIDTH = 111.222.333.1 111.222.333.255 500
LIMIT_BANDWIDTH = 111.222.333.111 111.222.333.111 0
```

In this case, no limiting occurs for the client with IP address 111.222.333.111

Configuring E-mail Notifications

You can configure NetBackup to send e-mail notifications to users and administrators with the results of backup, archive, and restore operations.

Notify server administrators when a scheduled backup, administrator-directed manual backup, or a backup of the NetBackup databases occurs.

Configure NetBackup to E-mail these notifications by specifying the server administrator's address with the NetBackup master server Global Attribute property, **Administrator's E-mail Address**. (See the *NetBackup System Administrator's Guide for Windows, Volume I*.)

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.

To Specify the Locale of a NetBackup Installation

Platform	Directions
Windows	To access the regional settings, double-click **Regional Settings** in the Windows Control Panel. This provides access to the predefined Number and Date/Time formats. See the Microsoft Help pages for further assistance.

UNIX	The `/usr/openv/msg/.conf` file contains information on the supported locales. This file defines the date and time formats for each supported locale.
	The `.conf` file contains very specific instructions on how to add or modify the list of supported locales and formats. However, the format of the file is summarized here.
	The `.conf` file is 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 fifth fields define the date and time fields and associated separators for that supported locale is as follows:
	You can modify the existing formats to change the default output. For example, the `TL` line for the C locale is:
	`TL 1 C :hh:mn:ss/mm/dd/yyyy`
	An alternate specification to the order of months, days, and years could be as follows:
	`TL 1 C :hh:mn:ss -yyyy-mm-dd`
	or:
	`TL 1 C :hh:mn:ss/dd/mm/yy`
	You can 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.

To Specify the Locale of a NetBackup Installation (continued)

Platform	Directions

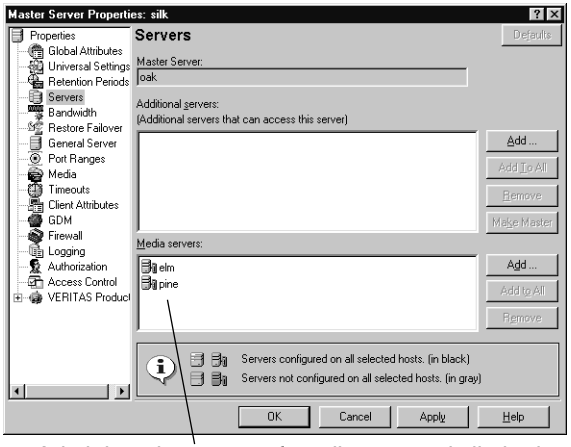
	TM Lines
	The `TM` lines define a mapping from unrecognized locales to those supported by NetBackup, as defined by the `TL` lines.
	The third field of the `TM` lines defines the unrecognized locale and the fifth field defines the supported equivalent identified in the `TL` lines.
	For example, use the 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, there are no default `TM` lines as the default locale will be `C` (`ov`).

Restricting Administrative Privileges of Media Servers

In the **Servers** host properties, the servers included in the **Media Servers** list are media servers only. (**Host Properties** > **Master Server** *or* **Media Servers** > **Servers**.)

Machines listed as media servers can back up and restore clients, but have limited administrative privileges.

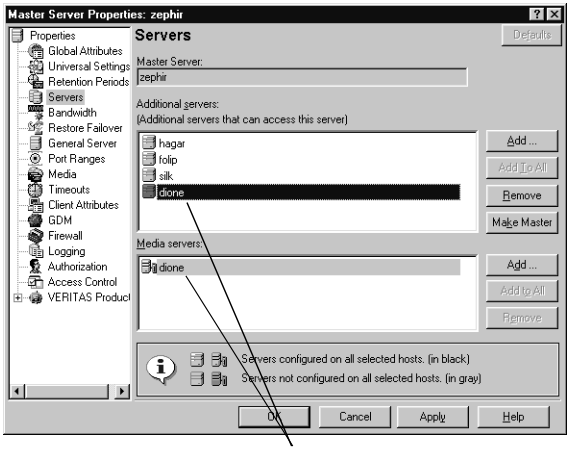
Suppose you have a configuration consisting of master server oak and two media servers—elm and pine. Set up oak as the master server and elm and pine as media servers.



Administrative scope of media servers is limited

If a machine is defined as *both* a master server and a media server, the master server entry takes precedence.

A consequence of listing a server as both a master and media server is that a system administrator on a media server would also be a NetBackup administrator on other master servers.



A machine listed as both an additional server and a media server has full administrative privileges

Reference Topics 4

The topics in this appendix provide additional information about various aspects of NetBackup configuration and management.

Rules for Using Host Names in NetBackup

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 "Dynamic Host Name and IP Addressing" on page 111.)

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()`. For this to work reliably, 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 Sometimes placing the system host name and IP address in the `%Systemroot%\system32\drivers\etc\hosts` file accelerates name lookups.

Qualifying Host Names

A major consideration when configuring host names is the extent to which you qualify them. In many cases, using the short host name of a computer is adequate. If the network environment is or will eventually be multi-domain, 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 just `mercury`.

How NetBackup Uses Host Names

The following discussions explain where NetBackup stores host names and how it uses them. These discussions also mention factors to consider when choosing host names.

Note Do not change the host name of a NetBackup server. This practice is not recommended because it can be necessary to import all previously used media to the server before you can use it under the new host name.

Policy Configuration

The host name that you specify for a client when adding it to a policy is called the *configured name* of the client, and is the client's host name as it appears in the NetBackup configuration.

The server uses the client's configured name to connect to the client and start the processes that satisfy client requests. When adding clients to a policy always use host names that are qualified to the extent 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 peername of the client (identified from its TCP connection) to determine the client's configured name.

If you add a client to more than one policy, always use the same configured name in all cases. Otherwise, the client cannot view all files backed up on its behalf and file restores are complicated because both user and administrator action is required to restore from some of the backups.

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 entries in the error catalog for generating reports. These entries contain the host name of the server generating the entry and the client's configured name, if applicable. The server host name is normally the server's short host name. (For example, shark instead of shark.null.com.)

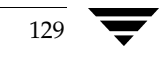
Scheduler

The NetBackup scheduler uses the media server host name associated with the storage units to start a process on the server. When you specify this host name, always qualify it to the extent necessary for the master server to make a connection to the server that has the storage units. Normally, a short host name is adequate. (For example, shark instead of shark.null.com.)

Catalog Backup Information

Applies to NetBackup Enterprise Server only.

If you configure media servers and include catalog files from the media server in your NetBackup catalog backups, qualify the host name portion of the media server's catalog file path to the extent necessary to allow the master server to make a connection to the media server.



How to Update NetBackup After Host Name Changes

Note Do not change the host name of a NetBackup server. This practice is not recommended because it can be necessary to import all previously used media to the server before you can use it under the new host name.

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

1. On the master server:
   - Delete the client's old name from all policies in which it exists and add the client's new name to those policies. You do not have to reinstall NetBackup software on the client. The client also still has access to all previous backups.
   - 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
     ```

2. On the client:
   - On PC clients, you can change the client name setting either through the user interface or in a configuration file. (See the client *User's Guide*.)
   - On UNIX clients, change the `CLIENT_NAME` value in the `bp.conf` file to the new name.

Note If users on UNIX clients have a `bp.conf` file in their `$HOME` directory, they 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. If this (possibly unqualified) name is unknown to the Domain Name Service (DNS) on the master server, it is possible that the master server cannot reply to client requests.

Whether this situation exists, depends on how the client and the server are configured. If `gethostname` on the client returns host names that are not qualified to the extent that DNS on the master server can resolve them, you will encounter problems.

A possible solution is to reconfigure the client or the master server DNS hosts file. However, because this is not always desirable, NetBackup allows you to create a special file in the altnames directory on the master server in order to force the desired translation of NetBackup client host names.

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

`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, indicating a configured name translation.
- *hostname_from_client* is the value to translate. This must correspond to the name obtained by the client's `gethostname` and be sent to the server in the request.
- *client_as_known_by_server* is the name to substitute for *hostname_from_client* when responding to requests. This name must be the name configured in the NetBackup configuration on the master server and must also be known to the master server's network services.

For example, the line

```
0 danr danr.eng.aaa.com
```

specifies that when the master server receives a request for a configured client name (numeric key 0), the name *danr* is always replaced by the name `danr.eng.aaa.com`. This resolves the problem mentioned above, assuming that:

- The client's `gethostname` returned `danr`.
- The master server's network services `gethostbyname` library function did not recognize the name *danr*.
- The client was configured and named in the NetBackup configuration as `danr.eng.aaa.com` and this name is also known to network services on the master server.

Factors Affecting Backup Time

The time NetBackup requires to complete a backup is an important factor in scheduling. This is particularly true for sites that deal with large amounts of data. For example, the total backup time can exceed the time allotted to complete backups and interfere with normal network operations. Longer backup times also increase the possibility of a problem disrupting the backup. The time to back up files can also give you an indication of how long it takes to recover them.

The following formula shows the major factors that affect backup time:

$$\text{Backup Time} = \frac{\text{Total data}}{\text{Transfer rate}} \times \text{Compression Factor} + \text{Device Delays (optional)}$$

Total Data

The amount of data you must back up depends on the size of the files for each client in the policy you are backing up. It also depends on whether it is a full or incremental backup.

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

With both differential and cumulative incremental backups, the amount of data in the backups depends on the frequency with which files change. If a large number of files change frequently, incremental backups are larger.

Transfer Rate

Transfer rate depends on factors such as the following:

- Speed of the backup device. For example, sending backups to a tape having a maximum transfer rate of 800 kilobytes per second normally takes less time than to a tape that transfers at only 400 kilobytes per second (assuming other factors allow taking advantage of 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. This varies with the hardware platform and depends on the other applications running on the platform. File size is also an important factor. Clients can process larger files faster than smaller ones. You can back up 20 files that are 1 megabyte in size faster than 20,000 files that are 1 kilobyte in size.
- 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 running on the platform. The number of concurrent backups being performed also affects server speed.

- Network configuration can affect performance. For example, in an Ethernet environment, having some machines running full-duplex and some running half-duplex will significantly reduce throughput.

See "Determining NetBackup Transfer Rate" on page 133 for methods to compute the transfer rate for your clients.

Device Delays

Device delays are due to factors such as the device being busy, loading the media, and finding the place on the media at which to start writing the backup. These delays depend on the devices and computing environments and can vary widely.

Determining NetBackup Transfer Rate

You can calculate three different variations of the backup transfer rate by using the data provided in NetBackup reports. The three rates and the methods for calculating them are:

- Network Transfer Rate
- Network Transfer Plus End-of-Backup-Processing Rate
- Total Transfer Rate

You can also use the Microsoft Windows System Monitor (Performance Monitor on Windows NT) to display the NetBackup transfer rate. (See "Using the Performance Monitor" on page 135.)

Network Transfer Rate

The network transfer rate considers only the time required to transfer data over the network from client to server. This rate ignores the following:

- Time to load and position media before a backup.
- Time to gracefully close the tape file and write an additional NetBackup information record to the tape.

The network transfer rate is the rate provided in the All Log Entries report.

Network Transfer Plus End-of-Backup-Processing Rate

This rate ignores the time it takes to load and position media before a backup, but includes 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
```

to the message

```
successfully wrote backup id xxx
```

Then, divide this time (in seconds) into the total bytes transferred (as recorded in the All Log Entries report) to calculate the transfer rate.

Total Transfer Rate

This transfer rate includes the time for loading and positioning the media as well as the end-of-backup processing. Using the List Client Backups report, calculate the transfer rate by dividing Kilobytes by Elapsed Time (converted to seconds).

Examples

Assume that the reports provide the following data.

All Log Entries Report

```
TIME                SERVER/CLIENT   TEXT
04/28/03 23:10:37 windows giskard begin writing backup
                  id giskard_0767592458, fragment 1 to
                  media id TL8033 on device 1 . . .
04/29/03 00:35:07 windows giskard successfully wrote
                  backup id giskard_0767592458,
                  fragment 1, 1161824 Kbytes at
                  230.325 Kbytes/sec
```

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:                04/28/03 23:07:38
Elapsed Time:               001:27:32
Expiration Time:            05/05/03 23:07:38
Compressed:                 no
Kilobytes:                  1161824
Number of Files:            78210
```

The following three rates were compiled using the backup data from the example reports above:

Network transfer rate:

1161824 Kbytes at 230.325 Kbytes per second

Network transfer plus end-of-backup processing rate:

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

1161824 Kbytes/5070 = 229.157 Kbytes per second

Total transfer rate:

Elapsed time = 01:27:32 = 5252 seconds

1161824 Kbytes/5252 = 221.216 Kbytes per second

Using the Performance Monitor

NetBackup adds the NetBackup Disk/Tape performance object to the list of objects monitored by the Windows System Monitor (Performance Monitor on Windows NT). Four counters are available for the NetBackup Disk/Tape performance object:

- Disk/Tape Read Bytes (GB)
- Disk/Tape Read Bytes/sec (KB)
- Disk/Tape Write Bytes (GB)
- Disk/Tape Write Bytes/sec (KB)

The NetBackup performance object supports *instances* in the System Monitor. The instances can be drive names, in the case of tape drives, or absolute paths in the case of disks, to which NetBackup is writing, or from which NetBackup is reading.

The System Monitor displays object instances when NetBackup begins to read or write from the disk or tape. The read or write counters are updated depending on the type of NetBackup operation performed. The object instance is removed from the list once the NetBackup operation is completed.

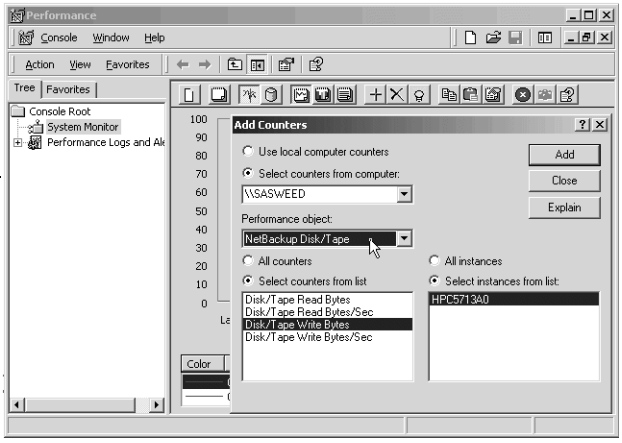
If the performance monitoring is done either locally or remotely during a NetBackup read or write operation, the object instance continues to exist after NetBackup operation is completed. In this case, the object instance is removed when performance monitoring is stopped.

When remotely monitoring NetBackup counters, the initiating computer attaches to the target computer's WinLogon process through RPC, thereby locking the object instances. Thus, the object instances remain until the system is rebooted.

▼ To use the System Monitor with NetBackup

1. Open the System (or Performance) Monitor on your Windows system. The Performance dialog appears.

2. Click the plus sign (+) to add a counter to the display. Select **NetBackup Disk/Tape** from the **Performance objects** drop-down list.



Note In order for the NetBackup objects to be available for selection, the following conditions must be met:
- The drive must be connected to a Windows media server (or SAN media server).
- A NetBackup job must be active (a drive is in use).
- The user must have permissions to read the Windows registry.
- Performance data collection is enabled (select **Host Properties** > **Media Servers** > **Universal Settings**).

3. Select the counter to display from the list of available counters. Available counters are:
   - Disk/Tape Read Bytes (GB)
   - Disk/Tape Read Bytes/sec (KB)
   - Disk/Tape Write Bytes (GB)
   - Disk/Tape Write Bytes/sec (KB)

4. Select one or more object instances from the list of instances. Instances are displayed when NetBackup begins to read or write from the disk or tape drives.

5. Click **Add**.

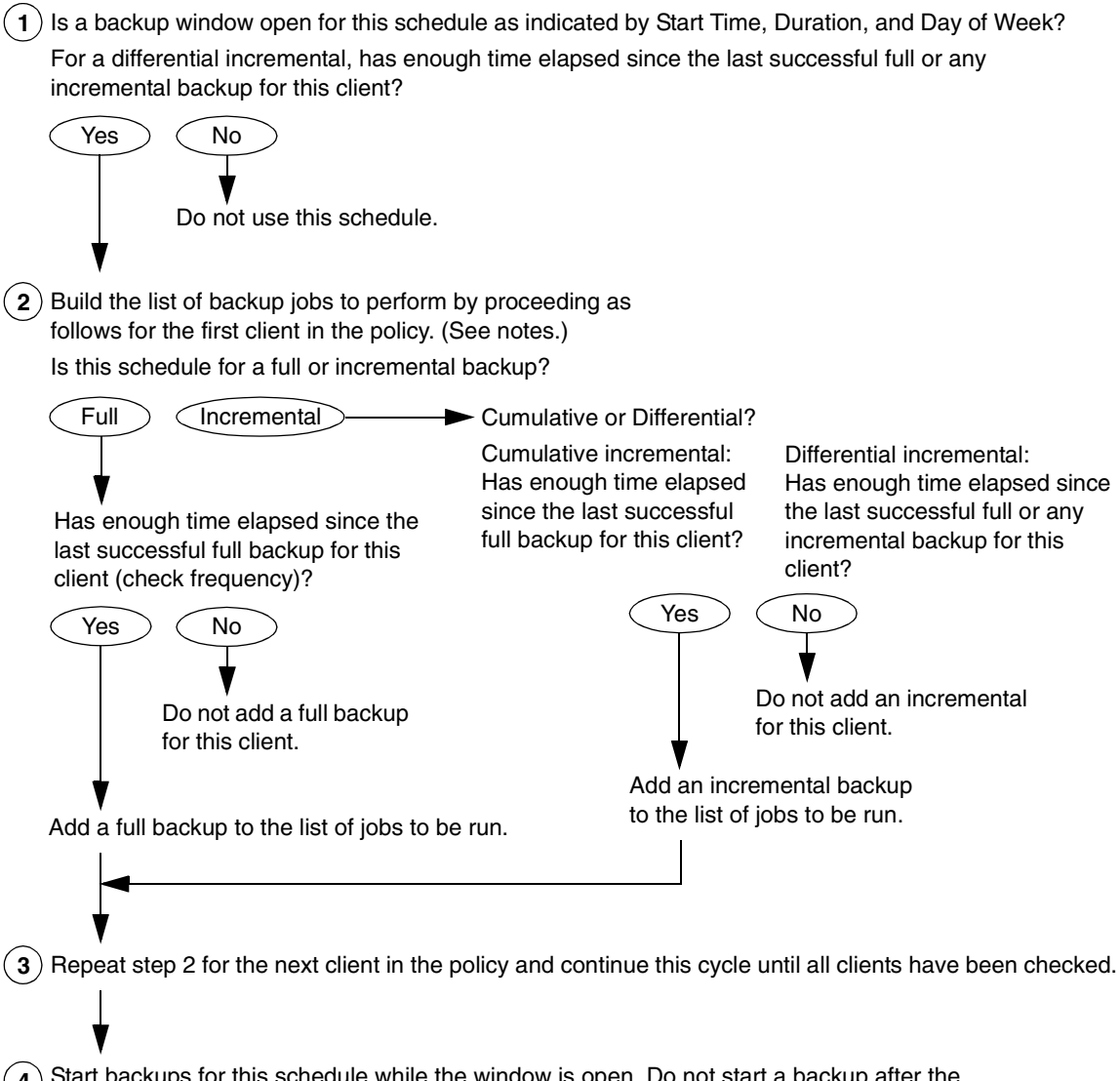
   The NetBackup counter you selected is displayed in the Performance dialog. The number of bytes read or written and the rate is updated dynamically.

How NetBackup Builds Its Automatic Backup Worklist

The following topics explain how NetBackup determines the order in which automatic backups occur for each client. This information is for reference only but will be useful in evaluating problems with your schedules.

Building the Worklist (Queue)

When the backup window opens for an automatic backup schedule, NetBackup proceeds to determine whether or not to add the client backups for that schedule to the worklist (queue). The following figure shows this process:



NOTES:

– If more than one schedule for this policy is due for a client, the backups from the schedule that is backed up least often are added first.

– If the NetBackup scheduler encounters a backup policy with two schedules (one full, one incremental) that are each due to run, are each within their defined backup window, and are each configured with the same frequency value, the schedule that is alphabetically first will be chosen to run.

– Cumulative and differential incremental backups have the same priority.

Prioritizing the Worklist

The worklist typically contains jobs from different policies and schedules. NetBackup checks for the following items when determining the order in which to run the backups that are in the worklist:

1. If multiplexing is enabled, a job will join an existing multiplexed group if allowed, even if a job of higher priority is on the worklist.

2. Highest priority backup as determined by the policy **Job Priority** setting.

   Backup jobs from the policy with the highest priority run first.

   For example, assume that clients ant and beetle are in different policies and that ant is in the policy with the highest priority. Here, the jobs for client ant always run before the client beetle jobs.

3. Backup with a retention level that is the same as a tape that is currently mounted.

   If policy priorities are equal, NetBackup tries to start a backup job that has the same retention period as a tape that is currently mounted. This reduces delays in waiting for tape mounts.

   For example, assume that clients ant and beetle are in the same policy but their schedules have different retention periods. Also, assume that the ant job is the most overdue. However, a tape is mounted that has the same retention level as client beetle.

   Here, the client beetle job runs first because it can be stored on a tape that is already mounted, thus making the most efficient use of resources. If there is another drive of the correct type available, a tape will be mounted on that drive for the client ant job.

4. Most overdue backup job.

   If the priorities and retention level are equal, NetBackup prioritizes backups according to how long they are overdue. The clients that are the most overdue have the highest priority.

   NetBackup determines how long a backup is overdue by subtracting the backup frequency (on the schedule) from the length of time since the last successful backup for that client.

   For example, assume that clients ant and beetle have backup jobs that are in the same policy and have the same retention level. Also assume that the schedules for these backup jobs both have a frequency of 1 day. If the last backup for client ant ran 25 hours ago and the last backup for client beetle ran 26 hours ago, then both clients are overdue for a backup. However, the client beetle job is the most overdue and will run first.

This approach ensures that a backup that was not successful during its previous backup window has priority over backups that were successful. This is important on a busy system where the backup window can sometimes close before all backups can begin.

Guidelines for Setting Retention Periods

The length of time that you must retain data usually depends on how likely you are to need it after a certain period of time. Some data, such as tax and other financial records, have legal requirements for retention. Other data, such as preliminary documents can probably be expired when the final version is complete.

How long you keep a backup also depends on what you need to recover from it. For example, if day-to-day changes are critical, you must keep all the incremental backups in addition to full backups for as long as you need the data. If incremental backups only track work in progress toward monthly reports, then you can probably expire the incremental backups sooner and rely on the full backups for long term recovery.

When deciding on retention periods, establish guidelines that apply to most of your data. After establishing guidelines, note files or directories that have retention requirements outside of these guidelines and plan to create a separate policy (or policies) for them. For example, placing files and directories with longer retention requirements in a separate policy allows you to schedule longer retention times for them without keeping all the others for the longer time period.

Another consideration for data retention is offsite storage of the backup media. This protects against fires or other disasters that occur at the primary site. Set the retention period to infinite for backups you must retain for more than one year.

- One method of implementing offsite disaster recovery is to use the duplicate feature to make a second copy for offsite storage.
- Another approach is to send monthly or weekly automatic full backups to an offsite storage facility. To restore the data, you get the media from offsite storage (a total directory or disk restore with incremental backups requires the last full backup plus all incremental backups).
- You can also configure an extra set of schedules for the backups to create duplicates for offsite storage.

Regardless of the method you use for offsite storage, ensure that you configure adequate retention periods. You can use the NetBackup import feature to retrieve expired backups but it is easiest just to set an adequate retention period.

Guidelines for Setting Backup Frequency

Choose the backup frequency based on how often you must back up your files to ensure that you can restore critical changes in case of a disk failure. How often the data changes is an important factor in determining backup frequency. For example, determine if files change several times a day, daily, weekly, or monthly. Determine the rate of change by analyzing typical file usage.

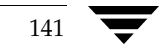
Typically, sites perform daily backups to preserve each day's work. This ensures that, at most, only one day's work is lost in case of a disk failure. More frequent backups are necessary when data changes many times during the day and these changes are important and difficult to reconstruct.

Daily backups are usually incremental backups that record the changes since the last incremental or full backup. This conserves resources because incremental backups use less storage and take less time to perform than full backups.

Full backups usually occur less frequently than incremental backups but should occur often enough to avoid accumulating too many consecutive incremental backups. Too many incremental backups between full backups increases restoration time because of the effort required to merge those incremental backups when restoring files and directories. When setting the frequency for full backups:

- Choose longer times between full backups for files that seldom change. This uses fewer system resources. It also does not significantly increase recovery time because there should be smaller incremental backups.
- Choose shorter times between full backups for files that change frequently. This decreases restore time. It can also use less resources because it reduces the cumulative effect of the longer incremental backups that are necessary to keep up with frequent changes in the files.

To achieve the most efficient use of resources, ensure that most of the files in a given policy change at about the same rate. For example, assume that approximately half of the files in a policy selection list change frequently enough to require a full backup every week, but the remaining files rarely change and require only monthly full backups. Here, if all the files are in the same policy, you must perform full backups weekly on all the files. This wastes system resources and media because half the files need full backups only once a month. A better approach is to divide them into two policies, each with the appropriate backup schedule or to consider using synthetic backups.



Determining Backup Media Requirements

To efficiently manage your backup environment, you must know the amount of media that is required for both daily and long-term use. The daily requirement must be known to ensure that enough tape volumes and disk space are available for each backup session. The long-term requirements are necessary to assess costs for acquisition of new media, storage devices, and offsite storage (if required).

For daily requirements, you must first determine the approximate amount of data in the files that you will back up to each type of media each day. Then, you can check the Media Summary report to verify that enough media IDs and disk space are available.

For long term planning, review the following considerations:

- How long you want to retain the data. A related consideration is that all backups on a given tape or optical disk have the same retention level unless the **Allow Multiple Retentions per Media** property is enabled. If not enabled, additional media is required for each different retention level.
- Duplicates for offsite storage or extra security.
- New software releases and other special backups.
- Replacing worn out media.
- Changes in disk usage patterns over the time period under consideration. If your disk usage and capacity increase, your backup needs will also probably increase.
- Number of backups that are on a tape. Because tape marks are created between backups, a tape with many small backups (as with incremental backups) contains less real data than if it contains fewer large backups. The size of the tape marks vary depending on the media type. A large number of small files will also have a higher percentage of overhead in the backup because each file requires an extra 512 bytes for catalog information on the tape or disk.
- If you have many different volume pools, ensure that enough media is defined in each one to accommodate the data.

Media Catalog

NetBackup keeps a media catalog with information that correlates backups to the volumes where the backups are stored. Each NetBackup server maintains a media catalog for the storage units attached to that server.

During installation, the media catalog is created in the *install_path*\NetBackup\db\media directory. NetBackup refers to the media catalog when it needs a volume for a backup or restore. If the media catalog does not contain a suitable volume, NetBackup has Media Manager assign one. In this manner, the catalog is populated as NetBackup uses new volumes for backups.

When the retention period has ended for all backups on a volume, NetBackup deletes it from the media catalog. Media Manager then unassigns the volume so it is available for reassignment at a future date.

Note Volumes for backups of the NetBackup catalogs are a special case and do not appear in the media catalog. You must track the media IDs for these volumes separately so you can find them in case the media catalog is damaged. However, they do appear in the Media Manager volume catalog and are listed as assigned to NetBackup (they are unassigned only if you delete them from your catalog backup settings).

Planning Worksheets

The next two figures show a blank copy of a worksheet that will be useful for planning. Following the blank copy is a completed example. See the *NetBackup System Administrator's Guide, Volume I* for information about the items on the worksheets.

Policies Planning Worksheet (Sheet 1)

Policy Name	
Clients	
Selection List	
Policy type	
Policy storage unit	Label:
Policy volume pool	Label:
☐ Limit jobs per policy	Value:
Job priority	
Keyword phrase	
☐ Active	Date
☐ Backup network drives (applies to Microsoft Windows clients only)	
☐ Cross mount points (applies to UNIX and Windows 2000 clients only)	
☐ Collect true image restore information	☐ with move detection
☐ Compression (applies to UNIX and Microsoft Windows clients only)	
☐ Collect disaster recovery information	
☐ Allow multiple data streams	

Policies Planning Worksheet (Sheet 2)

Attributes				
Schedule Name		Type of backup		
Schedule type				
	☐ Calendar			
	☐ Frequency	hours	days	weeks
☐ Multiple copies		Number of copies:		
	Storage Unit	Volume Pool	Retention	If this copy fails
☐ Override policy storage unit		Label:		
☐ Override policy volume pool		Label:		
Retention		weeks	months	other
Media multiplexing				
Start Window				
	Sunday	Start	Duration	End
	Monday			
	Tuesday			
	Wednesday			
	Thursday			
	Friday			
	Saturday			
Exclude Dates				

Policies Planning Worksheet (Sheet 3)

Attributes				
Schedule Name		Type of backup		
Schedule type				
	☐ Calendar			
	☐ Frequency	hours	days	weeks
☐ Multiple copies		Number of copies:		
	Storage Unit	Volume Pool	Retention	If this copy fails
☐ Override policy storage unit		Label:		
☐ Override policy volume pool		Label:		
Retention		weeks	months	other
Media multiplexing				
Start Window				
	Sunday	Start	Duration	End
	Monday			
	Tuesday			
	Wednesday			
	Thursday			
	Friday			
	Saturday			
Exclude Dates				

Sample Worksheet for UNIX Clients (Sheet 1)

Policy Name W2 on server bunny	
Clients mars (RS6000/AIX), jupiter (Solaris), neptune (HP)	
Selection List /usr, /home, /var	
Policy type Standard	
Policy storage unit	Label: TS_8
Policy volume pool	Label: Backups
☐ Limit jobs per policy	Value:
Job priority 0	
Keyword phrase	
☒ Active	Date *Current date*
☐ Backup network drives (applies to Microsoft Windows clients only)	
☐ Cross mount points (applies to UNIX and Windows 2000 clients only)	
☐ Collect true image restore information	☐ with move detection
☐ Compression (applies to UNIX and Microsoft Windows clients only)	
☐ Collect disaster recovery information	
☐ Allow multiple data streams	

Sample Worksheet for UNIX Clients (Sheet 2)

Attributes				
Schedule Name W2DailyIncr		Type of backup Differential Incr		
Schedule type				
	☐ Calendar			
	☒ Frequency	hours	1 days	weeks
☐ Multiple copies		Number of copies:		
	Storage Unit	Volume Pool	Retention	If this copy fails
☐ Override policy storage unit		Label:		
☐ Override policy volume pool		Label:		
Retention		1 weeks	months	other
Media multiplexing 1				
Start Window				
	Sunday	Start	Duration	End
	Monday	22:00	8	
	Tuesday	22:00	8	
	Wednesday	22:00	8	
	Thursday	22:00	8	
	Friday	22:00	8	
	Saturday	22:00	8	
Exclude Dates				

Sample Worksheet for UNIX Clients (Sheet 3)

Attributes				
Schedule Name W2WeeklyFull		Type of backup Full		
Schedule type				
	☐ Calendar			
	☒ Frequency	hours	days	1 weeks
☐ Multiple copies		Number of copies:		
	Storage Unit	Volume Pool	Retention	If this copy fails
☐ Override policy storage unit		Label:		
☐ Override policy volume pool		Label:		
Retention		weeks	1 months	other
Media multiplexing 1				
Start Window				
	Sunday	Start	Duration	End
	Monday	22:00	8	
	Tuesday	22:00	8	
	Wednesday	22:00	8	
	Thursday	22:00	8	
	Friday	22:00	8	
	Saturday	22:00	8	
Exclude Dates				

Sample Worksheet for Windows Clients (Sheet 1)

Policy Name W2 on server mercury	
Clients venus (Windows), pluto (Windows), saturn (Windows)	
Selection List C:\	
Policy type MS-Windows-NT	
Policy storage unit	Label: TS_8
Policy volume pool	Label: Backups
☐ Limit jobs per policy	Value:
Job priority 0	
Keyword phrase	
☒ Active	Date *Current date*
☐ Backup network drives (applies to Microsoft Windows clients only)	
☐ Cross mount points (applies to UNIX and Windows 2000 clients only)	
☐ Collect true image restore information	☐ with move detection
☐ Compression (applies to UNIX and Microsoft Windows clients only)	
☐ Collect disaster recovery information	
☐ Allow multiple data streams	

Sample Worksheet for Windows Clients (Sheet 2)

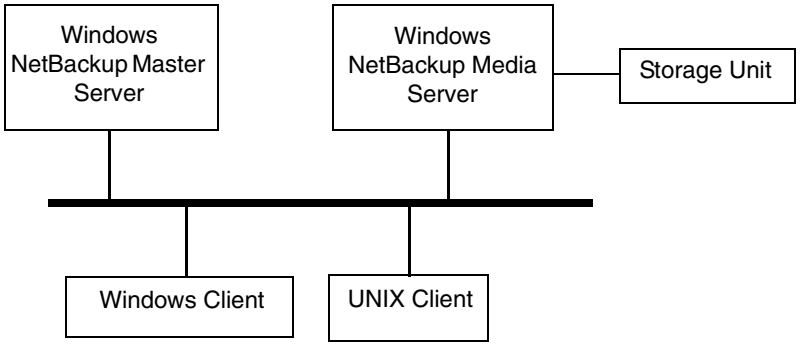
Attributes				
Schedule Name W2DailyIncr		Type of backup Differential Incr		
Schedule type				
	☐ Calendar			
	☒ Frequency	hours	1 days	weeks
☐ Multiple copies		Number of copies:		
	Storage Unit	Volume Pool	Retention	If this copy fails
☐ Override policy storage unit		Label:		
☐ Override policy volume pool		Label:		
Retention		1 weeks	months	other
Media multiplexing 1				
Start Window				
	Sunday	Start	Duration	End
	Monday	22:00		
	Tuesday	22:00		
	Wednesday	22:00		
	Thursday	22:00		
	Friday	22:00		
	Saturday	22:00		
Exclude Dates				

Sample Worksheet for Windows Clients (Sheet 3)

Attributes				
Schedule Name W2WeeklyFull		Type of backup Full		
Schedule type				
	☐ Calendar			
	☒ Frequency	hours	days	1 weeks
☐ Multiple copies		Number of copies:		
	Storage Unit	Volume Pool	Retention	If this copy fails
☐ Override policy storage unit		Label:		
☐ Override policy volume pool		Label:		
Retention		weeks	1 months	other
Media multiplexing 1				
Start Window				
	Sunday	Start	Duration	End
	Monday	22:00		06:00
	Tuesday	22:00		06:00
	Wednesday	22:00		06:00
	Thursday	22:00		06:00
	Friday	22:00		06:00
	Saturday	22:00		06:00
Exclude Dates				

UNIX Reference Topics 5

This chapter contains information that pertains specifically to administering UNIX NetBackup clients or media servers from a Windows NetBackup master server.



Most administrative tasks on the UNIX systems can be performed by using the NetBackup administration interface on a Windows NetBackup server or administration client.

Storage Units on UNIX Media Servers

Applies to NetBackup Enterprise Server only:

You can use the NetBackup Administration Console on a Window system to configure storage units on UNIX systems. However, the following exception applies for optical disks:

You can add an optical disk storage unit to a policy by using the NetBackup Administration Console on a Windows system. However, to add the devices and media you must use the NetBackup Administration Console on a UNIX system. For instructions, see the *Media Manager System Administrator's Guide for UNIX*.

Cross Mount Points

The following information applies specifically to UNIX clients.

Note The **Cross Mount Points** option applies only to certain policy types and NetBackup allows you to select it in only those instances.

The **Cross Mount Points** option controls whether NetBackup will cross file system boundaries during a backup or archive on UNIX clients or whether NetBackup enters volume mount points during a backup or archive on Windows clients.

- If you select **Cross Mount Points**, NetBackup backs up or archives all files and directories in the selected path, regardless of the file system. For example, if you specify root (/) as the file path, NetBackup backs up root (/) and all files and directories under it in the tree. Usually, this means all the client's files, other than those available through NFS.
- If you clear **Cross Mount Points**, NetBackup backs up or archives only files and directories that are in the same file system as the selected file path. This lets you back up a file path such as root (/) without backing up all the file systems that are mounted on it (for example, `/usr` and `/home`).

Notes on Cross Mount Points

- **Cross Mount Points** has no effect on UNIX raw partitions. If the raw partition that is being backed up is the root partition and has mount points for other file systems, the other file systems are not backed up even if you select **Cross Mount Points**.
- Do not use **Cross Mount Points** in policies where you use the `ALL_LOCAL_DRIVES` directive in the backup selection list.

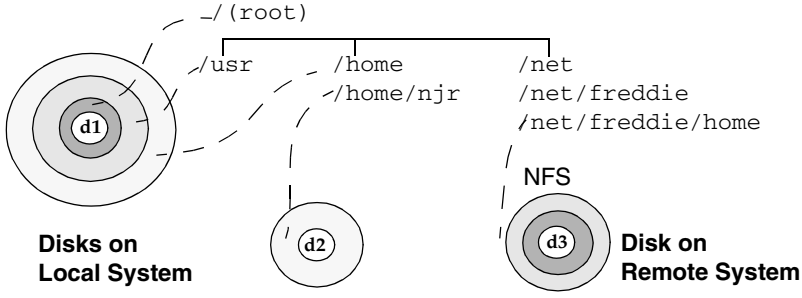
How Cross Mount Points Setting Interacts With Follow NFS

To back up NFS mounted files, select **Follow NFS**. The table below summarizes the behavior of **Cross Mount Points** and **Follow NFS**:

Cross Mount Points	Follow NFS	Resulting Behavior
No	No	No crossing of mount points. This is the default.
No	Yes	Back up NFS files if the file path is (or is part of) an NFS mount.
Yes	No	Cross local mount points but not NFS mounts.
Yes	Yes	Follow the specified path across mount points to back up files and directories (including NFS), regardless of the file system where they reside.

Cross Mount Point Examples

The next two examples illustrate the concepts mentioned above. In these examples, assume the client disks are partitioned as shown below.



Here, the client has `/`, `/usr`, and `/home` in separate partitions on disk d1. Another file system named `/home/njr` exists on disk d2 and is mounted on `/home`. In addition, disk d3 contains a directory named `/net/freddie/home` that is NFS-mounted on `/net/freddie`.

Example 1

Assume that you clear **Cross Mount Points** and **Follow NFS** and have the following entries in the backup selection list:

```
/
/usr
```


```
/home
```

In this case, NetBackup considers only the directories and files that are in the same file system as the backup selection list entry it is processing. It does not back up `/home/njr` or `/net/freddie/home`.

Example 2

Assume that you select **Cross Mount Points** and **Follow NFS** and include only `/` in the backup selection list.

In this case, NetBackup backs up all the files and directories in the tree, including those under `/home/njr` and `/net/freddie/home`.

To not back up everything, leave `/` out of the list and separately list the files and directories you want to include. The following backup selection list backs up only `/usr` and individual files under `/`:

```
/usr
/individual_files_under_root
```

Exclude and Include Lists on UNIX Clients

Note Exclude and include lists do not apply to user backups and archives.

On UNIX clients, you create the exclude and include lists in the following files on the client:

```
/usr/openv/netbackup/exclude_list
/usr/openv/netbackup/include_list
```

The following topics explain the rules for creating these lists on UNIX clients.

Creating an Exclude List on a UNIX Client

If you create a `/usr/openv/netbackup/exclude_list` file on a UNIX client, NetBackup uses the contents of the file as a list of patterns to skip during automatic full and incremental backups.

Note Exclude and include lists do not apply to user backups and archives.

The following types of files typically appear in an exclude list:

- *`*.o`* files
- `core` files

- `a.out` files
- Files prefixed or suffixed by ~ (backups for editors)
- Files and directories under `/tmp`, `/usr/tmp`
- Man pages
- Software that you can restore from original installation tapes
- Automounted directories
- CD-ROM file systems
- NetBackup automatically excludes the following file system types:
  - `mntfs` (Solaris)
  - `proc` (all UNIX platforms)
  - `cdrom` (all UNIX platforms)
  - `cachefs` (AIX, Solaris, SGI, UnixWare)

Note VERITAS suggests that you always specify automounted directories and CD-ROM file systems in the exclude list. Otherwise, if they are not mounted at the time of a backup, NetBackup must wait for a timeout before proceeding.

Check with users before excluding any files from their backups.

Syntax Rules

The following syntax rules apply to exclude lists:

- Blank lines or lines beginning with a pound sign (#) are ignored.
- Only one pattern per line is allowed.
- The following special or wildcard characters are recognized:

  [ ]

  ?

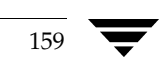
  *

  { }

- To use special or wildcard characters literally (that is, as non-wildcard characters), precede them with a backslash (\). For example, assume the brackets in the following are to be used literally

  ```
  /home/abc/fun[ny]name
  ```

  In the exclude list, precede them with a backslash as in



```
/home/abc/fun\[ny\]name
```

Note A backslash (\) acts as an escape character only when it precedes a special or wildcard character as in the above example. This means that NetBackup normally interprets a backslash literally and it is a legal character to use in pathnames.

- If you exclude all files in the backup selections list by using / or * or both symbols together (/*), NetBackup backs up only what is specified by full path names in the include list.
- Spaces are considered legal characters. Do not include extra spaces unless they are part of the file name.

  For example, if you want to exclude a file named

  `/home/testfile` (with no extra space character at the end)

  and your exclude list entry is

  `/home/testfile` (with an extra space character at the end)

  NetBackup cannot find the file until you delete the extra space from the end of the file name.
- End a file path with / to exclude only directories with that path name (for example, `/home/test/`). If the pattern does not end in / (for example, `/usr/test`), NetBackup excludes both files and directories with that path name.
- To exclude all files with a given name, regardless of their directory path, just enter the name without a preceding slash. For example:

  ```
  test
  ```

  rather than

  ```
  /test
  ```

  This is equivalent to prefixing the file pattern with

  ```
  /
  ```

  ```
  /*/
  ```

  ```
  /*/*/
  ```

  ```
  /*/*/*/
  ```

  and so on.
- Do not use patterns with links in the names. For example, assume `/home` is a link to `/usr/home` and `/home/doc` is in the exclude list. The file is still backed up in this case because the actual directory path, `/usr/home/doc`, does not match the exclude list entry, `/home/doc`.

Example of an Exclude List

In this example, an exclude list contains the following entries:

```
# this is a comment line
/home/doe/john
/home/doe/abc/
/home/*/test
/*/temp
core
```

Given the exclude list above, the following files and directories are excluded from automatic backups:

- The file or directory named `/home/doe/john`.
- The directory `/home/doe/abc` (because the exclude entry ends with `/`).
- All files or directories named `test` that are two levels below home.
- All files or directories named `temp` that are two levels below the root directory.
- All files or directories named `core` at any level.

Exclude Lists for Specific Policies or Schedules

NetBackup allows you to create an exclude list for a specific policy or a policy and schedule combination. To do this, create an exclude_list file with a *.policyname* or *.policyname.schedulename* suffix. The following are two examples for a policy named *wkstations* that contains a schedule named *fulls*:

```
/usr/openv/netbackup/exclude_list.wkstations
/usr/openv/netbackup/exclude_list.wkstations.fulls
```

The first file affects all scheduled backups in the policy named *wkstations*. The second file affects backups only when the schedule is named *fulls*.

For a given backup, NetBackup uses a single exclude list—the list containing the most specific name. For example, if there are files named:

`exclude_list.wkstations` and `exclude_list.wkstations.fulls`

NetBackup uses only:

```
exclude_list.wkstations.fulls
```


Creating an Include List on a UNIX Client

To add back in files that you eliminate with the exclude list, create a `/usr/openv/netbackup/include_list` file. The same syntax rules apply as explained previously for the exclude list.

Note Exclude and include lists do not apply to user backups and archives.

To illustrate the use of an include list, we use the example from the previous discussion. The exclude list in that example causes NetBackup to omit all files or directories named test from all directories beneath `/home/*/test`.

In this case, add back in a file named `/home/jdoe/test` by creating a `/usr/openv/netbackup/include_list` file on the client and adding the following to it:

```
# this is a comment line
/home/jdoe/test
```

To create an include list for a specific policy or policy and schedule combination, use a *.policyname* or *.policyname.schedulename* suffix. The following are two examples of include list names for a policy named *wkstations* that contains a schedule named *fulls*.

```
/usr/openv/netbackup/include_list.workstations
/usr/openv/netbackup/include_list.workstations.fulls
```

The first file affects all scheduled backups in the policy named workstations. The second file affects backups only when the schedule is named *fulls*.

For a given backup, NetBackup uses only one include list and that is the one with the most specific name. For example, assume there are files such as the following:

`include_list.workstations` and `include_list.workstations.fulls`

In such a case, NetBackup uses only the following:

```
include_list.workstations.fulls
```

Schedules for User Backups or Archives

To have NetBackup use a specific policy and schedule for user backups or archives of a UNIX client, add the following options to the `/usr/openv/NetBackup/bp.conf` file.

- `BPARCHIVE_POLICY`
- `BPARCHIVE_SCHED`
- `BPBACKUP_POLICY`
- `BPBACKUP_SCHED`

These options can also be added to a user's `$HOME/bp.conf` file on the client.

NetBackup Catalog Backups for UNIX Media Servers

The following section applies to NetBackup Enterprise Server only:

The procedure for backing up the catalogs for a UNIX media server is the same as for a Windows system except for the pathnames. The catalog backup paths required for a UNIX media server depend on whether the server has a volume database or devices configured.

- For UNIX NetBackup media servers that have a volume database or devices configured, add the following two pathnames:
  - *server_name*:`/usr/openv/netbackup/db/media`

    The files in this directory have information about files that were backed up from client workstations.
  - *server_name*:`/usr/openv/volmgr/database`

    The files in this directory have information about the media and devices that are used in the configuration.

  For example, to add catalog files for a UNIX NetBackup media server named elk that has a volume database or devices configured, make the following entries:

  ```
  elk:/usr/openv/netbackup/db/media
  elk:/usr/openv/volmgr/database
  ```
- For UNIX NetBackup media servers that do not have a volume database or devices configured, add only the following pathname:

  server_name:`/usr/openv/netbackup/db/media`

  The files in this directory have information about files backed up from client workstations.

Caution Do not specify a link as the final component in a path. If the final component is a link, it is not followed and the entire NetBackup catalog backup fails. You can, however, include links at other points in the path. If any other part of a listed path is a symbolic link, NetBackup saves the actual path during the backup.

Adding UNIX Media Servers

The following section applies to NetBackup Enterprise Server only:

▼ To add UNIX media servers

1. Install the following software packages on the media server as explained in the vendor's documentation:
   - Software required to drive the storage devices. This refers to software that the storage-device vendor provides.
   - NetBackup server software as explained in the NetBackup release notes.
2. On the media server, configure the drives and robots:
   a. Log in to the media server.
   b. Create the necessary device files, if this was not done at the time the devices were installed. If necessary, refer to the documentation for the device and your host system. The *Media Manager Device Configuration Guide* contains advice on creating device files.
   c. Configure the robots and drives using the Configure Storage Devices wizard.

      Remember, the server that you specify as the Volume Database Host is the one that keeps records of volumes used in this device. The Volume Database Host can be any of the following:
      - Master server
      - Media server that you are currently adding
      - Another media server

Note To simplify administration, use only one server as a volume database host and add all your volumes on that host. Multiple volume database hosts makes administration more complicated and it is not possible to merge the volume information later.

3. Add the volumes for each robot or nonrobotic drive configured in step 2.

   Remember, you must add the volumes to Media Manager on the server that was specified as the volume database host in step 2.

Note Defining a separate volume pool for volumes used on the media server can simplify administration.

4. On the master server, make the following changes to the NetBackup configuration:

a. Add the media server's storage units.

Remember, when adding the storage units, specify the media server as the media server for the storage unit.

b. Add the catalog paths for the media server to the NetBackup catalog backup configuration.

server_name:/usr/openv/netbackup/db/media

server_name:/usr/openv/volmgr/database

c. Configure the NetBackup policies and schedules that use the storage units you configured on the media server.

d. Add a server list entry for the media server by using NetBackup Host Properties or by running the *install_path*\NetBackup\bin\add_slave command on the master server.

Note The server list entries must be the same on all servers in a cluster. It is also recommended (but not mandatory) that all other configuration options, except the client name, match on all NetBackup servers.

---

5. On each NetBackup client, add a server list entry for the new media server.

The location of the entries depends on the client:

- On Microsoft Windows clients, make this change on the **Servers** tab in the Specify NetBackup Machines and Policy Type dialog. To open this dialog, start the user interface on the client and select **File > Specify NetBackup Machines and Policy Type** (this also applies to NetWare nontarget clients).
- On NetWare target clients, add a SERVER entry to the bp.ini file.
- For UNIX clients, add SERVER options to the /usr/openv/netbackup/bp.conf file.

  In the bp.conf file, the first SERVER entry must be for the master server. An entry for the media server must appear lower in the list:

  SERVER = *master_name*

  SERVER = *media_server_name*

Note Ensure that the host names match throughout your network's TCP/IP configuration or you will encounter problems with NetBackup.

---

6. On the master server, stop and then restart the NetBackup Request Manager and NetBackup Database Manager services.

Test your configuration by performing a user backup or a manual backup that uses a schedule that specifies the storage unit on the media server.

NetBackup Notify Scripts 6

Note Windows NT systems must be running Windows NT 4.0 or higher to use these scripts.

NetBackup uses the following scripts (batch files on Windows 2000 and NT) for collecting information and providing notification of events.

Scripts that run on a server:

`backup_notify.cmd`

`backup_exit_notify.cmd`

`dbbackup_notify.cmd`

`diskfull_notify.cmd`

`restore_notify.cmd`

`session_notify.cmd`

`session_start_notify.cmd`

`userreq_notify.cmd`

Scripts that run on clients:

`bpstart_notify.bat`

`bpend_notify.bat`

* On Windows 2000 or NT clients, `bpstart_notify.bat` and `bpend_notify.bat` scripts are not supplied with the software. You must create them on the client following the criteria in "bpstart_notify.bat (Microsoft Windows clients only)" on page 171 and "bpend_notify.bat (Microsoft Windows clients only)" on page 176.

The scripts that run on a server are installed during NetBackup server installation and are in:

install_path`\NetBackup\bin\goodies`

On a UNIX client, you can run only the `bpstart_notify` and `bpend_notify` scripts. Before using these scripts, you must copy them from

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

on the server to

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

on the client.

For further information, refer to the comments in the scripts.

Caution *Applies to NetBackup Enterprise Server only.*
If you use either the `bpstart_notify` or `bpend_notify` scripts, do not include commands that write to stdout. If you do, NetBackup sends this output to the server as part of the backup and the resulting backup can abort with an error message pertaining 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 and its use can cause data to be written to stdout or stderr, resulting in the same problem noted above.

backup_notify.cmd

The `backup_notify.cmd` script runs on the NetBackup server where the storage unit is located and is called each time a backup is successfully written to media. The parameters that NetBackup passes to this script are:

- The name of the program doing the backup
- The backup-image name or path

For example:

```
backup_notify.cmd bptm bilbo_0695316589
```

Note *Applies to NetBackup Enterprise Server only.*
If NetBackup backed up files to a UNIX disk storage unit that is being managed by Storage Migrator, the `backup_notify` script notifies Storage Migrator to perform migration as quickly as possible. The released script does not, however, have commands to force a backup of the managed file system after NetBackup has stored its backups. To back up the managed file system, modify the script as necessary to meet site requirements for backup.

backup_exit_notify.cmd

The `backup_exit_notify.cmd` script runs on the master server. The NetBackup scheduler on the master server calls this script to do site specific processing when an individual backup has completed from the perspective of the client, Media Manager, and the image catalog.

NetBackup passes the following parameters to the script:

Parameter	Description
`clientname`	Name of the client from the NetBackup catalog.
`policyname`	Policy name from the NetBackup catalog.
`schedname`	Schedule name from the NetBackup catalog.
`schedtype`	One of the following: `FULL`, `INCR` (differential incremental), `CINC` (cumulative incremental), `UBAK`, `UARC`
`exitstatus`	Exit code for the entire backup job.

For example:

```
backup_exit_notify.cmd freddie production fulls FULL 0
backup_exit_notify.cmd danr production incrementals INCR 73
```

bpstart_notify (UNIX clients only)

Note Before using this script, ensure that it is executable by *other* on the client. Do this by running `chmod 755` *script_name*. Where *script_name* is the name of the script.

On UNIX clients, NetBackup calls the `bpstart_notify` script each time the client starts a backup or archive operation. To use this script, copy

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

from the server to

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

on the UNIX client. Then, modify the script as desired and ensure that you have permission to run the script.

The bpstart_notify script runs each time a backup or archive starts and initialization is completed (but before the tape positioning). 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 and the bpbkar process on the client waits for it to complete before continuing. Any commands in the script that do not end with an & character run serially.

The server expects the client to respond with a continue message within the period of time specified by the NetBackup BPSTART_TIMEOUT option on the server.

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

NetBackup passes the following parameters to the script:

Parameter	Description
clientname	Name of the client from the NetBackup catalog.
policyname	Policy name from the NetBackup catalog.
schedname	Schedule name from the NetBackup catalog.
schedtype	One of the following: FULL, INCR (differential incremental), CINC (cumulative incremental), UBAK, UARC

For example:

```
bpstart_notify freddie cd4000s fulls FULL
bpstart_notify danr cd4000s incrementals INCR
bpstart_notify hare cd4000s fulls FULL
bpstart_notify freddie cd4000s user_backups UBAK
bpstart_notify danr cd4000s 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 named *production* that has a schedule named *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 named production. The second script affects scheduled backups in the policy 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 one 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 strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526

UNIXBACKUPTIME=0857340526

BACKUPTIME=Sun Mar 2 16:08:46 2004
```

In addition to the above, the following environment variables can be used for the support of multiple data streams:

`STREAM_NUMBER` indicates the stream number. The first stream started from a policy, client, and schedule will be 1. A value of 0 indicates that multiple data streams is not enabled.

`STREAM_COUNT` specifies the total number of streams to be generated from this policy, client, and schedule.

`STREAM_PID` is the pid (process ID) number of `bpbkar`.

`RESTARTED` can be used for 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 (Microsoft Windows clients only)

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:

install_path`\NetBackup\bin\goodies\bpstart_notify.bat`

from the server to the client, in the same directory as the NetBackup client binaries:

install_path\NetBackup\bin\goodies

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

You can create bpstart_notify scripts that provide notification for all backups or just 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 script applies only to a policy named *days*:

  install_path\netbackup\bin\bpstart_notify.days.bat

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

  install_path\netbackup\bin\bpstart_notify.days.fulls.bat

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 If you are also using bpend_notify scripts, they can provide a different level of notification than the bpstart_notify scripts. For example, if you had one of each, they could be bpstart_notify.policy.bat and bpend_notify.policy.schedule.bat.

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

Parameter	Description
%1	Name of the client from the NetBackup catalog.
%2	Policy name from the NetBackup catalog.

Parameter	Description
%3	Schedule name from the NetBackup catalog.
%4	One of the following: FULL, INCR, CINC, UBAK, UARC
%5	Status of the operation is always 0 for bpstart_notify.
%6	Results file that NetBackup checks for a return code from the script. NetBackup uses %6 to pass the file name and then expects the script to create the file in the same directory as the script. If the script applies to a specific policy and schedule, the results file must be named *install_path*\netbackup\bin\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 calling the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful.

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

For Windows 2000 and NT clients, the bpstart_notify script can use the following environment variables for the support of multiple data streams:

STREAM_NUMBER indicates the stream number. The first stream started from a policy, client, and schedule will be 1. A value of 0, indicates that multiple data streams is not enabled.

STREAM_COUNT specifies the total number of streams to be generated from this policy, client, and schedule.

STREAM_PID is the pid (process ID) number of bpbkar.

bpend_notify (UNIX clients only)

Caution The bpend_notify script is run when the client is finished sending data, but the server has not yet completed writing to media.

Note Before using this script, ensure that it is executable by *other* on the client. Do this by running chmod 755 *script_name*. Where *script_name* is the name of the script.

For a UNIX client, if you need notification whenever the client completes a backup or archive operation, copy

install_path\NetBackup\bin\goodies\bpend_notify

from the server to

/usr/openv/netbackup/bin/bpend_notify

on the UNIX client. Then, modify the script as desired, and ensure that you have permission to run 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 & character run serially.

The server expects the client to respond within the period of time specified by the BPEND_TIMEOUT NetBackup configuration option on the server. 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 or you will delay the server from servicing other clients.

NetBackup passes the following parameters to the bpend_notify script:

Parameter	Description
clientname	Name of the client from the NetBackup catalog.
policyname	Policy name from the NetBackup catalog.
schedname	Schedule name from the NetBackup catalog.
schedtype	One of the following: FULL, INCR (differential incremental), CINC (cumulative incremental), UBAK, UARC

Parameter	Description
exitstatus	Exit code from bpbkar. This is only client status and does not mean that the backup is complete and successful. For example, the client can show a status 0 when, due to a failure on the server, the All Log Entries report shows a status 84.

For example:

```
bpend_notify freddie pol_1 fulls FULL 0
```

```
bpend_notify danr 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 named *production* that has a schedule 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 named production. The second script affects scheduled backups in the policy named 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.

If the UNIX client is running NetBackup 3.0 or later software, 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 strings that are available to the script for use in recording information about a backup:

```
BACKUPID=freddie_0857340526
```

```
UNIXBACKUPTIME=0857340526
```

```
BACKUPTIME=Sun Mar 2 16:08:46 2004
```

In addition to the above, the following environment variables can be used for the support of multiple data streams:

STREAM_NUMBER indicates the stream number. The first stream started from a policy, client, and schedule will be 1. A value of 0, indicates that multiple data streams is not enabled.

STREAM_COUNT specifies the total number of streams to be generated from this policy, client, and schedule.

STREAM_PID is the pid (process ID) number of bpbkar.

FINISHED can be used for 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 the of data.

bpend_notify.bat (Microsoft Windows clients only)

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\goodies

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

You can create bpend_notify scripts that provide notification for all backups or just 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.

- 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 named *fulls* that is in a policy named *days*:

  install_path\netbackup\bin\bpend_notify.days.fulls.bat

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 If you are also using bpstart_notify scripts, they 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.

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

Parameter	Description
%1	Name of the client from the NetBackup catalog.
%2	Policy name from the NetBackup catalog.
%3	Schedule name from the NetBackup catalog.
%4	One of the following: FULL, INCR, CINC, UBAK, UARC
%5	Status of the operation and is same as sent to the NetBackup server. This 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	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 calling the script. After the script runs, NetBackup checks the new results file for the status. The status must be 0 for the script to be considered successful. If the results file does not exist, NetBackup assumes that the script was successful.

The server expects the client to respond with a *continue* message within the period of time specified by the NetBackup BPEND_TIMEOUT option on the server. The default for BPEND_TIMEOUT is 300. If the script needs more than 300 seconds, increase the value to allow more time.

For Windows 2000 and NT clients, the bpend_notify script can use the following environment variables for the support of multiple data streams:

STREAM_NUMBER indicates the stream number. The first stream started from a policy, client, and schedule will be 1. A value of 0, indicates that multiple data streams is not enabled.

STREAM_COUNT specifies the total number of streams to be generated from this policy, client, and schedule.

STREAM_PID is the pid (process ID) number of bpbkar.

dbbackup_notify.cmd

The dbbackup_notify.cmd script runs on the master server and is called each time NetBackup completes an attempt to back up its catalogs. NetBackup passes the following parameters to this script:

Parameter	Description
device	Device type the backup was written to.
vsn_or_path	Volume serial number (for tape) or path (for disk) used for the backup.
status	Specifies whether the backup was successful and must have a value of either SUCCESS or FAIL.

For example:

```
dbbackup_notify.cmd DISK /disk1/bpsync1 SUCCESS

dbbackup_notify.cmd OPTICAL AA0001 FAIL

dbbackup_notify.cmd TAPE XYZ047 SUCCESS
```

You must be able to identify the most recent catalog backup. Therefore, consider modifying this script to produce a printed copy of the media ID to which the catalog backup was done.

Note *Applies to NetBackup Enterprise Server only.*
If the NetBackup catalog files are backed up to a UNIX disk storage unit that is being managed by Storage Migrator, the dbbackup_notify script notifies

Storage Migrator to perform migration as quickly as possible. The script does not, however, have commands to force Storage Migrator to back up its own catalog after a backup of the NetBackup catalog. You must modify the script to meet site requirements for backup of the Storage Migrator catalog.

diskfull_notify.cmd

The `diskfull_notify.cmd` script runs on the NetBackup server that has the storage unit. The disk-media manager (`bpdm`) calls this script if it encounters a disk full condition when writing a backup to a disk type storage unit. The default action is to sleep five minutes and retry the write (file being written is kept open by the active `bpdm`).

You can modify the script to send a notification to someone or to perform actions such as removing other files in the affected directory or file system. NetBackup passes the following parameters to this script:

Parameter	Description
`programname`	Name of the program (always `bpdm`).
`pathname`	Path to the file being written.

For example:

```
diskfull_notify.cmd bpdm /disk1/images/host_08193531_c1_F1
```

restore_notify.cmd

Note *Applies to NetBackup Enterprise Server only.*
If the files are restored to a UNIX disk storage unit that is being managed by Storage Migrator, the `restore_notify` script notifies Storage Migrator to perform migration as quickly as possible after the restore is complete.

The `restore_notify.cmd` script runs on the server that has the storage unit. The NetBackup tape or disk manager (`bptm` or `bpdm`) calls the script when it is finished sending data to the client during a restore (regardless of whether data is actually sent). NetBackup passes the following parameters to this script:

Parameter	Description
`programname`	Name of the program doing the restore or other read operation.

Parameter	Description
pathname	Path to the backup name or path.
operation	One of the following: restore, verify, duplication, import

For example:

```
restore_notify.cmd bptm bilbo_0695316589 duplication
```

session_notify.cmd

The session_notify.cmd script runs on the master server and is called at the end of a backup session if at least one scheduled backup has succeeded. NetBackup passes no parameters to this script. The scheduler is suspended until this script completes, thus no other backups can start until that time.

session_start_notify.cmd

The session_start_notify.cmd script runs on the master server. When a set of backups is due to run, NetBackup calls this script to do any site specific processing prior to starting the first backup. NetBackup passes no parameters to this script.

userreq_notify.cmd

The userreq_notify.cmd script runs on the master server and is called by NetBackup each time a request is made to:

- List files that are in backups or archives
- Start a backup, archive, or restore

You can alter this script to gather information about user requests to NetBackup. NetBackup passes the following parameters to this script.

Parameter	Description
action	Defines the action and can have the following values: backup, archive, manual_backup, restore, list
clientname	Defines the client name.

Parameter	Description
`userid`	Defines the user ID.

For example:

```
userreq_notif.cmd backup mercury jdoe
userreq_notify.cmd archive mercury jdoe
userreq_notify.cmd manual_backup mercury jdoe
userreq_notify.cmd restore mercury jdoe
userreq_notify.cmd list mercury jdoe
```


Using NetBackup With AFS 7

This chapter explains how to install, configure, and use NetBackup to back up AFS file servers. (AFS is an acronym for Andrew File System.)

Installation

System Requirements

- AFS file servers that will be NetBackup AFS clients:
  - Solaris 2.6, Solaris 7, HP-UX 11.0, or IBM AIX 4.3.3 platform
  - NetBackup 4.5 or later
  - AFS level 3.6 installed
- NetBackup servers that will be backing up the clients must have NetBackup 4.5 or later installed.

Server and Client Installation

Both the AFS server software and the AFS client software are installed automatically with NetBackup. There are no additional instructions for installing AFS software.

Configuration

To configure backups for NetBackup AFS clients, add an AFS policy to the NetBackup configuration on the master server. Except for the differences mentioned here, the requirements are the same as for other NetBackup policies. To back up files and directories that are not in AFS volumes, create a separate policy.

General Policy Attributes

When selecting the general attributes for the policy, specify AFS as the policy type.

Client List

In the client list, specify the names of the AFS file servers to be backed up. These systems must have NetBackup client and NetBackup AFS software installed.

Backup Selections

In the backup selection list for the AFS policy, specify the AFS volumes and (or) vice partitions to be backed up by the schedules in this policy. The following example shows both volumes and vice partitions:

```
user.abc
/vicepb
/vicepc/user.*
```

In this instance, NetBackup backs up:

- The volume `user.abc`
- All volumes in vice partition `vicepb`
- All volumes in `vicepc` that begin with *user*.

  When the list includes a vice partition, all the volumes in the partition are backed up one at a time.

Note NetBackup supports the maximum AFS 3.6 volume size of 8 GB.

Backup Selection List Directives

The following directives can be in the backup selection list in an AFS policy:

- `CREATE_BACKUP_VOLUMES`

  This directive causes NetBackup to create .backup volumes prior to performing the backup. If a `.backup` volume already exists, NetBackup overwrites it, thus creating a more recent copy.

  Because NetBackup backs up only the .backup copy of AFS volumes, this directive is useful if an automated mechanism is not in place to create .backup copies. Creating `.backup` copies also ensures that the backups include the latest changes.

Caution If an automated mechanism is not in place to create .backup copies, you must include the CREATE_BACKUP_VOLUMES directive in the backup selection list or AFS volumes are not backed up.

- REMOVE_BACKUP_VOLUMES

  This directive causes NetBackup to remove .backup volumes after performing the backup. The directive removes .backup volumes created using the CREATE_BACKUP_VOLUMES directive or created by another mechanism.

- SKIP_SMALL_VOLUMES

  This directive allows you to skip small or empty volumes during backups. For example:

  ```
  SKIP_SMALL_VOLUMES=5
  ```

  (do not include spaces on either side of the = sign)

  In this example, NetBackup skips volumes ≤ 5 KB. You can specify any number for the volume size.

  If you do not specify a number, the size defaults to 2 KB. For example:

  ```
  SKIP_SMALL_VOLUMES
  ```

  The following rules also apply to the directives:

  - Directives must be all upper case.
  - Directives can be anywhere in the backup selection list but it is best to place directives at the top. For example:

    ```
    CREATE_BACKUP_VOLUMES
    SKIP_SMALL_VOLUMES
    /user.abc
    /vicepb
    ```

Regular Expressions

NetBackup supports regular expressions in backup selection list entries. These are useful if you want to:

- Add or move volumes without having to change the backup selection list.
- Add vice partitions without having to change the backup selection list.
- Split volumes and (or) vice partitions on AFS file servers into groups that can be backed up by separate policies. This allows concurrent backups or multiplexing.

The following examples use regular expressions:

```
user.[a-m]*
/vicep[a-c]
```

Exclude and Include Lists

Exclude lists can be created on the client in order to exclude certain specific volumes from automatic backups. An exclude list cannot contain vice partitions but it can contain individual volumes within a vice partition.

An include list adds back volumes specified in the exclude list. For example, if a range of volumes is excluded, the include list can add back specific volumes within the range.

Backups and Restores

Backups

Note You cannot perform user backups or archives of AFS volumes.

Automatic Backup

The most convenient way to back up NetBackup for AFS clients is to configure an AFS policy and set up schedules for automatic, unattended backups.

Manual Backup

The administrator on the master server can use the NetBackup Administration Console to manually run a backup for an AFS policy. For information about manual backups, see "Performing Manual Backups" on page 198 in *NetBackup System Administrator's Guide for Windows, Volume I*.

Restores

All restores must be performed by the administrator either on the NetBackup AFS client or the master server. Restores are performed on the basis of volumes. To restore a vice partition, the administrator must select all the volumes in that partition.

Caution If you select the **Overwrite Existing Files** option, the volumes are overwritten and all changes or files created since the last backup are lost.

Restore From the NetBackup for AFS Client

An administrator on a NetBackup AFS client (AFS file server) can use the NetBackup Backup, Archive, and Restore interface to restore volumes to that client. It is also possible to perform a redirected restore. A redirected restore will restore a volume to another volume or vice partition.

Restore From the NetBackup Master Server

The administrator can use the NetBackup Backup, Archive, and Restore interface on the master server to restore volumes to the same NetBackup AFS client (AFS file server) or do a redirected restore. This is called a server-directed restore. For instructions, see the *NetBackup User's Guide for Microsoft Windows*.

Notes About Restores

- If the administrator does not specify **Overwrite Existing Files** or an alternate name for the volume, then NetBackup adds an *R* to the name of the restored volume as follows:
  - If the volume name is less than 22 characters long, NetBackup adds a leading *R* to the name of the restored volume. For example:

    If the volume name is

    ```
    /AFS/shark/vicepa/user.abc
    ```

    The restored name is

    ```
    /AFS/shark/vicepa/Ruser.abc
    ```

  - If the volume name is 22 characters long (maximum allowable length for a volume name), the first character of the original volume name is replaced with an *R*. For example:

    If the volume name is

    ```
    /AFS/shark/vicepa/engineering.documents1
    ```

    The restored name is

    ```
    /AFS/shark/vicepa/Rngineering.documents1
    ```


- If you are restoring to an alternate path and specify an existing volume, you must select the **Overwrite Existing Files** option for the restore to succeed. In this case, the entire volume is overwritten. If you do not select the **Overwrite Existing Files** option, the restore fails.
- When restoring a volume to an alternate vice partition, the vice partition must exist or the restore fails.

Troubleshooting

The following sections provide tips and information for troubleshooting problems with NetBackup for AFS. See the *NetBackup Troubleshooting Guide for UNIX and Windows* for overall troubleshooting information.

Troubleshooting Backups

To increase the level of detail in the logs:

- Add the `VERBOSE` option to the `/usr/openv/netbackup/bp.conf` file on the NetBackup for AFS client.
- Create the following debug log directory on the NetBackup for AFS client:

  ```
  /usr/openv/netbackup/logs/bpbkar
  ```

  If the AFS backup terminates with a status code of 9 (an extension package is needed, but was not installed), it means that NetBackup AFS client software was not properly installed on the client.

  If the AFS backup terminates with a status code of 78 (`afs/dfs` command failed), it indicates an AFS `vos` command failure. The NetBackup Problems Report provides additional information on why the command failed. The `bpbkar` debug log shows the command that was run. You can run the `vos` command manually to attempt to duplicate the problem.

  Also, examine the `/usr/openv/netbackup/listvol` file on the NetBackup client for irregularities. The `vos listvol` command can be very demanding on system resources so NetBackup caches the output of the `vos listvol` command in this file. If the cached `listvol` file was created less than four hours prior to the backup, NetBackup uses it to obtain the list of volumes instead of running another `vos listvol` command.

Troubleshooting Restores

If the restore of an AFS volume fails, check the restore process log for additional information. If a `vos restore` command failure is indicated, create a `/usr/openv/netbackup/logs/tar` debug log directory, retry the operation, and check the resulting log to see that the `vos restore` command was run.

Intelligent Disaster Recovery 8

Intelligent Disaster Recovery (IDR) for Windows is a fully-automated disaster recovery solution that allows you to recover your Windows computers quickly and efficiently after a disaster. The IDR wizards guide you in preparing for disaster recovery and in recovering your computer to its pre-disaster state.

The information about protected computers applies to all Windows server types that NetBackup supports unless otherwise specified.

This chapter contains the following sections:

- "Requirements for IDR" on page 192 explains the prerequisites for using IDR.
- "Overview of IDR Use" on page 193 explains the main steps involved in using the disaster recovery software.
- "About the DR Files" on page 194 introduces the DR (Disaster Recovery) files and explains their importance in disaster recovery.
- "Configuring NetBackup Policies for IDR" on page 194 explains how to configure policies that contain clients that are using IDR.
- "Backing Up the System to be Protected" on page 195 explains that you must backup the system before you create the bootable media used in recovery.
- "Creating IDR Media" on page 195 explains how to use this wizard to prepare the bootable media that is used to recover your data.
- "Updating IDR Media" on page 202 explains how and when to update the IDR media so it is always ready when you need it.
- "Recovering Your Computer" on page 205 explains how to perform disaster recovery.
- "Notes on Recovering Specific Platforms" on page 211 provide information on recovering data on specific types of platforms.
- "IDR Frequently Asked Questions" on page 213 answers questions that are frequently asked about IDR.

Supported Windows Editions

IDR allows you to recover the following Windows platforms:

- Windows NT 4.0 Enterprise Server, Small Business Server, and Workstation editions with Service Pack 3 or later
- Windows 2000 Server, Advanced Server, and Professional
- Windows XP 32-bit versions
- Windows Server 2003 (Standard Edition, Enterprise Edition, and Web Edition)

Requirements for IDR

The following are the requirements for IDR:

- NetBackup 5.1 or later must be installed on both the machine that collects the disaster recovery information and the Windows systems that you are going to protect. The NetBackup master server that collects the disaster recovery information can reside on either a Windows or UNIX system.
- The Intelligent Disaster Recovery software must be installed on the Windows systems that you want to protect. IDR software is installed automatically on each Windows system on which NetBackup server or client software is installed. The software is not required and cannot be installed on UNIX systems.
- The NetBackup master server that collects the disaster recovery information must be licensed for IDR.
- The IDR Preparation Wizard can only be used to generate recovery media for systems that have the same version of IDR software installed. For example, the IDR Preparation Wizard running on a NetBackup 5.1 master server cannot generate recovery media for a NetBackup 4.5 client.
- The machine to be protected must be an Intel system running Windows NT 4.0 (with Service Pack 3 or later); Windows 2000; Windows XP; or Windows Server 2003 (Standard Edition, Enterprise Edition, Web Edition).
- At least 40 MB of hard drive space to hold the minimal recovery system on the machine to be protected.
- Sufficient space on the machine to be protected for the data that is being restored.
- Sufficient swap space on the machine to be protected to support your system's RAM.

  For example, if you have 128 MB of RAM, the minimum swap used is 128 MB. For a 2 GB partition that stores 1.8 GB of data, the required hard drive space for that partition is 1.8 GB plus 128 MB plus 40 MB, for a total of 1.97 GB.

- The partition on the first physical drive on the machine to be protected must be the boot partition and must also be labeled `c:\`.
- A protected computer must use a network card that does not require a Windows service pack to be installed. For a list of cards that have passed Microsoft compatibility tests without service packs, see the "Network LAN Adapters" section of the "Hardware Compatibility List" that comes with the Microsoft Windows software.
- The driver required by the CD-ROM drive on a protected computer must be supported by Windows. *Windows NT systems*: If the IDR Preparation Wizard detects that the driver on the system being protected is different than the driver on the Windows NT installation CD, you can choose which driver to use. VERITAS recommends that you use the SCSI drivers currently installed on the computer being protected because the drivers on the Windows CD may not be up to date. If you have an IDE hard disk greater than 8 GBs you must use the SCSI driver currently installed on the system.

Overview of IDR Use

Using IDR involves the following steps:

- Installation. The IDR software is installed automatically when NetBackup server or client software for Windows is installed. In order for IDR to be activated for backups, you must enter an IDR license key on the master server.

  The IDR software is not required (and cannot be installed) on UNIX systems.
- Configuration. On the NetBackup master server, select the **Collect disaster recovery information** general attribute when setting up the policy configuration for protected clients. You can use a NetBackup master server on either a Windows or UNIX system to collect disaster recovery information.
- Backup. An initial full backup must be completed before you create IDR media. Also, you should backup your computer frequently and update the DR files often.
- Preparing the IDR media. The IDR Preparation Wizard guides you through the preparation of media used to recover protected systems.
- Recovery. A Disaster Recovery Wizard guides you through the steps for rebuilding the protected system and then restoring data to that system. The systems to be protected should have their data backed up regularly by NetBackup.

The installation, configuration, backup, and media preparation steps are prerequisites for successfully recovering a Windows system through a network connection to a NetBackup server.

About the DR Files

The disaster recovery (DR) files are mentioned frequently in this chapter and in the screens that you see in the wizards. A DR file contains specific information about the computer you are protecting, including:

- Hard disk partition information.
- Network interface card information.
- NetBackup configuration information required to restore data files.

To fully automate the recovery of an IDR-protected computer, you need a copy of the DR file for that computer. If IDR software is installed on the server and client and the server is configured to collect disaster recovery information, NetBackup creates a DR file and stores a copy on the client and the master server after every:

- Full backup
- Incremental (differential or cumulative) backup
- User backup
- User archive

NetBackup stores the DR file for each client in the *install_path*\NetBackup\Idr\data directory on the client. The DR files generated after a backup are named in the format *netbackup_client_name*.dr. For example, if the client name is bison, the DR file is bison.dr.

Note IDR requires that the DR file name match the computer name of the client. That is, if the computer name is recognized by the network as bison, then the DR file must be named bison.dr. If the NetBackup client name is different for some reason, you must manually rename a DR file created after each backup to *computer_name*.dr before you can use it in a recovery.

On the NetBackup master server, the DR files for all clients are stored in the NetBackup catalogs on the server.

Configuring NetBackup Policies for IDR

Set up the policy configuration on the NetBackup master server as follows:

- Ensure that each protected client is in an MS-Windows-NT type policy.
- Select the **Collect disaster recovery information** policy attribute for at least one of the MS-Windows-NT policies that are backing up protected clients.

- The NetBackup master server that collects disaster recovery information must be licensed for IDR; otherwise, you cannot select the **Collect disaster recovery information** attribute.
- Ensure that all the clients in this policy have IDR installed. If a client in a policy that is collecting disaster recovery information does not have IDR installed, backups performed for that client by this policy will never end with a status of 0. A successful backup in this instance shows a status of 1 (partially successful). This is a result of NetBackup not finding a DR file to store in its catalog after each backup.
- NetBackup 5.1 will collect the DR information from clients that have versions of NetBackup earlier than 5.1. However, you must use the IDR software revision on the client to prepare the bootable media for that client (for example, if the client software is NetBackup 4.5, you must use that version of IDR to prepare the IDR media).
- Ensure that the client names used in the NetBackup policy configuration match the client's computer name. If these names do not match, you must manually rename the DR file that is created after each backup to *computer_name*.dr before you can use it in a recovery.

Backing Up the System to be Protected

Before you prepare the IDR media, which includes the DR file used in recovery, you must perform at least one full backup of the system to be protected. The NetBackup master server that performs the backup must be configured to collect disaster recovery information. The backup information collected is used when creating the DR file.

You can prepare IDR bootable media if differential or incremental backups have occurred since the full backup.

Ensure that all local drives are backed up, and, for Windows 2000, ensure that System State is backed up.

Ensure that any utility partitions are backed up. Utility partitions are small partitions created on the hard drive, usually by the computer vendor, that may contain system configuration and diagnostic utilities.

Creating IDR Media

The IDR Preparation Wizard guides you in creating the IDR media used in recovery. A set of IDR media includes the following:

- Bootable media used to boot the computer and install and configure the operating system.
- System specific drivers and the Disaster Recovery Wizard.
- The disaster recovery (DR) file.
- For Windows XP and Windows Server 2003 systems, Windows Automated System Recovery files.

To create IDR media, you must have:

- At least one full backup of the system to be protected.
- The Windows installation CD for the version and language installed on the protected system.
- The license key for your Windows 2000, Windows XP, or Windows Server 2003 operating system.
- Administrative privileges for the protected system.
- A device capable of creating bootable media:
  - CD-R drive (CD Recordable CD-ROM)
  - CD-RW drive (CD Rewritable CD-ROM)
  - Diskette drive (IDR does not support bootable diskette media for Windows XP or Windows Server 2003)

More information about media is provided later in this chapter.

You must prepare the media before a disaster. For CD-R or CD-RW, you should also try booting from the media before a disaster occurs to ensure that your hardware can boot from it. (See "Step 1: Boot Your Computer" on page 206.)

Choosing the Bootable Media

For Windows NT and Windows 2000, the IDR Preparation Wizard can create both bootable diskettes and bootable CD-Recordable (CR-R) or CD-Rewritable (CR-RW) media.

Note IDR does not support bootable diskette media for Windows XP or Windows Server 2003.

When choosing between diskettes and CD-ROM media, consider the following:

- Diskettes work on most systems but require more time for preparation and recovery than CDs.
- Diskettes require the Windows installation CD during recovery.

- Diskettes will hold SCSI driver information for only one computer (because of space limitations). If you want to use one set of diskettes to protect more than one computer, you must choose one computer that represents all the other computers and create bootable media for it. If you have computers with different SCSI drivers, you must create a set of diskettes for each computer with a different driver.
- CDs require less time for preparation and recovery than diskettes.
- CD media has enough space to store SCSI driver information for multiple systems, so you can use a single CD for multiple systems during disaster recovery.
- CD media requires that the computer being protected has BIOS that supports booting from a CD.
- CD media requires CD writing hardware. The computer to be protected does not have to have a CD writer; the IDR Preparation Wizard creates a bootable image that you can write to a CD on any computer that has a CD writer.
- For CD media, third party CD writing software is required if the computer being protected does not have a CD writer or if the IDR Preparation Wizard cannot detect the CD writer attached to the system being protected. The CD hardware and software must be able to write ISO 9660 CD images.
- With both diskettes and CDs, you must prepare separate media for each operating system level and language being protected.

Creating Bootable Diskettes

The IDR Preparation Wizard guides you through creating a full set of diskette media for booting a computer during recovery and running the Disaster Recovery Wizard. A full set of IDR diskette media includes the following:

- Windows Setup diskettes created by a utility that is on the Windows installation CD. IDR modifies these setup diskettes for use specifically with NetBackup for Windows.
- Intelligent Disaster Recovery diskettes that contain the computer specific information that is necessary to perform disaster recovery, including the DR file. (Alternatively, you can store the DR file on a diskette other than one of the IDR diskettes.)

If you select diskettes for the bootable media, you need five (for Windows NT) or six (for Windows 2000) blank, formatted 1.44 MB diskettes for each set of disaster recovery diskettes.

Note Windows XP and Windows Server 2003 do not support bootable diskettes.

Note The Windows installation CD is required both to prepare disaster recovery diskettes and for disaster recovery using those diskettes. You also need the Windows 2000 license key, either during bootable diskette preparation or during recovery.

▼ To create bootable diskettes

1. Format the diskettes that you are going to use.

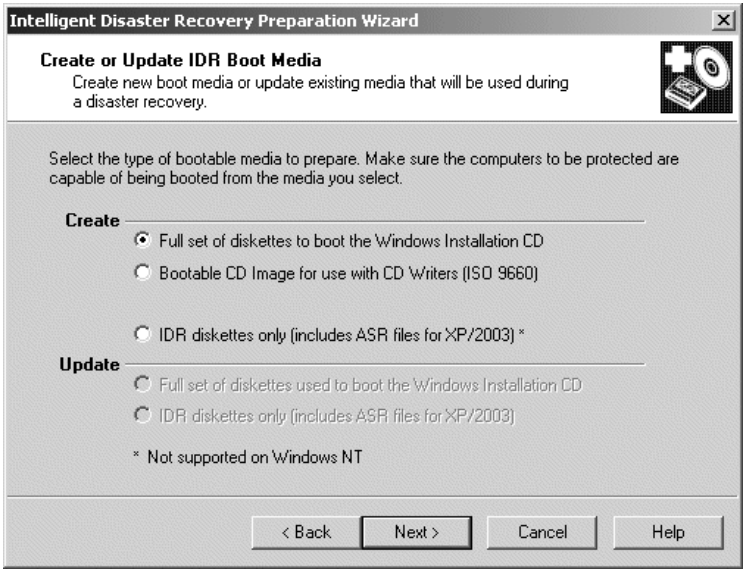
   Windows NT requires five diskettes and Windows 2000 requires six. Windows XP and Windows Server 2003 do not support bootable diskettes.

2. On the computer where you are going to prepare the diskettes, select **Start** > **Programs** > **VERITAS NetBackup** > **Intelligent Disaster Recovery PrepWizard**.

   The Welcome screen for the IDR Preparation Wizard appears.

3. Click **Next** to continue.

   The Create or Update IDR Boot Media screen appears.



4. Select **Create - Full Set of Diskettes to boot the Windows Installation CD** and click **Next**.

   The Starting Bootable Diskettes Creation screen appears.

5. Follow the prompts until the IDR Preparation Wizard is completed.

Windows 2000: If the **Let IDR Automatically Partition the Boot and System Drive** option is selected when recovery media is prepared, you must create a complete set of recovery diskettes for each Windows 2000 computer to be protected. However, if you do *not* select the **Let IDR Automatically Partition the Boot and System Drive** option, you can use the same diskettes 2 through 5 for all IDR-protected Windows 2000 computers — but you must reinstall any utility partitions by using the OEM-supplied installation media before recovery and then during recovery you must select the option to partition and format the drives manually. For details, see "Modifying Diskette Sets for Use with Multiple Windows 2000 Computers" on page 199.

Modifying Diskette Sets for Use with Multiple Windows 2000 Computers

If **Let IDR Automatically Partition the Boot and System Drive** option is *not* selected, you can use use the same diskettes 2 through 5 for all of the Windows 2000 computers that you want to protect. However, you have to create a different diskette 1 for each computer protected with IDR.

Diskette 1 contains a file named `winnt.sif`, which is the script used to automate the installation of Windows 2000 for disaster recovery when using the IDR option. This scripted installation of Windows 2000 requires that the name of the computer being recovered be listed in the `winnt.sif` file.

Therefore, for each Windows 2000 computer that will share diskettes 2 through 5, make a copy of diskette 1 (and its files). For each copy of diskette 1, edit the `winnt.sif` file and change the computer name to that of the machine to be protected. If the computer name is not modified, duplicate computer names on the network may occur and may prevent the recovered system from participating on the network.

Creating a Bootable CD Image

The IDR Preparation Wizard guides you through creating a bootable CD image. You then can write that image to a CD using the IDR Preparation Wizard or other writing software. If the system on which you are running the IDR Preparation Wizard does not have a CD-R or CD-RW drive, you can write the image onto a CD on a different machine using third-party CD writing software.

The CD image contains all the necessary IDR files unless you choose to store the Windows Server 2003 Automated System Recovery files on a diskette. If stored on the CD, the ASR files will always be read from the CD even if a more recent version is on an IDR diskette. For example, if you create IDR diskettes after you create the bootable CD, the ASR files will be read from the CD during recovery even though more recent versions may be on the IDR diskettes.

The Windows installation CD is required only during media preparation.

The license key for your Windows 2000, Windows XP, or Windows Server 2003 operating system is required. If you do not enter the license key while creating the bootable CD, you must enter it during recovery.

Note On Windows NT 4.0 systems, the IDR software cannot write to a CD; therefore, you must use other CD writing software to create the CD.

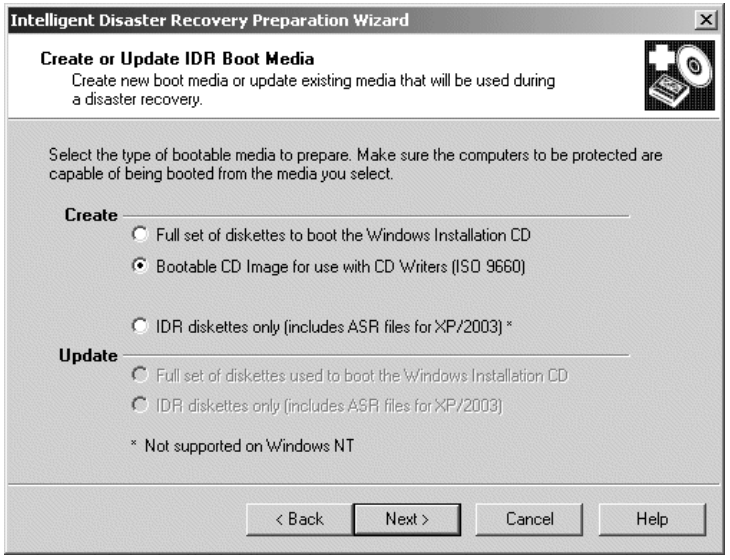
▼ To create a bootable CD image

1. On the computer where you are going to prepare the bootable CD image, select **Start** > **Programs** > **VERITAS NetBackup** > **Intelligent Disaster Recovery PrepWizard**.

   The Welcome screen for the IDR Preparation Wizard appears.

2. Click **Next** to continue.

   The Create or Update IDR Boot Media screen appears.



3. Select **Create - Bootable CD Image for Use with CD Writers (ISO 9660)** and click **Next**.

   The Starting CD Image Creation screen appears.

4. Follow the prompts until the IDR Preparation Wizard is completed.

Windows 2000: If you do *not* select **Let IDR Automatically Partition the Boot and System Drive**, before recovery you must reinstall any utility partitions by using the OEM-supplied installation media and then during recovery you must select the option to partition and format the drives manually. For details, see "Modifying Diskette Sets for Use with Multiple Windows 2000 Computers" on page 199.

Caution Test your bootable CD to ensure that your system can boot from it. (See "Step 1: Boot Your Computer" on page 206.)

Creating IDR Diskettes

Two formatted, 1.44 MB floppy diskettes are required to create IDR diskettes.

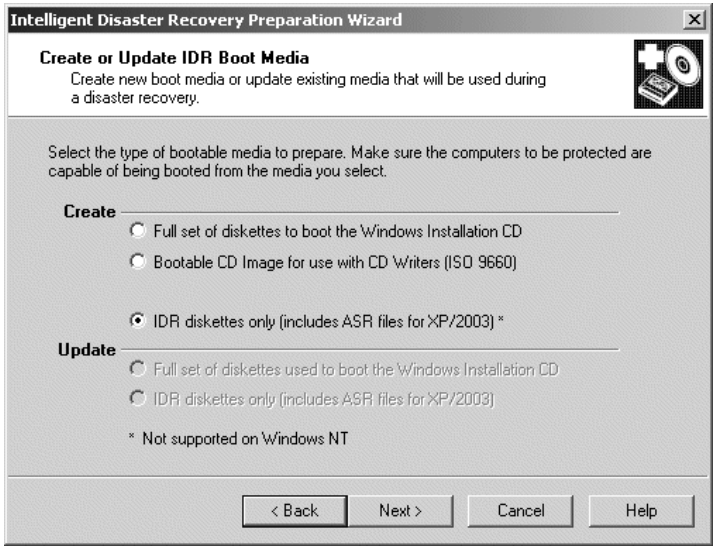
▼ To create IDR diskettes

1. On the computer where you are going to prepare the IDR diskettes, select **Start** > **Programs** > **VERITAS NetBackup** > **Intelligent Disaster Recovery PrepWizard**.

   The Welcome screen for the IDR preparation wizard appears.

2. Click **Next** to continue.

   The Create or Update IDR Boot Media screen appears.



3. Select **Create - IDR Diskettes Only (Includes ASR Files for XP/2003)** and click **Next**.

   The Creating the IDR Diskettes screen appears.

4. Follow the prompts until the IDR Preparation Wizard is completed.

Updating IDR Media

You should update your IDR media if your hardware configuration changes, if SCSI drivers were updated, or if other system drivers were updated.

Also, VERITAS recommends that you update the IDR diskettes periodically so they contain the latest DR files.

Updating a Bootable CD

You cannot update a bootable CD, you must create a new bootable CD image and then burn a new CD. If you install new hardware or change components on a protected system (such as a new SCSI card that is not supported by the Windows installation CD), create a new bootable CD as explained in "Creating a Bootable CD Image" on page 199.

Updating Bootable Diskettes

You can update the bootable diskette set by using the IDR Preparation Wizard. Use this option if you changed hardware, updated SCSI drivers, or updated other system drivers, and you already have a full set of bootable diskettes that you want to update.

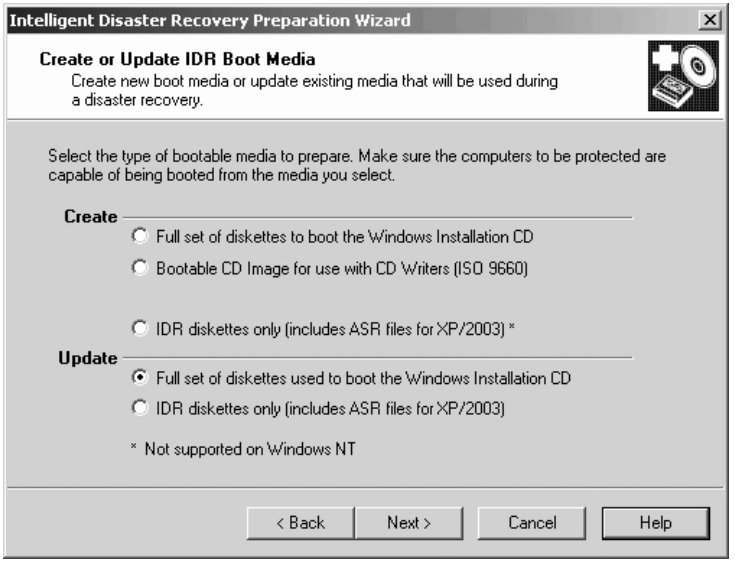
▼ To update IDR bootable diskettes

1. On the computer where you are going to prepare the IDR diskettes, select **Start** > **Programs** > **VERITAS NetBackup** > **Intelligent Disaster Recovery PrepWizard**.

   The Welcome screen for the IDR preparation wizard appears.

2. Click **Next** to continue.

The Create or Update IDR Boot Media screen appears.



3. Select **Update - Full Set of Diskettes Used to Boot the Windows Installation CD** and click **Next**.

4. Follow the prompts until the IDR Preparation Wizard is completed.

Updating IDR Diskettes Only

You can update the IDR diskettes with the latest DR file (and ASR files for Windows XP and Windows Server 2003 systems) by using the IDR Preparation Wizard.

Alternatively, to update the DR file only, you can run the `drfile.exe` file from a command prompt, which creates a new DR file, and then copy the DR file to the diskette. (See "Using drfile.exe to Create or Update a DR File" on page 204.)

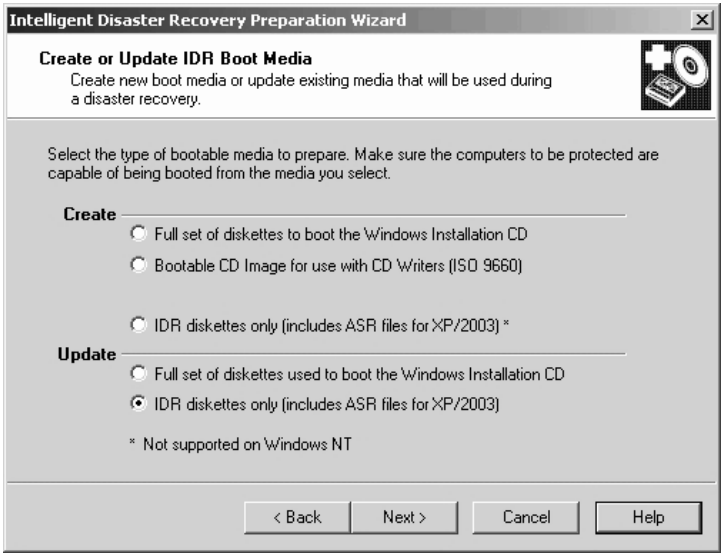
▼ To update IDR diskettes using IDR Preparation Wizard

1. On the computer where you are going to prepare the IDR diskettes, select **Start** > **Programs** > **VERITAS NetBackup** > **Intelligent Disaster Recovery PrepWizard**.

   The Welcome screen for the IDR Preparation Wizard appears.

2. Click **Next** to continue.

The Create or Update IDR Boot Media screen appears.



3. Select **IDR Diskettes Only (Includes ASR Files for XP/2003)** and click **Next**.

4. Follow the prompts until the IDR Preparation Wizard is completed.

Using drfile.exe to Create or Update a DR File

If IDR diskettes have already been created, you can update the DR file only by running the `drfile.exe` program on the client and then copying the DR file to the diskette that contains the DR file. The name of the DR file should always match the computer name of the client (which is the name required by IDR), even if this name happens to be different than the one used in the NetBackup policy configuration.

1. Go to the *`install_path`*`\NetBackup\bin` folder and double-click `drfile.exe` (*`install_path`* is `C:\Program Files\VERITAS` by default). This creates (or updates) the DR file that is located in the *`install_path`*`\NetBackup\Idr\Data` directory on your computer.

   The DR file name is of the form *`computer_name`*`.dr`, as in `bison.dr`. The name of the DR file will match the computer name of the client, which is the name required by IDR, even if the name is different from the one used in the NetBackup policy configuration.

2. Insert the diskette that contains the DR file into your drive and copy the DR file to it.

The diskette can be one of the IDR diskettes or a separate diskette. If using a separate diskette, insert the other diskette when prompted for the DR file during disaster recovery.

Recovering Your Computer

Restoring the computer to its pre-disaster status with IDR includes the following steps:

- Step 1: Boot Your Computer. Use the previously prepared IDR bootable media to boot the computer being recovered.
- Step 2: Windows Setup in IDR Recovery. Use the Windows Setup program to partition and format the system drive on the computer being recovered. The IDR bootstrap process loads and runs the Windows Setup program from the Windows installation CD.
- Step 3: Disaster Recovery Wizard. Use the NetBackup IDR Disaster Recovery wizard to restore your system to its pre-disaster state and restore your data files.

Automating the recovery with the Disaster Recovery wizard requires the following:

- A NetBackup server that can restore the latest backups to the computer being recovered.
- The latest DR file for the machine being recovered.

  If you have not updated the DR file since the last backup, it may contain out-of-date hard disk partition, network-interface-card driver, or backup set information.
- Bootable IDR CD media or the original Windows installation CD.
- The license key for your Windows operating system (if you did not enter the license key during preparation of the IDR bootable media).
- For Windows XP and Windows Server 2003 systems, the ASR files for the machine being recovered.
- If your network adapter requires special driver software, you need the installation media provided by the CD manufacturer. Special drivers are ones that are not on the operating system installation media, such as a driver for a network interface card (NIC) supplied by the manufacturer.

Note For Windows 2000 systems, if **Let IDR Automatically Partition the Boot and System Drives** was *not* selected during IDR preparation, before beginning the recovery process you must reinstall any utility partitions by using the OEM-supplied installation media. Then, during recovery, you must select the option to partition and format the drives manually.

Step 1: Boot Your Computer

You can recover a Windows system by using the bootable diskettes or CD created during disaster preparation. The computer being recovered must have a device capable of booting from the bootable media.

Caution Disconnect any storage area network or cluster systems that are attached to the computer being recovered; if you do not, the hard drives on those computers may also be repartitioned and reformatted.

▼ To boot a computer using a bootable diskette

1. Insert the bootable diskette.
2. Start the computer.
3. Follow the boot process instructions on screen and continue with "Step 2: Windows Setup in IDR Recovery" on page 207.

▼ To boot from a bootable CD

1. Insert the bootable CD.
2. Start the computer and perform the tasks necessary to boot from the CD. For example, depending on the BIOS in the computer, you may have to press a function key to boot from the CD drive.

   The NetBackup Intelligent Disaster Recovery Bootstrap screen appears.
3. Do one of the following:
   - If you are testing the CD to determine if it can boot the computer, press Esc to exit and then remove the CD from the drive.
   - If you are performing disaster recovery, press Enter to continue with the boot process.
4. Depending on the system, do one of the following:
   - For Windows NT and Windows 2000, go to "Step 2: Windows Setup in IDR Recovery" on page 207.
   - For Windows XP and Windows Server 2003, press F2 to load the ASR files when prompted by the boot process. If you have an ASR diskette, place it in the floppy disk drive so the ASR files can be loaded.
5. Continue by going to "Step 2: Windows Setup in IDR Recovery" on page 207.

Step 2: Windows Setup in IDR Recovery

During the recovery process, the DR boot process uses the Windows Setup program to partition and format the system drive on the computer being recovered. If you booted from the IDR bootable CD, Windows Setup is started from that CD; if you booted from diskette, you will be prompted to insert the Windows installation CD so the Windows Setup can be started.

▼ To use Windows setup in IDR recovery

1. Follow the instructions on screen to continue the boot process.

   If you booted from diskette, you will be prompted to insert the Windows installation CD.

   At this point of the recovery, the Windows Setup program is loaded and performs the tasks necessary to partition and format drives and install a limited version of the operating system.

2. During Windows Setup, you may have to make choices about the following:

   - For Windows NT, **Express Setup** or **Custom Setup**. Usually, **Express Setup** is the best choice. Use **Custom Setup** if SCSI drivers are not present on the boot media or if you have RAID hardware that needs to be reconfigured.
   - For Windows NT, FAT or NTFS file system. If a new hard drive is detected on your system, you will be asked which file system format to use. Select FAT format for the C drive. IDR cannot repartition to the old layout if you build the partition as NTFS.

3. When prompted to reboot, ensure that no diskettes or CDs are in the drives and press **Enter** to reboot the system.

   After the reboot, the Disaster Recovery Wizard starts automatically.

4. Go to “Step 3: Disaster Recovery Wizard” on page 207.

Step 3: Disaster Recovery Wizard

After Windows Setup finishes its tasks, the Disaster Recovery Wizard is started as part of the recovery process. Follow the instructions to recover the computer; although these instructions do not provide a step-by-step procedure because different conditions affect the process, the process will be similar to the following.

▼ To use the Disaster Recovery Wizard

1. If you have a DR file, when prompted select the DR file for the computer you are recovering and click **Next.**

   The name of a DR file matches the computer for which it was created. For example, if the computer is named carrot look for a file named `carrot.dr`.

Note If you do not have a DR file, click **Next** to proceed. A message stating that the recovery file was not selected appears. Click **Yes** to continue in manual mode.

2. One or more screens about hard disk layout may appear:
   - You may be prompted about replacing the current hard drive partition with the partition information contained in the DR file or to keep the current hard drive partitions.
   - You may to prompted to run the Windows Disk Administrator (or Disk Manager) program, which allows you to make additional changes to your partition information. To make partition changes, click **Run Disk Administrator** (or **Run Disk Manager)**. (See "Notes on Altering Hard Drive Partition Sizes" on page 211.) Otherwise, click **Next** to continue the recovery process.

     For more information about Disk Administrator and fault tolerant configurations, see the operating system documentation.

3. For Windows 2000, Windows XP, and Windows Server 2003, a Completed IDR Phase 1 dialog appears. Do one of the following:
   - If your network adapter requires special driver software, click **Pre-install Custom Network Driver** and then follow the prompts to find and install the appropriate driver software. Special drivers are ones that are not on the operating system installation media, such as a driver for a network interface card (NIC) supplied by the NIC manufacturer.
   - To continue, click **Next** and go to step 5 to continue the recovery.

4. For Windows NT only, you will be asked to select either **Automatic Restore** or **Manual Restore** for network installation. Do one of the following:
   - If your network adapters use the drivers and software included with the operating system, select **Automatic Restore**, click **Finish** to complete the network installation, and then go to step 5 to continue the recovery.
   - If your network adapters require special drivers and software, select **Manual Restore**, select **Wired to the Network**, click **Next**, and proceed to step a.

a. To select your network adapter, do one of the following:

- If your network adapter requires a manufacturer supplied setup diskette, click **Select from list**, then click **Have Disk**.
- If your network adapter does not require a manufacturer supplied setup diskette, either click **Select from list** or **Start search**.

A list of network adapters appears.

Note If your network adapter is not listed on the screen that appears, click **Select from list**, then click **Have Disk add an adapter to the Network Adapter List**. For automatic network installation to succeed, the Windows NT setup program must be able to recognize the network interface card being used.

b. The next screen lists the default network protocols. Select the networking protocols used on your network and click **Next**.

c. Windows NT is ready to install the networking components. Insert your Windows NT installation CD or the IDR bootable CD into the CD-ROM drive and click **Next** to continue. (If you created a bootable CD, it may include the appropriate network drivers if they were found during the IDR preparation process.)

Note If additional screens about setting up your network interface card appear, respond as appropriate.

d. If TCP/IP is selected as the network protocol, you are prompted to use DHCP. If you do not want to use DHCP, enter a TCP/IP number.

The Windows NT Networking Installation dialog appears.

e. Click **Next** to start the network and complete the installation of the networking components.

f. Enter the name of the workgroup or domain for your computer and click **Next**.

Note VERITAS recommends that you enter the name of a temporary workgroup rather than the name of a domain. When the recovery is complete, the system will be restored to its original workgroup or domain.

g. Click **Finish** to complete the network installation and continue with recovery.

5. Select either **Automatic** or **Manual**:

- If you selected **Automatic**, click **Next** and proceed to step 6.
- If you select **Manual**, click **Next** and proceed to step 8.

6. When recovering the registry, normally the restore process merges hardware information from the current *live* version of the registry into the *saved* version of the registry. (The saved version is the registry version that was backed up.) This ensures that the machine will reboot after the restore if the hardware changed.

If the hardware changed, select the server from which you want to restore files, then click **Start Restore** to submit the restore request to the selected server. By clicking **Start Restore**, the files will be restored and the hardware information from the current *live* version of the registry will be merged with the *saved* version of the registry. Go to step 7.

If the hardware on the machine that is being recovered has not changed, the live version and the saved version of the registry do not need to be merged because the hardware registry settings will be identical to what they were in the saved version of the registry. If you do not want to merge the registries, continue with step a:

a. Start a command window by pressing F1.

b. Navigate to the following directory (the default location; %SYSTEMROOT% is usually C:\Windows) :

```
%SYSTEMROOT%\System32\VERITAS\NetBackup\Bin
```

c. Type the following command, then press **Enter**.

```
W2KOption -restore -display -same_hardware 1
```

The following output appears:

```
NetBackup Restore Options
-----------------------------------------
            SYSVOL Restore: Primary
         Hard Link Restore: Perform secondary restore
     Same Hardware Restore: Assume different hardware

NetBackup Restore Options
-----------------------------------------
            SYSVOL Restore: Primary
         Hard Link Restore: Perform secondary restore
     Same Hardware Restore: Assume same hardware
```

d. Make sure that **Assume Same Hardware** is displayed in the `Same Hardware Restore` field, then continue with the restore process.

7. After the restore is complete, click **Next**. Go to step 10.

8. Select **Start NetBackup Interface** to start the NetBackup Backup, Archive, and Restore interface.

   Using this interface, you can make changes to the NetBackup configuration and you also have more control over the restore. (See the *NetBackup User's Guide for Microsoft Windows* for more information on using the interface.)

   When the restore is complete, close the Backup, Archive, and Restore interface and any other open NetBackup windows.

9. The **Next** button will be available when the restore is complete. Click **Next**.

10. Remove any diskettes from drive A and click **Finish** to reboot the computer.

Notes on Altering Hard Drive Partition Sizes

Note This section applies only to Windows NT and Windows NT 4.0. Reformatting and repartitioning is not supported on Windows 2000, Windows XP, or Windows Server 2003.

IDR defaults to restoring hard drive partitions to the same sizes they were before recovery. If the computer being recovered has a larger hard drive than before the recovery (for example, a larger hard drive was installed or the DR file is from a computer with a smaller hard drive), there will be unused and unallocated hard drive space. If so, you can run the Windows NT Disk Administrator program (during the IDR recovery process from within the Recovery Wizard) to alter the partition sizes to match the larger hard drive size. For information about fault tolerant configurations, please refer to the Windows NT Server 4.0 Resource Kit.

Notes on Recovering Specific Platforms

Recovering the Dell PowerEdge 6100/200 with RAID

Note Although this section discusses restoring a Dell system, the steps outlined can be used with any system that requires the use of third party drivers.

Recovering a Dell PowerEdge 6100/200 with RAID configuration is different than recovering a regular system with one hard drive.

In order to load Windows on this type of machine, you must load the PowerRaid II driver manually, which is not bundled with the Windows operating system.

After loading the PowerRaid II driver, you must load the Adaptec controller driver manually. Failure to follow these steps results in Windows not recognizing any hard drive partitions on the system.

▼ **Use the following steps with your IDR recovery diskette set**

1. When the Windows blue Setup screen appears after booting with the IDR boot diskette, press and hold down the **F6** key.

   Windows prompts for IDR diskette 2.

2. Insert IDR diskette 2 and press and hold the F6 key again.

   After loading additional drivers, a Setup screen appears that allows you to specify additional devices.

3. Release the F6 key and press the **S** key.

4. Follow the on-screen instructions to load the PowerEdge RAID II controller software.

5. After loading the PowerEdge RAID software, press **S** again to specify loading another device.

6. Follow the on-screen instructions to load the Adaptec controller software next.

7. After loading both pieces of third party software, press Enter and proceed as normal to recover your system.

Recovering IBM Computers

If you are using an IBM computer and the drive containing the system's configuration information fails, you must reconfigure the system using the IBM Reference Diskette before performing recovery.

Recovering Compaq Computers

If you are using a Compaq computer and the drive that contains the System Configuration Partition fails, Intelligent Disaster Recovery will recreate the partition on the new hard disk; however, you must use the Compaq SmartStart utilities to update the system partition.

IDR Frequently Asked Questions

Can I restore boot managers such as System Commander or OS/2 Boot Manager with Intelligent Disaster Recovery for Windows?

No, because boot managers usually are installed at a very low level that NetBackup cannot protect.

For example, the OS/2 boot manager resides in its own hard drive partition that NetBackup cannot access. In fact, because of the many different boot managers on the market, an Intelligent Disaster Recovery restore may render your system unbootable, even though your operating system has been restored. In this case, re-installing the boot manager should fix the problem.

I ran a full backup of my system but when I run the IDR Preparation Wizard again, I do not see a disaster recovery file. What happened?

For some reason, the DR file was not generated automatically. Generate it manually as explained in "Using drfile.exe to Create or Update a DR File" on page 204.

Why does the recovery wizard warn me that one or more of my hard drives are smaller than the originals?

If this is not actually the case, the reason may be because the minimal version of Windows that runs the recovery wizard has detected the hard drives in a different order than they were configured originally.

Be sure that your hard drive and controller configuration matches the original configuration before a disaster occurs.

If the original configuration does not match, you may be able to control the hard drive numbering. The following chart lists the normal order that Windows uses to assign disk drive numbers. Keep in mind that this chart can change if third party drivers are used.

Windows Hard Drive Numbering Scheme

Primary IDE	Master Server Media Server
Secondary IDE	Master Server Media Server
SCSI Adapter 0 (In order of the lowest I/O port address)	SCSI ID 0 SCSI ID 1 ... SCSI ID 7 (or 15 is wide SCSI)

Windows Hard Drive Numbering Scheme (continued)	
SCSI Adapter 1	SCSI ID 0 SCSI ID 1 ... SCSI ID 7 (or 15 is Wide SCSI)
SCSI Adapter *n*	SCSI ID 0 SCSI ID 1 ... SCSI ID 7 (or 15 is Wide SCSI)

Other types of mass storage controllers are usually seen as SCSI controllers by Windows.

Note On Windows NT only: If you cannot get the IDR Recovery Wizard to properly detect the hard drive order, you can still set up hard drive partitions manually by using the Windows NT Disk Administrator option within the Disaster Recovery Wizard. Then, you can continue with automated restore of your backup media.

If you have drives greater than eight GBs and the recovery wizard reports them as being only eight GBs, you must create bootable diskettes with the option **Use SCSI drivers currently installed on this system**.

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