BakBone®

The Power of Simplicity™

NetVault®: Backup
File System Plugin

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version 7.5.13

User's Guide

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Chapter 1:

INTRODUCING NETVAULT: BACKUP FILE SYSTEM PLUGIN

This chapter provides an overview of the NetVault: Backup File System Plugin. The information in this chapter is organized into the following topics:

- NetVault: Backup File System Plugin – At a Glance
- Key Benefits
- Feature Summary
- Target Audience
- Recommended Additional Reading
- Technical Support
- Documentation Updates

1.1.0 NetVault: Backup File System Plugin – At a Glance

Available with a standard installation of NetVault: Backup (NVBU), the File System Plugin increases confidence in the recoverability of critical file system data, and eliminates the need of writing complex backup and recovery scripts. The plugin offers a centralized console to set up, configure and create flexible backup policies that account for multiple recovery scenarios. Support for Full, Incremental and Differential Backup Types allows you to choose a preferred strategy, while the use of Volume Shadow Copy Services (VSS) guarantees consistent backups. Granular control over restores reduces downtime and increases business continuity, allowing you to recover data quickly and reliably with minimal interaction.

1.2.0 Key Benefits

- ***Increases Confidence and Reduces Risks for Critical Data***

  The File System Plugin provides total protection to your NVBU Servers and Heterogeneous Clients without requiring you to write complex backup scripts. It offers you the flexibility to perform Full, Incremental or Differential Backups using the Standard backup method, or the Volume Shadow Copy Service (VSS) backup method on Windows. Support for System State backups on Windows makes it possible to recover an entire system in the event of a disaster. By relying on the File System Plugin to implement your backup

policies, you can be confident that your data will be protected, and you will be able to recover exactly what is needed in the unfortunate event of a failure.

- **Speeds up Restores and Reduces Downtime**

  With the File System Plugin, Backup Administrators are no longer required to write scripts or execute restore commands in order to recover lost data. The point-and-click feature reduces manual steps and errors during data recovery. To maximize availability, the File System Plugin is designed for granular recoveries, allowing you to recover volumes, directories, and files at a granular level.

- **Ensure Business Continuity with Automatic Integration of Backup Devices**

  The File System Plugin takes advantage of NVBU's fundamental integration with disk-based devices such as NetVault: SmartDisk (NVSD) Devices, tape-based devices such as Virtual Tape Libraries (VTLs) and Shared Virtual Tape Libraries (SVTLs), and physical libraries and standalone drives. Offsite storage to tapes and disks gives you the confidence that your data is protected for disaster recovery purposes. With the File System Plugin, the administrators need not be present 24x7. Even less experienced administrators can initiate restores with the certainty that they will be performed correctly and quickly, thereby reducing downtime and improving business continuity.

1.3.0 Feature Summary

- Protection for Servers and Clients
- Standard and VSS backup methods
- Full, Incremental and Differential Backups while data is online and accessible
- Restores of volumes, partitions and files at a granular level
- Rename of files and directories during restores
- Restores to alternate location
- Restores to alternate NVBU Client
- System State backup and restore on Windows

1.4.0 Target Audience

This guide is intended for Backup Administrators and other technical personnel who are responsible for designing and implementing a backup strategy for the organization. A good understanding of the operating systems under which the NetVault: Backup Server and Clients are running is assumed.

1.5.0 | Recommended Additional Reading

- *NetVault: Backup Installation Guide* – This guide provides complete details on installing the NVBU Server and Client software.
- *NetVault: Backup Administrator's Guide* – This guide describes how to use NVBU and provides comprehensive information on all NVBU features and functionality.
- *NetVault: Backup Configuration Guide* – This guide explains how to change the preferences and default settings for NVBU.
- *NetVault: Backup Command Line Interface Reference Guide* – This guide provides detailed description of the command line utilities.

You can download these guides from the BakBone website at the following address:

<http://www.bakbone.com/documentation>

1.6.0 | Technical Support

BakBone Software is dedicated to providing friendly, expert advice to NetVault customers. Our highly trained professionals are available to answer your questions, offer solutions to your problems and generally help you make the most of your NetVault purchase. Log on to our web site for more information:

<http://support.bakbone.com>

1.7.0 | Documentation Updates

For the latest documentation updates, refer to the BakBone Software Knowledge Base. BakBone's Knowledge Base article for File System Plugin v7.5.13 can be found at the following link:

<http://kb.bakbone.com/5516>

Chapter 2:

INSTALLING AND REMOVING FILE SYSTEM PLUGIN

This chapter describes the procedures for installing and removing the File System Plugin. The information in this chapter is organized into the following topics:

- Installing File System Plugin
  - ❖ Installing File System Plugin on Windows and Linux/UNIX
  - ❖ Installing File System Plugin on Mac OS X
- Removing File System Plugin
  - ❖ Removing File System Plugin From Windows and Linux/UNIX
  - ❖ Removing File System Plugin From Mac OS X

2.1.0 Installing File System Plugin

Typically, the File System Plugin does not require a separate installation procedure. It gets installed on the NVBU Server and Client during a standard NVBU installation or upgrade procedure. A standalone installation might be required in the following situations:

- To reinstall the plugin if it was inadvertently removed.
- To upgrade the plugin if BakBone distributes a standalone patch for it.

Note: Before performing an upgrade, ensure that there are no active jobs using the File System Plugin, including file-level jobs for the NetVault: Backup VMware and Hyper-V Plugins.

The following sections describe the procedures for performing a standalone reinstallation or upgrade of the File System Plugin.

2.1.1 | Installing File System Plugin on Windows and Linux/ UNIX

To reinstall or upgrade the File System Plugin on Windows and Linux/UNIX platforms, perform the following steps:

1. Start NVBU Console.
2. Click **Client Management** on the toolbar or **Large Buttons** panel. Alternatively, on the **Administration** menu, click **Client Management**.
3. Right-click the Server or Client under **Clients**, and select **Install Software**.
4. In the browse window, navigate to the location of the **.npk** installation file for the File System Plugin (on the installation CD or the directory to which the file was downloaded from BakBone Software's web site). The plugin version shipped with NVBU resides in the **.../packages/standard** directory (where **...** represents the NVBU installation directory).
5. Select the file named **win-x-x-x-x.npk** on Windows and **nvf-x-x-x-x.npk** on UNIX/Linux (where **x-x-x-x** represents the version and build number), and click **Open** to begin the plugin installation. Upon completion, a message will be displayed.

2.1.2 | Installing File System Plugin on Mac OS X

To reinstall or upgrade the File System Plugin on Mac OS X, perform the following steps:

1. Start NVBU Administrator.
2. On the **NVBU Servers** pane, click **Client Management**.
3. Right-click the Server or Client under **Current Client Set**, and select **Install Software**.
4. In the browse window, navigate to the location of the **.npk** installation file for the File System Plugin (on the installation CD or the directory to which the file was downloaded from BakBone Software's web site). The plugin version shipped with NVBU resides in the **.../packages/standard** directory (where **...** represents the NVBU installation directory).
5. Select the file named **nvf-x-x-x-x.npk** (where **x-x-x-x** represents the version and build number), and click **Install** to begin the plugin installation. Upon completion, a message will be displayed.

2.2.0 | Removing File System Plugin

The following sections describe the procedures for removing the File System Plugin.

Important: BakBone recommends that you do not remove the File System Plugin unless instructed by BakBone Technical Support.

2.2.1 | Removing File System Plugin From Windows and Linux/UNIX

To remove the File System Plugin from Windows and Linux/UNIX platforms, perform the following steps:

1. Start NVBU Console.
2. Click **Client Management** on the toolbar or **Large Buttons** panel. Alternatively, on the **Administration** menu, click **Client Management**.
3. Right-click the Server or Client under **Clients**, and select **Remove Software**.
4. In the **Remove Software** window, select **File System Plugin** in the list of plugins and click **Remove**.
5. In the confirmation dialog, click **OK**.

2.2.2 | Removing File System Plugin From Mac OS X

To remove the File System Plugin from Mac OS X, perform the following steps:

1. Start NVBU Administrator.
2. On the **NVBU Servers** pane, click **Client Management**.
3. Right-click the Server or Client under **Current Client Set**, and then select **Remove Software**.
4. In the **Remove Software** window, select **File System Plugin** in the list of plugins and click **Remove**.
5. In the confirmation dialog, click **OK**.

Chapter 3:

CONFIGURING FILE SYSTEM PLUGIN

This chapter describes how to configure the default settings for File System Plugin. The information in this chapter is organized into the following topics:

- Configuring Default Settings
- Using Exclusion Lists
  - ❖ Exclusion List Types
  - ❖ Exclusion List Considerations
  - ❖ Adding an Exclusion List
  - ❖ Removing an Exclusion List

3.1.0 | Configuring Default Settings

To configure the default settings for the File System Plugin, perform the following steps:

1. Open the configuration window as described below:

   - *Windows and Linux/UNIX*

     - ❖ **Using NVBU Configurator** – Start NVBU Configurator. Click the **Plugin Options** tab, and then click the **File System Plugin** sub-tab.

     - ❖ **Using Remote Configurator** – Open the **NVBU Client Management** window. Right-click the NVBU Server under **Clients**, and select **Configure**. On the Remote Configurator, click the **Plugin Options** tab, and then click the **File System Plugin** sub-tab.

     - ❖ **Using NVBU Console** – Open the **NVBU Backup** window. On the **Selections** tab open the NVBU Server or Client node. Right-click **File System**, and select **Configure** to open the **Configure** window.

   - *Mac OS X*

     - ❖ **Using NVBU Settings** – Start NVBU Administrator, and load the **NVBU Settings** pane. Click **Plugin Options**, and then click the **File System Plugin** tab.

     - ❖ **Using NVBU Administrator** – Start NVBU Administrator, and load the **Backup Job** pane. On the **Selections** tab open the NVBU Server or Client node. Right-click **File System**, and select **Configure** to open the **Configure** window.

2. Configure the following parameters:

- ■ **Display Mapped Drives under Network Share** – On Windows Clients, select this check box to list the mapped drives under the **Network Shares** node on the **NVBU Backup** window.
- ■ **Backup Exclusion List - Name based Patterns** – To use a name based exclusion list for backups, enter the file path in this box.
- ■ **Backup Exclusion List - Path Based Patterns** – To use a path based exclusion list for backups, enter the file path in this box.

Note: For details on exclusion lists, refer to .

- ■ **Backup Windows File Short Names** – Select this check box to backup the short name attribute for the selected files.
- ■ **Restore Exclusion List - Name based Patterns** – To use a name based exclusion list for restores, enter the file path in this box.
- ■ **Restore Exclusion List - Path based Patterns** – To use a path based exclusion list for restores, enter the file path in this box.
- ■ **Initial Size of Memory Cache when Analyzing Directories to Restore** – Enter the minimum memory cache available to the File System Plugin for analyzing directories that are to be restored.

- **Maximum Size of Memory Cache when Analyzing Directories to Restore** – Enter the maximum memory cache available to the File System Plugin for analyzing directories that are to be restored.

- **Initial Size of Memory Cache when Analyzing Entries to Restore** – Enter the minimum memory cache available to the File System Plugin for analyzing entities that are to be restored.

- **Maximum Size of Memory Cache when Analyzing Entries to Restore** – Enter the maximum memory cache available to the File System Plugin for analyzing entities that are to be restored.

- **Restore Windows File Short Names** – Select this check box on Windows Clients to restore the short name attributes for a file. To use this option, you must backup the short name attributes by selecting **Backup Windows File Short Names** attributes configuration parameter.

- **Cluster Backup Directory** – In a Windows cluster set up, enter the share location to store the cluster database backup file. Use the format \\<machine name>\<share name>.

- **Delete Cluster Backup File From Disk after Backup** – During a cluster-based backup, the File System Plugin copies a backup file of the cluster database to the specified share directory. Leave this check box selected to delete this copy when the backup completes. Clear the check box if you want to retain the copy.

- **Reset Access Times** – By default, the File System Plugin does the following during backups:
  - ❖ Update the Access Time for files that are backed up
  - ❖ Use the Change Time to select files and directories for Incremental and Differential Backups

  When the **Reset Access Times** check box is selected, this behavior changes and the File System Plugin does the following:
  - ❖ Reset the Access Time for files included in the backup after the file is accessed
  - ❖ Use the Modify Time to select files and directories for Incremental and Differential backups

Note: On Linux/Unix, resetting the Access Time will cause the Change Time to be updated. Therefore, the File System Plugin uses the Modify Time for Incremental and Differential Backups instead of Change Time.

As a result of using Modify Time, the files or directories with "attribute-only" changes are not selected for Incremental or Differential Backups on Linux/UNIX. Examples of "attributes-only" changes include the following:

❖ Changing file mode/permissions

❖ Changing file owner

❖ Changing file group

❖ Hard-linking to the file

❖ Changing the file ACL

❖ Changing the extended attributes

These changes update the Change Time (inode ctime) and would have been included in a backup if the **Reset Access Times** check box is not selected.

Note: Currently, the File System Plugin cannot reset the Access Time on file systems that save file times in sub-second form. These file systems include NTFS, ext4, ZFS, and HFS (Mac OS X 10.6). However, the plugin will continue to use the Modify Time instead of the Change Time for Incremental and Differential Backups.

- **Maximum File System Read** – This parameter can be used to limit the maximum amount of data that can be read at a time. The maximum value is specified in KB. Retain the default value (zero) if you do not want to set any maximum read limit.

- **Maximum File System Write** – This parameter can be used to limit the maximum amount for data that can be written at a time. The maximum value is specified in KB. Retain the default value (zero) if you do not want to set any maximum write limit.

Important: Changing the default values for the Maximum **File System Read/ Write** parameters could result in a performance degradation. The backup and restore speeds may slow considerably. BakBone recommends that you change these settings only when network constraints demand.

3. Click **OK** to save the settings.

3.2.0 | Using Exclusion Lists

Exclusion Lists are basically text files that contain the list of files and directories to be excluded during a job. You can use any text editor to create this list. The file must be saved on the target Heterogeneous Client to which it is applied. The exclusion lists must be saved in the following formats:

- **Linux/UNIX** – **Multi-byte text format**
- **Windows** – **Unicode text format**

3.2.1 | Exclusion List Types

The File System Plugin supports the following types of Exclusion Lists:

- **Name-Based Exclusion List** – Use this exclusion list to omit particular files that match the name pattern. For example, if you add ***.tmp** in an exclusion list, all files with extension **.tmp** are omitted during backup. To exclude directory paths, terminate the path with a **/** on Linux/UNIX and a **** on Windows. For example, if you add **usr/tmp/** or **C:\TempFiles** in the list, these directories and their contents are excluded.

  An example of a name-based exclusion list is given below:

  ```
  # Name-Based Exclusion List
  #
  *.htm
  tmp/
  mp3_player.exe
  *.mp3
  install?.exe
  test*.*
  ```

  This exclusion list will exclude the following directories and files from a job:

  - ❖ All files with the extension **.htm**
  - ❖ Any directory named **tmp**
  - ❖ A specific file named **mp3_player.exe**
  - ❖ Any file with the extension **.mp3**
  - ❖ Any file named **install?.exe**, where ? is any single character
  - ❖ All files that begin with the characters **test** (e.g., testdata.doc; however, a file named atest1.txt will not be excluded)

- **Path-Based Exclusion List** – Use this list to omit specific files and directories. Enter the file paths to omit files in the specified path. For example, **usr/backup.tar** or **C:\MyFiles*.tmp**. To exclude a directory and its contents,

enter the path and terminate the path with a **/** on Linux/UNIX and a **** on Windows (e.g., **usr/tmp/** or **C:\TempFiles**).

An example of a path-based exclusion list is given below:

```
# Exclusion List for All Clients - Path Exclusions
#
C:\Application\Data\Test\
C:\Program Files\Microsoft\
C:\WINDOWS\system32\
D:\Work in Progress\
D:\Files\*.txt
D:\Database*\
```

This exclusion list will exclude the following directories and files from a job:

❖ All contents of the directory C:\Application\Data\Test

❖ All contents of the directory C:\Program Files\Microsoft

❖ All contents of the directory C:\WINNT\system32

❖ All contents of the directory D:\Work in Progress

❖ All files with the extension **.txt** in the directory D:\Files

❖ All directories within D:\ that begin with the characters **Database**

3.2.2 | Exclusion List Considerations

Consider the following points while creating an exclusion list:

■ You can use the following special characters and wildcards in an exclusion list:

Character	Description
/	Path terminator on Linux/UNIX
****	Path terminator on Windows
?	Match any one character
!n	New line
!r	Carriage return
!t	Tab
!f	Form feed
!b	Backspace
!	To escape any special character that follows
!!	To specify ! character in the filename or path

- Spaces are not ignored.
- Names are case-sensitive on Linux/UNIX but not on Windows.
- To insert comments use **#** at the beginning of the each line.
- BakBone recommends that you do not include any System State components on Windows, especially Windows File Protection and SYSVOL files on a Domain Controller.
- Exclusion lists cannot contain files or paths with Non-ASCII characters. If you include such entities, the backups might fail.

3.2.3 Adding an Exclusion List

Exclusion lists are added globally for all backup and restore jobs on the target Heterogeneous Client. To configure an exclusion list on a Client, perform the following steps:

1. Open the backup window as described below:
   - **NVBU Console** – Start NVBU Console. Click **Backup** on the toolbar or **Large Buttons** panel to open the **NVBU Backup** window. Alternatively, on the **Operations** menu, click **Backup**.
   - **NVBU Administrator on Mac OS X** – Start NVBU Administrator. On the **NVBU Operations** pane, click **Jobs**. Then, click **New Backup Job** to load the **Backup Job** pane.
2. On the **Selections** tab, open the target Client node.
3. Right-click the **File System** node in the list of plugins and select **Configure**.
4. In the **Configure** window, configure the following parameters:
   - **File Containing a List of Name-Only Patterns to Exclude from Backups** – To use a name based exclusion for backups, enter the file path in this box.
   - **File Containing a List of Name-Only Patterns to Exclude from Restores** – To use a name based exclusion list for restores, enter the file path in this box.
   - **File Containing a List of Path Based Patterns to Exclude from Backups** – To use a path based exclusion list for backups, enter the file path in this box.
   - **File Containing a List of Path Based Patterns to Exclude from Restores** – To use a path based exclusion list for restores, enter the file path in this box.
5. Click **OK** to apply the settings.

Note the following:

- The File System Plugin ignores invalid entries in an exclusion list and generates a log message for such entries.

- The File System Plugin excludes the file or directory named in an exclusion list, even if it is present in an inclusion list or selected explicitly on the **Selections** tab. The plugin logs warning messages for such entries and the resultant job status is **Completed with Warnings**. However, if the excluded files or directories are child nodes of parent nodes that are explicitly included, then the plugin only generates standard log messages.

3.2.4 Removing an Exclusion List

To remove an exclusion list for a Client, perform the following steps:

1. Open the backup window as described below:

   - **NVBU Console** – Start NVBU Console, and open the **NVBU Backup** window.

   - **NVBU Administrator on Mac OS X** – Start NVBU Administrator, and load the **Backup Job** pane.

2. On the **Selections** tab, open the target Client node.

3. Right-click the **File System** node in the list of plugins and select **Configure**.

4. In the **Configure** window, configure the following parameters:

   - **Backup Exclusion List - Name based Patterns** – To remove a name based exclusion list for backups, clear this box.

   - **Backup Exclusion List - Path Based Patterns** – To remove a path based exclusion list for backups, clear this box.

   - **Restore Exclusion List - Name based Patterns** – To remove a name based exclusion list for restores, clear this box.

   - **Restore Exclusion List - Path based Patterns** – To remove a path based exclusion list for restores, clear this box.

5. Click **OK** to apply the settings.

Chapter 4:

BACKING UP DATA WITH FILE SYSTEM PLUGIN

This chapter describes how to use the File System Plugin to perform backups. The information in this chapter is organized into the following topics:

4.1.0 | Available Backup Methods

The File System Plugin supports the following backup methods:

- **Standard Backup Method**

  The Standard Backup method can be used for native file system backups. This method is supported on all operating systems, and is the only available method on Linux/UNIX platforms.

- **Volume Shadow Copy Service (VSS) Backup Method**

  The VSS Backup method is supported on Windows versions that support VSS. It uses the VSS technology to create consistent point-in-time copies of data known as shadow copies. The shadow copies have two primary advantages:

  ❖ They allow the creation of consistent backups of a volume, ensuring that the contents cannot change while the backup is being made.

  ❖ They avoid problems of file locking. By creating a read-only copy of the volume, backup programs are able to access every file while minimizing interruption to other applications writing to those same files.

4.2.0 | Available Backup Types

The File System Plugin provides the following backup types to backup individual files and directories:

- **Full Backup**

  This method backs up all the selected files and folders. Full Backups take longer to complete and consume more backup media. However, Full Restores are faster since the plugin only requires to restore a single saveset. A Full Backup serves as the base for the future Incremental and Differential Backups.

- **Incremental Backup**

  This method backs up files that were created or modified since the last Full, Incremental or Differential Backup. Incremental backups consume minimum storage space and are quicker to perform. However, data recovery takes longer and may require the plugin to access several savesets depending on the number of Incremental savesets that must be restored.

- **Differential Backup**

  This method backs up files that were created or modified since the last Full Backup. Differential Backups speed up recovery since the plugin is only required to restore two savesets. However, they consume more storage space and take longer than the Incremental Backups. The Differential Backups duplicate the data backed up by previous Incremental or Differential Backups.

4.3.0 | System State Backup

System State backup is only supported on Windows. It backs up critical system data which is essential to recover a functional system in the event of a system failure. Components that comprise the system state include the following:

- Registry
- COM+ Class Registration Database
- Boot files, including the system files
- System files that are under Windows File Protection
- Certificate Services Database (on a Certification Services Server)
- Active Directory (on a Domain Controller)
- SYSVOL (on a Domain Controller)
- Cluster Service Information (in a cluster setup)
- IIS Metadirectory (if it is installed)

The VSS backup method is recommended for a consistent backup of the System State data. Regardless of the backup type selected, certain System State components are always backed up in full. BakBone recommends that you back up and restore system state components together.

Note: In a cluster environment, you may require the Disk Signature information during a System State restore if the shared cluster disks are changed after a backup. The Disk Signature information can be obtained using Microsoft's dumpcfg.exe tool. Consult the relevant Microsoft documentation for more information on dumpcfg.exe.

4.4.0 | Defining a Backup Strategy

A well-designed backup strategy helps you recover from the damages caused by failure, and resume normal operations as quickly as possible. Before you start backing up your data, ensure that a good strategy is in place that safeguards your data against various failure modes, such as media failure, data corruption, user error, and complete loss of a data centre.

Some backup sequences are described below to offer you guidelines.

- *Full Backups Only*

    A strategy comprising "Full Backups only" can only be considered if one or more of the following conditions is true:

    ❖ The amount of data to be backed up is small
    ❖ Backup window is not an issue
    ❖ Storage media is not a constraint

You can schedule Full Backups every night, or every <n> hours depending on the frequency of updates.

In the event of a failure, the File System Plugin only requires to restore a single saveset.

■ *Full + Incremental Backups*

For quicker backups and minimum use of storage media, choose a Full + Incremental backups strategy. For example, schedule Full Backups every Sunday and Incremental Backups every day or every <n> hours depending on the frequency of updates.

In the event of a failure, the plugin must restore data from the recent Full Backup and each Incremental in the sequence. The restore might take longer if several Incremental savesets have to be restored. For example, if the failure occurs on Saturday, the restore procedure would include restoration of Full Backup taken on Sunday and Incremental Backups taken from Monday through Friday.

■ *Full + Differential Backups*

For quicker restores and reduced media usage, choose Full + Differential Backup strategy. For example, schedule Full Backups every Sunday and Differential Backups every day or every <n> hours depending on the frequency of updates.

In the event of a failure, restore will be a two-step process consisting of restoration of the savesets for the Full Backup and the recent Differential Backup.

■ *Windows System State Backup*

For System State backup on Windows, you can choose either of the following strategies:

❖ Backup only System State

❖ Backup C Drive + System State

Backing up the System State with C drive has the following advantages:

❖ It eliminates duplication of the system files in a saveset. If you run two separate jobs, the system files will be included in both savesets.

❖ You can use this backup to perform a disaster recovery.

The VSS method is recommended for a consistent backup of the System State data.

■ *Policy-based Backups*

At enterprise-level, you can define a policy to backup the root directory on Linux/UNIX platforms, or the Fixed Drives + System State on Windows and schedule the job on multiple clients. For details on Policy Management refer to the *NetVault: Backup Administrator's Guide*.

4.5.0 | Performing Full Backups

The procedure for performing Full Backups with the File System Plugin can be divided into the following steps:

- Selecting Data for a Backup
- Setting Backup Options
- Finalizing and Submitting a Job

These steps are described in the following sections.

4.5.1 | Selecting Data for a Backup

To select the data for a backup, perform the following steps:

1. Open the backup window as described below:

    - **NVBU Console** – Start NVBU Console. Click **Backup** on the toolbar or **Large Buttons** panel to open the **NVBU Backup** window. Alternatively, on the **Operations** menu, click **Backup**.

    - **NVBU Administrator on Mac OS X** – Start NVBU Administrator. On the **NVBU Operations** pane, click **Jobs**. Then, click **New Backup Job** to load the **Backup Job** pane.

2. On the **Selections** tab, open the NVBU Server or Heterogeneous Client node. To open a node on the **Selections** tab, you can select any of the following methods:

    - **NVBU Console**
        - ❖ Double-click the node
        - ❖ Right-click the node, and select **Open**

    - **NVBU Administrator on Mac OS X**
        - ❖ Double-click the node
        - ❖ Click the associated disclosure triangle
        - ❖ Right-click or Ctrl-click the node, and select **Open**

3. Locate **File System** in the list of plugins. Open this node to display the following nodes:

    - *Linux/UNIX* (including Mac OS X)
        - ❖ / (the root node)

- ■ **Windows**
    - ❖ **Fixed Drives**
    - ❖ **Removable Drives**
    - ❖ **Network Shares** – For details, refer to *Backing up Network Shares* on page 36.
    - ❖ **System Stat**e – For details, refer to *Performing System State Backups* on page 38.

Figure 4-1:
Selections tab
for Windows
version
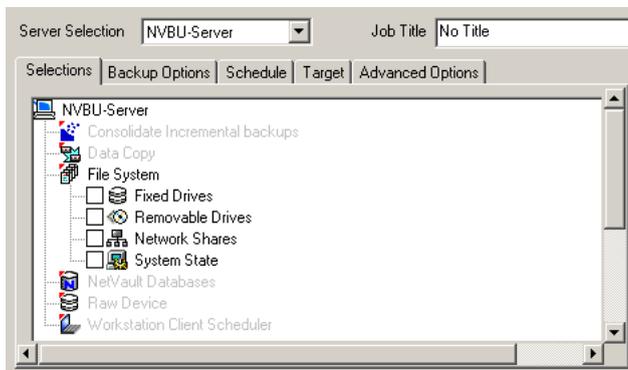
4. Select the required data as described in the following steps:
    a. Depending on the Client O/S, do the following:
        - ■ **Linux/UNIX** – To backup the entire system, select the root node.
        - ■ **Windows** – To backup the entire system, select the **Fixed Drives** node. To backup data on one or more removable drives, select the **Removable Drives** node.
    b. For selective backup, open the parent nodes to display the directory tree. Browse through the directory tree, and locate the files you want to backup. To include a file or a directory, select the corresponding check box. Selecting a parent node automatically selects all the files and folders within.
    c. To exclude a file or folder within a selected parent node, click the corresponding check box to replace the check mark with a cross.

Note: The Novell Storage Service (NSS) volumes are mounted to the **/media/nss/** directory. To select the files and directories on NSS volumes, navigate to the **/media/nss/…** directory.

5. To implement an Incremental or a Differential Backup strategy, save the selected data into a Backup Selection Set. For details on creating a selection set, refer to the *NetVault: Backup Administrator's Guide*.

4.5.1.a | **Using Inclusion Lists**

Inclusion Lists are basically text files that contain the list of files and directories to be included in a job. You can use any text editor to create this list. The file must be saved on the target client to which it is applied. An inclusion list must be saved in the following formats:

- **Linux/UNIX** – **Multi-byte text format**
- **Windows** – **Unicode text format**

Inclusion List Considerations

When generating an inclusion list, consider the following points:

- The maximum size of an inclusion list depends on how much memory is available to the backup process while it is running; it depends on the system load at the time of backup. The list can still contain tens of thousands of entries on a small system to hundreds of thousands of entries on a 64-bit system with large memory configuration.
- Enter the file paths for the file or directory that is to be included in a backup. The inclusion list does not support wildcards.
- Enter one inclusion per line.
- Inclusion lists cannot contain files or paths with Non-ASCII characters. If you include such entities, the backups might fail.

Adding an Inclusion List

Inclusion lists are added on a per-job basis. To add an inclusion list for a job, perform the following steps:

1. Open the backup window as described below:
   - **NVBU Console** – Start NVBU Console, and open the **NVBU Backup** window.
   - **NVBU Administrator on Mac OS X** – Start NVBU Administrator, and load the **Backup Job** pane.
2. On the **Selections** tab, open the target Client node.
3. Open the **File System** node.
4. Right-click the **File System** node in the list of plugins and select **Show Inclusion Lists**.
5. Open the newly added **Inclusion List** node.

6. Choose one of the following methods to add the inclusion list:
    a. ***Select the File From the Directory Tree***
        1. Open the **Browse for Inclusion List** node.
        2. Open the root node or the **Fixed Drives** node, and then the relevant drive node. Open the nodes further to display the directory that contains the inclusion list.
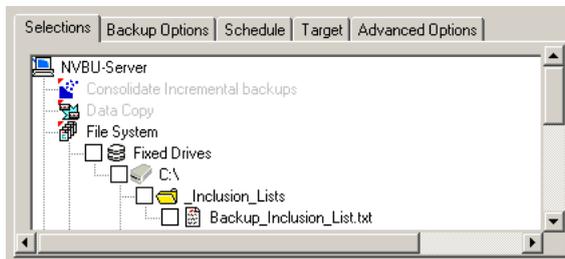
        3. Select the check box corresponding to the inclusion list.
    b. ***Specify the File Path***
        1. Right-click the **Specify Inclusion Files** node, and select **Add Inclusion Lists**.
        2. In the **Enter Path to Inclusion File** window, configure the following parameter:
            -   **Path** – In the **Path** box, enter the file path for the inclusion file.
        3. Click **OK**.

Removing an Inclusion List

To remove an inclusion list added to a job, perform the following steps:

1. Open the backup window as described below:
    -   **NVBU Console** – Start NVBU Console, and open the **NVBU Backup** window.
    -   **NVBU Administrator on Mac OS X** – Start NVBU Administrator, and load the **Backup Job** pane.
2. On the **Selections** tab, open the target Client node.
3. Open the **File System** node.
4. Open the **Inclusion List** node.
5. Right-click the **Specify Inclusion Files** node, and select **Show Inclusion Files**.
6. Clear the check box for the inclusion file.

4.5.2 | Setting Backup Options

This step includes the following tasks:

- Selecting the Backup Method
- Selecting the Backup Type
- Configuring File System Plugin Backup Options

4.5.2.a | Selecting the Backup Method

Click the **Backup Options** tab, and configure the following parameter:

Figure 4-3:
Backup
Options tab

- **Backup Method** – Under **Backup Method**, select one of the following options:
  - ❖ **Standard** – For native file system backups, select **Standard**. This is the only supported method on Linux/UNIX platforms.
  - ❖ **Volume Shadow Copy Service (VSS)** – On Windows versions that support VSS, select this option for a VSS based backup.

4.5.2.b | Selecting the Backup Type

Under **Backup Type**, configure the following parameter:

- **Full** – Select the **Full** option.

4.5.2.c | Configuring File System Plugin Backup Options

Under **Backup Options**, configure the following parameters:

- **Check For Files Being Modified During Backup** – To mark files modified during backup as *in flux*, leave this check box selected. During restore the files in flux state are not restored by default. You can override the default action by selecting the **Restore Files Modified During Backup** option on the **Restore Options** tab.

- **Backup through Mount Points** (Windows) / **Backup through Remote Mounts** (Linux/UNIX) – On Windows, select the **Backup through Mount Points** check box to backup data on volumes mounted on an NTFS folder. On Linux/UNIX, select the **Backup through Remote Mounts** check box to backup the data on the mounted file systems.

- **Check for and Skip Locked Mandatory Locking Files** (Linux/UNIX) – On Linux/UNIX systems, select the **Check for and Skip Locked Mandatory Locking Files** check box to check whether mandatory locking is enabled on the system or not. If mandatory locking is enabled, the File System Plugin tries to lock the file before backing it up. A file which cannot be locked is not backed up. For example, the File System Plugin will not be able to lock a file which is locked by another application. As a result, this file will not be backed up.

- **Enable Restartable Backup** – The File System Plugin provides the ability to stop a running job and resume it any time later from the point the backup was stopped. To use this feature, you must configure a job as restartable. When you stop the job, the plugin generates an index for the files backed up and writes it to the backup media and the NVDB. When you restart the job later, the plugin runs an Incremental job to backup the remaining files and folders. A backup can be stopped and resumed from the **NVBU Jobs** window. For details on stopping and resuming a backup job, refer to *Stopping and Restarting a Job* on page 39.

  To configure a job as restartable, select the **Enable Restartable Backup** check box. Only jobs that are defined using a backup selection set can be configured as restartable.

- **Path to Backup Log** – To generate a Backup Log file, enter the filename in the **Path to Backup Log** box. The log contains the list of all files selected for a backup. The files that are backed up successfully are marked with an **o** while the others are marked with an **x**. You can use this option with an Incremental Backup to find out which new/changed files have been actually backed up. If you specify an existing filename, the File System Plugin will overwrite the file. The Backup Log is a CSV file with column headers. The columns include file details, such as file size, date/time modified, and file type.

Note: The File System plugin contains certain platform-specific backup options. Do not apply a Backup Options Set created for a Windows Client to a Linux/UNIX Client.

4.5.3 Finalizing and Submitting a Job

This section describes the procedures for finalizing and submitting a job from NVBU Console and NVBU Administrator on Mac OS X.

4.5.3.a Submitting a Job from NVBU Console

To finalize and submit a backup job from NVBU Console, perform the following steps.

1. Click the **Schedule**, **Target** and **Advanced Options** tabs, and configure the required options. These options are common to all NVBU plugins. For details on configuring these options, refer to the *NetVault: Backup Administrator's Guide*.

2. Enter a title for the job in the **Job Title** box at the top right corner of the **NVBU Backup** window. Specify a detailed title that allows you to easily identify the job for monitoring its progress or restoring data.

3. Click **Submit** on the toolbar. Alternatively, on the **Accept** menu, click **Submit Backup**.

   To monitor the job progress and view the logs, open the **NVBU Jobs** and the **NVBU Logs** windows, respectively. For details on these functions, refer to the *NetVault: Backup Administrator's Guide*.

Note: If a target file is open, the backup may Complete with Warnings. In such cases, the following message will appear in the logs "The process cannot access the file because it is being used by another process". This problem often occurs when the system files are selected on Windows. It can be avoided by choosing the VSS backup method on Windows platforms.

4.5.3.b Submitting a Job from NVBU Administrator on Mac OS X

To finalize and submit a backup job from NVBU Administrator on Mac Os X, perform the following steps:

1. Click the **Schedule**, **Target** and **Advanced Options** tabs, and configure the required options. These options are common to all NVBU plugins. For details on configuring these options, refer to the *NetVault: Backup Administrator's Guide for Mac OS X*.

2. Click **Submit** at the bottom-right corner of the **Backup Job** pane.

3. In the job list dialog, configure the following parameters:
   - **Job Name** – Enter a title for the job in the **Job Name** box. Specify a detailed title that allows you to easily identify the job for monitoring its progress or restoring data.
   - **Submit for Scheduling** – Ensure this check box is selected.
4. Click **OK**. A message along with the Job ID will be displayed. Click **OK** to close this dialog.

   To monitor the job progress and view the logs, load the **Jobs** and the **Logs** panes, respectively. For details on these functions, refer to the *NetVault: Backup Administrator's Guide for Mac OS X*.

4.6.0   Performing Incremental and Differential Backups

To create an Incremental or a Differential Backup, perform the following steps:

1. Open the backup window as described below:
   - **NVBU Console** – Start NVBU Console. Click **Backup** on the toolbar or **Large Buttons** panel to open the **NVBU Backup** window. Alternatively, on the **Operations** menu, click **Backup**.
   - **NVBU Administrator on Mac OS X** – Start NVBU Administrator. On the **NVBU Operations** pane, click **Jobs**. Then, click **New Backup Job** to load the **Backup Job** pane.
2. On the **Selections** tab, open the NVBU Server or Client node.
3. Locate **File System** in the list of plugins and open this node.
4. Load the Backup Selection Set as described in the following steps:
   a. Click **Load** under **Backup Selection Set** at the bottom of the tab.
   b. Select the required set in the **Load Backup Selection Set** list.
   c. Click **OK** to apply the selections to the current job.
5. Click the **Backup Options** tab, and configure the following parameters:
   - **Backup Method** – Under **Backup Method**, select the **Standard** or **Volume Shadow Copy Service (VSS)** backup method that was used for the original Full Backup. The File System Plugin does not allow you to combine Standard and VSS backup methods in a single backup sequence.
   - **Backup Type** – Under **Backup Type**, select one of the following options:
     - ❖ **Incremental** – Select this option to back up files that were created or modified since the last Full, Incremental or Differential Backup.
     - ❖ **Differential** – Select this option to back up files that were created or modified since the last Full Backup.

■ **Ignore Archive Bit** – On Windows, the archive bit helps determine whether or not a file has been modified since the last backup. The archive bit is set to 1 if the file has changed, and it is set to 0 if the file has not changed. By default, the File System Plugin includes files for which the archive bit is set to 1, and clears the bit after backup. Regardless of the state of the archive bit, the File System Plugin backs up a file if certain information has changed, such as the file size or last modified time, since the previous backup.

Note: The archive bit is not a clear indication that a file has changed, only that the bit has been set. Some applications intentionally modify the archive bit in a way that is not consistent with changes to the file.

To ignore the archive bit settings and use only the file size, last update date, etc., for selecting files, select the **Ignore Archive Bit** check box. BakBone recommends that you only select this option under the following conditions:

❖ Another program is changing the state of the archive bit causing the File System Plugin to backup unnecessary files or folders.

❖ NVBU can only access the files for a backup and cannot clear the archive bit settings after backup because of access rights violation.

Note: If the **Ignore Archive Bit** check box is selected, files and directories with only Discretionary Access Control List (DACL), System Access Control List (SACL) or Owner Attribute changes are not included in the backup. Do not select this option if you want to backup files with such "attribute-only" changes.

6. Configure the remaining backup options. For details, refer to *Configuring File System Plugin Backup Options* on page 32.

7. Complete and submit the job. For details, refer to *Finalizing and Submitting a Job* on page 33.

4.7.0 | Backing up Network Shares

This section describes the procedure for network share backups. Currently the network share backup support is limited to only Windows network shares. Problems might be encountered if you use this feature to backup CIFS-compatible shares such as Samba, Snap Appliance Filers or Mac OS X Shares. This includes the inability to backup files with certain filename encoding or lengths, changing the filename while backing them up, or not restoring the permissions correctly.

The procedure for backing up a network share on a non-NVBU Client can be divided into the following steps:

- Configuring a Network Share
- Configuring a Login Account for Network Share
- Backing up Data

These steps are described in the following sections.

Note: When running Incremental Backups of network shares using the File System Plugin, the user that has been configured to connect to a particular share must be given **Change** privileges to the shared folder. Failure to so will cause Incremental Backup job instances to repeatedly backup modified files, as the File System Plugin will be unable to update the necessary file attribute to indicate that the backup read the file successfully. Potentially, Incremental Backups will backup all share files repeatedly.

4.7.1 | Configuring a Network Share

To backup a shared folder on a non-NVBU Client, you must first configure a network share on an NVBU Client from which the data is to be backed up. To accomplish this, perform the following steps:

1. Open the **Backup** window.
2. Open the Client from which you want to backup the shared network drives.
3. Locate **File System** in the list of plugins and open this node.
4. Right-click the **Network Shares** node and select **Add Network Share**.
5. In the **Add New Network Share** window, configure the following parameter:

Figure 4-4:
Add New
Network Share
window

- **Share Name** – Enter the file path for the shared drive in the following format:
  \\<IP Address or Resolvable Network Name>\<Share Name>

6. Click **Add** to add the shared folder to the **Network Shares** node.

4.7.2 | **Configuring a Login Account for Network Share**

To configure a login account in order to access a network share, perform the following steps:

1. On the **NVBU Backup** window, right-click the shared folder and select **Connect As**.

2. In the **Connection Details** window, configure the login details:

*Figure 4-5:
Connection
Details window*
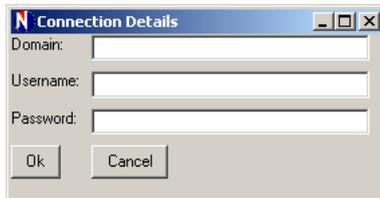
- ■ **Domain** – Enter the Windows Domain for the system that contains the shared folders.
- ■ **Username** – Enter a user name with necessary privileges to perform backups and restores.
- ■ **Password** – Enter the password associated with the user specified in the box above.

3. Click **OK**.

4.7.3 | **Backing up Data**

To backup data on a network share, perform the following steps:

1. Select the required data as described in the following steps:

*Figure 4-6:
Network
Shares node
on NVBU
Backup
window*
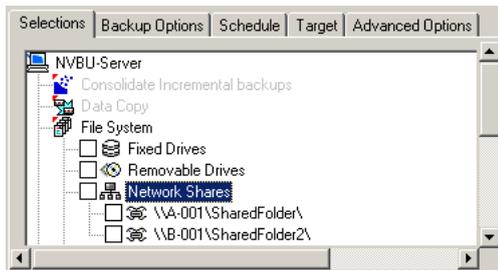
a. To backup all network shares, select the **Network Shares** node.

b. For selective backup, open a network share to display the directory tree. Browse through the directory tree, and locate the files you want to backup. To include a file or a directory, select the corresponding check box. Selecting a parent node automatically selects all the files and folders within.

    c. To exclude a file or folder within a selected parent node, click the corresponding check box to replace the check mark with a cross.

2. To implement an Incremental or a Differential Backup strategy, save the selected data into a Backup Selection Set. For details on creating a selection set, refer to the *NetVault: Backup Administrator's Guide*.

3. Configure the backup options. For details, refer to *Setting Backup Options* on page 31.

4. Complete and submit the job. For details, refer to *Finalizing and Submitting a Job* on page 33.

4.8.0   Performing System State Backups

To backup the System State data on a Windows machine, perform the following steps:

1. Open the **NVBU Backup** window.
2. On the **Selections** tab, open the NVBU Server or Client node.
3. Locate **File System** in the list of plugins and open this node.
4. Select the **System State** node.

Figure 4-7: System State components on a Domain Controller
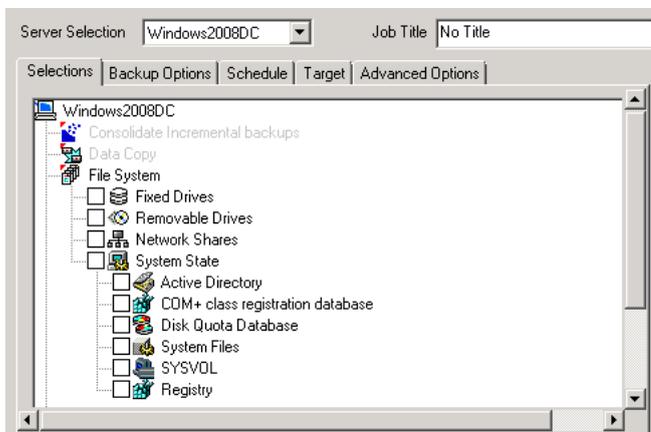
- System State Node – For only System State backups.
- Fixed Drive or C Drive + System State Nodes – To use the backup for disaster recovery.

Note: Although, the File System Plugin allows you to select individual components, BakBone recommends that you backup all the System State components together.

5. Click the **Backup Options** tab, and configure the following parameters:

   - **Backup Method** – Under **Backup Method**, select **Volume Shadow Copy Service (VSS)**. If the VSS backup method is not supported, select **Standard**.

   - **Backup Type** – Under **Backup Type**, select one of the following options:

     ❖ **Full** – Select **Full** to perform a Full Backup of the System State data.

     ❖ **Incremental** – Select **Incremental** to perform an Incremental Backup of the System State data.

     ❖ **Differential** – Select **Differential** to perform a Differential Backup of the System State data.

Note: Only the SYSVOL and System Files components are capable of truly being included in an Incremental or a Differential Backup. The remaining components are always backed up in full regardless of the backup type you select. Similarly, when you perform a backup consolidation using the NVBU Consolidate Incremental Backups Plugin, the new reference point only applies to the SYSVOL and System Files components.

   - **Ignore Archive Bit** – To ignore the archive bit settings and use only the file size, last update date, etc., for selecting files, select the **Ignore Archive Bit** check box. For details on this option, refer to *Performing Incremental and Differential Backups* on page 34.

6. Configure the remaining backup options. For details, refer to *Configuring File System Plugin Backup Options* on page 32.

7. Complete and submit the job. For details, refer to *Finalizing and Submitting a Job* on page 33.

4.9.0 | Stopping and Restarting a Job

A job that is configured as restartable can be stopped while it is running and resumed any time later from the point it was stopped. When you stop the job, the File System Plugin generates an index for the files that have been processed up to the point the backup is stopped and writes the index to the media and the NVDB. When you restart the job later, the File System Plugin runs the job as a new instance and performs an Incremental Backup of the remaining files and folders.

To stop an active job, perform the following steps:

1. Click **Job Management** on the toolbar or **Large Buttons** panel to open the **NVBU Jobs** window. Alternatively, on the **Operations** menu, click **Job Management**.

2. On the **Status** tab, right-click the job and select **Stop**. The File System Plugin will generate the saveset index and stop the job. The status for the job will change to **Job Stopped**. If the plugin is writing a very large backup index, the jobs status will continue to display **Writing to Media: Storing Backup Index** until the index is written.

3. To restart the stopped job, right-click it and select **Restart Job**.

Select only a single instance on the **Status** tab at a time. This feature will not work if you select multiple job instances simultaneously.

4.10.0 Additional Considerations

Consider the following while backing up data with the File System Plugin.

4.10.1 General Considerations

- The maximum length of a backup file path depends on the operating system and the file system the data resides on.

  Windows, by default, supports a maximum path length of 260 characters (format: D:\<256 chars>NUL). Longer path names up to 32,000 characters are supported with components of maximum length of 255 characters.

  On Linux/UNIX systems, consider the following limitations:

  ❖ A backup file path can consist of a maximum of 1024 characters, including the target filename and path.

  ❖ A backup path can consist of a maximum of 255 elements. An element here refers to individual directory named in the path as well as the target filename. Restores of data to platforms or file systems with different namespace support may result in truncation of some path elements.

  These limitations do not apply to all UNIX file systems, particularly ZFS. NVBU uses cpio tape format for Linux/UNIX backups, which does not impose these limitations. However, O/S imposed limitations do apply. For details on O/S imposed limitations, refer to the relevant O/S documentation.

- Various instances of the hard-linked files on Linux/UNIX systems are considered separate entities.The File System Plugin backs up the complete file and the link information for each selected hard-linked file. To backup all instances of a hard-linked file, include each instance in the selection. For example, if a file /usr/data1/a.txt is hard-linked to the file /usr/data2/b.txt, then selecting /usr/data1/a.txt will backup only this file (with the link information). To backup /usr/data2/b.txt you must include this file in the backup.

  ❖ To maintain synchronization between the files, BakBone recommends that you backup and restore all instances of hard-linked files together.

- When a symbolic link is explicitly selected for a backup, only the link information is backed up and not the file or directory the link points to.

■ On systems utilizing the Solaris Zones Partitioning technology, the Non-Global Zones share files with the Global Zone through the use of loopback file system read-only mounts, usually /usr, /lib, /sbin, and /platform. When the Global Zone (i.e., /) is selected for a file system backup, these directories are backed up for the Global Zone and for each Zone configured on the system. For example, if four Zones are configured on the system and root is selected for a file system backup, then five copies of these Global Zone directories are backed up. To avoid multiple backups of these directories during the Global Zone backup, de-selected them individually, or create an exclusion list

■ The File System Plugin treats certain file system types as special mount points and does recurse into these mount points. However, the mount point itself, which is a directory is backed up.

For example, on a Linux system if the **proc** file system is mounted as follows:

```
none on /proc type proc (rw)
none on /var/chroot/named/proc type proc (rw)
```

When you perform a backup of the entire system, the directories **/proc** and **/var/chroot/named/proc** will be included in the backup. However, the pseudo-files under **/proc** or **/var/chroot/named/proc** will not be backed up as these mount points are not traversed.

The special mount points on various operating systems are listed in the table below:

Operating System	File System Types
Linux, HP-UX and IRIX	❖ proc ❖ swap ❖ sysfs
FreeBSD and Mac OS X	❖ procfs ❖ kernfs ❖ swap ❖ devfs ❖ fdesc ❖ volfs
NCR	❖ proc ❖ stats
OSF	❖ procfs
Solaris	❖ proc ❖ stats ❖ mntfs

- In addition, the following file systems are also treated as special mount points:
  - ❖ bind
  - ❖ rbind
- Doors on Solaris and Sockets on Linux/UNIX are not backed up.
- On Windows, the files listed under the following registry keys are not backed up:
  - ❖ HKLM\SYSTEM\CurrentControlSet\Control\BackupRestore\FilesNotToBackup
  - ❖ HKLM\SYSTEM\CurrentControlSet\Control\hivelist
- If a directory included in the selection set is changed to a mount point, then any future Incremental Backups performed using the selection set will be performed as Full Backups. This will occur even if an intervening Full Backup is performed using the selection set. To correct this problem, you must re-create/manually edit the selection set.

4.10.2 Backing up Distributed File System (DFS) Paths

If a user account configured to access the root node in the DFS tree does not have access to the shared folders, a symbolic link icon accompanies the shares instead of a folder icon. If the user does not have necessary privileges, the backup will Complete with Warnings.

The File System Plugin only backs up the DFS files and directories and not the DFS tree. If the tree structure does not exist during restore, the data is restored to the local file system. To backup the DFS tree, run a backup pre-script on the client that contains the DFS root to write the tree structure to a file that is included in the backup. Alternatively, you can backup the DFS structure external to NVBU. For example, the DFS structure can be written to a **.bat** file using **dfscmd** Windows tool with the **/batch** option:

```
dfscmd /view \\rootservername\namespace /batch >
<path\filename.bat>
```

4.10.3 Backing up Extended Attributes on NSS Volumes

To backup and restore the **novell.metadata** extended attributes on NSS volumes, install the **attr** package and enable ListXattrNWMetadata and CtimeIsMetadataModTime switches. The following example illustrates how to enable these switches from NSSCON:

1. Start a terminal session.
2. Log in as root.

3. Issue the following commands:
    - nss /ListXattrNWMetadata
    - nss /CtimeIsMetadataModTime

These settings are temporary and will be lost after a system reboot. To set these switches permanently across reboots, add the following lines to the /**etc/opt/novell/nss/nssstart.cfg** file:

- /ListXattrNWMetadata
- /CtimeIsMetadataModTime

Ensure the switches are spelled correctly, and do not have any spaces after the forward slash (/). If the switch names are entered incorrectly in the **nssstart.cfg** file, parsing errors can prevent the NSS pool from mounting.

Chapter 5:

RESTORING DATA WITH FILE SYSTEM PLUGIN

This chapter describes how to use the File System Plugin to restore data. The information in this chapter is organized into the following topics:

5.1.0 | Available Restore Types

The File System Plugin supports two types of restore:

- ***Restore from Selected Backup***

  This restore type allows you to restore all the data up to a specific Incremental or Differential saveset. Only a single restore job is required to restore an Incremental or a Differential Backup sequence. For example, if some critical data was inadvertently deleted or some data was corrupted on Wednesday, you can select the Tuesday's saveset to restore Sunday's Full Backup, Monday's Incremental and Tuesday's Incremental in a single job.

- ***Restore from Latest Backup***

  This restore type allows you to restore all the data up to the last available saveset. Only a single restore job is required to restore an Incremental or a Differential Backup sequence. For example, you can select any saveset in the sequence to restore all the data up to Tuesday's Incremental Backup in a single job.

5.2.0 | Restoring from a Selected Backup

The procedure for restoring a selected backup can be divided into the following steps:

- Selecting Data for a Restore
- Setting Restore Options
- Selecting the Restore Type
- Finalizing and Submitting a Job

These steps are described in the following sections.

5.2.1 | Selecting Data for a Restore

To select the data for restore, perform the following steps:

1. Open the restore window as described below:

   - **NVBU Console** – Start NVBU Console. Click **Restore** on the toolbar or **Large Buttons** panel to open the **NVBU Restore** window. Alternatively, on the **Operations** menu, click **Restore**.

   - **NVBU Administrator on Mac OS X** – Start NVBU Administrator. On the **NVBU Operations** pane, click **Jobs**. Then, click **New Restore Job** to load the **Restore Job** pane.

2. On the **Selections** tab, open the NVBU Server or Heterogeneous Client node. To open a node on the **Selections** tab, you can select any of the following methods:

- ■ **NVBU Console**
  - ❖ Double-click the node
  - ❖ Right-click the node, and select **Open**
- ■ **NVBU Administrator on Mac OS X**
  - ❖ Double-click the node
  - ❖ Click the associated disclosure triangle
  - ❖ Right-click or Ctrl-click the node, and select **Open**

3. Open the **File System** node to display all savesets generated using the plugin.

4. In the saveset list open the target saveset.

Figure 5-1:
NVBU
Restore
window
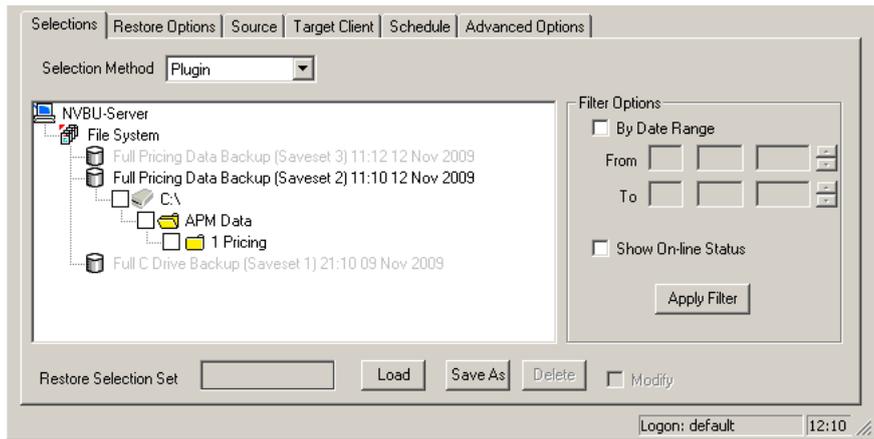
5. Select the required data as described in the following steps:
   a. To restore the entire saveset, select the primary or the root node.
   b. For selective restore, open the parent nodes to display the directory tree. Browse through the directory tree, and locate the files you want to restore. To include a file or a directory, select the corresponding check box. Selecting a parent node automatically selects all the files and folders within.
   c. To exclude a file or folder within a selected parent node, click the corresponding check box to replace the check mark with a cross.

Setting Restore Options

Click the **Restore Options** tab, and configure the following parameters:

Figure 5-2:
File System
Restore
Options
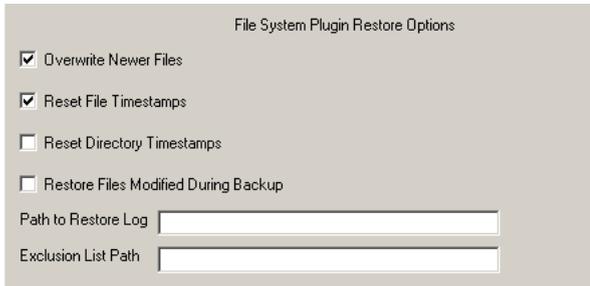
File System Plugin Restore Options

☑ Overwrite Newer Files

☑ Reset File Timestamps

☐ Reset Directory Timestamps

☐ Restore Files Modified During Backup

Path to Restore Log

Exclusion List Path

- **Overwrite Newer Files** – To overwrite the files on the restore destination with the version in the saveset, leave the **Overwrite Newer Files** check box selected. Clear the check box if you do not want to overwrite the files that are present on the restore destination.

- **Reset File Timestamps** – To reset the timestamps for the restored files to what is recorded in the backup, leave the **Reset File Timestamps** check box selected. Clear the check box if you want to restore the files with current timestamp.

- **Reset Directory Timestamps** – By default, the directory time stamps will be set to the time of the restore job. To reset the timestamp to what is recorded in the saveset, select the **Reset Directory Timestamps** check box. You must also select the **Reset File Timestamps** check box to reset the timestamps for the restored directories to what is recorded in the backup.

- **Restore Files Modified During Backup** – Select the **Restore Files Modified during Backup** check box to restore the files that were marked as *in flux* state during backup.

- **Path to Restore Log** – To generate a Restore Log file, enter the filename in the **Path to Restore Log** box. The log file contains the list of all files selected for a restore. The files that are restored successfully are marked with an **o** while the others are marked with an **x**. If you specify an existing filename, the File System Plugin will overwrite the file. The Restore Log is a CSV file with column headers. The columns include file details, such as file size, date/time modified, and file type.

- **Exclusion List Path** – To use an exclusion list, enter the file path in the **Exclusion List Path** box. For details on creating exclusion lists refer to *Using Exclusion Lists* .

Setting Metadata Restore Options on Mac OS X

For metadata restore on Mac OS X, select one of the following options:

Figure 5-3:
File System
Restore
Options for
Mac OS X

File System Plugin Restore Options

■ Overwrite Newer Files

■ Reset File Timestamps

☐ Reset Directory Timestamps

☐ Attempt to Restore Hard Links

☐ Restore Files Modified During Backup

Path to Restore Log

Exclusion List Path

Restore Meta Data   ◆ Compatible

◇ Force

◇ Discard

- ■ **Compatible** – Select this option if either of the following is true:
  - ❖ The backup source and the restore target run Mac OS X 10.4.0 or later
  - ❖ The backup source and the restore target run the same major version of Mac OS. For example, backups from Mac OS 10.3.2 can be restored to 10.3.5.
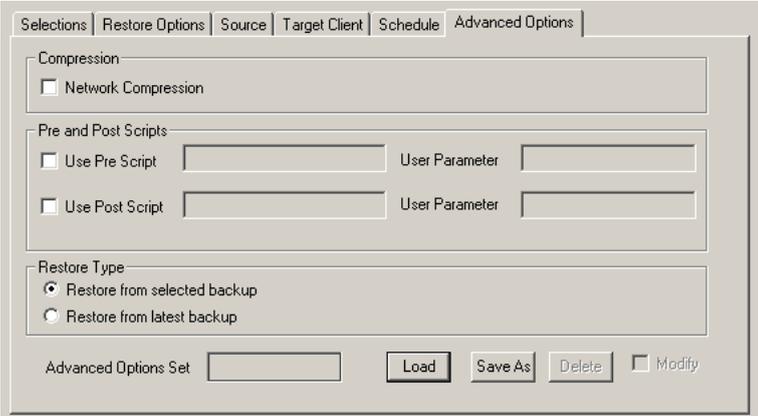
  This option is selected by default.

- ■ **Force** – Select this option when the following are true:
  - ❖ The backup is from a Mac system
  - ❖ The backup is not very old.

- ■ **Discard** – Select this option if you do not want to restore the metadata.

Important: Due to Mac OS X operating system limitations, some metadata may not be restorable between PowerPC and Intel platforms.

5.2.3 | Selecting the Restore Type

Click the **Advanced Options** tab. Under **Restore Type**, configure the following parameter:

- **Restore from Selected Backup** – Ensure that the **Restore from Selected Backup** option is selected. It is selected by default.

5.2.4 | Finalizing and Submitting a Job

This section describes the procedures for finalizing and submitting a job from NVBU Console and NVBU Administrator on Mac OS X.

5.2.4.a | Submitting a Job from NVBU Console

To finalize and submit a restore job from NVBU Console, perform the following steps:

1. Click the **Source**, **Schedule** and **Advanced Options** tabs, and configure the required options. These options are common to all NVBU plugins. For details on configuring these options, refer to the *NetVault: Backup Administrator's Guide*.

2. Enter a title for the job in the **Job Title** box at the top right corner of the **Restore** window. Specify a detailed title that allows you to easily identify the job for monitoring its progress.

3. Click **Submit** on the toolbar. Alternatively, on the **Accept** menu, click **Submit Restore**.

   To monitor the job progress and view the logs, open the **NVBU Jobs** and the **NVBU Logs** windows, respectively. For details on these functions, refer to the *NetVault: Backup Administrator's Guide*.

5.2.4.b | ### Submitting a Job from NVBU Administrator on Mac OS X

To finalize and submit a restore job from NVBU Administrator on Mac Os X, perform the following steps:

1. Click the **Schedule** and **Advanced Options** tabs, and configure the required options. These options are common to all NVBU plugins. For details on configuring these options, refer to the *NetVault: Backup Administrator's Guide for Mac OS X*.

Note: NVBU Administrator does not provide the **Source** tab on the **Restore Job** pane.

2. Click **Submit** at the bottom-right corner of the **Restore Job** pane.
3. In the job list dialog, configure the following parameters:
   - **Job Name** – Enter a title for the job in the **Job Name** box. Specify a detailed title that allows you to easily identify the job for monitoring its progress.
   - **Submit for Scheduling** – Ensure this check box is selected.
4. Click **OK**. A message along with the Job ID will be displayed. Click **OK** to close this dialog.

   To monitor the job progress and view the logs, load the **Jobs** and the **Logs** panes, respectively. For details on these functions, refer to the *NetVault: Backup Administrator's Guide for Mac OS X*.

5.3.0 | Restoring from the Latest Backup

To restore the latest saveset in an Incremental or a Differential Backup series, perform the following steps:

1. Open the restore window as described below:
   - **NVBU Console** – Start NVBU Console. Click **Restore** on the toolbar or **Large Buttons** panel to open the **NVBU Restore** window. Alternatively, on the **Operations** menu, click **Restore**.
   - **NVBU Administrator on Mac OS X** – Start NVBU Administrator. On the **NVBU Operations** pane, click **Jobs**. Then, click **New Restore Job** to load the **Restore Job** pane.
2. On the **Selections** tab, open the Client that was the backup target.
3. Open the **File System** node to display all savesets generated using the plugin.
4. In the saveset list open any saveset in the backup series.

5. Select the required data as described in the following steps:

   a. To restore the entire saveset, select the primary or the root node.

   b. For selective restore, open the parent nodes to display the directory tree. Browse through the directory tree, and locate the files you want to restore. To include a file or a directory, select the corresponding check box. Selecting a parent node automatically selects all the files and folders within.

   c. To exclude a file or folder within a selected parent node, click the corresponding check box to replace the check mark with a cross.

6. Configure the restore options. For details, refer to *Setting Restore Options* on page 48

7. Click the **Advanced Options** tab. Under **Restore Type**, configure the following parameter:

   ■ **Restore from Latest Backup** – Select the **Restore from Latest Backup** option.

8. Complete and submit the job. For details, refer to *Finalizing and Submitting a Job* on page 50.

5.4.0 | Renaming or Relocating Data During Restore

With the File System Plugin, you can rename or relocate data using either the Selected Backup or the Latest Backup restore types. This feature can be used to create a copy of a file or a directory in the original location, or move it to an alternate location with the same or a new name. To rename or relocate data during restore, perform the following steps:

1. Select the required data. For details, refer to *Selecting Data for a Restore* on page 46.

2. Right-click the entity that you want to rename or relocate, and select **Rename**.

3. In the **Restore Rename** window, configure the following parameters:
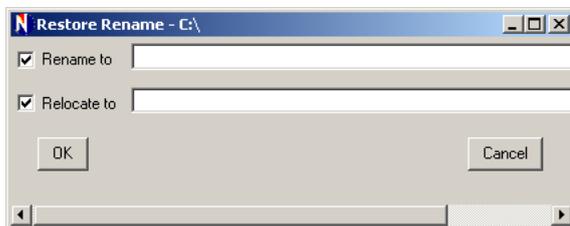
Figure 5-5: Restore Rename window

- ■ **Rename To** – To rename a file or directory, select the **Rename to** check box. In the box next to the check box, enter the new name for the entity.
- ■ **Relocate To** – To relocate a file or directory, select the **Relocate to** check box. In the box next to the check box, enter the new file path.

To rename and relocate a file or directory, configure both parameters.

4. Click **OK**.

5. Configure the restore options. For details, refer to *Setting Restore Options* on page 48.

6. Click the **Advanced Options** tab. Under **Restore Type**, configure the following parameter:

- ■ **Restore from Selected Backup** – To restore from the selected backup, ensure that the **Restore from Selected Backup** option is selected. It is selected by default.
- ■ **Restore from Latest Backup** – To restore from the latest backup, select the **Restore from Latest Backup** option.

7. Complete and submit the job. For details, refer to *Finalizing and Submitting a Job* on page 50.

5.5.0 Restoring Data to an Alternate Server

With the File System Plugin, you can restore data to an alternate NVBU Client using either the Selected Backup or the Latest Backup restore types. This feature can be used while migrating a server or performing a disaster recovery operation. The procedure for restoring data to an alternate NVBU Client can be divided into the following steps:

- ■ Prerequisites
- ■ Restore Procedure

5.5.1 Prerequisites

Before proceeding complete the following tasks:

- ■ Install the NVBU Server or Client software on the target client. The NVBU Server or Client must be the same version or newer than the Client originally used to backup the files.
- ■ Add the target Client to the NVBU Server.

5.5.2 | Restore Procedure

To restore the data to an alternate client, perform the following steps:

1. Select the required data. For details, refer to *Selecting Data for a Restore* on page 46.

2. To rename or relocate data to a different directory, refer to *Renaming or Relocating Data During Restore* on page 52.

3. Configure the restore options. For details, refer to *Setting Restore Options* on page 48.

4. Click the **Target Client** tab.

Figure 5-6: Target Client tab on NVBU Restore window
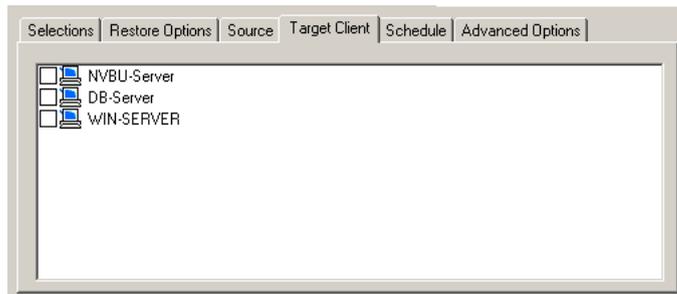
5. Select the target machine in the Client list.

6. Click the **Advanced Options** tab. Under **Restore Type**, configure the following parameter:

   ■ **Restore from Selected Backup** – To restore from the selected backup, ensure that the **Restore from Selected Backup** option is selected. It is selected by default.

   ■ **Restore from Latest Backup** – To restore from the latest backup, select the **Restore from Latest Backup** option.

7. Complete and submit the job. For details, refer to *Finalizing and Submitting a Job* on page 50.

5.6.0 Restoring Windows System State Data

This section describes how to restore the System State data using the File System Plugin. The information in this section is organized as follows:

- System State Restore – An Overview
- Supported Restore Methods for Active Directory
- Supported Restore Methods for SYSVOL Directory
- Prerequisites
- Procedure for Restoring the System State Data
- Restoring Cluster Database on Windows 2008
- Performing an Authoritative Restore of Active Directory Objects
- Additional Considerations for Domain Controllers

5.6.1 System State Restore – An Overview

System State restore allows you to recover a functional system without reinstalling the Windows operating system. It is useful in the following situations:

- Perform a Rollback (e.g., overwrite the corrupted system data)
- Perform a Disaster Recovery

Typically, when you perform a System State restore, all the components are restored to their original location. However, the File System Plugin also allows you to restore the System State data to an alternate directory without affecting the active system. Restoring System State in a situation other than system recovery is not recommended.

While restoring the System State data on a Domain Controller, you need to select the method for restoring distributed services like Active Directory and SYSVOL. The restore method determines whether the restored data gets replicated to other servers or not. The method you choose is dictated by the number and configuration of Domain Controllers in your environment.

5.6.2 Supported Restore Methods for Active Directory

Microsoft supports the following methods for restoring the Active Directory on a Domain Controller:

- Primary Restore
- Authoritative Restore
- Non-Authoritative Restore

During non-authoritative restore, the distributed services on a Domain Controller are restored from backup media and the restored data is then updated through normal replication. Non-authoritative restore is typically performed when a Domain Controller has completely failed due to hardware or software problems. During

authoritative restore, an entire directory, a subtree, or individual objects can be designated to take precedence over any other instances of those objects on Domain Controllers. Through normal replication, the restored Domain Controller becomes authoritative in relation to its replication partners. Authoritative restore is typically used to restore a system to a previously known state, for example, if one or more Active Directory objects were erroneously deleted. Primary restore is used when the server you are trying to restore is the only running server of a replicated data set (for example, the SYSVOL and FRS).

Important: The File System Plugin only supports the non-authoritative restore of the Active Directory.

To authoritatively restore Active Directory data, you need to run the **ntdsutil** utility after you have restored the System State data but before you restart the server. For details on the **ntdsutil** utility, refer to the relevant Microsoft documentation.

5.6.2.a Performing an Authoritative Restore of Active Directory Objects

The File System Plugin only supports the Non-Authoritative restore method. When you restore the Active Directory using the File System Plugin, the objects will have their original update sequence number. The Active Directory replication system uses this number to detect and propagate Active Directory changes among the other servers. The data that is restored non-authoritatively appears as old data and does not get replicated to the other servers. Instead, the Active Directory replication system updates the restored data with the newer data available on the other servers.

To authoritatively restore Active Directory data, you must run the **ntdsutil** utility after you have restored the System State data but before you restart the server. The **ntdsutil** utility lets you mark Active Directory objects for authoritative restore. When an object is marked for authoritative restore its update sequence number is changed so that it is higher than any other update sequence number in the Active Directory replication system. This ensures that any replicated or distributed data that you restore is properly replicated or distributed to all servers. For details on using **ntdsutil**, refer to the relevant Microsoft documentation.

5.6.3 Supported Restore Methods for SYSVOL Directory

SYSVOL (System Volume) is a collection of folders and reparse points in the file systems that exist on each Domain Controller in a Domain. SYSVOL provides a standard location to store important elements of Group Policy objects (GPOs) and scripts so that the File Replication Service (FRS) can distribute them to other Domain Controllers within that Domain. FRS monitors SYSVOL and, if a change occurs to any file stored on SYSVOL, then FRS automatically replicates the changed file to the SYSVOL folders on the other Domain Controllers in the Domain.

The File System Plugin supports the following restore methods for the SYSVOL directory:

- ■ *Primary Restore*

  Use this restore type only when restoring SYSVOL on a standalone Domain Controller, or on the first of several Domain Controllers. Typically, a primary restore is only required when all the Domain Controllers in the Domain are lost, and you are trying to rebuild the Domain from backup. Select Primary only for the first server. Do not use this restore type if you have already restored SYSVOL on one or more servers.

- ■ *Authoritative Restore*

  Use this restore type when you have more than one Domain Controller in order to roll back the SYSVOL changes, and replicate the restored data the to all the other servers.

- ■ *Non-Authoritative Restore*

  Use this restore type when you want to restore the data on a single Domain Controller in a replicated environment, and the restored data does not have to be replicated to the other servers.

5.6.4 | Prerequisites

Before proceeding, refer to the following notes and complete the required tasks:

- ■ Ensure that there are no Automatic Updates which will be applied on reboot. If necessary, disable Automatic Updates and reboot the machine. After restoring the system state, reboot the machine and then enable Automatic Updates. If the Automatic Updates that are installed during reboot are inconsistent with restored data, it may cause system failure.

- ■ For a disaster recovery, ensure that the following requirements are met:
  - ❖ The operating system on the target server must match the original server. the target server must run the same version of the operating system. All the patches, hotfixes and updates installed on the original server must also be installed on the target server.
  - ❖ The number and size of drives on the target server must match the original server.
  - ❖ The file system format on the target server must match the original server.
  - ❖ The NVBU version on the target server must match the original server.

- ■ If the destination server is a Windows Domain Controller, start it in the **Directory Services Restore Mode** (press F8 during boot and select **Directory Services Restore Mode** in the list of boot methods).

5.6.5 | Procedure for Restoring the System State Data

1. Open the **NVBU Restore** window.

2. On the **Selections** tab, open the NVBU Client that was the backup target.

3. Open the **File System** node to list all the savesets generated using the plugin.

4. Open the latest saveset.

5. Select the required data as described below:

   ■ **Perform a Rollback** – To restore only the System State data from a saveset, select the **System State** node.

   ■ **Perform a Disaster Recovery** – To perform a disaster recovery, select the C drive or Fixed Drives node, and the **System State** node.

6. Click the **Restore Options** tab, and configure the standard restore options. For details, refer to *Setting Restore Options* on page 48.

Figure 5-7: System State Restore Options for Windows 2008 Domain Controller

7. Under **System State** ensure that the **Live Restore** option is selected. This option is selected by default.

Note: To create a copy of the System State data without affecting the active system, select the **Restore to a File** option. In the box to the right, enter the full file path to the alternate location where you want to restore the data. This option is intended for advanced users. BakBone Software offers no support or instructions on how to use the data restored in this manner.

8. On a Domain Controller, select the method for restoring the SYSVOL directory:

   - **Primary SYSVOL Restore** – Select the **Primary SYSVOL Restore** check box only when you are rebuilding the Domain. Use it to restore a standalone Domain Controller, or to restore the first of several Domain Controllers.

   - **Authoritative SYSVOL Restore** – Select the **Authoritative SYSVOL Restore** check box to restore the system to a previously known state, and replicate the restored data to all the other servers.

   - **Non-Authoritative SYSVOL Restore** – Select the **Non-Authoritative SYSVOL Restore** check box to restore a single Domain Controller and update the restored data through normal replication process.

9. In a Windows 2000 and 2003 cluster environment, configure the following parameters:

Figure 5-8:
System State
Restore
Options for
Windows 2003
Domain
Controller

File System Plugin Restore Options

☑ Overwrite Newer Files

☑ Reset File Timestamps

☐ Reset Directory Timestamps

☐ Restore Files Modified During Backup

Path to Restore Log

Exclusion List Path

System State

⦿ Live restore
◯ Restore to file

☐ Force cluster database restore

☐ Use original cluster database location

C:\ Cluster Quorum Drive Letter

   - **Force Cluster Database Restore** – Select the **Force Cluster Database Restore** check box to complete the restore operation if either of the following conditions is true:

     ❖ Other cluster nodes are currently active.

     ❖ The partition layout of the current quorum resource is not identical to the partition layout of the quorum resource that was in place when the backup was made.

> **Note:** The term "partition layout" refers to the number of partitions on the disk and the offsets to each partition. The disk signature and drive letter assignments do not have to be identical.

> Without this option the cluster database can only be restored if no other cluster nodes are available except the target Client, and the Quorum drive letter has not changed after backup.

- **Use Original Cluster Database Location** – This check box is selected by default. Clear it in order to restore the cluster database to an alternate location, which might be required if the quorum resource was replaced after backup. In conjunction, configure the **Cluster Quorum Drive Letter** parameter below.

- **Cluster Quorum Drive Letter** – In the **Cluster Quorum Drive Letter** box, enter the new drive for the quorum resource.

10. Complete and submit the job. For details, refer to *Submitting a Job from NVBU Console* on page 50.

5.6.6 Restoring Cluster Database on Windows 2008

On Windows 2008, the File System Plugin uses VSS for backing up and restoring the cluster database. The Windows Cluster Service must be running to use this feature. The File system Plugin only supports the authoritative restore schema. In an Active-Active cluster, VSS will stop other nodes when you perform a restore operation. These nodes must be manually restarted after restore. Note that the **Restore Options** tab will not include the following options:

- **Force Cluster Database Restore**
- **Use Original Cluster Database Location**
- **Cluster Quorum Drive Letter**

5.6.7 Additional Considerations for Domain Controllers

Note the following:

- A Domain Controller in a non-authoritative state will not function as a Domain Controller until it has synchronized with active Domain Controller. The synchronization is implemented using Microsoft File Replication Service and SYSVOL. If the SYSVOL data on a target Client has been restored non-authoritatively, then the File Replication Service must successfully replicate the data to the active controller with Authoritative version of the SYSVOL data before the machine functions as a Domain Controller.

- If a restored Domain Controller owns the Flexible Single Master Operations (FSMO) roles, it will not start performing these roles until it has synchronized with the active Domain Controller. It may take some time before the restored Domain Controller starts performing the FMSO roles.

5.7.0 | Additional Features Available on the Selections Tab

This section provides a brief description of the additional features present on the **Selections** tab of the **NVBU Restore** window. These features are common to all NVBU plugins. For details on their use, refer to the *NetVault: Backup Administrator's Guide*.

- **Sorting the Savesets** – To sort the savesets listed on the **Selections** tab, select one of the following methods in the **Selection Method** list:
    - ❖ **Plugin** – This is the default method. The savesets are ordered according to the plugin used to generate them.
    - ❖ **Backup Set** – To sort the savesets by the Selection Set used for the backup, select **Backup Set** in the **Selection Method** list.
    - ❖ **Job** – To sort the savesets by the Job Title, select **Job** in the **Selection Method** list.
- **Filtering the Savesets** – To filter the savesets displayed on the **Selections** tab, configure the following parameters under **Filter Options**:
    - ❖ **By Date Range** – Select the **By Date Range** check box, and enter or select the **From** and **To** dates in the boxes provided to list the savesets generated during a given period.
    - ❖ **Show On-line Status** – Select the **Show On-line Status** check box to list the savesets stored on the currently online media.

    Click **Apply Filter** to set the filter.
- **Searching for Data Items** – To find a data item inside a saveset, right-click it and select **Search**. Enter the item name in the **Search String** box and click **Search**.
- **Viewing Media List** – To view the media list for a saveset, right-click it and select **Media List**.
- **Compressing Indexes** – To compress the online indexes in order to reduce the space used by the NVDB, right-click the target Client or the saveset, and select **Compress**. The index is automatically de-compressed when you open a saveset to browse or restore the data.

5.8.0 | **Additional Considerations**

Consider the following during restores using the File System Plugin:

- The savesets generated using the older versions of the File System Plugin (v6.0.2 and earlier) cannot be restored using File System Plugin v6.17 or later. The job will fail if you attempt this and a message will be logged. The version of the File System Plugin that was used to create a saveset is required to restore the data.

- An attempt to overwrite a file that is marked as read-only may not always be successful. The File System Plugin will attempt to remove the read-only before restoring the file. However, success is not guaranteed because the SetFileAttributes call is not sensitive to the elevated privileges of the plugin.

- It is not possible to restore a non-encrypted file over an encrypted file.