Symantec NetBackup™ for Hyper-V Administrator's Guide

Release 7.6

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Symantec NetBackup™ for Hyper-V Guide

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Introduction

This chapter includes the following topics:

- About Hyper-V
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- Hyper-V terminology related to backup
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About Hyper-V

NetBackup for Hyper-V provides snapshot-based backup of the virtual machines that run on Windows 2008, 2008 R2, and 2012 Hyper-V servers.

The principal features of NetBackup for Hyper-V are the following:

- NetBackup for Hyper-V uses snapshot technology to keep virtual machines 100% available to users. NetBackup for Hyper-V creates quiesced Windows snapshots using Volume Shadow Copy Service (VSS).
- NetBackup for Hyper-V performs full backups and file-level incremental backups of the virtual machine.
- Can restore the full virtual machine or selected virtual machine files.
- Can restore selected files from a full virtual machine backup.
- Can restore to the original virtual machine, to other locations on the Hyper-V server, or to a different Hyper-V server.

New features in NetBackup 7.6 for Hyper-V

NetBackup 7.6 adds support for Hyper-V servers on Windows Server 2012.

Support details are available in the following Symantec tech note:

http://www.symantec.com/docs/TECH127089

NetBackup for Hyper-V environment

The following table describes the components that are required to back up and restore a Hyper-V virtual machine.

Table 1-1   Components required for NetBackup for Hyper-V

Component	Description and requirements
NetBackup master server	Creates the backup policies and starts backups and restores. The NetBackup master server must be at 7.6 or later. It must include the NetBackup Enterprise Client license.
NetBackup media server	Reads and writes backup data and manages NetBackup storage media. The NetBackup media server must be at 7.6 or later. The NetBackup media server can be installed on the Hyper-V server or on a different host. For a more efficient backup, install the NetBackup media server on the same host as the Hyper-V server.
NetBackup client (and optional alternate client)	Processes backup and restore requests. For the optional off-host backup approach, a NetBackup client must be installed on the alternate client. **Note:** In most cases, the client need not be installed on any virtual machine. For exceptions, refer to the following topics. See "About restoring individual files" on page 45. See "About Hyper-V pass-through disks with NetBackup" on page 85.
Hyper-V server	A Windows hypervisor-based virtualization system, for creating the virtual machine guests that run in a Windows Server host computer. Additional requirements may apply. Refer to your Microsoft Hyper-V documentation.
Hyper-V integration services (integration components)	Provides the integration between the Hyper-V server and the virtual machines. **Note:** The Hyper-V backup integration service must be enabled. For installation instructions, refer to the *Microsoft Hyper-V Getting Started Guide*: http://technet.microsoft.com/en-us/library/cc732470(v=ws.10).aspx#BKMK_step4

The following figure shows the NetBackup for Hyper-V environment.

Figure 1-1   NetBackup for Hyper-V backup environment

NetBackup
master server

LAN / WAN

NetBackup media server
with external storage
(tape or disk)

Windows Hyper-V server with virtual
machines. Each Hyper-V server
needs one NetBackup client.
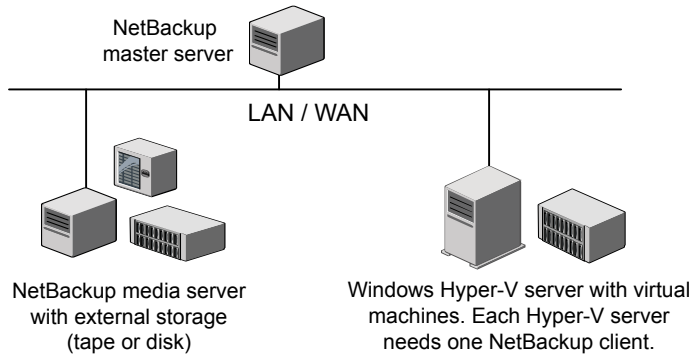
Basic phases in a NetBackup backup of a Hyper-V virtual machine

The following table describes the phases of the NetBackup for Hyper-V backup process.

Table 1-2   Phases of NetBackup for Hyper-V backup

Phase	Description
Phase 1	The NetBackup master server initiates the backup.
Phase 2	The NetBackup client on the Hyper-V server initiates a snapshot.
Phase 3	The VSS Hyper-V writer quiesces the Windows virtual machine and creates the snapshot on the host volume. If the Hyper-V writer cannot quiesce the virtual machine, the virtual machine is placed in the Saved state before creation of the snapshot.
Phase 4	The NetBackup client reads the data from the snapshot of the virtual machine and transfers the data to the media server. The media server writes the data to the NetBackup storage unit.
Phase 5	If the virtual machine was placed in the Saved state, Hyper-V returns the virtual machine to its original state.

Hyper-V terminology related to backup

The following table describes the Hyper-V terminology that is related to backup.

Table 1-3   Hyper-V terminology related to backup

Term	Description
.avhd, .avhdx file	A snapshot file that Windows Hyper-V creates, for point-in-time recovery of the virtual machine.
	This snapshot-and-recovery mechanism is entirely separate from the one used by NetBackup for Hyper-V. NetBackup creates its own snapshots when it backs up virtual machines. NetBackup does not create Hyper-V .avhd or .avhdx files.
Common .vhd, .vhdx files	Refers to a virtual disk (.vhd or .vhdx file) that contains the files that multiple virtual machines require. Instead of copies of the same file existing at multiple places, the virtual machines share a single .vhd or .vhdx file (the parent).
	See "About restoring common files" on page 56.
CSV	A cluster-shared volume in a failover cluster. Refer to your Microsoft documentation for more details regarding CSV.
Differencing disk	A differencing disk is in a child relationship to the parent disk (see common .vhd, .vhdx files). The parent and child virtual disks may be on the same physical drive or on different physical drives. This mechanism enables common files to be shared across virtual machines.
Failover cluster	A Windows Server failover cluster (formerly known as a Microsoft Cluster Server).
HA (high availability)	Describes a virtual machine that is configured in a cluster. If the virtual machine's Hyper-V host goes down, the virtual machine automatically moves to another Hyper-V host in the cluster. Users perceive little or no downtime on the virtual machine. Refer to your Microsoft documentation for more details.
pass-through disk	Any disk that the Hyper-V server can access. It can be locally attached to the Hyper-V server, or on a SAN. The pass-through disk is attached to a virtual machine, but the disk is not in a .vhd/.vhdx format.

Table 1-3	Hyper-V terminology related to backup *(continued)*

Term	Description
.vhd, .vhdx file	A file in a Windows Hyper-V installation that contains the virtualized contents of a hard disk. A .vhd or .vhdx file can contain an entire virtual operating system and its programs. Hyper-V supports several kinds of these files, such as fixed, dynamic, and differencing. Refer to your Microsoft Hyper-V documentation for more information.
virtual machine configuration files: .xml, .bin, .vsv	NetBackup backs up these files as part of a full virtual machine backup. The .bin and .vsv files are visible only when the virtual machine is running.
virtual machine GUID	A globally unique identifier of the virtual machine.

NetBackup administrator tasks for Hyper-V

The following are the tasks for the NetBackup administrator:

- Install the NetBackup 7.6 master server and media server. Add the NetBackup 7.6 Enterprise Client license on the master server.
  See the *NetBackup 7.6 Installation Guide*.
  Symantec recommends that the NetBackup media server and the Hyper-V server be installed on the same host. For alternate client off-host backup, install the media server on the alternate client host.

- Install a NetBackup 7.6 or later client on the Hyper-V server. Only one NetBackup client is required on each Hyper-V server. As an option for restore, a client may be installed on a virtual machine.

- Add the name of the NetBackup master server to the client's server list. In the NetBackup Backup, Archive, and Restore interface, click **File > Specify NetBackup Machines and Policy Type**. Add the master server to the **Server to use for backups and restores** list.

- Read the notes on NetBackup for Hyper-V.
  See "NetBackup for Hyper-V notes and restrictions" on page 17.
  See "Notes on full virtual machine restore" on page 42.
  See "Notes on individual file restore" on page 40.

- Read the best practices.
  See "Best practices" on page 58.

- Create a NetBackup policy for Hyper-V.

See "Creating a Hyper-V policy from the NetBackup Policies utility" on page 21.

- Run a Hyper-V backup.
  See "Backing up Hyper-V virtual machines" on page 38.

- Perform a restore.
  See "About restoring individual files" on page 45.
  See "Restoring the full virtual machine" on page 50.

- Troubleshoot your configuration.
  See the Troubleshooting chapter.

Quick reference for troubleshooting

Consult the following topics for troubleshooting tips and pointers:

- See "NetBackup status codes related to Hyper-V" on page 65.

- See "NetBackup logs and how to create them" on page 60.

Notes and prerequisites

This chapter includes the following topics:

- NetBackup for Hyper-V prerequisites
- NetBackup for Hyper-V notes and restrictions
- Notes on Linux virtual machines

NetBackup for Hyper-V prerequisites

The following prerequisites apply to NetBackup for Hyper-V:

- For Hyper-V servers, Symantec recommends Windows Server 2008 SP2, Windows Server 2008 R2 SP1, or Windows Server 2012.
  For Hyper-V servers on Windows 2008, apply the following hot fixes:

  - http://support.microsoft.com/kb/959962
    This hot fix is an update for Windows Server 2008-based computers to address issues with backing up and restoring Hyper-V virtual machines.

  - http://support.microsoft.com/default.aspx/kb/956697
    This hot fix is an update for an unsuccessful virtual machine restore. The unsuccessful restore causes an invalid link to the virtual machine configuration XML file that was created at the following:
    %SystemDrive%\ProgramData\Microsoft\Windows\Hyper-V\Virtual Machines

  - http://support.microsoft.com/KB/959978
    An update for the VSS hardware provider snapshot for Hyper-V, to avoid a Hyper-V writer crash during backup.

  - Check with Microsoft to see if additional hot fixes have been released:
    http://technet.microsoft.com/en-us/library/dd430893.aspx

- Before starting a backup of a virtual machine, verify that the NetBackup master server and media server can communicate with the Hyper-V server. Add the name of the NetBackup master server to the server list on the NetBackup client and (optional) alternate client.

- On a virtual machine, Windows shadow storage for a volume (such as C:) does not have to be configured on the same volume. For instance, shadow storage for the C:\ volume can be configured on D:\. If the Hyper-V server is Windows 2008 R1 and shadow storage for a volume is not configured on the same volume, note: Windows hot fix KB959962 must be installed to perform an online backup of the virtual machine. In this case, if the Hyper-V server is 2008 R1 and the hot fix has not been applied, the backup is performed offline.
  Windows 2008 R2 contains all required hot fixes.
  Windows shadow storage is required whenever the Windows Volume Shadow Copy Service (VSS) creates point-in-time snapshots.

NetBackup for Hyper-V notes and restrictions

The following notes and restrictions apply to NetBackup for Hyper-V:

- If a virtual machine is Paused when the backup starts, the virtual machine is placed in the Saved state after the backup completes.

- For VSS with disk arrays:
  To use a hardware array snapshot, make sure that the hardware array's VSS provider supports the snapshots that involve the Hyper-V writer. Check the release notes of the array vendor or VSS provider.

- More information about NetBackup for Hyper-V support is available in the following Symantec tech note:
  Support for NetBackup 7.x in virtual environments
  www.symantec.com/business/support/index?page=content&id=TECH127089

- NetBackup for Hyper-V does not support the NetBackup Instant Recovery feature.

- To perform Hyper-V backups with the SAN Client feature, install SAN Client on the Hyper-V server. Do not install SAN Client on the virtual machines. For more information on SAN Client with Hyper-V, see the *NetBackup SAN Client and Fibre Transport Guide*.

- NetBackup for Hyper-V supports Windows NTFS file encryption and compression, for backup and restore. However, it does not support NetBackup's compression or encryption options (in the NetBackup policy attributes).

For UNIX or Linux guest operating systems: NetBackup for Hyper-V does not support any type of compression or encryption, whether they are set in NetBackup or in the guest OS.

Note: The compressed Windows NTFS files are backed up and restored as compressed files.

- (The following is due to a Microsoft limitation.) NetBackup for Hyper-V does not support backup of encrypted .vhd or .vhdx files.

- (The following is due to a Microsoft limitation.) For the virtual machines that have a FAT or FAT32 file system, NetBackup supports only Hyper-V offline backup.
  See "About Hyper-V online and offline backups" on page 82.

- NetBackup for Hyper-V does not support the virtual machine display names that contain non-US-ASCII characters. To configure a policy to back up the virtual machine, select **VM hostname** or **VM GUID** as the **Client Name Selection** type.

- NetBackup for Hyper-V does not support restores with the Fibre Transport data transfer method.

- More information is available on the restore of Hyper-V virtual machines.
  See "Notes on individual file restore" on page 40.
  See "Notes on full virtual machine restore" on page 42.

Notes on Linux virtual machines

The following notes apply to virtual machines with Linux guest operating systems:

- Windows Hyper-V provides no mechanism for quiescing file system activity on Linux virtual machines.
  As a result, NetBackup has no way to guarantee that data in the file system is in a consistent state when the snapshot occurs. If data has not been flushed to disk before the snapshot is created, that data is not included in the snapshot.
  To guarantee that Linux files are consistent at the time of backup, turn off the virtual machine before backing it up. When the virtual machine is turned off, data buffers are flushed to disk and the file system is consistent.
  For a description of file system quiesce, see the *NetBackup Snapshot Client Administrator's Guide*.

- Linux files that are inconsistent at the time of the backup can be recovered from the NetBackup.lost+found directory.

See "About the NetBackup lost and found directory on Linux" on page 44.

- Unmounted LVM2 volumes must start with /dev
  If the path of an unmounted LVM2 volume does not start with /dev, the backup
  of the virtual machine fails. Note: The path of the volume is set with the "dir"
  parameter on the LVM volume configuration file. An example of this configuration
  file is /etc/lvm/lvm.conf.

- For Linux files or directories, NetBackup for Hyper-V has the same path name
  restriction as NetBackup on a Linux physical host. Files or directories with path
  names longer than 1023 characters cannot be individually backed up or restored.
  Such files can be restored when you restore the entire virtual machine from a
  full virtual machine backup.
  For more information on the files that NetBackup does not back up, refer to the
  topic on excluding files from backups in the *NetBackup Administrator's Guide
  for UNIX and Linux, Vol I*.

- More information is available on the restore of Hyper-V virtual machines.
  See "Notes on individual file restore" on page 40.
  See "Notes on full virtual machine restore" on page 42.

Create a backup policy for Hyper-V

This chapter includes the following topics:

Creating a Hyper-V policy from the Policy Configuration Wizard

The following procedure describes how to create a backup policy with the **Policy Configuration Wizard**.

To create a backup policy with the Policy Configuration Wizard

1 In the **NetBackup Administration Console** (on the NetBackup master server), click the name of the master server.

2 Click the **Create a Policy** wizard.

3 Under **Create a backup policy for**, click **VMware and Hyper-V**.

4 Click **Next**.

5 Enter a name for the policy.

6 Click **Hyper-V** as the virtual machine type.

7 Enter the name of the Hyper-V server.

8 Follow the remaining panels in the wizard.

The wizard creates the policy according to your selections. Backups run according to the choices that you make on the wizard's **Frequency and Retention** and **Start Windows** panels.

Creating a Hyper-V policy from the NetBackup Policies utility

Before you configure a policy, make sure that the Hyper-V server is online. NetBackup must be able to communicate with the Hyper-V server.

Use the following procedure to create a policy to back up Hyper-V virtual machines.

To create a policy for Hyper-V

1 Start the **NetBackup Administration Console** as follows:

On UNIX, enter: `/usr/openv/netbackup/bin/jnbSA &`

On Windows, click **Start > Programs > Symantec NetBackup > NetBackup Administration Console**.

2 Click **Policies** and expand **Actions > New**.

3 Select **Hyper-V** as the policy type.

4 If you use the Java Administration Console, click **Apply**.

Options for Hyper-V backup are available on the **Hyper-V** tab.

To configure policies for 7.1 clients, you can use the **FlashBackup-Windows** policy type. For more information on FlashBackup-Windows and Hyper-V backup, see the *NetBackup 7.1 for Hyper-V Administrator's Guide*.

5 Select a policy storage unit or storage unit group (or select **Any Available**).

6 In most cases, you can leave the **Disable client-side deduplication** option at the default (unchecked).

The **Disable client-side deduplication** option is described in the *NetBackup Administrator's Guide, Volume I*.

7 Click the **Hyper-V** tab.
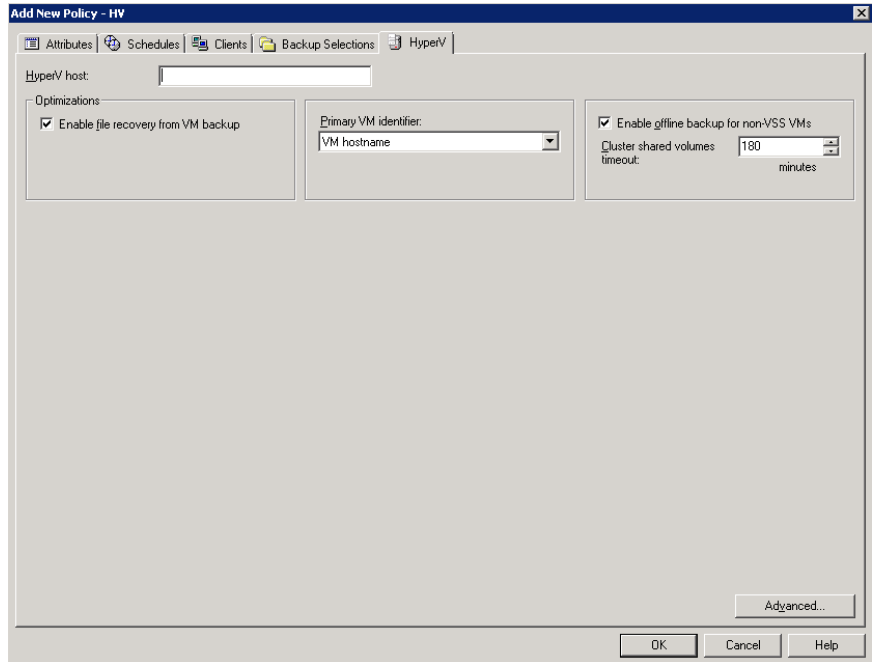
Use this dialog to set Hyper-V options.

See "Backup options on the Hyper-V tab" on page 24.

8 Use the **Schedules** tab to define a schedule.

On the **Schedules Attributes** tab, you can select **Full backup**, **Differential Incremental Backup**, or **Cumulative Incremental Backup**.

Note that incremental backups require selection of the **Enable file recovery from VM backup** option on the **Hyper-V** tab.

9 On the **Clients** tab, click **New** to specify the virtual machines to back up.

The Browse for Virtual Machines screen appears. You can type the name of the Hyper-V host in the **Enter the VM hostname** field, or click **Browse and select Virtual Machine**.
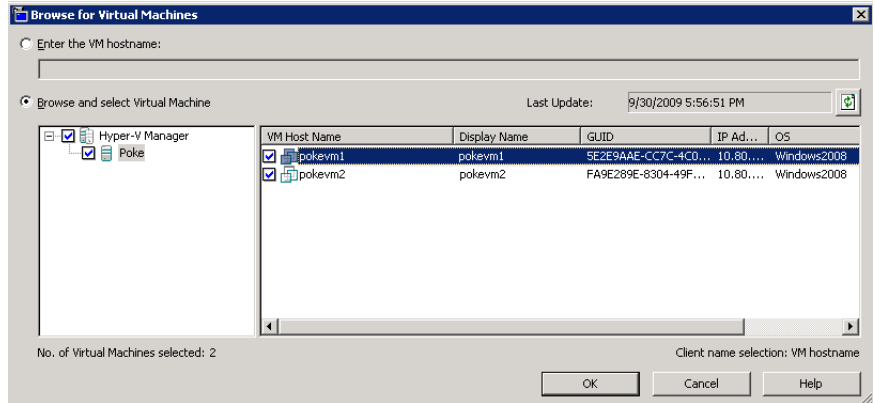
If NetBackup cannot obtain the IP address of the virtual machine, the IP address is displayed as NONE.

See "Browse for Hyper-V virtual machines" on page 28.

10 Click **OK**.

The virtual machines you selected are listed in the **Clients** tab.
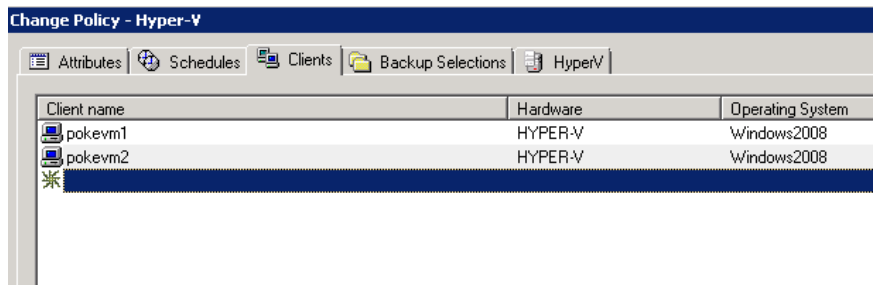
Note: The **Backup Selections** tab is set to ALL_LOCAL_DRIVES. Individual drives cannot be specified.

11 When you click **OK** on the policy Attributes tab, a validation process checks the policy and reports any errors. If you click **Cancel**, no validation is performed.

Backup options on the Hyper-V tab

In the NetBackup Administration Console, the Hyper-V tab appears when you select Hyper-V as the policy type.

The following options apply to the Hyper-V policy type.

Hyper-V host selection on the Hyper-V policy tab

The Hyper-V host is a NetBackup client that performs backups on behalf of the virtual machines.

In the **Hyper-V host** field, enter the name of the Hyper-V server.

Optimizations on the Hyper-V policy tab

Enable file recovery from VM backup

This option allows the restore of individual files from the backup. With or without this option, you can restore the entire virtual machine.

Use this option for incremental backups (differential incremental backup or cumulative incremental backup).

To perform a Hyper-V backup to a deduplication storage unit, select this option. This option provides the best deduplication rates.

Note: This option is not supported for the virtual machines that have .vhdx files. If the virtual disk is in the .vhdx format, you can restore the entire virtual machine but not individual files.

Primary VM identifier option on the Hyper-V policy tab

This setting specifies the type of name by which NetBackup recognizes virtual machines when it selects them for backup.

Table 3-1   Primary VM identifier options

Option	Description
VM hostname	Specifies the network host name for the virtual machine. The host name is available only when the virtual machine is running. If you select **VM hostname** but the virtual machine is not running at the time of the backup, the backup may fail.

Table 3-1   Primary VM identifier options *(continued)*

Option	Description
VM display name	Specifies the name of the virtual machine as it appears in the Hyper-V Manager console. **Note:** NetBackup for Hyper-V does not currently support the virtual machine display names that contain non-US-ASCII characters. If the display name contains such characters, select **VM hostname** or **VM UUID**.
VM UUID	Specifies the unique ID assigned to the virtual machine when the virtual machine was created.

Note: If you create a policy and then change the **Primary VM identifier**, you may have to delete the virtual machine selections on the **Clients** tab. Otherwise, NetBackup may no longer be able to identify the virtual machines to back up.

For example: if you change the **Primary VM identifier** from **VM hostname** to **VM display name**, and the display names of the virtual machines are different from the host names, note: The host names in the **Clients** tab cannot be used and the virtual machines are not backed up. You must delete the host name entries on the **Clients** tab and browse the network to select the virtual machines by their display names.

Note: When creating virtual machines, use the same name for both the host name and the display name. If the **Primary VM identifier** is changed, the existing entries on the **Clients** tab still work.

Enable offline backup for non-VSS VMs on the Hyper-V policy tab

This option determines whether or not NetBackup is allowed to perform an offline backup of a virtual machine. This option is intended for the guest operating systems that do not support VSS (such as Linux).

Note: Online vs. offline backup are Microsoft backup types and are not configured in NetBackup.

If this option is enabled, NetBackup can perform an offline backup of a virtual machine.

In certain situations, if the virtual machine cannot be quiesced for an online backup, the virtual machine must be placed in the Saved state. The backup is thus performed

offline. User access to the virtual machine may be interrupted during the backup. After the backup is completed, the virtual machine is returned to its original state.

If this option is disabled, NetBackup is not allowed to perform an offline backup of a virtual machine. Only an online backup can be done (user access to the virtual machine is not interrupted). If an online backup cannot be done, the backup job fails with status 156.

More information is available about online and offline backups.

See "About Hyper-V online and offline backups" on page 82.

See "Snapshot error encountered (status code 156)" on page 67.

Cluster shared volumes timeout on the Hyper-V policy tab

This option applies to backups of the virtual machines that are configured in a Microsoft Cluster that uses cluster shared volumes (CSV). The timeout determines how long the backup job waits, in case another cluster node backs up the same shared volume at the same time.

The default is 180 (wait for three hours). A wait of three hours is recommended if you have multiple virtual machines on one CSV. The Windows 2008 R2 cluster node owns the CSV for the entire duration of the backup.

If you do not want NetBackup to wait for another backup to release the shared volume, set the value to 0. If at the same time another cluster node backs up a shared volume that this backup requires, the backup fails with status 156.

The appropriate value for this timeout parameter depends on the following factors:

- The average backup job duration for the virtual machines that reside on the same CSV. The duration depends on the size of the virtual machines and the I/O speed.

- The number of virtual machines on the same CSV.

Note: On Windows server 2012, cluster nodes can back up the same cluster-shared volume simultaneously. As a result, NetBackup does not use the **Cluster shared volumes timeout** option if the cluster is on Windows 2012.

More information is available on NetBackup support for the virtual machines that use CSVs.

See "About virtual machines on Windows 2008 and 2012 failover clusters" on page 32.

Hyper-V - Advanced Attributes

This dialog appears when you click **Advanced** on the **Hyper-V** policy tab.

You can use the Hyper-V Advanced Attributes dialog to set the following additional parameters for Hyper-V backup. In most situations, the best settings are the defaults.

Table 3-2   Hyper-V Advanced Attributes

Configuration parameter	Description
Provider Type	See "Provider Type configuration parameter" on page 27.
Snapshot Attribute	See "Snapshot Attribute configuration parameter" on page 27.

Provider Type configuration parameter

The **Provider Type** configuration parameter determines the type of VSS snapshot provider that creates the snapshot.

Auto	Attempts to select the available provider in this order: hardware, software, system.
System	Uses the Microsoft system provider, for a block-level copy on write snapshot. Unlike the **Hardware** type, the **System** provider does not require any specific hardware.
Software	Not certified in this release.
Hardware	Uses the hardware provider for a disk array. A hardware provider manages the VSS snapshot at the hardware level by working with a hardware storage adapter or controller. For example: To back up the data that resides on an EMC CLARiiON or HP EVA array by means of the array's snapshot provider, select **Hardware**. Depending on your array and on the snapshot attribute you select, certain preconfiguration of the array may be required. See the chapter on configuration of snapshot methods for disk arrays in the *NetBackup Snapshot Client Administrator's Guide*.

Snapshot Attribute configuration parameter

The **Snapshot Attribute** configuration parameter determines the type of VSS snapshot that is created.

Unspecified	Uses the default snapshot type of the VSS provider.
Differential	Uses a copy-on-write type of snapshot. For example, to back up an EMC CLARiiON array with an EMC CLARiiON SnapView Snapshot, select **Differential**.
Plex	Uses a clone snapshot or mirror snapshot. For example, to back up an HP EVA array with an HP EVA Snapclone snapshot, select **Plex**.

Browse for Hyper-V virtual machines

On the **Clients** tab, click **New** to enter or browse for virtual machines.

The following table describes the options that you can use to browse for Hyper-V virtual machines.

Table 3-3   Options to use to browse for Hyper-V virtual machines

Option	Description
Enter the VM hostname	Enter the host name, display name, or GUID of the virtual machine. The format of the host name or display name depends on your system. It may be the fully qualified name or another name, depending on your network configuration and how the name is defined in the guest OS. If NetBackup cannot find the name or GUID you enter, the policy validation fails. Make sure the **Browse and select Virtual Machines** option is unchecked.
Browse and select Virtual Machines	Click this option to discover Hyper-V servers or cluster nodes (shown in the left pane). You can select virtual machines from a list (in the right pane). The virtual machine names that are listed may be derived from a cache file. Use of the cache file is faster than rediscovering the virtual machines on the network if your site has a large number of virtual machines. If the virtual machine is turned off but was turned on when the cache file was last created, its name appears in the list. If the display name of the virtual machine was recently changed in the Hyper-V Manager, note: The virtual machine name that was used for the backup does not change. If NetBackup cannot obtain the IP address of the virtual machine, the IP address is displayed as NONE. See "About cached names for virtual machine backup" on page 29.
Last Update	To update the cache file and re-display virtual machines, click the refresh icon to the right of the **Last Update** field. This field shows the date and time of the most recent cache file that contains the names of virtual machines.

About cached names for virtual machine backup

The NetBackup policy maintains a cache file of virtual machine names. The names are shown in the **Browse for Virtual Machines** dialog box. You can select a virtual machine from the cached list in the dialog box, rather than waiting to rediscover them on the network. This approach can save time if your site has a large number of virtual machines.

If you change the VM display name in the Hyper-V Manager, the new name may not be used for backups until the cache is renewed. On the policy's **Browse for Virtual Machines** dialog box, click the refresh icon to the right of the **Last Update** field to update the list of virtual machines.

Prerequisites for alternate client backup of a virtual machine

You can back up a virtual machine with a NetBackup client that is installed on a host other than the Hyper-V server. The separate host is called an alternate client. Although a NetBackup client must reside on the Hyper-V server, that client does not perform the virtual machine backup. The alternate client handles the backup I/O processing, to save computing resources on the Hyper-V server.

Note that the NetBackup media server can be installed on the alternate client instead of on the Hyper-V server. In this configuration, the alternate client host performs the media server processing.

Note the following prerequisites for the alternate client backup of a virtual machine:

- The VSS snapshot provider must support transportable snapshots with the Hyper-V writer. A transportable snapshot is one that can be imported to the alternate client.
  Check with the vendor of the VSS provider, or use the `vshadow` command.

- The VSS provider should be installed on both the primary client (the Hyper-V server) and the alternate client.

- All virtual machine files must reside on Hyper-V host volume(s) that the VSS provider supports for transportable snapshots involving the Hyper-V writer.

- The primary client (Hyper-V server) and alternate client must run the same Windows operating system, volume manager, and file system. For each of these I/O system components, the alternate client must be at the same version as the primary client, or at a higher version.

■ The primary client and alternate client must run the same version of NetBackup. For example, the use of a later version of NetBackup on the primary client and an earlier version on the alternate client is not supported.

For more information on alternate client requirements, see "Alternate client backup" in the *NetBackup Snapshot Client Administrator's Guide*.

Configuring alternate client backup of virtual machines

This topic describes the details unique to setting up a policy for alternate client backup. This topic is a supplement to a larger procedure. For further instructions on creating a policy, see the following:

See "Creating a Hyper-V policy from the NetBackup Policies utility" on page 21.

To configure an alternate client backup of a virtual machine

1   On the NetBackup policy **Attributes** tab, select **Hyper-V** as the policy type.

2   Under **Snapshot Client**, click **Perform off-host backup** and select **Alternate Client** from the pull-down. Enter the name of the alternate client in the **Machine** field.

Following is the **Snapshot Client** pane of the policy **Attributes** tab.

3 Click the **Hyper-V** tab and review the options.

See "Backup options on the Hyper-V tab" on page 24.

Note the following:

Enable file recovery from VM backup	This option supports full and incremental schedules.

4 Create a schedule for the backup.

5 On the **Clients** tab, select the virtual machine(s) to back up.

Click **New**.

See "Browse for Hyper-V virtual machines" on page 28.

Note: The **Backup Selections** tab is set to **ALL_LOCAL_DRIVES**.

---

6 Click **OK** to validate and save the policy.

After you start the backup, the Detailed Status log should include the following line:

```
... snapshot backup using alternate client <host_name>
```

Troubleshooting assistance is available.

See "Problems with alternate client backup" on page 72.

Requirements for a NetBackup client inside the virtual machine

Although a NetBackup client is required on the Hyper-V server, it is not required in the virtual machine except in the following cases:

- To back up the individual virtual drives that are inside the virtual machine. For example, the virtual drives that are on vhd (or vhdx) files as though on a physical host.

- To back up the physical disks that the virtual machine accesses in a pass through configuration.
  To back up disks in a pass through configuration by means of a VSS hardware snapshot provider, an alternate client configuration is required.
  See "About Hyper-V pass-through disks with NetBackup" on page 85.

- To back up databases or applications using NetBackup agents.

Windows Server 2008 and 2012 failover cluster support

This chapter includes the following topics:

About virtual machines on Windows 2008 and 2012 failover clusters

NetBackup support for failover clusters includes the following:

- NetBackup can use a single policy to back up high availability (HA) and non-HA virtual machines in the cluster.

- NetBackup can back up a virtual machine even if it migrates to a different node in the cluster.

- NetBackup can restore the entire virtual machine to a cluster or to any Hyper-V host.

Note: A NetBackup client must be installed on each node of the cluster.

When restoring a clustered virtual machine to its original location, note the following:

- The restore destination depends on the following: The virtual machine's HA status at the time of its backup and at the time of restore (if it still exists). See "Location of the restored virtual machine in a cluster" on page 36.

- Virtual machines are always restored to a state of non-high-availability. They can be manually reset for high availability.

- If the existing virtual machine has a status of highly available at restore time, also note the following:

  - Its cluster resources are deleted during the restore.

  - Its cluster group is not deleted during restore. Removal of the cluster group must be done manually.
    See "Virtual machine maintenance after a restore" on page 36.

Notes on CSV backup and restore

The Windows Server 2008 R2 added a new feature for Hyper-V called Cluster Shared Volumes (CSV). CSV allows multiple virtual machines to share volumes (disk LUNs). CSV also allows live migration of a running virtual machine from one Hyper-V server to another without user interruption.

Multiple virtual machines can be created on a single cluster-shared volume (CSV) and owned by different nodes. (Hyper-V servers are configured as nodes in the cluster.) All nodes can access the CSV simultaneously.

NetBackup can back up the virtual machines that are configured in cluster-shared volumes.

Note the following:

- During the backup, the cluster-shared volume (CSV) enters the online state ("Backup in progress, Redirected access"). The cluster node that performs the backup becomes the owner of the CSV.

- On Windows versions before 2012, multiple nodes cannot back up a CSV simultaneously. When a node backs up a virtual machine on a CSV, the attempt by another node to back up the same virtual machine fails.

Note: On Windows server 2012, cluster nodes can back up the same CSV simultaneously.

For Windows versions before 2012: You can use the **Cluster shared volumes timeout** option in the policy to adjust how long NetBackup waits for another backup of the same CSV to complete.

See "Cluster shared volumes timeout on the Hyper-V policy tab" on page 26.

- A single node containing two virtual machines can back up both virtual machines simultaneously, even if they use the same CSV. As long as both virtual machines reside on the same node, simultaneous backups are allowed.

Creating a policy for virtual machines in a cluster

This procedure focuses on the configuration items that are unique to the virtual machines that use a CSV. Broader details on creating a policy are available:

See "Creating a Hyper-V policy from the NetBackup Policies utility" on page 21.

To create a policy for the virtual machines that are in a CSV cluster

1   Select **Hyper-V** as the policy type.

2   On the Hyper-V tab, enter the name of the cluster in the **Hyper-V host** field.

3   Note the following options on the Hyper-V tab.

Enable offline backup for non-VSS VMs	Determines whether or not NetBackup is allowed to perform an offline backup of a virtual machine.
	See "Enable offline backup for non-VSS VMs on the Hyper-V policy tab" on page 25.
Cluster shared volumes timeout	Determines how many minutes the backup job waits, in case another node backs up the same shared volume(s) that this backup requires.
	Note: This option is not used if the cluster is on Windows 2012.
	See "Cluster shared volumes timeout on the Hyper-V policy tab" on page 26.

4   Click the **Clients** tab, and then click **New**.

5   You can enter the host name, display name, or GUID of the virtual machine to back up, or click **Browse and select Virtual Machine**.
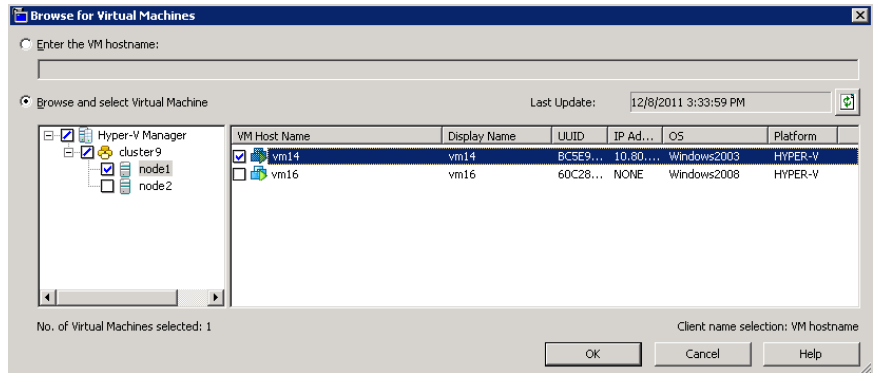
The cluster name and its nodes (Hyper-V servers) appear in the left pane, under **Hyper-V Manager**. The virtual machines appear in the larger pane to the right.

The **High Availability** column indicates whether the virtual machine is configured as highly available in the cluster.

Note the following:

- The host name or display name must appear in the list according to the **Primary VM identifier** option on the **Hyper-V** tab. If you selected **VM hostname** for the **Primary VM identifier** option, and a host name for the virtual machine does not appear: The virtual machine cannot be added to the **Clients** list.
  The host name of a virtual machine is available only when the virtual machine is in the running state. The display name and GUID are always available. If the host name does not appear, make sure that the virtual machine is turned on. To update the cache file and re-display virtual machines, click the refresh icon to the right of the **Last Update** field.

- If the right pane reads "Unable to connect," the highlighted node in the left pane is down or the NetBackup client service is not running.

6 When you have selected virtual machines, click **OK**.

   The selected virtual machine(s) appear on the **Clients** tab.
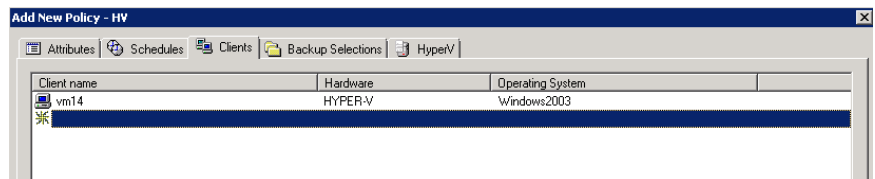
Location of the restored virtual machine in a cluster

When you restore a virtual machine to a cluster, you can restore to the original location or to a different location. But for a virtual machine that failed over to another node after the backup occurred, what is the original location? Is it the node (Hyper-V server) where the virtual machine resided when it was backed up, or the node where it now resides?

The following table is a decision chart for restore to original location in a cluster. It indicates where the virtual machine is restored. The location depends on the virtual machine's high availability (HA) state when it was backed up and when it was restored.

Table 4-1   Decision chart for restore to original location in a cluster

Is the virtual machine status HA at time of backup?	Is the virtual machine status HA at time of restore?	Virtual machine is restored to this node (to non-HA state):
Yes	Yes	Restored to node that owns the virtual machine at the time of restore.
Yes	No	Restored to node on which the virtual machine resided at the time of backup.
Yes	Virtual machine does not exist.	Restored to node on which the virtual machine resided at the time of backup.
No	Yes	Restored to node on which the virtual machine resided at the time of backup. At the time of restore, if virtual machine resides on a different node from where it resided when backed up, the restore fails.
No	No	Restored to node on which the virtual machine resided at the time of backup.
No	Virtual machine does not exist.	Restored to node on which the virtual machine resided at the time of backup.

Note: In all cases, the virtual machine is restored to the non-HA state.

Virtual machine maintenance after a restore

Note the following about restoring a virtual machine in a cluster:

■ Virtual machines are always restored to a state of non-high availability. To return the virtual machine to high availability, use the **Microsoft Failover Cluster**

Manager and the **High Availability Wizard**. For instructions, refer to the following Microsoft document:

Hyper-V: Using Hyper-V and Failover Clustering

- If the existing virtual machine has a status of high availability and the restore overwrites the virtual machine, note the following:

  - The existing virtual machine's cluster resources are removed during the restore.
    See "Removal of cluster resources during restore" on page 37.

  - The virtual machine's cluster group is not removed during restore. When two or more virtual machines are created on the same cluster disks, the cluster software places their resources in the same virtual machine group. Since another virtual machine may share that group, NetBackup does not delete the group.
    Removal of the cluster group must be done manually. Refer to Microsoft documentation for instructions.

Removal of cluster resources during restore

When a virtual machine is configured as highly available, the Microsoft Cluster software creates a group for that virtual machine. The group contains various resources, such as VM resource, VM configuration resource, and disk resource. These resources are under the control of the group.

When a highly available (HA) virtual machine is restored to its original location, the existing virtual machine at that location must be removed. As part of the restore, the Microsoft Cluster software automatically removes the virtual machine's group resources as well, as described in the following table.

Table 4-2 Removal of cluster resources during restore: CSV-based vs. non-CSV-based

Is the HA virtual machine based on a CSV volume?	These group resources are removed along with the existing virtual machine:
Yes	VM resource, VM configuration resource, and disk resource are removed.
No	VM resource and VM configuration resource are removed. The existing disk resource is retained as part of the cluster group.

Back up and restore Hyper-V

This chapter includes the following topics:

Backing up Hyper-V virtual machines

Virtual machine backups can be initiated from a NetBackup policy. You can start the backup manually from a policy, or have it run automatically according to a schedule that is defined in the policy.

For further information on NetBackup policies and backup schedules, see the chapter on creating backup policies in the *NetBackup Administrator's Guide, Volume I*.

To create the policy, you can use the **Policies** option of the **NetBackup Administration Console**, or you can use the **Policy Configuration Wizard**.

See "Creating a Hyper-V policy from the NetBackup Policies utility" on page 21.

See "Creating a Hyper-V policy from the Policy Configuration Wizard " on page 20.

To back up a virtual machine manually from an existing policy

1   In the **NetBackup Administration Console**, click on **Policies**, select the policy name, and expand **Actions > Manual Backup**.

The **Manual Backup** dialog box appears.
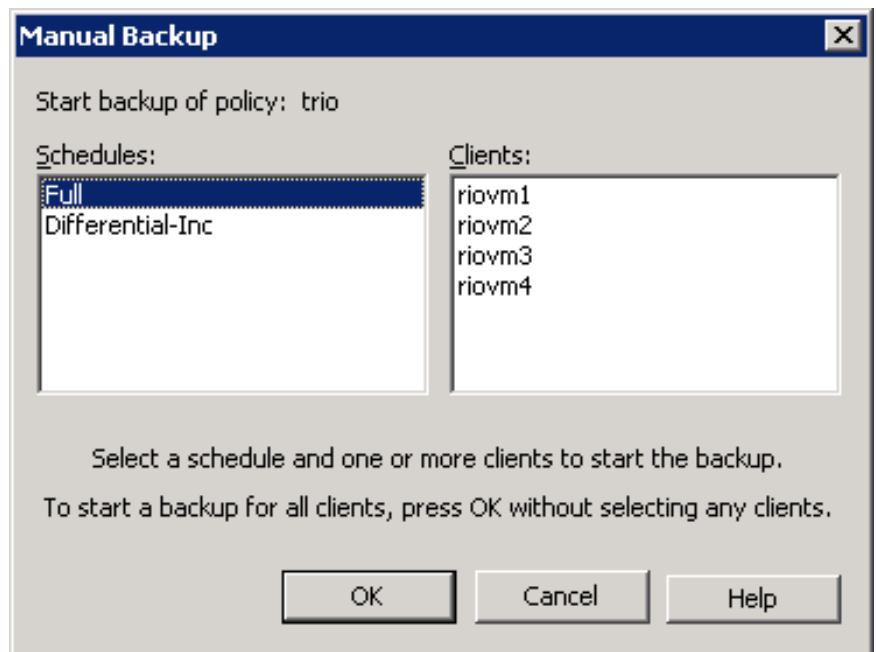
2   Select the type of schedule for the backup.

3   Select the clients (virtual machines) to back up.

4   Click **OK** to start the backup.

5   To watch the backup progress in the **NetBackup Administration Console**, click **Activity Monitor**.

Notes on individual file restore

Note the following:

- The policy **Enable file recovery from VM backup** option is not supported for virtual machines that have .vhdx files. If the virtual disk is in the .vhdx format, you can restore the entire virtual machine but not individual files.

- If you are running antivirus protection on Hyper-V virtual machines, Symantec recommends Symantec Endpoint Protection 11.0 Maintenance Release 4 (build 11.0.4000) or later. Restores of virtual machine files complete faster if the virtual machine is running this version as opposed to an earlier version of Endpoint Protection.

- Cross-platform restore of individual files is not supported. You can restore Windows files to Windows guest operating systems only, not to Linux. You can restore Linux files to Linux guest operating systems only, not to Windows.

- To restore files to a shared location on the virtual machine, note: Virtual machines must be in the same domain as the NetBackup client and master and media server.

- To restore an individual file that is larger than approximately 2 GB, restore the file to a host that has a NetBackup client. NetBackup for Hyper-V does not currently support restores of large files by means of a shared location on the virtual machine. This file size restriction does not apply to restore of an entire virtual machine.
  See "Restoring individual files to a host that has a NetBackup client" on page 46.

- From a backup image that was made with the **Enable file recovery from VM backup** option: If you select individual files to restore, the selected files must have originally resided on the same virtual machine volume. If some of the files resided on one volume and other files resided on a different volume, the restore fails.

- To restore Windows encrypted files, the NetBackup Client Service must be logged on as Administrator on the target host for the restore. Under services on the control panel, change the logon for the NetBackup Client Services from Local System Account to Administrator.

- Files that use NTFS-file system features cannot retain those features if you attempt to restore the files to a FAT or FAT32 file system.

  Note the following:

  - Files that were compressed under NTFS are restored as uncompressed files in a FAT or FAT32 file system.

- Files that were encrypted under NTFS cannot be restored to a FAT or FAT32 file system.

- Files that had NTFS-based security attributes are restored without those attributes in a FAT or FAT32 file system.

- The restore fails with NetBackup status 2817 when the files that have alternate data streams are restored to a FAT or FAT32 file system.

- Windows Hyper-V provides no mechanism for quiescing file system activity on Linux virtual machines. Therefore, at the time of backup, a snapshot of a Linux virtual machine may be in an inconsistent state (sometimes called crash-consistent). Note that the backup succeeds. For restore of inconsistent Linux files from the backup, NetBackup creates a NetBackup.lost+found directory for each Linux volume.

  See "About the NetBackup lost and found directory on Linux" on page 44.

- On a restore, NetBackup recreates the linking between a hard link and its original file only if the link file and its target file are restored in the same job. If each file is restored individually in separate restore jobs, they are restored as separate files and the link is not re-established.

- On a Linux virtual machine, a backup that was made with the **Enable file recovery from VM backup** option may have file-mapping issues if the virtual machine experiences heavy I/O. (Windows Hyper-V provides no mechanism for quiescing file system activity on Linux virtual machines.)

  See "Problems with restore of individual files" on page 77.

- For Linux virtual machines, only the ext2, ext3, and ext4 file systems are supported for individual file restore. If a partition uses some other file system, the backup succeeds but files in that partition cannot be individually restored. Note: The "/" (root) partition must be formatted with ext2, ext3, or ext4 so that NetBackup can present mount points in the Backup, Archive, and Restore interface.

- The Linux ext4 file system includes a persistent pre-allocation feature, to guarantee disk space for files without padding the allocated space with zeros. When NetBackup restores a pre-allocated file (to any supported ext file system), the file loses its preallocation and is restored as a sparse file.

- To migrate an ext2 or ext3 file system to ext4: See the instructions under Converting an ext3 file system to ext4 on the following page of the Ext4 wiki: https://ext4.wiki.kernel.org/index.php/Ext4_Howto#Converting_an_ext3_filesystem_to_ext4
  If you do not follow these instructions, data in a newly created ext4 file is not promptly flushed from memory to disk. As a result, NetBackup cannot back up the data of recently created files in the ext4 file system. (The NetBackup snapshot captures the file as zero length.) As a workaround for the file systems that were

not correctly migrated, note: Run the Linux sync command on the ext4 file system before starting each backup.

- NetBackup supports backup of Linux FIFO files and socket files. Note however that NetBackup does not support restoring FIFO files and socket files individually. FIFO files and socket files can be restored along with the rest of the virtual machine data when you recover the entire virtual machine.

- For Linux virtual machines, NetBackup cannot restore individual files from software RAID volumes. The files are restored when you restore the entire virtual machine

- NetBackup supports backup and restore of Linux LVM2 volumes, including individual file restore from an LVM2 volume. Note however that NetBackup does not support individual file restore from a snapshot that was created by means of the snapshot feature in LVM2. If an LVM2 snapshot exists at the time of the backup, the data in the snapshot is captured in the backup. The data can be restored along with the rest of the virtual machine data when you recover the entire virtual machine.

- For Linux, additional notes apply.
  See

- NetBackup for Hyper-V does not support individual file restore by means of ClientDirect Restore.

Notes on full virtual machine restore

Note the following:

- A backup of the full virtual machine can be restored only to Windows Server 2008 or later with the Hyper-V role enabled.

- By default, the NetBackup client on the Hyper-V server does not have Windows Administrator privileges. You can restore a full virtual machine from the NetBackup server. You cannot restore a full virtual machine from a NetBackup client that does not have Administrator privileges.

- For the virtual machines that are configured in a volume GUID with a differencing disk in another volume GUID, redirected restores are not supported.
  See

- When you restore the virtual machine to its original location with the **Overwrite virtual machine** option, note: The same virtual machine on the Hyper-V server is automatically turned off and deleted before the restore. The .vhd or .vhdx files of the virtual machine on the Hyper-V server are overwritten by the .vhd or .vhdx

files from the backup image. If any new .vhd or .vhdx files were created after the backup, those files are not removed.

- When you restore the virtual machine to a different location on the original Hyper-V server or to a different server, note: The same virtual machine (if it exists) on the Hyper-V server is automatically turned off and deleted before the restore if you choose the **Overwrite virtual machine** option. The .vhd or .vhdx files of the deleted virtual machine, however, are not deleted. You must delete those files.

- When you restore the virtual machine to a Hyper-V server that has a virtual machine of the same GUID, you must select the **Overwrite virtual machine** option. Otherwise, the restore fails.

- If you restore a virtual machine without the **Overwrite virtual machine** option, note: You must remove the current virtual machine and its .vhd or .vhdx files from the destination server before you start the restore. If you remove the virtual machine but leave one or more of its .vhd or .vhdx files on the destination server, the .vhd or .vhdx files from the backup are not restored.

- (This item is a limitation in VSS and the Hyper-V writer, not in NetBackup.) If the virtual machine contains Hyper-V snapshot files (`.avhd or .avhdx` files), NetBackup cannot restore the virtual machine to a different location or to a different Hyper-V server.

  Note the following:

  - This issue has been fixed in Windows Server 2008 R2 (restore server).

  - This restriction does not apply in either of the following cases: When you restore the virtual machine to its original location on the original Hyper-V server, or when you restore to a staging location.

  Note that NetBackup does not create Hyper-V snapshot files (`.avhd or .avhdx`).

- (This item is a limitation in VSS, not in NetBackup.) Immediately after a full virtual machine is restored, the virtual machine volume may be larger than it was when the virtual machine was backed up. The increase is normal: After the restore, snapshot-related cache files remain on the volume. After about 20 minutes, the cache files are automatically removed and the volume returns to its original size Note: A new backup of the restored virtual machine could fail if the virtual machine volume contains insufficient space to create a snapshot for the backup. According to Microsoft, this situation should not occur as long as the virtual machine volume has at least 10 to 15% free space.

- In the following case a race condition may result:

  - You attempt to do a full restore of two virtual machines at the same time.

- The two virtual machines also share a virtual hard disk (.vhd or .vhdx file) that both restore jobs have selected to restore.

  The two jobs may simultaneously attempt to access the same .vhd or .vhdx file, but only one job gains access to the file. The other job is denied access, and that job may fail with error code 185.
  See "NetBackup status codes related to Hyper-V" on page 65.

- If you restore a virtual machine to a different Hyper-V server, note: The original Hyper-V server and the target server must have the same number of network adapters (NICs). You must configure the network adapter(s) for the restored virtual machine on the target server.
  See "Restored virtual machine fails to start" on page 75.

- Windows Hyper-V provides no mechanism for quiescing file system activity on Linux virtual machines. Therefore, at the time of backup, a snapshot of a Linux virtual machine may be in an inconsistent state (crash-consistent). Note that the backup succeeds. For restore of inconsistent Linux files from the backup, NetBackup creates a NetBackup.lost+found directory for each Linux volume.

About the NetBackup lost and found directory on Linux

Windows Hyper-V provides no mechanism for quiescing file system activity on Linux virtual machines. As a result, a snapshot of a Linux virtual machine may be in an inconsistent state (crash-consistent). In that case, the snapshot data is equivalent to the state of a file system after an abrupt, uncontrolled shutdown. If the system is restarted, a file system consistency check (`fsck`) reports the inconsistencies that need repair.

To handle inconsistent data from backups of crash-consistent Linux virtual machine snapshots, NetBackup creates a `NetBackup.lost+found` directory for each Linux volume. This directory is not a physical directory on the volume but a virtual directory in the NetBackup catalog. Any inconsistent directories or files are linked to the NetBackup.lost+found directory. The names of the inconsistent directories and files cannot be determined. The items in the NetBackup.lost+found directory are therefore assigned the names that represent the inode numbers of the original directories or files.

If a NetBackup.lost+found directory already exists on the virtual machine, NetBackup appends numbers to the new NetBackup.lost+found directory names, to keep them unique. The directories are named NetBackup.lost+found.1, NetBackup.lost+found.2, and so forth.

Note: The NetBackup.lost+found directory is not the same as the standard Linux lost+found directory that Linux maintains in case of an abnormal system shutdown.

The following Backup, Archive, and Restore screen shows examples of inconsistent directories and files in a NetBackup.lost+found directory. This example also shows the standard Linux lost+found.
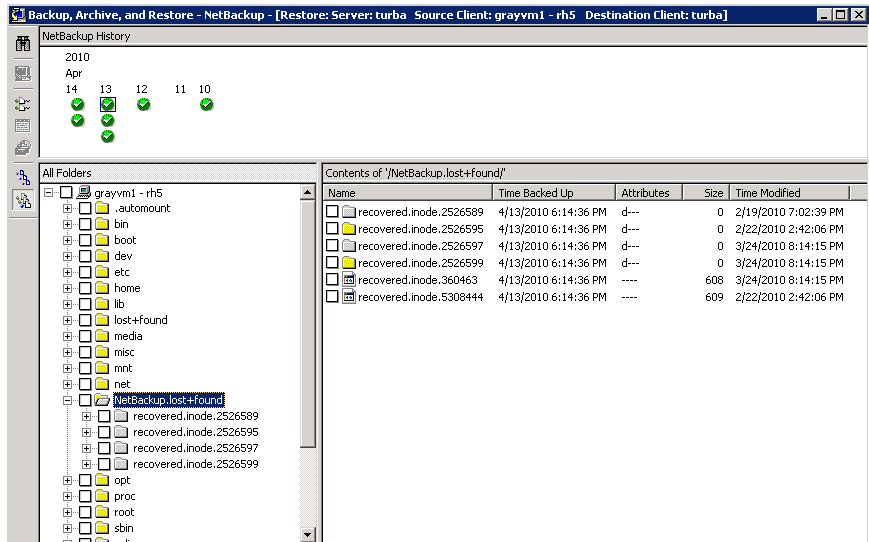
In the NetBackup Backup, Archive, and Restore interface, you can search the NetBackup.lost+found directory for any inconsistent files and restore them. Symantec recommends that you restore them to an alternate location (not to the original virtual machine). You can then examine their contents to determine their original names. Any metadata that was captured at the time of the backup may be helpful in identifying the inconsistent files or directories. Examples of such metadata are file size, file owner, and file creation and modification dates.

About restoring individual files

If the **Enable file recovery from VM backup** option was enabled, you can restore the files and folders that existed on that virtual machine at the time of the backup.

If the **Enable file recovery from VM backup** option was not enabled, you can restore the full virtual machine only.

See "Restoring the full virtual machine" on page 50.

More information is available on the Hyper-V backup options.

See "Creating a Hyper-V policy from the NetBackup Policies utility" on page 21.

You can set up a configuration to restore individual files in any of the following ways:

- Install a NetBackup client on another computer. Create a share on the virtual machine to allow that computer to access the virtual machine. (The virtual machine does not require a NetBackup client.) Specify the UNC path as the destination for the restore. More information is available on this option:
  See "Restoring individual files to a shared location on the virtual machine" on page 48.
  See "Setting up NetBackup Client Service for restore to a shared location on the virtual machine" on page 49.

- Install a NetBackup client on the virtual machine where you want to restore the files. Restore the files to the virtual machine in the same manner as restoring to any NetBackup client.
  See "Restoring individual files to a host that has a NetBackup client" on page 46.

- Install a NetBackup client on another computer. Restore the files to that computer and then copy the files to the virtual machine.
  To restore encrypted files, you must install a NetBackup client on the virtual machine and restore the files directly to the virtual machine.
  See "Restoring individual files to a host that has a NetBackup client" on page 46.

You can use the NetBackup Backup, Archive, and Restore interface to restore files and folders from NetBackup for Hyper-V backups.

Important notes on Hyper-V restore are also available.

See "Notes on full virtual machine restore" on page 42.

See "Notes on individual file restore" on page 40.

Restoring individual files to a host that has a NetBackup client

Use the following procedure to restore individual files to a host that has a NetBackup client.

To restore individual files to a host that has NetBackup client

1   Start the **NetBackup Backup, Archive, and Restore** interface on a NetBackup client.

2   Click **Files > Specify NetBackup Machines and Policy Type**.

    Select the following.

Server to use for backups and restores	Specify the NetBackup master server that performed the Hyper-V backup.
Source client for restores (or virtual client for backups)	Specify the Hyper-V virtual machine that was backed up.
Destination client for restores	Specify a physical host or a virtual machine. The host or virtual machine must contain a NetBackup client.
	You must use a different procedure to restore the files to a virtual machine that does not have a NetBackup client.
	See "Restoring individual files to a shared location on the virtual machine" on page 48.
Policy type for restores	Specify **Hyper-V**.
Date / time range	The time period (date and time) within which to search for backups.

3   Under **Actions > Select Restore Type**, select **Normal Backups**.

4   In the **All folders** pane, select the files to restore.

5   Click **Actions > Restore**.

6   Make your selections in the **Restore Marked Files** dialog box.

    Note the following:

    ■   **Restore everything to its original location**
        Select this option to restore the files to their original paths or folders on the destination client. If the original volume at the time of backup (such as E:\) does not exist on the destination client for this restore, the restore fails.

    ■   **Restore everything to a different location**
        Select this option to restore the files to a different path or folder on the destination client. Specify the folder in the **Destination** field.
        If the original volume at the time of backup (such as E:\) does not exist on the destination client for this restore, the restore fails.

Use a different procedure to restore the files to a virtual machine that does not have a NetBackup client:

See "Restoring individual files to a shared location on the virtual machine" on page 48.

- **Restore individual folders and files to different locations**
  Select this option to restore files to particular locations. Each item you selected to restore appears in the **Source** column. Double-click on an item to enter or browse for a restore destination.

7   Click **Start Restore**.

Restoring individual files to a shared location on the virtual machine

You can restore virtual machine files to a Hyper-V virtual machine that does not have a NetBackup client installed on it.

To restore individual files to a virtual machine that is not a NetBackup client

1   Install a NetBackup client on a physical host.

The host must be in the same domain as the virtual machine that you want to restore the files to. This host can be a Hyper-V server or another computer.

2   Create a share to allow the host that contains the NetBackup client to access the virtual machine. The share must allow write access.

For example: `\\virtual_machine1\share_folder`

In this example, virtual_machine1 is the ultimate destination for the restored files. The host with the NetBackup client acts as a conduit for the restore.

3   Start the NetBackup Backup, Archive, and Restore interface on the NetBackup client.

4   Click **Files > Specify NetBackup Machines and Policy Type**.

Select the following.

Server to use for backups and restores	Specify the NetBackup master server that performed the Hyper-V backup.
Source client for restores (or virtual client for backups)	Specify the Hyper-V virtual machine that was backed up.
Destination client for restores	Select the host that has the NetBackup client. The virtual machine to which you want to restore must have a share for this host.
	Do not specify the virtual machine in this field.
Policy type for restores	Specify Hyper-V.
Date / time range	The time period (date and time) within which to search for backups.

5   Under **Actions > Select Restore Type**, select **Normal Backups**.

6   In the **All folders** pane, select the files to restore.

7   Click **Actions > Restore**.

8   In the **Restore Marked Files** dialog box, click **Restore everything to a different location**.

In the **Destination:** field, specify the UNC path name that refers to the shared drive or folder on the destination virtual machine.

For example, to restore files to E:\folder1 on virtual_machine1, enter the following:

```
\\virtual_machine1\share_folder\
```

NetBackup restores the files to the shared location on the virtual machine.

9   You may have to change the logon for the NetBackup Client Service.

See "Setting up NetBackup Client Service for restore to a shared location on the virtual machine" on page 49.

Setting up NetBackup Client Service for restore to a shared location on the virtual machine

To restore individual files to a Windows virtual machine that has a shared drive, note: the NetBackup Client Service must be logged on as the domain administrator

account. It must not be logged on as the Local System account. The Administrator account allows NetBackup to write to the directories on the virtual machine to which the data is restored.

If you try to restore files while the NetBackup Client Service is logged on as the Local System account, the restore fails.

To log on the NetBackup Client Service as Administrator

1   In Windows Services on the host that has a share to the virtual machine, double-click the NetBackup Client Service.

2   Check the **Log On** tab: if the service is not logged on as Administrator, stop the service.

3   Change the logon to the Administrator account, in the domain in which both the virtual machine and the host that has a share reside.

4   Restart the service.

5   Retry the restore.

Restoring the full virtual machine

You can restore the entire virtual machine to the original Hyper-V server or to a different Hyper-V server.

For important notes on restoring the full virtual machine, see the following:

To restore the entire Hyper-V virtual machine

1   Start the **NetBackup Backup, Archive, and Restore** interface.

2   Specify the source client, destination client, and type of policy.

Windows:

Click **Files > Specify NetBackup Machines and Policy Type**.

Java:

On the **Restore Files** tab, click the hand icon that is in the upper right corner.

Select the following.

Server to use for backups and restores	Specify the NetBackup master server that performed the Hyper-V backup.
Source client for restores (or virtual client for backups)	Specify the Hyper-V virtual machine that was backed up.
Destination client for restores	This field is ignored when you restore an entire virtual machine. A later step in this procedure explains how to restore to a different Hyper-V server.
Policy type for restores	Specify Hyper-V.
Date / time range	The time period (date and time) within which to search for backups.

3   Select the type of restore:

Windows:

Click the down arrow next to the **Select for Restore** option and select **Restore from Virtual Machine Backup**. A restore window displays the backups available for restore.

Java:

On the **Restore Files** tab, select **Restore type > Virtual Machine Backups**.

4   Select the backup of the virtual machine that you want to restore.

Windows:

In the **NetBackup History** pane, click on the Hyper-V backup, then click on the item that is displayed under **All Folders**. You must select the entire virtual machine.

Java:

- On the **Restore Files** tab, specify the Start date and End date within which to search for the backup.

- Specify root (/) in the **Browse directory** field and press Enter.

- Click on the root folder that is displayed under **Directory Structure**.

5   Open the **Restore Marked Files** dialog box.

Windows: Click **Actions > Restore**.

Java: Click **Restore**.

More information is available on this dialog box.

See "Restore Marked Files dialog box (Hyper-V)" on page 52.

6   Click **Start Restore**.

When the restore is complete, the restored virtual machine is placed in the Saved or Off state. The state after restore depends on its state at the time of the backup and the type of Hyper-V backup that occurred.

See "About Hyper-V online and offline backups" on page 82.

Restore Marked Files dialog box (Hyper-V)

Select from the following options on the **Restore Marked Files** dialog box.

Restore Marked Files

Hyper-V

Hyper-V virtual machine GUID

D82F7022-A662-4C4C-B098-372F16A53B2D

Restore Options

○ Restore to Hyper-V server

Restores virtual machine to the same location on the same Hyper-V server

○ Restore to different locations on same / different Hyper-V server

Restores virtual machine to a different location on the same or different Hyper-V server

○ Restore to staging location

Restores only the virtual machine files to the staging location

☐ Overwrite virtual machine

Restore Destinations

Hyper-V server:

LANDLORD

List of backed up files:

Source	Destination	Time Bac...	Time Mo...	Size
☑ C:\Program...		9/14/200...	9/14/200...	16310
☑ C:\Program...		9/14/200...	9/14/200...	536870912
☑ C:\Program...		9/14/200...	9/14/200...	20971520
☑ C:\Users\P...		9/14/200...	9/14/200...	16752730...

Restore to the following staging directory:

View paths...

☐ Override default job priority

Job priority   0

(Higher number is greater priority)

Start Restore   Cancel   Help

Table 5-1   Options on the **Restore Marked Files** dialog box

Option	Description
Hyper-V virtual machine GUID	Shows the Hyper-V GUID (globally unique identifier) of the virtual machine that was backed up. Use this value to verify that this backup represents the virtual machine that you want to restore. The GUID is a unique string for a virtual machine in addition to the host name.
Restore Options	
Restore to Hyper-V server	Restores the virtual machine to its original location on the original Hyper-V server.
Restore to different locations on same / different Hyper-V server	Restores the virtual machine to a different location on the original Hyper-V server, or restores it to a different Hyper-V server.
Restore to staging location	Restores the virtual machine files to the staging location on the server that you specify under **Hyper-V server** and **Restore everything to different directory**. Use this option if: ■ You do not want to restore an entire virtual machine ■ You do not want NetBackup to start the virtual machine after the restore For instance, you can use this option to add restored files as a .vhd or .vhdx volume to a virtual machine other than the one from which they were backed up.
Overwrite virtual machine (If you selected **Restore to staging location**, this option is **Overwrite existing files**)	If you selected **Restore to Hyper-V server** or **Restore to different locations on same / different Hyper-V server**, note the following: ■ If a virtual machine with the same GUID exists at the destination server, that virtual machine is removed with its configuration files and snapshot files. Any existing .vhd or .vhdx files for the virtual machine on the destination server are overwritten. The virtual machine that you selected to restore is restored from the backup. ■ If the **Overwrite virtual machine** option is not selected and a virtual machine with the same GUID exists on the destination server, the restore fails. ■ If the **Overwrite virtual machine** option is not selected and .vhd or .vhdx file(s) for the virtual machine still exist on the destination: The .vhd or .vhdx file(s) from the backup are not restored. See "Problems with restore of the full virtual machine" on page 78. If you selected **Restore to staging location**, note the following: ■ If the .vhd or .vhdx file already exists on the destination server in the specified restore location, that file on the destination server is overwritten. ■ If the **Overwrite existing files** option is not selected and any file you want to restore already exists in the restore location, the file is not overwritten. Any other files that are selected for restore are restored. The restore is reported as a partial success.
Restore Destinations	See the following fields.

| | Table 5-1 | Options on the **Restore Marked Files** dialog box *(continued)* |

Option	Description
Hyper-V server	If you selected **Restore to Hyper-V server** (to restore to the original location), note: the restore destination is the name of the Hyper-V server from which the virtual machine was backed up. In this case, the destination cannot be changed.
	For the other restore options (restore to a different location, or restore to a staging location), specify the destination Hyper-V server for the restore.
List of backed up files (Source)	Lists the Hyper-V virtual machine files as they existed when the virtual machine was backed up. By default, all listed files are selected for restore.
	If you do not want the restore to replace certain files on the current virtual machine on the destination server, uncheck those files. Leave a check mark next to the files that you want to restore. The files that are not checked are not restored. Note that the following virtual machine configuration files are not de-selectable in restores other than staging restores:
	.xml, .vsv, and .bin files, and .avhd or .avhdx files.
	Caution: Replacing common files with earlier versions can be problematic for the virtual machines that rely on the common files. If you do not want to overwrite the common files on the Hyper-V server, uncheck the common files that you do not want to restore.
	See "About restoring common files" on page 56.
	Note the following about the listed files:
	■ If you do not select any .vhd or .vhdx files, NetBackup tries to find them in their original location. If they are absent from the original location, the restore fails. If a parent .vhd or .vhdx file was in E:\myVhds\ on the original virtual machine and is not selected during restore, NetBackup looks for the parent file in E:\myVhds\ on the target virtual machine. If the file does not exist, the restore fails.
	■ For **Restore to Hyper-V server** or **Restore to different locations on same / different Hyper-V server**, you can uncheck any .vhd or .vhdx files in this list. All other files are pre-checked and cannot be unchecked.
	■ For **Restore to staging location**, you can uncheck any files in the list.
	■ Configuration files (such as xml, bin, vsv, and snapshot files) are always restored when you restore the full virtual machine.
Restore everything to different directory	This field is disabled if you selected **Restore to Hyper-V server**.
	For restore to a different location or to a staging location: Enter the path on the server or other computer that you specified under **Hyper-V server** or **Staging machine name**. NetBackup creates the appropriate subdirectories.
View Paths	Displays the directories on the destination server in which the Hyper-V files are to be restored. You must specify a destination path in the **Restore everything to different directory** field.

| | Table 5-1 | Options on the **Restore Marked Files** dialog box *(continued)* |

Option	Description
Override default job priority	Determines the restore job's priority for restore resources. A higher priority means that NetBackup assigns the first available drive to the first restore job with the highest priority. Enter a number (maximum 99999). The default for all restore jobs is 0, the lowest priority possible. Any restore job with a priority greater than zero has priority over the default setting.

About restoring common files

You can save disk space by creating a Hyper-V virtual hard disk that contains the files that a number of virtual machines require. Instead of copies of the same .vhd or .vhdx file existing in several places, multiple virtual machines can share a single file. Two or more virtual machines (each called a child) can access that virtual disk. The parent .vhd or .vhdx file is called a common file, because more than one virtual machine uses it.

The files unique to each virtual machine are maintained on differencing virtual disks. These virtual disks are in a child relationship to the parent disk. The parent and child virtual disks may be on the same physical drive or on different physical drives.

For example, the base version of Windows XP can be installed as a read-only image on a virtual hard disk (parent). Two or more virtual machines can run the same XP system files from the base image on the parent virtual hard disk. Applications that are unique to a virtual machine are not included in the common files. Instead they are on the .vhd or the .vhdx files that are specific to the virtual machine.

Caution: Use care when restoring common files. If you restore an earlier version of the common files (overwriting the current version), the virtual machines that rely on those files may experience problems.

When restoring common files, note the following:

- Before you restore common files, make sure the virtual machines that use the common files are in the Off or Saved state. Otherwise, a virtual machine may have a lock on the common files and the restore fails.

- To keep the common files that are currently on the server, uncheck the common .vhd files or .vhdx files on the **Restore Marked Files** dialog box under **List of backed up files**. The restore does not replace the files on the destination Hyper-V server that are not selected in the **Restore Marked Files** dialog box.

- To overwrite the existing common files, check all the .vhd files or .vhdx files from the **List of backed up files**. However, if the common files are in use on the

destination server, the restore fails. For the restore to succeed, the virtual machines that use the common files must be in the Off or Saved state.

- To restore common files without overwriting any common files that exist on the destination server: Specify a different location on the **Restore Marked Files** dialog box under **Restore everything to different directory**.

Best practices and more information

This chapter includes the following topics:

- Best practices

Best practices

Symantec recommends the following for NetBackup for Hyper-V:

- For a more efficient backup, the NetBackup media server should be installed on the same host as the Hyper-V server. In an off-host configuration, the NetBackup media server should be installed on the same host as the alternate client.
  In this configuration, the backup data can be sent to storage without traveling over the network.

- When creating virtual machines, use the same name for both host name and display name. If the NetBackup policy's **Primary VM identifier** option is changed, the existing entries on the policy **Clients** tab still work.
  See "Primary VM identifier option on the Hyper-V policy tab" on page 24.

More information is available on NetBackup and Hyper-V.

- For details on NetBackup support for Hyper-V, see the following Symantec tech note:
  Support for NetBackup 7.x in virtual environments
  http://www.symantec.com/docs/TECH127089

- A wide variety of information is available at Microsoft TechNet.
  For example, refer to the Hyper-V Getting Started Guide:
  http://technet.microsoft.com/en-us/library/cc732470.aspx

Troubleshooting

This chapter includes the following topics:

- NetBackup logs and how to create them

- Errors during policy creation

- Increasing the client connect timeout value

- NetBackup status codes related to Hyper-V

- Backup job hangs for multiple virtual machines

- Viewing or resizing Windows NTFS shadow storage

- The Hyper-V integration component is not installed

- LDM volumes and status code 1

- Hyper-V snapshots (.avhd or .avhdx files) and status code 1

- When backing up the virtual machines that reside on the same CSV, Windows warning 1584 can be ignored

- Problems with alternate client backup

- Restored virtual machine fails to start

- Problem with a restart of a restored virtual machine: Why did the computer shut down unexpectedly?

- Problems with restore of individual files

- Problems with restore of the full virtual machine

NetBackup logs and how to create them

For log messages about NetBackup for Hyper-V backup or restore, see the following NetBackup log folders.

Table 7-1 NetBackup logs that pertain to Hyper-V backup and restore

Log folder	Contains the messages on	Resides on
install_path\NetBackup\logs\bpbrm	Backup and restore	NetBackup master or media server
install_path\NetBackup\logs\bptm	Backup and restore	NetBackup media server
install_path\NetBackup\logs\bpcd	Snapshot creation, backup, and restore	NetBackup client on the Hyper-V server
install_path\NetBackup\logs\bpfis	Snapshot creation and backup	NetBackup client on the Hyper-V server
install_path\NetBackup\logs\bpbkar	Backup	NetBackup client on the Hyper-V server
install_path\NetBackup\logs\bprd	Restore	NetBackup master server
install_path\NetBackup\logs\tar	Restore	NetBackup client on the Hyper-V server
install_path\NetBackup\logs\bpVMreq	Restore	NetBackup master or media server, and NetBackup client on the Hyper-V server
install_path\NetBackup\logs\bpVMutil	Policy configuration and on restore	NetBackup client on the Hyper-V server
install_path\NetBackup\logs\nbproxy	Policy configuration	NetBackup master or media server
install_path\NetBackup\logs\vxms	File mapping during backup and VxMS APIs. This folder also contains a vhd log, which describes the format of the virtual machine's .vhd files. NetBackup support can use the vhd log to reproduce a customer's virtual machine environment for troubleshooting purposes.	NetBackup client on the Hyper-V server See "Configuring VxMS and vhd logging" on page 62.

Table 7-1	NetBackup logs that pertain to Hyper-V backup and restore *(continued)*	

Log folder	Contains the messages on	Resides on
\Program Files\Common Files\Symantec Shared\VxFI\4\logs\	Snapshot creation and VSS APIs.	NetBackup client on the Hyper-V server See "Enabling VxFI logging" on page 61.

Note: These log folders must already exist in order for logging to occur. If these folders do not exist, you must create them.

To create most of these log folders, run the following command on the NetBackup servers and on the Hyper-V server:

Windows:

install_path\NetBackup\logs\mklogdir.bat

UNIX (on master or media servers):

/opt/openv/netbackup/logs/mklogdir

See "Configuring VxMS and vhd logging" on page 62.

For more detail on snapshot-related logs, logging levels, and the required folders, see the *NetBackup Snapshot Client Administrator's Guide*.

A broader discussion of NetBackup logging is available in the *NetBackup Troubleshooting Guide*.

Enabling VxFI logging

By default, VxFI logging occurs at the error level. You can increase the logging verbosity by changing the log configuration file for the appropriate provider.

To increase the VxFI logging level

1   On the Windows desktop of the Hyper-V server where the NetBackup client is installed, go to the following location:

\Program Files\Common Files\Symantec Shared\VxFI\4\ConfigFiles\

This folder contains a configuration file for each provider, such as `vss.conf` and `emcclariionfi.conf`. These files are generated after a successful load of VxFI providers, usually during NetBackup policy validation.

2   Edit the `.conf` file for the appropriate provider, as follows:

Change the TRACELEVEL entry to the following:

`"TRACELEVEL"=dword:00000006`

The default TRACELEVEL value is 00000001.

Note that VSS and WMI provider logs are relevant to Hyper-V.

Configuring VxMS and vhd logging

The following procedure describes how to configure VxMS logging.

Except as noted in this topic, you can also use the Logging Assistant (in the NetBackup Administration Console) to configure VxMS logging. For details on the Logging Assistant, see the NetBackup Administrator's Guide, Volume I.

Note: VxMS logging may require significant resources on the Hyper-V server.

To configure VxMS and vhd logging on the Hyper-V server

1   Create the VxMS log directory:

install_path\NetBackup\logs\vxms

Note: For logging to occur, the VxMS folder must exist.

---

2   In the Windows registry, create the DWORD registry entry `VXMS_VERBOSE` in the following location:

HKEY_LOCAL_MACHINE > SOFTWARE > Veritas > NetBackup > CurrentVersion > Config

3   To configure the logging level, set the numeric value of `VXMS_VERBOSE` to 0 or greater. Larger numbers result in more verbose logs.

0   No logging.

1   Error logging.

2   Level 1 + warning messages

3   Level 2 + informative messages.

4   Same as level 3.

5   Highly verbose (includes level 1) + auxiliary evidence files (`.mmf, .dump, VDDK logs, .xml, .rvpmem`).

6   VIX (VMware virtual machine metadata) dump only.

7   VHD (Hyper-V virtual machine metadata) dump only.

>7   Full verbose + level 5 + level 6 + level 7

Note: Log levels higher than 5 cannot be set in the Logging Assistant.

Note: Log levels higher than 5 should be used in very unusual cases only. At that level, the log files and metadata dumps may place significant demands on disk space and host performance.

4   To change the log location:

■ Open regedit and go to the following location:
   HKEY_LOCAL_MACHINE > SOFTWARE > Veritas > NetBackup > CurrentVersion

■ Create the registry entry `vxmslogdir` with a string value `(REG_SZ)`. For the string value, specify the full path to an existing folder.

Note: You can use NTFS compression on VxMS log folders to compress the log size. The new logs are written in compressed form only.

Note: If the VxMS log location is changed, the Logging Assistant does not collect the logs.

Errors during policy creation

The following errors may occur when you attempt to create a policy:

- `cannot connect on socket (25)`

- `Error Validating Hyper-V machine name`
  `Connect to Hyper-v server <name> failed (25)`

  In either case, the NetBackup client service is not running on the current owner (node) of the cluster. Start the NetBackup client service on the cluster node and create the policy again.

NetBackup policy validation failed

NetBackup policy validation may fail in the following cases:

- No host name entry for the virtual machine exists in the DNS server or in the Windows hosts file on the Hyper-V server:
  Windows\System32\drivers\etc\hosts
  Create a virtual machine name entry in either the DNS server or in the hosts file of the Hyper-V server.

- A firewall is enabled and no port entry exists for the master server.
  Add a port entry for the NetBackup master server.
  See the *NetBackup Administrator's Guide*.

Increasing the client connect timeout value

You can use the **Browse for Virtual Machines** dialog box in the policy to search for virtual machines and add them to the policy. If the virtual machines are in a cluster and a cluster node is not accessible, note: A default timeout may prevent listing the virtual machines in the dialog box. Use the following procedure to resolve this problem by increasing the client connect timeout value.

To increase the client connect timeout value

1   Open the appropriate configuration file on the NetBackup master server, as
    follows:

    UNIX

    `/usr/openv/netbackup/bp.conf`

    Windows

    In regedit, go to the following:

    **My computer > HKEY_LOCAL_MACHINE > SOFTWARE > Veritas >
    NetBackup > Current Version > Config**

2   Set the `CLIENT_CONNECT_TIMEOUT` value to 30 seconds.

    Add the following:

    `CLIENT_CONNECT_TIMEOUT=30`

    where 30 designates 30 seconds.

    When this string is added to the configuration file, the clustered virtual machines
    should appear in the **Browse for Virtual Machines** dialog box, as follows:

    ■   Browsing continues for 30 seconds.

    ■   The Hyper-V cluster nodes are listed beneath the Hyper-V cluster name.

    ■   Downed cluster nodes are displayed as `unable to connect to client`.

    ■   All virtual machines are listed beneath the owner node, including migrated
        virtual machines.

NetBackup status codes related to Hyper-V

The following table describes the NetBackup status codes that are related to
Hyper-V.

Table 7-2 NetBackup status codes related to Hyper-V

NetBackup status code	Explanation and recommended action
1, the requested operation was partially successful	The problem may be one of the following: ■ The problem may involve a virtual disk that is configured for Logical Disk Manager (LDM) volumes. See "LDM volumes and status code 1" on page 71. ■ A snapshot of the virtual machine (`*.avhd or .avhdx` file) was created while the backup was in progress. See "Hyper-V snapshots (.avhd or .avhdx files) and status code 1" on page 72. ■ The virtual machine is configured with pass-through disks. NetBackup for Hyper-V does not back up pass-through disks. If all of the virtual machine's disks are pass-through, note: Only the configuration files (such as XML, bin, vsv) that represent the virtual machine are backed up. To back up pass-through disks, see the following: See "About Hyper-V pass-through disks with NetBackup" on page 85.
42, network read failed	The Windows shadow storage for the volume may have insufficient space to hold all required snapshots. A larger shadow storage area may be required. See " Viewing or resizing Windows NTFS shadow storage " on page 70.

48, client hostname could not be found	The problem may be one of the following:
	
	■ The NetBackup master server cannot communicate with the virtual machine.
	
	■ The host name of the virtual machine is not available.
	The NetBackup job details log contains the following message:
	
	`Error bpbrm(pid=8072) Nameuse [0], VM [<vm name>]`
	`not found on any node. Is either powered off or does`
	`not exist.`
	
	The virtual machine is either not running, or it is starting up. Make sure that the virtual machine is running and then rerun the backup.

156, snapshot error encountered	See "Snapshot error encountered (status code 156)" on page 67.
185, tar did not find all the files to be restored	If you attempt to do a full restore of two VMs at the same time, note: If the two VMs share a virtual hard disk that contains a file that both restore jobs must restore, a race condition may result. The two jobs may simultaneously attempt to access the same file, but only one job gains access to the file. The other job is denied access, and that job may fail with status code 185. After the first restore job successfully completes, retry the second job.

Table 7-2   NetBackup status codes related to Hyper-V *(continued)*

NetBackup status code	Explanation and recommended action

2817
 	
Hyper-V policy restore error
	The problem may be one of the following:
	
	■ In a full virtual machine restore, the **Overwrite virtual machine** option was not selected: A virtual machine with the same GUID exists on the destination server. If a virtual machine with the same GUID exists on the destination server, you must select **Overwrite virtual machine**.
	■ For individual file restore through a shared location on the destination virtual machine, one or more of the files is larger than 2 GB. Restore such files to a virtual machine that has a NetBackup client. (This issue does not apply to recovery of the full virtual machine.)
	■ In a restore of common files, the virtual machines that use the common files were in the Running or Paused state. The virtual machines that use the common files must be in the Off or Saved state. Otherwise, a virtual machine may have a lock on the common files.
	■ The virtual machine is highly available (HA). But the node that owns the virtual machine is not the restore server (the node that performs the restore).
	See "Problems with restore of the full virtual machine" on page 78.
	■ The virtual machine restore job fails but the virtual machine is nonetheless registered in the Hyper-V server.
	See "Problems with restore of the full virtual machine" on page 78.
	■ A redirected restore failed because the virtual machine had `*.avhd or .avhdx` file(s) when it was backed up. The restore system is earlier than Windows Server 2008 R2. The tar log contains the following:
	
	`Redirected restore of VM having [.avhd] files is`
	`not supported on this platform. It is supported on`
	`[Windows server 2008 R2] onwards.`
	
	■ A redirected restore failed because the virtual machine is configured in a volume GUID and its differencing disk is configured in another volume GUID.
	See "Restored virtual machine fails to start" on page 75.

Snapshot error encountered (status code 156)

The following table describes the Hyper-V issues that relate to NetBackup status code 156.

Table 7-3   Possible causes of status code 156

Causes of status code 156	Description and recommended action
The virtual machine name is incorrectly specified in the NetBackup policy.	A mismatch may exist between the virtual machine names that are specified on the policy **Clients** tab and the actual names on the Hyper-V server. Check the actual names as listed in the Hyper-V Manager on the Hyper-V server. The following are the recommended actions: ■ In the NetBackup policy, the virtual machines must be specified as fully qualified names. ■ In the NetBackup policy, the virtual machine name may have been entered incorrectly. If you browsed for the virtual machines on the **Clients** tab and selected names from the list, the list may be out of date. (The list is derived from a cache file.) Refresh the list by clicking on the icon next to the **Last Update** field.
Volumes on the virtual machine are almost full.	Volumes on the virtual machine do not have enough free space for the snapshot. Microsoft recommends that at least 10% of the virtual machine volume is available for the snapshot. Recommended action: create more space on the volume.
The Hyper-V integration component is absent.	The Hyper-V integration component is not properly installed in the virtual machine. Recommended action: See "The Hyper-V integration component is not installed" on page 71.

Table 7-3   Possible causes of status code 156 *(continued)*

Causes of status code 156	Description and recommended action
The VSS framework in the virtual machine does not work properly	The following application error event may be written to the virtual machine during backup: ``` Event Type: Error Event Source: VSS Event Category: None Event ID: 12302 Date: 1/8/2009 Time: 1:36:21 AM User: N/A Computer: ARTICTALEVM8 Description: Volume Shadow Copy Service error: An internal inconsistency was detected in trying to contact shadow copy service writers. Please check to see that the Event Service and Volume Shadow Copy Service are operating properly. For more information, see Help and Support Center at http://go.microsoft.com/fwlink/events.asp. ``` Recommended action: Run the `vssadmin list writer` command. If no writer is listed in the output and a similar error is logged, refer to the following to resolve this issue: http://support.microsoft.com/kb/940184
A CSV timeout occurred	The bpfis log contains the following: ``` VssNode::prepareCsvsForBackup: CSV TimeOut expired, Not all required CSV available in required state. ``` One or more or the required cluster shared volumes (CSV) cannot be prepared in the specified timeout period. A current backup that started from another node needs one or more of the same CSVs. Increase the **Cluster shared volumes timeout** period and rerun backup, or try the backup at another time. See

Table 7-3 Possible causes of status code 156 *(continued)*

Causes of status code 156	Description and recommended action

The **Enable offline backup for non-VSS VMs** option is disabled	The bpfis log contains the following:
	
	`VssNode::prepare Backup type of VM [<VM GUID>]`
	`will be OFFLINE and configuration parameter`
	`allowOfflineBackup] is not set. To backup`
	`this VM, set [allowOfflineBackup] configuration`
	`parameter.`
	
	NetBackup is not allowed to perform an offline backup of the virtual machine, because the **Enable offline backup for non-VSS VMs** option is disabled.
	
	Enable the **Enable offline backup for non-VSS VMs** option.
	
	See "Enable offline backup for non-VSS VMs on the Hyper-V policy tab" on page 25.

Backup job hangs for multiple virtual machines

If the policy specifies multiple virtual machines, and the storage unit "Maximum concurrent jobs" option is set to 2 or more, the backup may hang. If you have Symantec Endpoint Protection on your Hyper-V server, make sure that it is at version 11.0 Maintenance Release 4 (build 11.0.4000) or later. Backups of multiple virtual machines with multiple concurrent jobs may experience this backup problem with earlier versions of Symantec Endpoint Protection.

Viewing or resizing Windows NTFS shadow storage

For the backups that are made with the **System** Provider Type (for a block-level copy-on-write snapshot), note: Windows shadow storage for a volume on a Hyper-V host must have enough space to hold all required snapshots. If too little space is available, the backup fails with status code 42, "network read failed." In that case, a larger shadow storage area is required. Refer to Microsoft documentation for recommendations on shadow storage size. For example, refer to the following:

http://technet.microsoft.com/en-us/library/cc728305.aspx

If additional space is not available for shadow storage, reschedule backups so they do not occur at the same time.

To view or resize Windows NTFS shadow storage

1   To list the current shadow storage settings, run the following on the virtual machine:

    vssadmin list shadowstorage

2   To resize shadow storage, run the following:

    vssadmin resize shadowstorage

Refer to your Microsoft Windows documentation for more details.

The Hyper-V integration component is not installed

Make sure the proper version of the Hyper-V virtual machine integration component is installed on the virtual machine. The integration component should be at version 6.0.6001.18016 or later. It should also be the same version as *drive_letter*\Windows\System32\vmms.exe on the Hyper-V server. Otherwise, the backup fails with status code 156.

To determine the integration component version, right-click on the following file on the virtual machine and click **Properties > Details**:

    drive_letter\Windows\System32\vmicsvc.exe

This file is the integration service running in the virtual machine.

LDM volumes and status code 1

If a virtual disk has been configured for Logical Disk Manager (LDM) volumes, and the NetBackup policy specifies the **Enable file recovery from VM backup** option, note: in certain cases a backup of the virtual machine may not complete. The NetBackup job may issue status 1, "the requested operation was partially successful." This error can occur if the controller type of the .vhd disk was SCSI when the disk was formatted but the controller type was later changed to IDE (or vice versa).

In this case, the NetBackup progress log may contain the following message:

    ERR - Unable to retrieve volumes from virtual machine, error = 1

You must restore the controller type of the .vhd disk to the controller type originally assigned before the LDM volume was created. Then retry the backup.

Hyper-V snapshots (.avhd or .avhdx files) and status code 1

If a snapshot of the virtual machine (.avhd or .avhdx file) is created while a NetBackup backup of the virtual machine is in progress, the backup may be only partially successful. A message similar to the following appears in the bpbkar log:

```
5:02:54Hyper-V snapshot.570 PM: [10948.8980] <2> tar_base::V_vTarMsgW: INF - VxMS
Error message 1 = translate_to_virtual_extent: ERROR Unable to locate MAP file = \\?\
GLOBALROOT\Device\HarddiskVolumeShadowCopy89\VM1\testvm2.veritas.com\TestVM1_diffVM1k
_8275A265-BD90-4E61-94C8-C347B7228E95.avhd
```

Retry the backup.

Note that NetBackup does not create Hyper-V .avhd or .avhdx files. NetBackup creates its own snapshots when it backs up virtual machines.

When backing up the virtual machines that reside on the same CSV, Windows warning 1584 can be ignored

In a simultaneous backup of virtual machines that reside on the same Cluster Shared Volume (CSV), the following Windows warning event (1584) may be issued:

```
A backup application initiated a VSS snapshot on Cluster Shared
Volume Volume1 (Cluster Disk 8) without properly preparing the volume for
snapshot. This snapshot may be invalid and the backup may not be usable for
restore operations. Please contact your backup application vendor to verify
compatibility with Cluster Shared Volumes.
```

For this case, Microsoft has acknowledged that message 1584 is a false alarm. For NetBackup backups of the virtual machines that reside on the same CSV, this warning can be safely ignored.

Problems with alternate client backup

Note the following potential problems:

- If the snapshot job fails, check the detailed error messages in the bpfis logs on the primary client and alternate client.
- If the bpfis log shows VSS errors, check the VxFI VSS provider logs for details: \Program Files\Common Files\Symantec Shared\VxFI\4\logs\

Note the following strings in the VxFI VSS provider logs:

- VSS_E_PROVIDER_VETO

- VSS_E_NO_SNAPSHOTS_IMPORTED

   This string indicates that the snapshot resources are not available. Check the Windows event logs and the VSS hardware provider logs.

   The snapshot device that the VSS hardware provider creates is not visible to the primary client or alternate client. Check the Windows event logs and the VSS hardware provider logs. Use the `vshadow` command to rule out any configuration issues.

   See "Verifying support for transportable snapshots by using the `vshadow` command" on page 73.

Verifying support for transportable snapshots by using the `vshadow` command

The `vshadow` command is a VSS test tool supplied with the Windows VSS SDK. The following procedure describes how to verify support for transportable snapshots.

Note: To use the following procedure, only vshadow.exe needs to be copied to the host. You do not have to install the VSS SDK.

To verify support for transportable snapshots

1 On the primary host, create a snapshot with the transportable option.

Snapshot information is maintained as part of a Backup Components Document (.xml file).

For example: If the virtual machine to be backed up resides on volumes M:\ and N:\, do the following:

Use the `vshadow` command to create a hardware snapshot (plex) for M:\ and for N:\ with the Hyper-V writer:

```
vshadow -p -ap -t=c:\bcd1.xml M:\ N:\
```

This command creates a bcd.xml file in the location that the -t option specifies.

The following is example output:

```
...

Select explicitly included components ...
 * Writer 'Microsoft Hyper-V VSS Writer':
   - Add component \276E8343-33A9-4122-88EA-51646ACB7F50
Creating shadow set {c63b0a96-5952-4f48-a6d7-33162f1def74} ...
- Adding volume \\?\Volume{1c5150b9-0249-11de-b47c-001aa03ba298}\ [M:\] to the
shadow set...
- Adding volume \\?\Volume{1c5150b3-0249-11de-b47c-001aa03ba298}\ [N:\] to the
shadow set...
...

Shadow copy set successfully created.
```

The important lines in the output are shown in italics, for emphasis:

The `* Writer` line should include `Microsoft Hyper-V VSS Writer`.

The `Add component` line should show the virtual machine GUID.

More information is available about the `vshadow` command:

http://msdn.microsoft.com/en-us/library/bb530725%28VS.85%29.aspx

2 Copy the generated bcd.xml file from the primary to the alternate client.

3   Import the snapshot to the alternate client.

For example:

```
vshadow -I=c:\bcd1.xml
```

where `c:\bcd1.xml` specifies the location of the bcd.xml file on the alternate client.

If these `vshadow` commands run successfully on the primary client and alternate client, the VSS snapshot provider supports transportable snapshots with the Hyper-V writer.

Restored virtual machine fails to start

The following issues may prevent a restored virtual machine from starting:

- If you restore a virtual machine to a different Hyper-V server, and the original Hyper-V server and the target server do not have the same number of network adapters (NICs), note: You must configure the network adapter(s) for the restored virtual machine on the target server. Otherwise, the attempt to start the restored virtual machine fails and a message similar to the following appears:

```
Microsoft Synthetic Ethernet Port (Instance ID {C549AG45-5925-49C0-
ADD2-218E70A4A1EA}): Failed to power on with Error 'The system
cannot find the path specified.' (0x80070003). (Virtual machine
5412BD43-DC85-31CB-A688-1B29CE2C57C8)
```

- The restored virtual machine may fail to start if all of the following are true:

  - The virtual machine resided on a Hyper-V Server 2008 when the virtual machine was backed up.

  - At the time of backup, the virtual machine was not in the Off state.

  - The virtual machine is restored to a Hyper-V Server 2008 R2.

  A Hyper-V message states

```
An error occurred while attempting to start the selected virtual
machine(s). <virtual machine name> could not initialize.
Saved state file version is incompatible.
```

  In this case, you must delete the virtual machine's saved state file after the restore and then start the virtual machine. In the Hyper-V Manager interface, right-click on the restored virtual machine and select "Delete Saved State."

- After a redirected restore of the virtual machine on Windows 2008 SP2 and Windows 2008 R2, the virtual machine unexpectedly enters the Saved state. It

also fails to start. If the virtual machine was backed up in the Online state, the expected state after restore is Off. But due to a Hyper-V error, the virtual machine incorrectly enters the Saved state.

During the restore, the Hyper-V-VMMS writes the event ID 12340. The following is a sample message:

```
'Saved State' cannot read key '/configuration/_ba8735ef-e3a9-
4f1b-badd-dbf3a5909915_/VideoMonitor/State' from the repository.
Error: %%2147778581'(7864368). (Virtual machine ID
0AD7DFCC-BDC0-4218-B6DF-7A3BC0A734BF)
```

In the Hyper-V Manager, you must delete the virtual machine's saved state after the restore and then start the virtual machine.

- For the virtual machines that are configured in a volume GUID with a differencing disk in another volume GUID, redirected restores are not supported. Note that redirected restores are supported if the virtual machine's .vhd or .vhdx file is configured in a drive-letter volume rather than a volume GUID.

  A virtual machine restore to an alternate location may fail in the following case:

  - The virtual machine's .vhd or .vhdx file is in a GUID-based volume, and

  - A differencing disk for the same .vhd or .vhdx is in another GUID-based volume.

  In this case, the attempt to restore the virtual machine to an alternate location fails. The cause of the failure is in the Microsoft Hyper-V Writer. The .vhd or .vhdx files and other configuration files are restored to the correct location, but registration of the virtual machine fails. As a result, Hyper-V is unable to start the restored virtual machine. A Hyper-V writer event log similar to the following may appear:

```
Failed to update the path of the parent disk for virtual
hard disk 'E:\restore123\Volume{D2CC1448-BCFD-11CE-96DD-
001EC9EEF3B2}\test1\diff.vhd' for virtual machine 'test':
The system cannot find the path specified. (0x80070003).
The disk may not work properly. If you cannot start your virtual
machine, remove the disk and try again.(Virtual machine ID <id>)
```

  After the restore, you must configure a new virtual machine and attach the restored .vhd or .vhdx files to the new virtual machine. The restored .xml file contains information on the original configuration of the virtual machine.

- When a virtual machine is restored to a different Hyper-V server: The location of a virtual CD or DVD drive may prevent the virtual machine from restarting.

  The problem occurs in the following case:

- The original virtual machine had a CD ISO image that is attached to a virtual CD or DVD drive.

- On the Hyper-V server where the virtual machine was restored: The ISO image is not on the same path as on the original Hyper-V host during backup. For example: The virtual machine originally had E:\cd1.iso attached to its virtual DVD drive. But E:\cd1.iso does not exist on the target Hyper-V host, or it exists at a different location, such as F:\cd1.iso. In either case, the restored virtual machine does not turn on.

To solve the attached CD/DVD problem

1   In the Hyper-V Manager, click on the restored virtual machine.

2   Click **Settings**.

3   Under the appropriate IDE Controller, click **DVD drive**.

4   In the **Media** pane, specify the correct location of the CD, or select None.

Problem with a restart of a restored virtual machine:
Why did the computer shut down unexpectedly?

An unexpected shutdown message is displayed when a restored Windows virtual machine is started.

When you start a restored virtual machine, the system may display the message `Why did the computer shut down unexpectedly?` It may prompt you to enter a problem ID. This message and prompt occur if the virtual machine was in the Running state when the backup was initiated.

When a Windows system starts up, a bit is set indicating that the system did not shut down gracefully. If the system is shut down gracefully, the bit is cleared. However, when an online backup of a running virtual machine is performed, the unexpected shutdown bit remains set in the backed up image. When the restored virtual machine is started, the bit is detected and the unexpected shutdown message is displayed.

Problems with restore of individual files

When you restore individual files (not the entire virtual machine), the restore may fail in certain cases. The following table describes the problems and recommended actions for the restore of individual files.

Table 7-4   Problems with restore of individual files

Cause of the problem	Description and recommended action

Files are selected from multiple drives (volumes) on the virtual machine.	For example: The original virtual machine had two drives (C:\ and D:\), and files from each drive are selected in the same restore operation. Messages similar to the following appear in the job progress log:
	
	`13:26:05 (86.001) (86.001) INF - Skipping to next file header...`
	`13:26:05 (86.001) (86.001) INF - TAR EXITING WITH STATUS = 0`
	`13:26:05 (86.001) (86.001) INF - TAR RESTORED 11368 OF 11463 FILES`
	` SUCCESSFULLY`
	`13:26:05 (86.001) (86.001) INF - TAR KEPT 0 EXISTING FILES`
	`13:26:05 (86.001) (86.001) INF - TAR PARTIALLY RESTORED 0 FILES`
	
	`13:26:15 (86.001) Status of restore from image created 7/21/2008`
	`2:55:05 PM = the requested operation was partially successful`
	
	Select files from a single drive at a time. Selecting files from multiple drives is not supported.

You have attempted to restore the files into a mapped drive on the virtual machine. The restore fails with NetBackup status code 185.	Restore the files by means of a shared location on the virtual machine (with a UNC path) rather than by means of a mapped drive. See "Restoring individual files to a shared location on the virtual machine" on page 48.
The snapshot contains invalid inodes.	Windows Hyper-V provides no mechanism for quiescing file system activity on Linux virtual machines. As a result, invalid inodes may be present in the snapshot. A backup that was made with the **Enable file recovery from VM backup** option may have file-mapping failures if the virtual machine experiences heavy I/O. The failures are reported in the **NetBackup Administration Console** in this form: `ERR - Unable to read metadata for index: 379023, VFM error = 6.` Note that the backup succeeds, but any files with metadata errors cannot be restored individually. For the backups that enable individual restore of all files, schedule the backup when the I/O activity is lower. If metadata errors persist, shut down the virtual machine during the backup.

Problems with restore of the full virtual machine

Restores of a full virtual machine may fail in the following cases:

- The **Overwrite virtual machine** option was not selected and .vhd or .vhdx file(s) for the virtual machine still exist on the destination. In that case, the .vhd or .vhdx file(s) from the backup are not restored. You must select **Overwrite virtual machine** for the restore, or remove the current virtual machine and .vhd or .vhdx files from the destination server before you start the restore. If you remove the virtual machine but leave one or more .vhd or .vhdx files at the destination, the .vhd or .vhdx files from the backup are not restored.

- The virtual machine restore job fails but the virtual machine is nonetheless registered in the Hyper-V server. The Hyper-V-VMMS writes the following warnings in the events log:
  Event ID: 10127, sample event log message:

```
Unable to repair the network configuration for virtual machine'Virtual Machine
Display Name'. The virtual machine may not have the same network connectivity as
it did when the backup was taken. Inspect the network settings and modify them
as necessary. (Virtual machine ID 0AD8DFCC-BDC0-4818-B6DF-7A1BA0A735BF)
```

Event ID: 10104, sample event log message:

```
One or more errors occurred while restoring the virtual machine from backup.
The virtual machine might not have registered or it might not start. (Virtual
machine ID "0AD8DFCC-BDC0-4718-B6DF-7A3BA2A735BF ")
```

The Hyper-V writer encountered a Network configuration error. The restored virtual machine can be started after you change the Network Adaptor configuration in the virtual machine settings.

- The virtual machine is highly available (HA), but the node that owns the virtual machine is not the restore server. (It is not the node that performs the restore.) The tar log contains a message similar to the following:

```
VssNode::doRestore: Current owner of VM .[<VM name> {<VM guid>}] is
[<current owner>] not this [<restore server>], To perform this restore either move
VM to this host [<restore server>] or Delete VM from Cluster, or perform redirected
restore at current owner.
```

Note the following explanations:

- For a restore to the original location: When the backup took place, the virtual machine was not HA, but now the virtual machine is HA. However, the node that owns the virtual machine is not the node from which the virtual machine was backed up.

- For a redirected restore: The virtual machine is HA but the node that owns the virtual machine is not the restore server (the node that performs the restore).

See the recommended actions in the tar log message.

- A redirected restore of a volume-GUID-based virtual machine fails if the virtual machine was backed up from a previous redirected restore.

  Note: In a redirected restore, the virtual machine is restored to a different location on the original Hyper-V server or to a different Hyper-V server. It is not restored to its original location on the original server.

  A virtual machine may be configured on a Windows volume GUID. The following is an example of a Windows volume GUID:

  ```
  \\?\Volume{1a2b74b1-1b2a-11df-8c23-0023acfc9192}\
  ```

  If you perform a redirected restore of a volume-GUID-based virtual machine and you back up the restored virtual machine, note: An attempt to do a redirected restore from the backup may fail. For example, consider a virtual machine that is configured on the following volume GUID:

  ```
  \\?\Volume{1a2b74b1-1b2a-11df-8c23-0023acfc9192}\
  ```

  The virtual machine is then restored to a different volume GUID, such as:

  ```
  \\?\Volume{2a3b70a1-3b1a-11df-8c23-0023acfc9192}\
  ```

  If the restored virtual machine is backed up and you do a redirected restore from the backup, the restore may fail.

  To avoid this problem in a redirected restore, restore the virtual machine to a subdirectory of the volume GUID, such as to the following:

  ```
  \\?\Volume{1a3b70a1-3b1a-11df-8c23-0023acfc9192}\REDIR_subdirectory\
  ```

- NetBackup cannot perform a redirected restore of a virtual machine to a Hyper-V 2008 R2 server if the virtual machine contains a compressed .vhd or .vhdx file. The NetBackup job Detailed Status tab contains a message similar to the following:

```
12/11/2009 17:35:58 - started process bpdm (pid=2912)
...
the restore failed to recover the requested files  (5)
12/11/2009 17:47:06 - Error bpbrm (pid=1348) client restore EXIT STATUS 185: tar
did not find all the files to be restored
```

A message similar to the following appears in the eventvwr.msc file:

```
Failed to update the configuration with the new location of virtual hard disk
'F:\REDIR_VM\f\ADD_VHD\IDE_1_DISK.vhd' for virtual machine
```

```
'<virtual_machine_name>': The requested operation could not be
completed due to a virtual disk system limitation.  Virtual disks are only
supported on NTFS volumes and must be both uncompressed and unencrypted.
(0xC03A001A). Remove the disk from the virtual machine and then attach the disk
from the new location. (Virtual machine ID <virtual_machine_ID.)
```

This issue is due to a Microsoft limitation. See the following Microsoft link for more information:

http://technet.microsoft.com/en-us/library/dd440865.aspx

Hyper-V online and offline backups

This appendix includes the following topics:

- About Hyper-V online and offline backups
- Conditions that determine online vs. offline backup
- Additional notes on offline backups

About Hyper-V online and offline backups

A Hyper-V virtual machine can be in any of the following states: Running, Saved, Paused, or Off.

In addition, Microsoft provides the following two types of Hyper-V virtual machine backups:

Online   Specifies that a virtual machine that is in the Running state is briefly quiesced
            for the backup. User access during the backup continues without interruption.

Offline   Specifies that a virtual machine that is in the Running or Paused state is
            rendered temporarily inactive. It is returned to its original state before the
            backup completes. User access during the backup is interrupted.

Note: Type of backup (online or offline) is a Microsoft designation and is not
configured in NetBackup.

The following table shows the possible combinations of virtual machine state and
the type of backup.

Table A-1   State of virtual machine before and after restore

State at the time of backup	Type of backup	State after restore
Running	Online	Off
Running	Offline	Saved
Saved	Offline	Saved
Paused	Offline	Saved
Off	Offline	Off

Conditions that determine online vs. offline backup

A Hyper-V online backup can be performed with no downtime on a running virtual machine when all of the following conditions are met:

- The Hyper-V integration services are installed and the VSS integration service is enabled.

- All virtual machine disks are configured within the guest operating system as NTFS-formatted basic disks. If the virtual machine uses dynamic disks or the FAT or FAT32 file system, an online backup cannot be performed.
  Note that "dynamic" disks are not a type of virtual hard disk (.vhd or .vhdx format). Dynamic disks and basic disks are disk types defined by Microsoft for certain Windows operating systems.

- Each virtual machine volume must specify itself as the storage location for its shadow copies. For example, the shadow copy storage for C:\ must be configured on the C:\ volume. The shadow copy storage for D:\ must be on D:\, and so forth.

If these conditions are not met, the backup is performed offline. An offline backup results in some downtime on the virtual machine. If the virtual machine is in the Running or Paused state, it is put in a Saved state as part of the offline backup. After the backup is completed, the virtual machine is returned to its original state.

Additional notes on offline backups

When an offline backup is performed on a virtual machine that is currently in the Running state, note: the virtual machine briefly enters the Saved state during the backup and then returns to its original state.

For a virtual machine in the Running state at the start of the backup, the type of backup is offline in the following circumstances:

- The VSS integration component of Hyper-V is not running in the virtual machine. The VSS integration component is part of the Hyper-V integration services that are installed in the virtual machine.

- The virtual machine is running an operating system that does not support Windows Volume Shadow Copy Service (VSS).

- The storage configuration of the virtual machine is not compliant.

  Any of the following can result in a non-compliant storage configuration:

  - The virtual machine has one or more disks that are configured as dynamic disks in the operating system. Note that dynamic disks are not a type of virtual hard disk. Dynamic disks and basic disks are disk types defined by Microsoft for certain Windows operating systems.

  - The virtual machine has the volumes that do not support Volume Shadow Copy Service (VSS).
    If the virtual machine has a non-NTFS formatted volume (such as FAT or FAT32), the virtual machine enters the Saved state during the backup.

Hyper-V pass-through disks

This appendix includes the following topics:

- About Hyper-V pass-through disks with NetBackup

- Configurations for backing up pass-through disks

- Requirements for backing up Hyper-V pass-through disks

- Restrictions for Hyper-V pass-through disks

- Configuring a local snapshot backup of pass-through disks

- About alternate client backup of pass-through disks

- Configuring an alternate client backup of pass-through disks

- Important note on VSS and disk arrays

About Hyper-V pass-through disks with NetBackup

This topic describes how to use NetBackup to back up Hyper-V pass-through disks. Hyper-V pass-through configuration allows a virtual machine to directly access physical disks. With pass-through access, a virtual machine can use large storage devices such as disk arrays. Access to a pass-through disk is faster than to a fully virtualized disk (.vhd or .vhdx file). A pass-through disk can be locally attached to the Hyper-V server or configured on a Fibre Channel SAN.

For assistance in setting up pass-through devices, refer to your Microsoft documentation.

The devices that NetBackup supports for pass-through are the same as for a physical (non-hypervisor) environment: the device vendor however must support the device in a virtual environment.

Note: The NetBackup for Hyper-V feature and Hyper-V snapshot method (as described in other chapters of this guide) do not back up pass-through disks.

Configurations for backing up pass-through disks

You can use either of the following NetBackup configurations to back up Hyper-V pass-through disks:

- Without Snapshot Client.

  Install a NetBackup client on the virtual machine. You can configure NetBackup to back up virtual machine data as if the client was installed on a physical host. Note that without Snapshot Client software on the virtual machine, the features of Snapshot Client are not available.

- With Snapshot Client (explained in this appendix).

  Install a NetBackup client on the virtual machine, as well as a license for Snapshot Client. Configure either a local snapshot backup or an alternate client backup.

  To use a VSS hardware provider for the disk array, the off-host alternate client method is required.

Requirements for backing up Hyper-V pass-through disks

Note the following requirements:

- Consult your Microsoft documentation for pass-through configuration requirements.

- Consult your VSS provider documentation for snapshot preconfiguration requirements. For example, the disk array clones or mirrors must be synchronized with the disk array source device before the backup is started.

- NetBackup may require certain OS and array configuration, depending on the guest OS and the array. For details, see the disk arrays chapter of the *NetBackup Snapshot Client Administrator's Guide*.

- For backups using a VSS provider type of Hardware, pass-through disks should be added as SCSI disks.

- NetBackup client software must be installed on the virtual machine.

- To use Snapshot Client for local snapshot or alternate client backup, Snapshot Client must be licensed on the virtual machine.

■ For alternate client backup, the virtual machine and alternate client must be running the same operating system, volume manager, and file system. For each of these I/O system components, the alternate client must be at the same level as the primary client, or higher level.

For complete requirements on alternate client backup, refer to the Policy configuration chapter of the *NetBackup Snapshot Client Administrator's Guide*.

Note: The requirements for the NetBackup for Hyper-V feature do not apply to backups of the disk arrays that are configured as pass-through disks. The NetBackup for Hyper-V feature (using the Hyper-V snapshot method as described in other parts of this guide) does not back up pass-through disks.

Restrictions for Hyper-V pass-through disks

Note the following:

■ For pass-through disks, Instant Recovery point-in-time rollback is not supported for the backups that were made with a VSS hardware provider.

Note that point-in-time rollback is supported with a VSS provider type of System. You can use VSS Provider Type of System for a local snapshot backup, but not for alternate client backup. Note also that copy back restore from an Instant Recovery backup is supported with both provider types of System and Hardware.

■ A pass-through disk must not be assigned by means of an IDE controller. If an IDE controller is used to assign a pass-through disk, NetBackup cannot create a snapshot of the disk using a hardware provider type.

Configuring a local snapshot backup of pass-through disks

To create a policy for local snapshot backup of a pass-through disk

1   Start the **NetBackup Administration Console**.

2   Click on **Policies** and create a new policy.

3   On the policy **Attributes** tab, select the **MS-Windows** policy type or **FlashBackup-Windows** policy type.

4   Click **Perform snapshot backups**.

5   Optional: click **Retain snapshots for instant Recovery**.

6   Click **Options**.

7   Select the **VSS** snapshot method.

The **Hyper-V** method does not apply.

The array may require additional OS and NetBackup configuration as described in the disk arrays topic of the *NetBackup Snapshot Client Administrator's Guide*.

8   Specify snapshot options for VSS.

Select the following:

■   **Provider Type**: You can select **1-system** or **2-software**. **3-hardware** is not supported for local backup.
See "Provider Type configuration parameter" on page 27.
See "Restrictions for Hyper-V pass-through disks" on page 87.

■   **Snapshot Attribute**: The selection depends on your VSS hardware provider. Supported snapshot methods and hardware types are described in the following document:
NetBackup 7 Snapshot Client Compatibility

■   **Maximum snapshots (Instant Recovery only)**: This option sets the maximum number of Instant Recovery snapshots to be retained at one time.
For more information on this option, refer to the topic on the Maximum Snapshots parameter in the *NetBackup Snapshot Client Administrator's* guide.

9   In the policy **Clients** tab, select the virtual machine that has a pass-through disk configured.

10 In the policy's **Backup Selections** tab, specify the pass-through disk that you want to back up. Or specify the files or volumes that reside on the pass-through disk.

About alternate client backup of pass-through disks

Alternate client backup of pass-through disks consists of the following:

■   The disk array contains the data to be backed up. Another host containing NetBackup client software and Snapshot Client software must have access to the disk array. That host is the alternate client. (In this configuration, the virtual machine is called the primary client.)

■   A snapshot of the data is created on the disk array and is mounted on the alternate client. The alternate client creates a backup image from the snapshot, using original path names, and streams the image to the NetBackup media server.
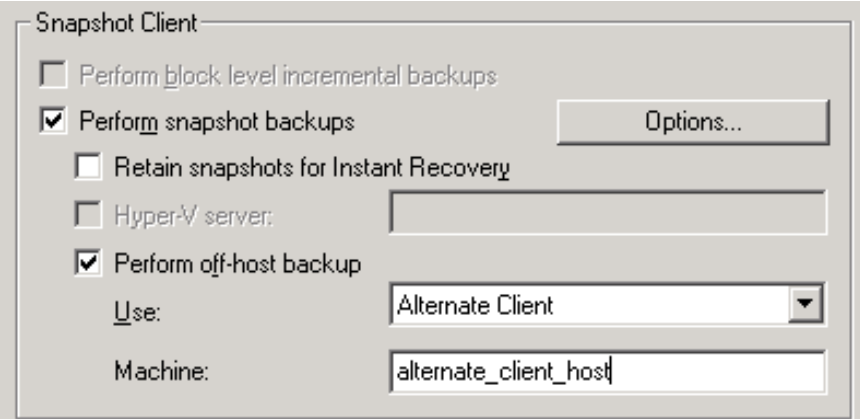
■ The alternate client handles the backup I/O processing; the backup has little or no effect on the virtual machine. The media server reads the snapshot data from the alternate client and writes the data to storage.

Configuring an alternate client backup of pass-through disks

To create a policy for alternate client backup of a pass-through disk

1   Start the **NetBackup Administration Console**.

2   Click on **Policies** and create a new policy.

3   On the policy **Attributes** tab, select the **MS-Windows** policy type or the **FlashBackup-Windows** policy type.

4   Click **Perform snapshot backups**.

5   Optional: click **Retain snapshots for Instant Recovery**.

6   Click **Perform off-host backup**.

7   In the **Use** field pull-down list, select **Alternate Client**.

8   For **Machine**, enter the name of the host that is configured as an off-host backup computer (the alternate client).

    The following shows the **Snapshot Client** group box of the policy **Attributes** tab.

9   Click **Options**.

    The **Snapshot Client Options** dialog box appears.

10 Select the **VSS** snapshot method.

The **Hyper-V** method does not apply to alternate client backup and is not available in the list.

The array may require additional OS and NetBackup configuration as described in the disk arrays chapter of the *NetBackup Snapshot Client Administrator's Guide*.

11 Specify snapshot options for VSS.

Select the following:

- **Provider Type**: For disk arrays, select **3-hardware** as the provider type.

  Depending on your array and on the snapshot attribute you select, certain preconfiguration of the array may be required. In the *NetBackup Snapshot Client* guide, see the chapter on snapshot methods for disk arrays, for the appropriate topic for your disk array and the VSS method.

  For pass-through disks, note: Instant Recovery point-in-time rollback is not supported for the backups that were made with a hardware provider (VSS provider type of **3-hardware**). Copy back restore is supported.

  See "Provider Type configuration parameter" on page 27.

  See "Restrictions for Hyper-V pass-through disks" on page 87.

  See "Important note on VSS and disk arrays" on page 90.

- **Snapshot Attribute**: Select **1-differential** (for a copy-on-write type of snapshot) or **2-plex** (for a clone type or mirror type of snapshot). The choice depends on the hardware provider that is used with the disk array.

- **Maximum snapshots (Instant Recovery only)**: This option sets the maximum number of Instant Recovery snapshots to be retained at one time.

  For more information on this option, refer to the topic on the Maximum Snapshots parameter in the *NetBackup Snapshot Client Administrator's* guide.

12 On the **Clients** tab, specify the virtual machine that has a pass-through disk configured.

13 On the **Backup Selections** tab, specify the pass-through disk that you want to back up, or the files or volumes that reside on the pass-through disk.

Important note on VSS and disk arrays

To back up a Windows client with the VSS method, please note the following about snapshot parameter values:

- For Provider Type of 3-hardware and Snapshot Attribute of 2-plex, you must configure an appropriate number of clones or mirrors in the disk array.

- You must also synchronize the clones or mirrors with the disk array source device before starting the backup. If the clones or mirrors are not synchronized before the backup begins, VSS cannot select a clone or mirror on which to create the snapshot. As a result, the backup fails.

C

Using NetBackup commands to create a Hyper-V policy

This appendix includes the following topics:

- Using NetBackup commands to create a Hyper-V policy

- bpplinfo command: options and keywords for Hyper-V policies

Using NetBackup commands to create a Hyper-V policy

This topic describes how to use NetBackup commands to create a policy to back up virtual machines.

For examples of the nbrestorevm command to restore Hyper-V virtual machines, see the nbrestorevm man page or the *NetBackup Commands Reference Guide*.

The NetBackup commands for policy creation are in the following directory:

Windows:

`install_path\Veritas\NetBackup\bin\admincmd`

UNIX or Linux:

`usr/openv/netbackup/bin/admincmd`

Run these commands on the NetBackup master server.

Note: To make virtual machine backups, a NetBackup client must be installed on the Hyper-V server.

To use NetBackup commands to create a Hyper-V policy

1 Create a blank policy.

```
bppolicynew policyName
```

For example:

```
bppolicynew HVpolicy1
```

2 Set the policy attributes.

To accept the default attributes, enter the following:

```
bpplinfo policyName -set -pt Hyper-V -use_virtual_machine 2
-hyperv_server "hyper-v_server" -fi 1 -snapshot_method Hyper-V_v2
```

Or to specify additional options, enter the following:

```
bpplinfo policyName -set -pt Hyper-V -use_virtual_machine 2
-hyperv_server "hyper-v_server" -fi 1 -snapshot_method Hyper-V_v2
-offhost_backup value -use_alt_client value -alt_client_name
"client_name" -discovery_lifetime value in seconds
-snapshot_method_args keyword=value,keyword=value,...
```

If you include the -snapshot_method_args option, it must be specified with all parameters. (Otherwise, the snapshot job fails.) snapshot_method_args is a comma-delimited list of keywords that define the Hyper-V snapshot and policy.

The keywords are described in a separate topic:

3 Create a policy schedule.

```
bpplsched policyName -add sched_label -st sched_type
```

For -st, the available schedule types are FULL (full), INCR (differential incremental), or CINC (cumulative incremental).

For example:

```
bpplsched policy1 -add Full -st FULL
```

Incremental backups require use of the Virtual_machine_backup=2 option in the -snapshot_method_args.

4 Select the virtual machines to back up.

```
bpplclients policyName -add VM_to_back_up
```

On this command, specify one virtual machine at a time. Specify the virtual machine's display name, host name, or UUID. You can use the Hyper-V management console to obtain the display name or UUID.

The following is an example for bpplclients:

```
bpplclients policy1 -add prodvm1.acme.com
```

`prodvm1.acme.com` is the virtual machine to back up, including all of its local drives. Note: The backup selection is automatically set to ALL_LOCAL_DRIVES. ALL_LOCAL_DRIVES is the only option that is available for the Hyper-V policy type.

5 Validate the policy.

```
bpclient -policy policyName -validate -fi
```

If the policy successfully validates, no output appears. Otherwise, the following error occurs:

```
Error code 48 : client hostname could not be found
```

bpplinfo command: options and keywords for Hyper-V policies

Table C-1 describes the options that are available on the bpplinfo command.

Table C-1   bpplinfo options for Hyper-V

Option	Values	Required?	Keyword label in policy GUI
-use_virtual_machine	2	Y	
-hyperv_server	name of Hyper-V server	Y	
-snapshot_method	Hyper-V_v2	Y	
-offhost_backup	0 No off-host backup (default) 1 Use off-host backup method (for alternate client)	N	**Attributes** tab > Perform off-host backup
-use_alt_client	0 No alternate client 1 Use an alternate client	Y (with offhost_backup option)	**Attributes** tab > Perform off-host backup > Use

Table C-1   bpplinfo options for Hyper-V *(continued)*

Option	Values	Required?	Keyword label in policy GUI
alt_client_name	name of alternate client	Y (with use_alt_client)	**Attributes** tab > Perform off-host backup > Machine
snapshot_method_args	*keyword=value,keyword=value,...* See Table C-2 on page 95.	N	

Table C-2 describes the keywords for -snapshot_method_args.

Table C-2   Keywords and values for snapshot_method_args

Keyword	Values	Name of keyword in policy GUI
Virtual_machine_ backup=	1 disable file-level recovery 2 enable file-level recovery	Hyper-V tab > Enable file recovery from VM backup
nameuse=	0 Use VM host name to identify backup image 1 Use VM display name to identify backup image 2 Use VM UUID to identify backup image	Hyper-V tab > Primary VM identifier
allow_offline_ backup=	0 Do not allow offline backup of non-VSS virtual machines 1 Allow offline backup of non-VSS virtual machines	Hyper-V tab > Enable offline backup for non-VSS VMs
csv_timeout=	Determines how many minutes the backup job waits, in case another node in the cluster backs up the same shared volume at the same time. The default is 180 (wait for three hours). A wait of three hours is recommended if you have multiple virtual machines on one CSV. The Windows 2008 R2 cluster node owns the CSV for the entire duration of the backup. If you do not want NetBackup to wait for another backup to release the shared volume, set the value to 0. If at the same time another node in the cluster backs up a shared volume that this backup requires, the backup fails with status 156. **Note:** On Windows server 2012, cluster nodes can back up the same CSV simultaneously. As a result, NetBackup does not use this option if the cluster is on Windows 2012.	Hyper-V tab > Cluster shared volumes timeout

Table C-2   Keywords and values for snapshot_method_args *(continued)*

Keyword	Values	Name of keyword in policy GUI
prov_type=	0 Automatic selection of provider. Allows VSS to use the best possible provider for the snapshot. 1 Use system provider 2 Use software provider 3 Use hardware array provider	Hyper-V tab > Advanced > Provider Type
snap_attr=	0 (default) 1 Differential. Use copy-on-write snapshot method. 2 Plex. Use clone or mirror snapshot method.	Hyper-V tab > Advanced > Snapshot Attribute

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