

NetBackup™ for Hyper-V Administrator's Guide

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NetBackup™ for Hyper-V Administrator's Guide

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Introduction

This chapter includes the following topics:

- [About Hyper-V](#)
- [NetBackup for Hyper-V environment](#)
- [Hyper-V terminology related to backup](#)
- [Basic phases in a NetBackup backup of a Hyper-V virtual machine](#)
- [NetBackup administrator tasks for Hyper-V](#)
- [Quick reference for troubleshooting](#)

About Hyper-V

NetBackup for Hyper-V provides snapshot-based backup of the virtual machines that run on Hyper-V servers. For a list of supported Hyper-V servers, see the NetBackup Software Compatibility List available from the following location:

[NetBackup Compatibility List for all Versions](#)

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) and Windows Management Instrumentation (WMI).
- NetBackup for Hyper-V performs full backups and file-level incremental backups of the virtual machine. With the WMI backup method, it also performs block-level incremental backups and Accelerator backups.
- Can restore the full virtual machine from the following:
 - Full backups of the VM.

- Block-level incremental backups of the VM.
 - Accelerator backups of the VM.
- Can restore individual files of the virtual machine from the following:
 - Full backups of the VM.
 - File-level incremental backups of the VM.
 - Block-level incremental backups of the VM.
 - Accelerator backups of the VM.
- Can restore to the original virtual machine, to other locations on the Hyper-V server, or to a different Hyper-V server.

NetBackup for Hyper-V environment

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

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

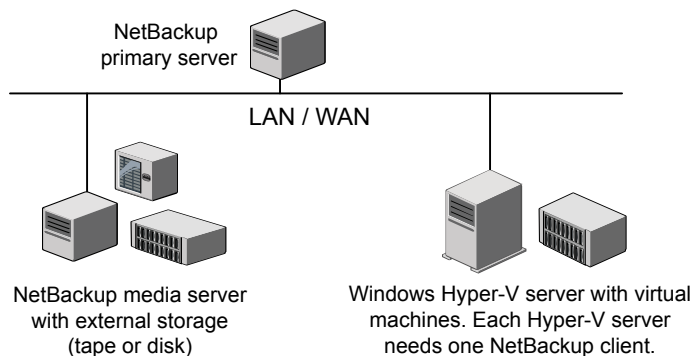
Component	Description and requirements
NetBackup primary server	Runs the backup policies and starts backups and restores.
NetBackup media server	Reads and writes backup data and manages NetBackup storage media. The NetBackup media server can be installed on the Hyper-V host or on a different host. For a more efficient backup, install the NetBackup media server on the Hyper-V host.
NetBackup client (and optional alternate client)	Processes backup and restore requests. The NetBackup client must be installed on the Hyper-V host(s). If the Server type on the policy Clients tab is System Center Virtual Machine Manager, a NetBackup client must also be installed on the SCVMM server. Note: In most cases, the client does not need to be installed on any virtual machine. For exceptions, refer to the following topics. See “Requirements for a NetBackup client inside the virtual machine” on page 48. See “Prerequisites for alternate client backup of a virtual machine (VSS)” on page 46. See “About restoring individual files” on page 96.

Table 1-1 Components required for NetBackup for Hyper-V (*continued*)

Component	Description and requirements
Hyper-V server	A Windows hypervisor 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.

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

Figure 1-1 NetBackup for Hyper-V backup environment



Hyper-V terminology related to backup

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

Table 1-2 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. See “Basic phases in a NetBackup backup of a Hyper-V virtual machine” on page 12.
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 109.

Table 1-2 Hyper-V terminology related to backup *(continued)*

Term	Description
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.
Windows Server Failover Cluster	A Windows Server Failover Cluster (WSFC).
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 vhd or vhdx format.
vhd, vhdx file	A file in a Windows Hyper-V installation that contains the virtualized contents of a hard disk. The vhd or vhdx files 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, vmcx, vmrs	NetBackup backs up these files as part of a full virtual machine backup. The bin and the vsv files are visible only when the virtual machine is running. The vmcx files and vmrs files are for VM configuration versions later than 5 (Hyper-V 2016).
Virtual machine GUID	A globally unique identifier of the virtual machine. In an SCVMM environment, the VM GUID is referred to as the VM ID.

Basic phases in a NetBackup backup of a Hyper-V virtual machine

The following tables describe the phases of the NetBackup backup process for the two Hyper-V backup methods: VSS and WMI.

Table 1-3 VSS backup method: Phases of NetBackup for Hyper-V backup

Phase	Description
Phase 1	The NetBackup primary server initiates the backup.
Phase 2	The NetBackup client on the Hyper-V host initiates a snapshot.
Phase 3	On Windows 2012 hosts: The VSS Hyper-V writer quiesces the Windows virtual machine (places the data in a consistent state) 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. On Windows hosts: The Hyper-V writer quiesces the Windows virtual machine and creates a .avhd or .avhdx snapshot on the host volume.
Phase 4	On Windows 2012 hosts: If the virtual machine was placed in the Saved state, Hyper-V returns the virtual machine to its original state.
Phase 5	The NetBackup client on the Hyper-V host 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 6	The NetBackup client on the Hyper-V host deletes the host volume snapshot.

Table 1-4 WMI backup method: Phases of NetBackup for Hyper-V backup

Phase	Description
Phase 1	The NetBackup primary server initiates the backup.
Phase 2	The NetBackup client on the Hyper-V host initiates a virtual machine snapshot (checkpoint).
Phase 3	On Windows 2016 or later hosts, the NetBackup client on the Hyper-V host creates a virtual machine snapshot (checkpoint). ■ If the Hyper-V policy Consistency level option is set to Application consistent or Application consistent then crash consistent: The VSS integration services component inside the guest OS attempts to quiesce the virtual machine. ■ If the Hyper-V policy Consistency level option is set to Crash consistent: The virtual machine is not quiesced. If the backup uses block-level incremental backup (BLIB), the snapshot is converted to a reference point. Resilient change tracking (RCT) is used to perform faster backup of the virtual machines by moving only the blocks that have changed between backups. As a result of the virtual machine snapshot (checkpoint), the .avhd or .avhdx files are created for the virtual machine. All subsequent writes from the virtual machine go to these files. Note: The Consistency level option is set on the policy's Hyper-V tab, under Advanced.

Table 1-4 WMI backup method: Phases of NetBackup for Hyper-V backup
(continued)

Phase	Description
Phase 4	The NetBackup client reads the data directly from the virtual machine files on the Hyper-V host and transfers the data to the media server. The media server writes the data to the storage unit.
Phase 5	The NetBackup client on the Hyper-V host deletes the virtual machine snapshot (checkpoint). As a result, the .avhd or .avhdx files that were created during the backup are merged back into the original virtual machine disks.

NetBackup administrator tasks for Hyper-V

The following are the tasks for the NetBackup administrator:

- Install the NetBackup primary server and media server.
For information on licensing, contact your sales or partner representative.
See the *NetBackup Installation Guide*.
- Install a NetBackup client on each 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.
See [“About restoring individual files”](#) on page 96.
- To back up VMs under the Microsoft System Center Virtual Machine Manager (SCVMM), install a NetBackup client on the SCVMM server.
See [“About backup of virtual machines in an SCVMM environment”](#) on page 81.
- Add the name of the NetBackup primary 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 primary 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 95.
See [“Notes on individual file restore”](#) on page 92.
- Read the best practices.
See [“Best practices”](#) on page 127.
- Create a NetBackup policy for Hyper-V.
See [“Creating a Hyper-V policy”](#) on page 31.
See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

- Run a Hyper-V backup.
See [“Backing up Hyper-V virtual machines”](#) on page 91.
- Perform a restore.
See [“About restoring individual files”](#) on page 96.
See [“Restoring the full Hyper-V virtual machine”](#) on page 102.
- To 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 136.
- See [“NetBackup logs for Hyper-V and how to create them”](#) on page 130.

Notes and prerequisites

This chapter includes the following topics:

- [NetBackup for Hyper-V prerequisites](#)
- [NetBackup for Hyper-V notes and restrictions](#)
- [NetBackup character restrictions for Hyper-V virtual machine display names](#)
- [NetBackup character restrictions for vhd or vhdx names and the VM path when the Enable file recovery from VM backup option is used](#)
- [Notes on Linux virtual machines](#)

NetBackup for Hyper-V prerequisites

The following prerequisites apply to NetBackup for Hyper-V:

- For a list of supported Hyper-V servers, see the appropriate version of the NetBackup Software Compatibility List available from the following location:
[NetBackup Compatibility List for all Versions](#)
- Before starting a backup of a virtual machine, verify that the NetBackup primary server and media server can communicate with the Hyper-V server. Add the name of the NetBackup primary 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:\.
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:

- 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. Consult the release notes of the array vendor or VSS provider.
- NetBackup for Hyper-V does not support the NetBackup Instant Recovery feature.
- The following is due to a Microsoft limitation: NetBackup for Hyper-V does not support VSS or WMI backup or restore of the vhd files that are shared among multiple VMs.
- 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*.

Note: The SAN Client feature for Hyper-V is only supported for the VSS backup method (not for WMI).

- The following is due to a Microsoft limitation: If the VM's virtual disk files reside in a volume or folder that is compressed, NetBackup cannot use the WMI backup method to create a snapshot of the VM. The snapshot job fails with status 156, "snapshot error encountered."
 As a workaround, remove compression from the volume or folder where the virtual disk resides and rerun the backup.
- 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.

- If a policy is changed from manual selection to Intelligent policy (or vice versa), note: The next backup of the VM is a regular full backup, even if a backup already exists for that VM.

For example:

- In a new Hyper-V policy, the **Select manually** option on the **Clients** tab is used to select a VM. The first backup from the policy runs.
- If the primary VM identifier is a host name, ensure that you configure Microsoft failover cluster with FQDN of VM getting protected.
- In the policy, an Intelligent Policy query is used to select the same VM, and the VM is backed up a second time. Because of the switch from manual selection to query-based selection, this second backup is a regular full backup. Note that for a policy that uses **Enable block-level incremental backup** (BLIB) or BLIB plus Accelerator, the backup processing is not limited to changed blocks only.

For the second backup, the Detailed status log includes a message similar to the following:

```
Sep 29, 2016 11:16:53 AM - Info bpbrm (pid=13680) There is no
complete backup image match with track journal, a regular full
backup will be performed.
```

The same backup behavior occurs if the policy's VM selection is switched from query-based to manual selection: The second backup is a regular full backup.

- For the WMI backup method with the **Enable block-level incremental backup** option (with or without Accelerator): If the VM has multiple virtual disks that have the same disk UUID, NetBackup performs a full backup of those disks. It does not perform an incremental backup of them. The disks that have unique IDs undergo an incremental backup, as expected. In the Activity Monitor, the job details include messages such as the following:

```
The virtual machine (Name: testVM, GUID: 98321741-A936-4128-8AB0-07099B23E25C) uses
multiple disks with the same disk Id.
Disk Id: 7198C033-AB5D-4585-905D-0DA68D26F9C5   Disk path: E:\VMs\testVM\testVM1.vhdx
Disk Id: 7198C033-AB5D-4585-905D-0DA68D26F9C5   Disk path: E:\VMs\testVM\testVM2.vhdx
You may lose optimization during the backups for the above listed disks.
```

To perform incremental backup of these virtual disks, assign a unique ID to each disk. For example, you can use the `Set-VHD` PowerShell cmdlet to reset the disk ID for testVM1 as follows:

```
Set-VHD -Path E:\VMs\testVM\testVM1.vhdx -ResetDiskIdentifier
```

In the case of the differencing disks, you must run additional commands to re-create the disk chain. For more details on the `Set-VHD` cmdlet, see the following Microsoft TechNet article:

<https://technet.microsoft.com/en-us/library/hh848561.aspx>

- Additional notes are available on Accelerator:
 See [“Accelerator notes and requirements for virtual machines”](#) on page 115.
- 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; this note applies to the VSS backup method only. 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 for VSS”](#) on page 153.
- The WMI backup method (for Hyper-V Server 2016 and later) does not employ online vs offline backups.
 See [“WMI backup method: State of the virtual machine before and after restore”](#) on page 92.
- For the VSS backup method: If a virtual machine is in the Paused state when the backup starts, the virtual machine is placed in the Saved state after the backup completes.
- The WMI backup method supports the option **Consistency level** (on the policy's **Hyper-V** tab under **Advanced**). The available settings are **Application consistent then crash consistent**, **Application consistent**, and **Crash consistent**.

For the WMI backup method, note the following:

- If a virtual machine is in the Paused state during backup and **Consistency level** is set to **Application consistent**, the backup fails during snapshot creation. If **Consistency level** is set to **Application consistent then crash consistent** or **Crash consistent**, the backup succeeds. The virtual machine is in the Off state after the restore.
- If a virtual machine is in the Saved state during backup and **Consistency level** is set to **Application consistent**, the backup fails during snapshot creation. If **Consistency level** is set to **Application consistent then crash consistent** or **Crash consistent**, the backup succeeds. The virtual machine is in the Saved state after the restore.

See [“Consistency level parameter \(WMI\)”](#) on page 42.

- NetBackup for Hyper-V has certain character restrictions for virtual machine display names.
 See [“NetBackup character restrictions for Hyper-V virtual machine display names”](#) on page 20.
- 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 92.

See [“Notes on full virtual machine restore”](#) on page 95.

- More information about NetBackup for Hyper-V support is available in the following documents:
 - The NetBackup Software Compatibility List:
[NetBackup Compatibility List for all Versions](#)
 - *Support for NetBackup in virtual environments*:
<http://www.veritas.com/docs/000006177>

NetBackup character restrictions for Hyper-V virtual machine display names

When Hyper-V virtual machines are included in a NetBackup policy, certain characters are not allowed in the virtual machine display name.

If the name contains the wrong characters, the backup may fail.

For NetBackup, the following characters are allowed in virtual machine display names:

- Uppercase and lowercase ASCII letters (A-Z a-z)
- Numbers (0-9)
- Underscore (_)
- Plus sign (+)
- Left and right parentheses ()
- Spaces
- Hyphen (-) Note however that a display name cannot begin with a hyphen.
- Period (.) Note the following limitation:
 A display name cannot end with a period. For example, a display name of `vm1.` is not allowed.

Note: No other characters are allowed.

For the policies that select virtual machines automatically: A space in a display name is converted to "%20" in the test query results if the virtual machine is listed as included.

Additional character restrictions for VM names can be found in the *NetBackup Cloud Administrator's Guide*, available from this location:

<http://www.veritas.com/docs/000003214>

NetBackup character restrictions for vhd or vhdx names and the VM path when the **Enable file recovery from VM backup option** is used

For Hyper-V policies that include the **Enable file recovery from VM backup** option, non-ASCII characters are not supported in the vhd name or vhdx name or anywhere in the VM's path. Examples of non-ASCII characters are Japanese or Chinese characters (multi-byte). If the virtual disk name or VM path contains non-ASCII characters, the backup job completes but the VM's files cannot be individually restored from the backup.

As an alternative, you can restore the entire VM.

Notes on Linux virtual machines

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

- To quiesce the file system on a Linux VM (with either the VSS or WMI snapshot method), the proper integration services must be installed in the VM. For a list of the available integration services, see [Support for NetBackup 7.7.x and 8.x in virtual environments](#).
- 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*.
- The NetBackup policy's **Enable file recovery from VM backup** option is not supported for the disks inside a Linux guest OS that are configured as follows:
 - The disks are divided into logical volumes by means of the Linux Logical Volume Manager (LVM), and

- The LVM volumes were created with thin-provisioning.
- More information is available on the restore of Hyper-V virtual machines.
See [“Notes on individual file restore”](#) on page 92.
See [“Notes on full virtual machine restore”](#) on page 95.

Configure NetBackup communication with Hyper-V

This chapter includes the following topics:

- [Changing the NetBackup Legacy Network Service logon \(vnetd.exe\) to the domain user account](#)
- [Setting global limits on the use of Hyper-V resources](#)

Changing the NetBackup Legacy Network Service logon (vnetd.exe) to the domain user account

You can configure a NetBackup Hyper-V Intelligent Policy to search for VMs in all the nodes of a Hyper-V failover cluster.

Important! To allow the policy to discover all cluster nodes, you must set the NetBackup Legacy Network Service (vnetd.exe) logon to the domain user account. The logon must not be left at its default (the local system account). If the logon is not changed, the policy does not search the VMs on other nodes of the cluster.

Note: Because VMs can automatically migrate from one cluster node to another, it is important to allow the policy to search the entire cluster. The node where the VM currently resides may have changed since the VM was last backed up.

To verify the privileges that are needed to discover the failover cluster

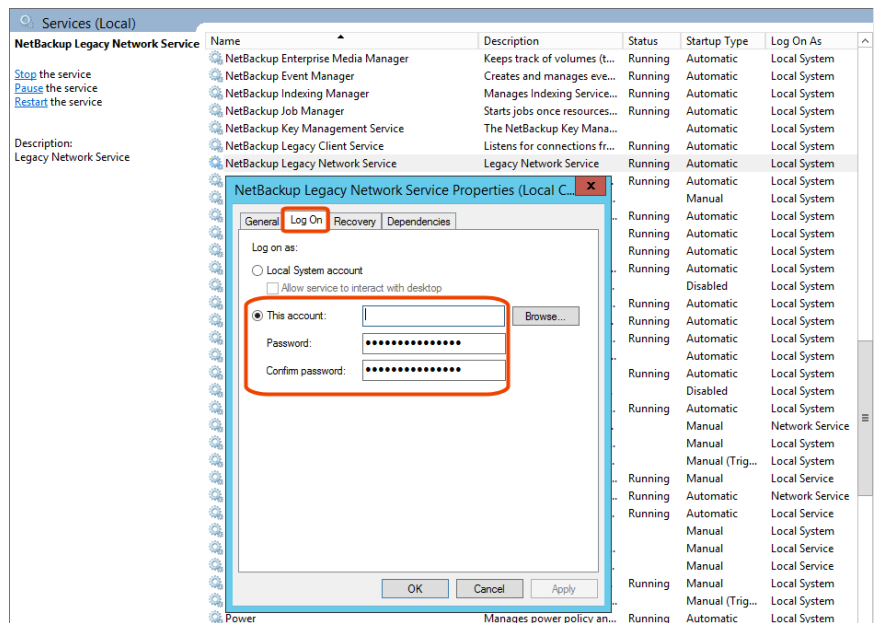
- ◆ Run the Failover Cluster Manager as the Failover Cluster Manager user.

Changing the NetBackup Legacy Network Service logon (vnetd.exe) to the domain user account

- On the Failover Cluster Manager host, click **Start**, click **Administrative Tools**, and then right-click **Failover Cluster Manager**.
- Click **Run as different user**, and provide the user name and password for the Failover Cluster Manager.

To change the NetBackup Legacy Network Service (vnetd.exe) logon to the domain user account

- 1 Make sure that your logon account is in the domain's Administrator group or in the Administrator group on the Hyper-V nodes. This procedure requires Administrator privileges.
- 2 On a Hyper-V server node that you want the policy to search, open **Services** (run `services.msc`).
- 3 Double-click the **NetBackup Legacy Network Service**. This service is `vnetd.exe`.



- 4 Click the **Log On** tab, and click **This account**.
- 5 Enter the user name and password for the domain user account.
For **This account**, enter the user name in the form `domain\username`.
- 6 Click **OK**.

- 7 Restart the **NetBackup Legacy Network Service**.
- 8 Repeat these steps for each cluster node that you want the policy to search.

Setting global limits on the use of Hyper-V resources

You can control the number of simultaneous backups that can be performed on a Hyper-V resource type in the Resource limits host property on the primary server. The settings apply to all NetBackup policies for the primary server.

For example, to avoid overloading the Hyper-V server, you can place a limit on the number of concurrent snapshots per server.

Note: The resource limits only apply to policies that use automatic selection of virtual machines (Query Builder). If virtual machines are selected manually, the Resource limit settings have no effect.

Note: To limit the number of simultaneous jobs per policy, use the **Limit jobs per policy** setting on the policy **Attributes** tab. The effect of this option depends on how the policy selects virtual machines.

See [“Limit jobs per policy on the Attributes tab \(for Hyper-V\)”](#) on page 34.

To set limits on the use of Hyper-V resources

- 1 Open the NetBackup web UI.
- 2 Click **Hosts > Host properties**. Select the primary server. If necessary click **Connect**. Then click **Edit primary server**.
- 3 Expand **Resource limits**. Then click **Hyper-V**.
- 4 Click in the **Resource limit** column to change the limit for a resource. The settings apply to all policies for the primary server.

For each resource type, the default is 0, No limit.

[Table 3-1](#) describes the limits.

Table 3-1 Hyper-V resource types and limits

Resource type	Backup method	Resource limit
Active Snapshots Per Server	VSS	Controls the maximum number of active backup jobs per Hyper-V server. Applies to a standalone Hyper-V server as well as to every Hyper-V server in a cluster. The typical setting for this resource type is 2. See the following examples. Example 1: ■ A Hyper-V Intelligent Policy discovers 32 VMs on one Hyper-V server. ■ Active Snapshots Per Server: 12. The NetBackup Activity Monitor shows 32 snapshot jobs. 12 snapshot jobs and their backup jobs are active. 20 snapshot jobs are queued. As active backup jobs are completed, queued snapshot jobs become active. Example 2: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 64 VMs in the cluster. ■ Active Snapshots Per Server: 12. The NetBackup Activity Monitor shows 64 snapshot jobs. 12 snapshot jobs for VMs on Node1 are active and another 12 snapshot jobs for VMs on Node2 are active. 40 snapshot jobs are queued. As active backup jobs are completed, queued snapshot jobs become active.

Table 3-1 Hyper-V resource types and limits (*continued*)

Resource type	Backup method	Resource limit
Active Snapshots Per Cluster	VSS	Controls the maximum number of active backup jobs per Hyper-V cluster. The typical setting for this resource type is 4. Example 1: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 60 VMs in the cluster. ■ Active Snapshots Per Cluster: 20. ■ Active Snapshots Per Server: No Limit. The NetBackup Activity Monitor shows 60 snapshot jobs. For the VMs in the cluster, 20 snapshot jobs are active. 40 snapshot jobs are queued. As active backup jobs are completed, queued jobs become active. Example 2: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 60 VMs in the cluster. ■ Active Snapshots Per Cluster: 20. ■ Active Snapshots Per Server: 5. The NetBackup Activity Monitor shows 60 snapshot jobs. 10 snapshot jobs for the VMs in Node1 and Node2 are active. 50 snapshot jobs are queued. Even though the Active Snapshots Per Cluster setting is higher, the Active Snapshots Per Server setting controls the number of active jobs.

Table 3-1 Hyper-V resource types and limits (*continued*)

Resource type	Backup method	Resource limit
Snapshot Operations Per Server	VSS	Controls the maximum number of simultaneous VSS operations such as create snapshot and delete snapshot on a Hyper-V server or a Hyper-V server in a cluster. Applies only during the snapshot creation and snapshot deletion phase of a backup. Does not control the number of simultaneous backup jobs. The typical setting for this resource type is 1. Each VM backup consists of a snapshot job and a subsequent backup job. Note: Snapshot Operations Per Server controls VSS snapshot creation and deletion, which are part of the snapshot job. When snapshot creation is completed, the backup job starts. When the backup job is active, the snapshot job is still shown as active even though the snapshot creation is completed. Therefore, this resource does not control the number of active backup jobs. See the following examples. Example 1: ■ A Hyper-V Intelligent Policy discovers 32 VMs on one Hyper-V server. ■ Snapshot Operations Per Server: 2. ■ Active Snapshots Per Server: No Limit. The NetBackup Activity Monitor shows 32 snapshot jobs. 2 snapshot jobs are active and 30 snapshot jobs are queued. When the first snapshot job completes the snapshot creation, its backup job starts and the third snapshot job becomes active. When the second snapshot job completes snapshot creation, its backup job starts and the fourth snapshot job becomes active. When all the snapshots are created, there are 32 active backup jobs. Example 2: ■ A Hyper-V Intelligent Policy discovers 32 VMs on one Hyper-V server. ■ Snapshot Operations Per Server: 2. ■ Active Snapshots Per Server: 10. The NetBackup Activity Monitor shows 32 snapshot jobs. 2 snapshot jobs are active and 30 snapshot jobs are queued. When the first snapshot job completes snapshot creation, its backup job starts and the third snapshot job becomes active. When the second snapshot job completes snapshot creation, its backup job starts and the fourth snapshot job becomes active. This process continues until there are 10 active snapshot jobs and their backup jobs. When the first backup job completes, the eleventh snapshot job becomes active, and so forth.

Table 3-1 Hyper-V resource types and limits (*continued*)

Resource type	Backup method	Resource limit
Snapshot Operations Per Cluster	VSS	Controls the maximum number of simultaneous VSS operations such as create snapshot and delete snapshot within a cluster. Applies only during the snapshot creation and snapshot deletion phase of a backup. Does not control the number of simultaneous backup jobs. For example: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 60 VMs in the cluster. ■ Snapshot Operations Per Cluster: 5. ■ Active Snapshots Per Cluster: 12. The NetBackup Activity Monitor shows 60 snapshot jobs. 5 snapshot jobs are active and 55 snapshot jobs are queued. When the first snapshot job completes snapshot creation, the corresponding backup job starts and the sixth snapshot job becomes active. When the second snapshot job completes snapshot creation, its backup job starts and the seventh snapshot job becomes active, and so forth. When 12 backup jobs are active, the thirteenth and following backup jobs are queued because Active Snapshots Per Cluster is set to 12.
Active Backups Per Hyper-V Server	WMI	Controls the maximum number of active backup jobs per Hyper-V server. Applies to a standalone Hyper-V server as well as to every Hyper-V server in a cluster. The typical setting for this resource type is 2. Example 1: ■ A Hyper-V Intelligent Policy discovers 32 VMs on one Hyper-V server. ■ Active Backups Per Hyper-V Server: 12. The NetBackup Activity Monitor shows 32 snapshot jobs. 12 snapshot jobs and their backup jobs are active. 20 snapshot jobs are queued. As active backup jobs are completed, queued snapshot jobs become active. Example 2: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 40 VMs in the cluster (10 on Node1 and 30 on Node2). ■ Active Backups Per Hyper-V Server: 12. The NetBackup Activity Monitor shows 40 snapshot jobs. 10 snapshot jobs for VMs on Node1 are active and 12 snapshot jobs for VMs on Node2 are active. 18 snapshot jobs are queued for the VMs on Node2.

Table 3-1 Hyper-V resource types and limits (*continued*)

Resource type	Backup method	Resource limit
Active Backups Per Hyper-V Cluster	WMI	Controls the maximum number of active backup jobs per Hyper-V cluster. The typical setting for this resource type is 6. Example 1: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 60 VMs in the cluster. ■ Active Backups Per Hyper-V Cluster: 20. ■ Active Backups Per Hyper-V Server: No Limit. The NetBackup Activity Monitor shows 60 snapshot jobs. 20 snapshot jobs for VMs on the cluster are active. 40 snapshot jobs are queued. As active backup jobs are completed, queued snapshot jobs become active. Example 2: ■ A cluster has two nodes (Node1 and Node2), each node with 32 VMs. ■ A Hyper-V Intelligent Policy discovers 60 VMs in the cluster. ■ Active Backups Per Hyper-V Cluster: 20. ■ Active Backups Per Hyper-V Server: 5. The NetBackup Activity Monitor shows 60 snapshot jobs. 10 snapshot jobs for VMs on Node1 and Node2 are active. 50 snapshot jobs are queued. Even though the Active Backups Per Hyper-V Cluster setting is higher, the Active Backups Per Hyper-V Server setting controls the number of active jobs.

Configure NetBackup policies for Hyper-V

This chapter includes the following topics:

- [Creating a Hyper-V policy](#)
- [Limit jobs per policy on the Attributes tab \(for Hyper-V\)](#)
- [Virtual machine host names and display names should be unique if VMs are selected manually in the policy](#)
- [Backup options on the Hyper-V tab](#)
- [Hyper-V - Advanced attributes](#)
- [Browse for Hyper-V virtual machines](#)
- [Prerequisites for alternate client backup of a virtual machine \(VSS\)](#)
- [Configuring alternate client backup of virtual machines](#)
- [Requirements for a NetBackup client inside the virtual machine](#)

Creating a Hyper-V policy

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 the Hyper-V virtual machines that you select manually.

To create a policy that selects virtual machines automatically, see the following topic.

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

To create a Hyper-V policy through manual selection of virtual machines

- 1 Open the NetBackup web UI.
- 2 On the left, click **Protection > Policies**.
- 3 Click **Add**.
- 4 Select **Hyper-V** as the policy type.
- 5 Select a policy storage unit or storage unit group (or **Any available**).
- 6 On the **Schedules**, define one of the following schedules:
 - **Full backup**
 - **Differential incremental backup**
 - **Cumulative incremental backup**

Note: For the VSS backup method on the **Hyper-V** tab, incremental backups require that you select the **Enable file recovery from VM backup** option.

- 7 Click the **Clients** tab.
- 8 Select the **Server type**. This option designates the type of environment in which NetBackup searches for the VMs to back up.

Hyper-V standalone/cluster A standalone Hyper-V server or cluster.

System Center Virtual Machine Manager An SCVMM server that manages Hyper-V servers or clusters.

This procedure assumes the use of the **Hyper-V standalone/cluster** option. For assistance with the **System Center Virtual Machine Manager** option, see the following topics.

See [“About backup of virtual machines in an SCVMM environment”](#) on page 81.

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

- 9 For **Server name**, enter the name of the Hyper-V server or cluster. This host must contain a NetBackup client to perform backups of the virtual machines.

Important: IPv6 addresses are not supported for **Server name**. Use fully qualified domain names (FQDN) or host names instead.
- 10 Select the **Virtual machines for backup**.

Select manually

To manually select the virtual machines to back up:

- Click **Add**.
- Under **Enter the VM display name**, type the name of the virtual machine to back up. Then click **Add**.
 Or, click **Browse virtual machines**, and click the appropriate checkboxes to select the virtual machines to back up. Then click **Select**.

If NetBackup cannot obtain the IP address of the virtual machine, the IP address is displayed as NONE.

More information is available on these fields:

See [“Browse for Hyper-V virtual machines”](#) on page 45.

System automatically through Hyper-V intelligent policy query

This option sets up the rules that select virtual machines automatically. This option is required for VMs that an SCVMM server manages.

See [“About Hyper-V Intelligent Policy \(automatic selection of virtual machines for backup\)”](#) on page 50.

Automatic selection of virtual machines is explained in different topics:

See [“Options for selecting Hyper-V virtual machines”](#) on page 54.

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

See [“About backup of virtual machines in an SCVMM environment”](#) on page 81.

11 Select the **Hyper-V** tab.

For further information on the options on this tab, see the following topics. The available options depend on the backup method that is selected.

See [“Backup method \(Hyper-V\)”](#) on page 35.

See [“Backup options on the Hyper-V tab”](#) on page 35.

See [“Hyper-V - Advanced attributes”](#) on page 39.

12 Click **Create** to save the policy.

Limit jobs per policy on the Attributes tab (for Hyper-V)

The **Limit jobs per policy** option operates as follows, depending on how the policy selects virtual machines.

For the policies that select virtual machines automatically (Query Builder)

The **Limit jobs per policy** option controls the number of parent (discovery) jobs that run simultaneously for the policy. This option does not limit the number of snapshot jobs and backup (bpbkar) jobs that the parent job launches. For example, if this option is set to 1 and you begin a backup of a policy that discovers 100 virtual machines: all the snapshot jobs and backup jobs for each of the 100 virtual machines are allowed to execute simultaneously. Only the initial discovery job counts against **Limit jobs per policy**. If you begin a second backup of the policy, its discovery job cannot start until all the child jobs from the first backup are complete.

For the policies that use manual selection of virtual machines

Limit jobs per policy controls the number of virtual machines that the policy can back up simultaneously. Because no discovery job is needed, each virtual machine backup begins with a snapshot job. Each snapshot counts against the **Limit jobs per policy** setting. If this option is set to 1: the backup of the next virtual machine that is specified in the policy cannot begin until the first snapshot job and its backup are complete.

See [“Setting global limits on the use of Hyper-V resources”](#) on page 25.

Virtual machine host names and display names should be unique if VMs are selected manually in the policy

Hyper-V servers do not require unique names for virtual machines. In a given Hyper-V server, two or more virtual machines can have the same host name or display name.

Identically named virtual machines can present a problem for any policies that are configured as follows:

- The primary server's policies use the **Select manually** option on the **Clients** tab to select the VMs for backup.

- The **Primary VM identifier** option on the **Hyper-V** tab identifies VMs by their host names or display names.

These policies may back up a different but identically named VM, instead of the VM that you selected. In that case, the VM that you selected is not backed up. For these policies to work, the virtual machines' display names or host names must be unique.

Consider the following options:

- For manual policies that identify VMs by display name or host name, change the VM names so that each VM has a unique host name or display name.
- As an alternative, configure the policies' **Primary VM identifier** option to identify the VMs by their VM GUIDs instead of by host name or display name.
See [“Primary VM identifier option \(Hyper-V\)”](#) on page 37.
- Instead of policies with manual-selection, use a Hyper-V Intelligent policy to select the VMs through a query. Even if the **Primary VM identifier** option is set to host name or display name, NetBackup identifies each VM by its GUID.

Backup options on the Hyper-V tab

The **Hyper-V** tab displays when you select **Hyper-V** as the policy type.

The following topics describe the Hyper-V backup options.

See [“Backup method \(Hyper-V\)”](#) on page 35.

See [“Optimization options \(Hyper-V\)”](#) on page 36.

See [“Primary VM identifier option \(Hyper-V\)”](#) on page 37.

See [“Enable offline backup of non-VSS VMs \(Hyper-V with VSS\)”](#) on page 38.

See [“Cluster shared volumes timeout \(Hyper-V with VSS\)”](#) on page 39.

See [“Hyper-V - Advanced attributes”](#) on page 39.

Backup method (Hyper-V)

Table 4-1 Backup methods for Hyper-V policies

Backup method	
Volume Shadow Copy Service (VSS)	Select this method for older Hyper-V hosts that run Windows Server versions earlier than Windows 2016. This method does not support block-level incremental backups or Accelerator.

Table 4-1 Backup methods for Hyper-V policies (*continued*)

Backup method	
Windows Management Instrumentation (WMI)	This method is recommended for Hyper-V hosts that run Windows 2016 or later. It enables the faster Hyper-V backup features and is required for block-level incremental backups or Accelerator. The virtual machines must be at a VM configuration version later than 5.

Optimization options (Hyper-V)

Table 4-2 Optimizations for Hyper-V

Option	Backup method	Description
Enable file recovery from VM backup	VSS, WMI	This option allows the restore of individual guest OS files from the backup, such as text files and other documents. This option supports full and incremental schedules. Note: With or without this option, you can restore the entire virtual machine. See “NetBackup character restrictions for vhd or vhdx names and the VM path when the Enable file recovery from VM backup option is used” on page 21.
Enable block-level incremental backup	WMI	For block-level backups of the virtual machine. Uses Microsoft's resilient change tracking (RCT) to perform faster backup of virtual machines. This option also reduces the size of the backup image. Note: When you select this option, Perform block-level incremental backups (on the Attributes tab) is automatically selected by default and grayed out. Use Accelerator NetBackup Accelerator uses Microsoft's resilient change tracking (RCT) to perform faster backups (full and incremental backups).
Exclude deleted blocks	WMI	Reduces the size of the backup image by excluding any unused or deleted blocks within the file system on the virtual machine. This option uses proprietary mapping technology to identify vacant sectors (allocated but empty) within the file system. This option supports the following file systems: Windows NTFS, and Linux ext2, ext3, and ext4. It also supports the Windows Logical Disk Manager (LDM) and the Linux Logical Volume Manager (LVM2).

Table 4-2 Optimizations for Hyper-V (*continued*)

Option	Backup method	Description
Exclude swap and paging files	WMI	Reduces the size of the backup image by excluding the data in the guest OS system paging file (Windows) or the swap file (Linux). Note: This option does not exclude the swapping and paging files from the backup: it only excludes the data in those files. If the files are restored, they are restored as empty files. Note: For a Linux virtual machine, this option disables the swap file when you restore the virtual machine. You must reconfigure the swap file after the virtual machine is restored. To allow the virtual machine to be restored with its swap file enabled, do not select Exclude swap and paging files.

Primary VM identifier option (Hyper-V)

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

Table 4-3 Primary VM identifier options

Option	Description
VM hostname	Specifies the network host name for the virtual machine. Note: For VMs in a Hyper-V server or cluster, 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. Note: On the policy Clients tab, if the Server type is System Center Virtual Machine Manager, NetBackup can back up VMs by their host name even if they are powered off.
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 GUID. Note: When virtual machines are included in a NetBackup policy, restrictions apply to the characters that are allowed in the virtual machine display name. See "NetBackup character restrictions for Hyper-V virtual machine display names" on page 20.
VM GUID	Specifies the unique ID assigned to the virtual machine when the virtual machine was created. In an SCVMM environment, the VM GUID is referred to as the VM ID.

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, consider using 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 of non-VSS VMs (Hyper-V with VSS)

For the VSS backup method, 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 [“Snapshot error encountered \(status code 156\)”](#) on page 139.

See [“About Hyper-V online and offline backups for VSS”](#) on page 153.

See [“Creating a policy for virtual machines in a cluster”](#) on page 86.

Cluster shared volumes timeout (Hyper-V with VSS)

The default is 180 (wait for 3 hours). A wait of 3 hours is recommended if you have multiple virtual machines on one CSV.

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 job duration depends on the size of the virtual machines and the I/O speed.
- The number of virtual machines on the same CSV.

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

See [“About virtual machines on Windows failover clusters”](#) on page 85.

See [“Notes on CSV backup and restore”](#) on page 86.

Hyper-V - Advanced attributes

The **Hyper-V - Advanced attributes** are available on the **Hyper-V** policy tab.

You can set the following parameters for a Hyper-V backup. In most situations, the best settings are the defaults.

The available settings depend on which backup method you have chosen: VSS or WMI.

Table 4-4 Hyper-V Advanced Attributes

Configuration parameter	Backup method	Description
Provider type	VSS	See “Provider type configuration parameter (VSS)” on page 40.
Snapshot Attribute	VSS	See “Snapshot attribute configuration parameter (VSS)” on page 40.
Virtual disk selection	WMI	See “Virtual disk selection parameter (WMI)” on page 41.
Existing snapshot handling	WMI	See “Existing snapshot handling parameter (WMI)” on page 42.

Table 4-4 Hyper-V Advanced Attributes (*continued*)

Configuration parameter	Backup method	Description
Consistency level	WMI	See “Consistency level parameter (WMI)” on page 42.

Provider type configuration parameter (VSS)

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 <i>NetBackup Snapshot Manager for Data Center Administrator's Guide</i> .

See [“Configuring a local snapshot backup of Hyper-V pass-through disks”](#) on page 159.

See [“Configuring an alternate client backup of Hyper-V pass-through disks”](#) on page 161.

Snapshot attribute configuration parameter (VSS)

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

Automatic	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 .

See [“Configuring a local snapshot backup of Hyper-V pass-through disks”](#) on page 159.

Virtual disk selection parameter (WMI)

Determines the kind of disks on the virtual machine that are included in the backup. This parameter can reduce the size of the backup, but should be used with care. The following options are intended only for the virtual machines that have multiple virtual disks.

- **Include all disks**

This option is the default. Backs up all virtual disks that are configured for the virtual machine.

- **Exclude boot disk**

The virtual machine's boot disk (for example the C drive) is not included in the backup. Any other disks (such as D) are backed up. Consider this option if you have another means of recreating the boot disk, such as a virtual machine template for boot drives.

Note: A virtual machine that is restored from this backup cannot start. Data files are available in the restored data disks.

- **Exclude data disks**

The virtual machine's data disks (for example the D drive) are not included in the backup. Only the boot disk is backed up. Consider this option only if you have a different policy that backs up the data disks.

Note: When the virtual machine is restored from the backup, the virtual machine data for the data disk may be missing or incomplete.

Existing snapshot handling parameter (WMI)

This option specifies the action that NetBackup takes when a NetBackup snapshot is discovered before NetBackup creates a new snapshot for the virtual machine backup. After it creates a snapshot, NetBackup usually deletes the snapshot when the backup completes.

Remove NetBackup snapshots and continue the backup

If a virtual machine snapshot exists that NetBackup previously created, NetBackup removes the old snapshot, creates an updated snapshot, and proceeds with the virtual machine backup.

See [“Hyper-V - Advanced attributes”](#) on page 39.

Abort if NetBackup snapshots exist

If a virtual machine snapshot (checkpoint) exists that a NetBackup backup previously created for a WMI backup, NetBackup aborts the job for that virtual machine only. This option is the default operation of NetBackup.

You can use the NetBackup `nbhypervtool.exe` tool to remove NetBackup snapshots of the virtual machine. This tool is in the following location on the Hyper-V server:

```
install_path\NetBackup\bin\nbhypervtool.exe
```

For example, to remove a snapshot by specifying the name of the VM:

```
nbhypervtool.exe deleteNbuCheckpoints -vmname VM_name
```

Where *VM_name* is the name of the VM.

To remove a snapshot by specifying the GUID of the VM:

```
nbhypervtool.exe deleteNbuCheckpoints -vmguid VM_guid
```

Where *VM_guid* is the GUID of the VM.

Consistency level parameter (WMI)

This option determines whether or not the I/O on the virtual machine is quiesced before NetBackup creates the snapshot.

■ Application consistent then crash consistent

NetBackup makes two attempts to quiesce I/O on the virtual machine for an application-consistent snapshot. If both attempts fail to create an application-consistent snapshot, NetBackup creates a crash-consistent snapshot and proceeds with the backup. (See the other two options for a description of application consistent and crash consistent.)

- **Application consistent**

This setting is the default. I/O on the virtual machine is quiesced before NetBackup creates the snapshot. Without quiescing file activity, data consistency in the snapshot cannot be guaranteed. If not consistent, the backed-up data may be of little or no value.

In the great majority of cases, you should accept the default.

Note: If the virtual machine is in the saved state or the paused state, it cannot be quiesced and the backup job fails. You must use one of the other Consistency level options.

Note these prerequisites for the **Application consistent** option:

- The latest version of Hyper-V integration services must be installed and running inside the VM.
- The Hyper-V integration services must be enabled in the VM settings.

- **Crash consistent**

Caution: In most cases, **Crash consistent** is not recommended. With this setting, NetBackup cannot guarantee that all required data has been flushed to disk when the snapshot occurs. The data that is captured in the snapshot may be incomplete.

The snapshot is created without quiescing I/O on the virtual machine. In this case, you must perform your own analysis for data consistency in the backed-up data.

About the exclude disk options for virtual disk selection

The default setting for **Virtual disk selection** is **Include all disks**. You should use this setting in most cases.

The other options are **Exclude boot disk** and **Exclude data disks**. These options are intended for the virtual machines that have multiple virtual disks. You should use these options with care.

To exclude a boot disk or data disk, note the following requirements:

- The virtual machine must have more than one disk.
- NetBackup must be able to identify the boot disk.
- The boot disk must not be part of a managed volume (Windows LDM or Linux LVM). The boot disk must be fully contained on a single disk.

The boot disk must include the following:

- The boot partition.
- The system directory (Windows system directory or Linux boot directory).

Important! The exclude disk options are meant only for the following cases:

- **Exclude boot disk:** Consider this option if you have another means of recreating the boot disk, such as a virtual machine template for boot drives. If **Exclude boot disk** is enabled, the policy does not back up the boot disk.

Note: When the virtual machine is restored from the backup, the virtual machine data for the boot disk may be missing or incomplete.

Note the following about **Exclude boot disk**:

- If the virtual machine has a boot disk but has no other disks, the boot disk is backed up. It is not excluded.
- Adding a virtual disk and changing this option before the next backup can have unexpected results.
See [“Virtual disk selection options: an example to avoid”](#) on page 45.
- **Exclude data disks:** Consider this option if you have a different policy or other backup program that backs up the data disks. If **Exclude data disks** is enabled in a policy, that policy does not back up the data disks.

Note the following about excluding data disks:

- If the virtual machine has only one disk (such as C:), that drive is backed up. It is not excluded.
- If the virtual machine's boot disk is an independent disk, and the virtual machine has a separate data disk, the boot disk is backed up. The restored boot disk however contains no data, because NetBackup cannot back up the data in an independent disk.

Note: When the virtual machine is restored from the backup, the virtual machine data for the data disk may be missing or incomplete.

Caution: Use of the exclude disk options can have unintended consequences if these rules are not followed.

The following topics contain important guidance on the exclude disk options:

See [“Virtual disk selection parameter \(WMI\)”](#) on page 41.

Virtual disk selection options: an example to avoid

You should use the **Virtual disk selection** option with care. For example, if you add a disk to the virtual machine and change the **Virtual disk selection** setting, note: The next backup may not capture the virtual machine in the state that you intended. You should back up the entire virtual machine (**Include all disks**) before using **Virtual disk selection** to exclude a disk from future backups.

Restoring data from the backups that excluded the boot disk or data disks

If the policy's **Virtual disk selection** option excluded the boot disk or data disks, you can restore the backed-up data as follows:

- If **Enable file recovery from VM backup** was enabled on the backup policy: You can restore individual files from those portions of the virtual machine that the Virtual disk selection option did not exclude.
- If the **Virtual disk selection** option was set to **Exclude boot disk**: You can restore the virtual machine and move the restored data disk(s) to another virtual machine.

Browse for Hyper-V virtual machines

To browse for Hyper-V virtual machines:

- Open the NetBackup web UI.
- On the **Clients** tab, click **Add** to select virtual machines.

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

Table 4-5 Options for selecting Hyper-V virtual machines

Option	Description
Enter the VM display name (or VM hostname or VM GUID)	Note: The type of name to enter depends on the Primary VM identifier setting on the Hyper-V tab of the policy. 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 virtual machines option is unchecked.
Browse 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.

Prerequisites for alternate client backup of a virtual machine (VSS)

With the VSS backup method, 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:

- Requires the VSS backup method.

- 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.
- 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.

Configuring alternate client backup of virtual machines

This topic describes the details unique to create 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”](#) on page 31.

To configure an alternate client backup of a virtual machine

- 1 Open the NetBackup web UI.
- 2 Click **Protection > Policies**.
- 3 Click **Add**.
- 4 On the **Attributes** tab, select **Hyper-V** as the policy type.
- 5 Create a schedule for the backup.
- 6 On the **Clients** tab, click **Add** to select the virtual machines to back up.
See [“Browse for Hyper-V virtual machines”](#) on page 45.

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

- 7 Click the **Hyper-V** tab and select **Volume Shadow Copy Service (VSS)**.

8 Click **Perform off-host backup** and select **Alternate client** from the **Use** list. Enter the name of the alternate client in the **Machine** field.

9 On the **Hyper-V** tab, review the other options.

See [“Backup options on the Hyper-V tab”](#) on page 35.

Note the following:

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

10 Click **Create** to validate and save the policy.

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 if they were 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 157.
- To back up databases or applications using NetBackup agents.

Configure Hyper-V Intelligent Policies

This chapter includes the following topics:

- [About Hyper-V Intelligent Policy \(automatic selection of virtual machines for backup\)](#)
- [The basics of a NetBackup query rule](#)
- [Important notes on Hyper-V Intelligent Policy](#)
- [NetBackup requirements for Hyper-V Intelligent Policy](#)
- [Setting up Hyper-V Intelligent Policy: Task overview](#)
- [Options for selecting Hyper-V virtual machines](#)
- [Creating a Hyper-V policy for automatic virtual machine selection](#)
- [Edit or remove a query in Basic mode](#)
- [Using the Query Builder in Advanced mode](#)
- [AND vs. OR in queries](#)
- [Examples for the NetBackup Query Builder](#)
- [The IsSet operator in queries](#)
- [About selecting virtual machines by means of multiple policies](#)
- [Order of operations in queries \(precedence rules\)](#)
- [Parentheses in compound queries](#)
- [Query rules for virtual machine Notes that contain a newline character](#)

- [Query Builder field reference](#)
- [Test Query screen for Hyper-V](#)
- [Test Query: Failed virtual machines](#)
- [Effect of Primary VM identifier parameter on Selection column in Test Query results](#)
- [Effect of Primary VM identifier parameter on VM Name column in Test query results](#)
- [Restoring a VM that was backed up with a Hyper-V Intelligent Policy and that has a pass-through disk](#)

About Hyper-V Intelligent Policy (automatic selection of virtual machines for backup)

A Hyper-V Intelligent Policy lets you configure NetBackup to automatically select virtual machines based on a range of criteria. NetBackup creates a list of the virtual machines that currently meet the rules and adds those virtual machines to the backup.

For a list of requirements for this policy type, see the appropriate version of the NetBackup Software Compatibility List available from the following location:

[NetBackup Compatibility List for all Versions](#)

Automatic selection of virtual machines has the following advantages:

- Simplifies the policy configuration for sites with large virtual environments. You do not need to manually select virtual machines from a long list of hosts: NetBackup selects all the virtual machines that meet the selection rules in the policy's Query Builder.
- Allows the backup list to stay up-to-date with changes in the virtual environment. Eliminates the need to revise the backup list whenever a virtual machine is added or removed.
- Virtual machine selection takes place dynamically at the time of the backup.

The basics of a NetBackup query rule

For automatic virtual machine selection, NetBackup uses query rules to determine which Hyper-V virtual machines to select for backup. You create the rules in the Query Builder, on the **Clients** tab of the policy.

A query rule consists of the following:

- A keyword, such as **Displayname** (many keywords are available).
For example: For automatic selection of the virtual machines with the display names that contain certain characters, you need the **Displayname** keyword in the rule.
- An operator, such as **Contains**, **StartsWith**, or **Equal**.
The operator describes how NetBackup analyzes the keyword. For example: **Displayname StartsWith** tells NetBackup to look for the display names that start with particular characters.
- Values for the keyword.
For the **Displayname** keyword, a value might be "prod". In that case, NetBackup looks for the virtual machines that have the display names that include the characters prod.
- An optional joining element (AND, AND NOT, OR, OR NOT) to refine or expand the query.

The policy uses these elements to discover and select virtual machines for backup.

[Table 5-1](#) contains the examples of rules.

Table 5-1 Examples of rules

Rule	Description
Displayname Contains "vm"	NetBackup selects the virtual machines that have the characters <code>vm</code> anywhere in their display names.
Displayname EndsWith "vm"	NetBackup selects the virtual machines that have the characters <code>vm</code> at the end of their display names.
HypervServer AnyOf "hv1", "hv2"	NetBackup selects the virtual machines that reside on Hyper-V servers <code>hv1</code> or <code>hv2</code> .
Powerstate Equal poweredOn	NetBackup selects only the virtual machines that are currently turned on.

Important notes on Hyper-V Intelligent Policy

The Hyper-V Intelligent Policy in NetBackup is a different approach to Hyper-V virtual machine selection in the policy. The effective use of this feature requires forethought, preparation, and care.

Table 5-2 Important notes on automatic virtual machine selection!

Note!	Explanation
Create rules carefully.	Instead of manually selecting virtual machines for backup, you create guidelines for automatic selection of virtual machines. The guidelines are called rules; you enter the rules in the policy's Query Builder. You make the rules, and NetBackup follows them. If the rules state: Back up all virtual machines with a host name that contains "prod", NetBackup does that. Any virtual machine that is added to the environment with a host name containing "prod" is automatically selected and backed up when the policy runs. Virtual machines with the names that do not contain "prod" are not backed up. To have other virtual machines automatically backed up, you must change the query rules (or create additional policies).
Changes to the virtual environment can affect backup times.	If many virtual machines are temporarily added to your environment and happen to fall within the scope of the query rules, they are backed up. The backups can therefore run much longer than expected.
Test the query rules.	Test the query rules ahead of time. The policy includes a Test Query function for that purpose. It's important to verify that your query operates as expected. Otherwise, the query may select too many or too few virtual machines. Note also: The policy's Primary VM identifier parameter can affect the automatic selection process. See "Effect of Primary VM identifier parameter on Selection column in Test Query results" on page 76. See "Effect of Primary VM identifier parameter on VM Name column in Test query results" on page 77.
A query test does not create the backup list. NetBackup creates the backup list when the backup runs.	The automatic selection process is dynamic. Changes in the virtual environment may affect which virtual machines the query rules choose when the backup runs. Note: If virtual machine changes occur, the virtual machines that are selected for backup may not be identical to those listed in your query test results.
The policy does not display a list of the virtual machines that are to be backed up. Use the Activity monitor.	If you select virtual machines manually (with the Browse for Virtual machines screen), the selected virtual machines are listed on the policy Clients tab. But when you use the Query Builder for automatic selection, the selected virtual machines are not listed on the Clients tab. For a list of the backed up virtual machines, use the NetBackup Activity monitor.

Table 5-2 Important notes on automatic virtual machine selection!
(continued)

Note!	Explanation
When you save the policy, the query rules are not validated.	When you save a policy, policy validation does not consult the query rules and select virtual machines for backup. Because of the potential for changes in the virtual environment, virtual machine selection must wait until the backup runs. As a result, when you save the policy, NetBackup does not check the policy attributes against a backup list. If the query rules select the virtual machines that are incompatible with a policy attribute, policy validation cannot flag that fact. The incompatibility becomes apparent when NetBackup determines the backup list at the time of the backup.

NetBackup requirements for Hyper-V Intelligent Policy

Note the following requirements for automatic selection of Hyper-V virtual machines:

- The system where NetBackup runs must have access to the Hyper-V server.
- For the policies that back up VMs that reside in a Hyper-V cluster: The NetBackup primary server should not be installed on any Hyper-V nodes of the cluster. If the primary server resides on one of the nodes, you cannot log on to NetBackup web UI.
See [“Unable to log in to the NetBackup Administration Console”](#) on page 143.
- If the policy's **Primary VM identifier** option is set to **VM display name**, certain special characters are not supported in the name.
The following characters are supported: ASCII letters a through z (uppercase and lowercase), numbers 0 through 9, hyphen (-), period (.), underscore (_), plus sign (+), left and right parentheses (), spaces.
If the display name contains unsupported characters, set the **Primary VM identifier** to **VM GUID**, or to **VM hostname** if a host name is available.
- Refer to the following document for support information and additional requirements for Hyper-V Intelligent Policy:
[Support for NetBackup in virtual environments](#)

Setting up Hyper-V Intelligent Policy: Task overview

This topic is a high-level overview of how to set up a NetBackup policy for automatic selection of Hyper-V virtual machines. Follow the links in the table for more details.

Table 5-3 Automatic selection of virtual machines: overview of the tasks

Steps to configure automatic selection	Description and notes
Configure a Hyper-V policy	Use the policy Attributes tab. See “Creating a Hyper-V policy” on page 31.
Set rules for virtual machine selection in the policy Query Builder	On the policy Clients tab, click Select automatically through Hyper-V Intelligent Policy query . Choose a host for virtual machine selection (the default is the Hyper-V server). To add the rules, use the Query Builder drop-down fields. See “Creating a Hyper-V policy for automatic virtual machine selection” on page 56. See “Options for selecting Hyper-V virtual machines” on page 54.
Test the rules	Click Test Query in the Query Builder on the Clients tab. Virtual machines are labeled as included or excluded, based on the rules. Note: The list of virtual machines is not saved in the Clients tab. Note: The query rules are also displayed in the Backup selections tab. The backup selections are pre-set to All_LOCAL_DRIVES (not displayed).
Run a backup	When the policy runs, NetBackup consults the rules in the Query Builder, creates a list of virtual machines, and backs them up.
Check the backup	To see which virtual machines were backed up, use the Activity Monitor.

Options for selecting Hyper-V virtual machines

This topic describes the options on the policy **Clients** tab for Hyper-V policies. (In the NetBackup web UI, click **Protection > Policies** and then open the Hyper-V policy.)

You can use these options to manually select virtual machines or to configure NetBackup to select virtual machines automatically. For automatic selection, you specify the selection criteria (rules) in the policy's Query Builder. When the backup job runs, NetBackup discovers the virtual machines that currently meet the criteria and backs up those virtual machines.

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

Table 5-4 Virtual machine selection options

Option	Description
Server type	Select the type of environment in which NetBackup searches for the VMs to back up.
Server name	Enter the name of the Hyper-V server or SCVMM server. For a clustered environment, note: ■ Enter the name of the cluster (or one of the Hyper-V cluster nodes). ■ Set the NetBackup Legacy Network Service logon to the cluster user. See “Changing the NetBackup Legacy Network Service logon (vnetd.exe) to the domain user account” on page 23. ■ The NetBackup primary server should not be installed on any Hyper-V nodes in the cluster. If the primary server resides on one of the nodes, you cannot log on to the NetBackup web UI.
Select manually	Click this option and click Add to manually enter virtual machines names, or to browse and select them from a list. See “Browse for Hyper-V virtual machines” on page 45. Note: The rest of the fields and options are for automatic selection of virtual machines.
Select automatically through Hyper-V Intelligent Policy query	Click this option to allow NetBackup to automatically select virtual machines for backup based on the rules that you enter in the Query Builder.

Table 5-5 Query Builder

Option	Description
Query Builder (Join, Field, Operator, Value)	Use these pull-down fields to define rules for automatic selection of virtual machines. From left to right, each pull-down refines the rule. Click Add query to add the rule to the Query pane. Click the Reset to clear the query selections. See “Query Builder field reference” on page 67. See “Examples for the NetBackup Query Builder” on page 61.
Advanced mode	Places the Query Builder in Advanced mode for manual entry of rules. See “Using the Query Builder in Advanced mode” on page 59. See “Query Builder field reference” on page 67. See “Examples for the NetBackup Query Builder” on page 61.

Table 5-5 Query Builder (*continued*)

Option	Description
Basic mode	Places the Query Builder in Basic mode. See “ Query Builder field reference ” on page 67.
Edit	Use this option to change an existing query rule when in Basic Mode, as follows: ■ Locate the rule and then click Edit. ■ Make new selections in the Query Builder fields. ■ Click the Save.
Remove	Deletes a query rule when in Basic Mode. Click on the rule and then click Remove .
Test Query	Click this option to test which virtual machines NetBackup selects based on the rules in the Query Builder. Note: This test option does not create the backup list for the policy. When the next backup runs from this policy, NetBackup re-discovers virtual machines and consults the query rules. At that time, NetBackup backs up the virtual machines that match the rules.

Creating a Hyper-V policy for automatic virtual machine selection

NetBackup can automatically select Hyper-V virtual machines for backup based on the criteria that you enter. You specify the criteria (rules) in the Query Builder on the NetBackup policy **Clients** tab. You can set up rules to include certain virtual machines for backup, or to exclude virtual machines. The Query Builder can operate in Basic Mode or in Advanced Mode.

When the backup job runs, NetBackup creates a list of the virtual machines that currently meet the query rules and backs them up.

To configure automatic virtual machine selection in Basic mode

- 1 Open the NetBackup web UI.
- 2 On the left, click **Protection > Policies**.
- 3 Click **Add**.
- 4 On the **Attributes** tab, select **Hyper-V** for the policy type.
- 5 Make other policy selections as needed (for example, create a Schedule).

- 6 Click the **Clients** tab, and select **Select automatically through Hyper-V Intelligent Policy query**.

If you had used the **Select manually** option to select virtual machines, those virtual machines are removed from the policy.

- 7 Select the **Server type**.

This option designates the type of environment in which NetBackup searches for the VMs to back up.

Hyper-V Standalone/Cluster A standalone Hyper-V server or cluster.

System Center Virtual Machine Manager An SCVMM server that manages Hyper-V servers or clusters.

- 8 For **Server name**, enter the name of the Hyper-V server, cluster, or SCVMM server.

Important: IPv6 addresses are not supported for **Server Name**. Use fully qualified domain names (FQDN) or host names instead.

Another topic describes the requirements for SCVMM:

See [“About backup of virtual machines in an SCVMM environment”](#) on page 81.

For a clustered environment, note the following:

- Enter the name of the cluster (or one of the Hyper-V cluster nodes) in the **Server Name** field.
- Set the NetBackup Legacy Network Service logon to the domain user account:
See [“Changing the NetBackup Legacy Network Service logon \(vnetd.exe\) to the domain user account”](#) on page 23.
- The NetBackup primary server should not be installed on any Hyper-V nodes in the cluster. If the primary server resides on one of the nodes, you cannot log on to the NetBackup web UI.

- 9 Click the **Basic mode** tab. To create a rule, make selections from the Query Builder fields.

- For the first rule, you can start with the **Field** list, depending on the type of rule. For the first rule, the only selections available for the **Join** field are blank (none), or NOT.
Select a keyword for **Field**.
- Select an **Operator**.
- Indicate a **Value**.

You can enter the value manually (enclose the value in single quotes or double quotes).

As an alternative, you can click the folder icon to browse for values. Depending on the **Field** keyword, you can use the **Value** list to select the value.

Note that browsing with the folder icon may take some time in large environments.

See [“Query Builder field reference”](#) on page 67.

The arrow icon resets the **Join, Field, Operator, and Value** fields to blank.

- 10 Click the **Save** to add the rule to the **Query** pane.

- 11 Create more rules as needed.

See [“Query Builder field reference”](#) on page 67.

See [“Examples for the NetBackup Query Builder”](#) on page 61.

- 12 To see which virtual machines NetBackup currently selects based on your query, click **Test Query**.

On the Test Query screen, the virtual machines in your current environment that match the rules for selection in the policy are labeled INCLUDED. Note however that the Test Query option does not create the backup list for the policy. When the next backup runs from this policy, NetBackup re-discovers virtual machines and consults the query rules. At that time, NetBackup backs up the virtual machines that match the query rules.

The list of virtual machines is saved but the virtual machines are not displayed in the policy's **Clients** tab.

Edit or remove a query in Basic mode

Edit a query rule in Basic mode

To edit a query rule

- 1 Open the NetBackup web UI.
- 2 On the left, click **Protection > Policies**.
- 3 Click on the policy that you want to edit.
- 4 Click the **Clients** tab.
- 5 With the Query Builder in **Basic mode**, locate the query rule and click **Actions > Edit**.

- 6 Make the query selections using the query fields.
- 7 Click **Save**.

Remove a query rule

To remove a query rule

- 1 Open the NetBackup web UI.
- 2 On the left, click **Protection > Policies**.
- 3 Click on the policy that you want to edit.
- 4 Click the **Clients** tab.
- 5 With the Query Builder in **Basic mode**, locate the query rule.
- 6 Click **Actions > Remove**.

Using the Query Builder in Advanced mode

The Query Builder's Advanced mode provides more flexibility in crafting rules for virtual machine selection, including the use of parentheses for grouping.

To use the Query Builder in Advanced mode

- 1 Open the NetBackup web UI.
- 2 On the left, click **Protection > Protection**.
- 3 Create a **Hyper-V** policy and specify a Hyper-V server.

For assistance, you can refer to the first few steps of the following procedure:

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

- 4 Click the **Clients** tab.
- 5 Click **Select automatically through Hyper-V Intelligent Policy query**.
- 6 Locate **Query builder** and click the **Advanced mode** tab.
- 7 You can use the Query Builder fields to add query rules. You can also type in rules manually.

For example:

```
Displayname Contains "vm"
```

- 8 To insert a rule between existing rules, place the cursor where you want the new rule to start and type it in.

When you create a rule with the fields, it appears at the end of the query. You can cut and paste it to a different position.

- 9 To establish the proper order of evaluation in compound queries, use parentheses to group rules as needed. Compound queries contain two or more rules, joined by AND, AND NOT, OR, or OR NOT.

More information is available on the use of parentheses and on the order of precedence.

See [“AND vs. OR in queries”](#) on page 60.

See [“Order of operations in queries \(precedence rules\)”](#) on page 65.

See [“Parentheses in compound queries”](#) on page 66.

AND vs. OR in queries

The **Join** field in the Query Builder provides connectors for joining rules (AND, AND NOT, OR, OR NOT). The effect of AND versus OR in the Query Builder may not be obvious at first glance.

In essence, AND and OR work in this way:

- AND limits or restricts the scope of the query.
- OR opens up the query to an additional possibility, expanding the scope of the query.

Note: Do not use AND to join the rules that are intended to include additional virtual machines in the backup list. For instance, AND cannot be used to mean "include virtual machine X AND virtual machine Y."

For example: To include the virtual machines that have either "vm1" or "vm2" in their names, use OR to join the rules:

```
Displayname Contains "vm1"  
OR Displayname Contains "vm2"
```

If you use AND to join these rules:

```
Displayname Contains "vm1"  
AND Displayname Contains "vm2"
```

the result is different: the backup list includes only the virtual machines that have both vm1 and vm2 in their names (such as "acmevm1vm2"). A virtual machine with the name "acmevm1" is not included in the backup.

Examples for the NetBackup Query Builder

The following table provides example query rules.

To use the Query Builder, you must click **Select automatically through Hyper-V Intelligent Policy query** on the **Client** tab.

Another topic is available on the difference between AND and OR in a query.

See [“AND vs. OR in queries”](#) on page 60.

Since the available Query Builder keywords depend on the **Server Type** that is selected on the policy **Clients** tab, the following examples are in two groups:

- [Table 5-6](#) provides examples for server type **Hyper-V Standalone/Cluster**.
- [Table 5-7](#) provides examples for server type **System Center Virtual Machine Manager**.

Table 5-6 Query Builder examples for server type **Hyper-V Standalone/Cluster**

Example query	Query result when backup job runs
No query rules specified (Query pane is empty)	All virtual machines are added to the backup list. Exceptions are those that do not have a host name, or that have invalid characters in the display name. See “Effect of Primary VM identifier parameter on Selection column in Test Query results” on page 76.
Displayname Contains "prod"	All virtual machines with the display names that contain the string "prod" are added to the backup list. See “Effect of Primary VM identifier parameter on Selection column in Test Query results” on page 76.
Displayname AnyOf "grayfox7","grayfox9"	The virtual machines named "grayfox7" and "grayfox9" are added to the backup list. Note that each value must be enclosed in its own quotes, with a comma in between.
powerstate Equal "poweredOn"	Any virtual machine that is turned on is added to the backup list.
powerstate Equal "poweredOn" AND HypervServer Equal "HV_serv1"	Any virtual machine that is turned on and resides on Hyper-V server HV_serv1 is added to the backup list.
IsClustered Equal TRUE	Any virtual machine that is in a clustered Hyper-V server is added to the backup list.
Displayname Contains "pre-prod" AND IsClustered Equal FALSE	Any virtual machine with a display name containing "pre-prod" and that is not in a clustered Hyper-V server is added to the backup list.

Table 5-6 Query Builder examples for server type **Hyper-V Standalone/Cluster** *(continued)*

Example query	Query result when backup job runs
IsClustered Equal TRUE AND Notes Contains "pre-prod"	Adds to the backup list any virtual machine in a clustered Hyper-V server if the virtual machine has "pre-prod" in its Notes field.
Displayname StartsWith "prod" OR Notes Contains "prod"	Adds to the backup list any virtual machine with a display name starting with "prod" or with Notes that contain "prod."
ConfigurationVersion Greater "5"	Adds to the backup list any virtual machine that has a VM configuration version greater than 5.

Table 5-7 Query Builder examples for server type **System Center Virtual Machine Manager**

Example query	Query result when backup job runs
Name StartsWith "prod"	Adds to the backup list any VMs that have a display name that starts with "prod". Note: For VMs that reside under SCVMM, a Hyper-V Intelligent policy can back up VMs by their host name even if they are powered off. In this example: even if the policy's Primary VM identifier is set to VM hostname , VMs are added to the backup list whether they are powered on or powered off.
ComputerName Contains "VM"	Adds to the backup list any VMs that have a network host name that contains "VM". See the note in this table for the example Name StartsWith "prod" .
VMHost AnyOf "hv1", "hv2" AND Description Contains "pre-prod"	Adds to the backup list any VMs that reside on Hyper-V servers "hv1" or "hv2" if the VM has "pre-prod" in its Description field. The SCVMM Description field is similar to the VM's Notes field in Hyper-V.
Generation Equal "2"	Adds to the backup list any VMs of Generation 2.
IsUndergoingLiveMigration Equal FALSE	Adds to the backup list any VM that is not in live migration.
VirtualMachineState Equal "Running"	Adds to the backup list any VM that is running.
Cloud Contains "cloud9" AND HasSharedStorage Equal TRUE	Adds to the backup list any VM that meets the following: the VM is part of an SCVMM cloud that contains cloud9 in its name, if the VM is in a cluster that has shared storage.

Table 5-7 Query Builder examples for server type **System Center Virtual Machine Manager** (*continued*)

Example query	Query result when backup job runs
IsHighlyAvailable Equal TRUE AND IsFaultTolerant Equal FALSE	Adds to the backup list any VM that resides in a CSV cluster if the VM is not marked for fault tolerance.
VMConfigurationVersion Greater "5"	Adds to the backup list any virtual machine that has a VM configuration version greater than 5.

Click **Advanced** to see the query rule in Advanced Mode. Only Advanced Mode supports the use of parentheses for grouping sets of rules.

The IsSet operator in queries

In a query, you can use the IsSet operator to ensure that certain virtual machines are included or excluded from the backup.

For example: You can use IsSet to exclude virtual machines from the backup list that do not have any Notes associated with them.

Table 5-8 Examples of queries with the IsSet operator

Query rules with IsSet operator	Effect of the query on virtual machine selection
Displayname Contains "prod" AND Notes IsSet	INCLUDED: Any virtual machine with a display name that contains the string "prod" if the virtual machine also has Notes. EXCLUDED: Any virtual machines that do not have Notes. Without Notes IsSet in this query, virtual machines without Notes cannot be excluded.
Cluster Contains "dev" AND Notes IsSet	INCLUDED: Any virtual machine in a cluster that has a name that contains the string "dev" if the virtual machine also has Notes. EXCLUDED: Any virtual machines that do not have Notes, and any virtual machines that have Notes but that are not in a cluster that has a name that contains "dev". Without Notes in this query, virtual machines without Notes cannot be excluded.

The policy's **Primary VM identifier** parameter has an important effect on which virtual machines NetBackup can back up. This parameter affects the test query results.

See [“Effect of Primary VM identifier parameter on Selection column in Test Query results”](#) on page 76.

About selecting virtual machines by means of multiple policies

If your virtual environment has many virtual machines with inconsistent naming conventions, you may need multiple policies working in tandem. It may be difficult to create a single policy that automatically selects all the virtual machines that you want to back up.

For this situation, configure several policies so that each policy backs up a portion of the environment. One policy backs up a particular set or group of virtual machines, such as those that have host names. A second policy backs up a different group of virtual machines that were not backed up by the first policy, and so forth. When all the policies have run, all the virtual machines are backed up.

The following table describes the policies that are designed to back up the virtual environment in three phases. Note that each policy relies on a different setting for the **Primary VM identifier** parameter.

Table 5-9 Three policies that back up the virtual machines in phases

Policy	Query Builder rules	Backup result
First policy Primary VM identifier parameter: VM hostname	Notes IsSet	This policy backs up all virtual machines that have a host name and any Notes. Any virtual machines that do not have a host name and do not have Notes are either excluded from the backup or listed as FAILED.
Second policy Primary VM identifier parameter: VM display name	NOT Notes IsSet AND IsClustered Equal 'TRUE'	This policy backs up all virtual machines that have a display name, that are clustered, and that do not have any Notes. Any virtual machines that have Notes but are not clustered are excluded from the backup.
Third policy Primary VM identifier parameter: VM GUID	NOT Notes IsSet AND IsClustered NotEqual 'TRUE'	This policy backs up the virtual machines that were not backed up by the first two policies. This policy selects the virtual machines that do not have any Notes and are not clustered, but that do have a GUID.

More information is available on the **Primary VM identifier** parameter and its effect on virtual machine selection.

See [“Effect of Primary VM identifier parameter on Selection column in Test Query results”](#) on page 76.

Order of operations in queries (precedence rules)

The information in this topic is for advanced users who understand precedence in programming languages. In the Query Builder, the order in which operations occur can determine which virtual machines are selected and backed up.

The following table lists the order of operations, or precedence, from highest to lowest (7 is the highest). For example, an operation with a precedence of 6 (such as Contains) is evaluated before an operation with a precedence of 5 (such as Greater).

Table 5-10 Order of operations

Operation	Description	Precedence
!x	Produces the value 0 if x is true (nonzero) and the value 1 if x is false (0).	7
x Contains y	Does y exist somewhere in x	6
x StartsWith y	Does x start with y	6
x EndsWith y	Does x end with y	6
x AnyOf list	Does x appear in list	6
x Greater y	Is x greater than y	5
x GreaterEqual y	Is x greater than or equal to y	5
x Less y	Is x less than y	5
x LessEqual y	Is x less than or equal to y	5
x Equal y	Is x equal to y	4
x NotEqual y	Is x not equal to y	4
Not x	operator produces the value 0 if x is true (nonzero) and the value 1 if x is false (0).	3
x And y	True if both x and y are true	2
x OR y	True if either x or y are true	1

Note the following:

- AND has a higher precedence than OR.
In the Query Builder's Advanced Mode, you can use parentheses to change the order of evaluation in the rules that use AND or OR.

See [“Parentheses in compound queries”](#) on page 66.

- In the Query Builder's Advanced Mode, you can combine two or more operations in a single rule without AND or OR to join them. Precedence determines the order in which the operations are evaluated within the rule.

Example of a rule that includes three operations:

```
Displayname StartsWith "L" NotEqual Displayname contains "x"
```

This rule selects the following virtual machines:

Virtual machines with the names that start with L.

Virtual machines with the names that do not start with L but that do contain x.

Explanation: The StartsWith and Contains operations have a precedence of 6, whereas NotEqual has a lower precedence of 3. Starting on the left, the StartsWith operation is evaluated first and the Contains operation is evaluated next. The last operation to be evaluated is Not Equal.

See [“Using the Query Builder in Advanced mode”](#) on page 59.

Parentheses in compound queries

You can use the Query Builder to make precise queries containing as many rules as necessary to identify the appropriate virtual machines. In a query such as **powerstate Equal "poweredOn"**, the result of the query is easy to predict: only the virtual machines that are turned on are included in the backup. But if several rules are combined with AND and OR, the result may not be obvious. This kind of query is called a compound query. Compound queries contain two or more rules, joined by AND, AND NOT, OR, or OR NOT.

The order in which the Query Builder evaluates compound rules affects the outcome of the query. Grouping the rules with parentheses can change the order of evaluation and thus the outcome of the query.

The examples in the following table demonstrate how the Query Builder evaluates compound queries with and without parentheses.

Note: Only the Query Builder's Advanced Mode supports the use of parentheses.

Table 5-11 Examples of compound queries with and without parentheses

Example query	The following virtual machines are selected
HypervServer Equal "HV-serv1" OR IsClustered Equal TRUE AND powerstate Equal ON	All virtual machines in HV-serv1 (regardless of their power state), and any virtual machines that are turned on in a clustered environment. To select only the virtual machines that are turned on both in the Hyper-V server and in clustered environments, use parentheses (see next example).
(HypervServer Equal "HV-serv1" OR IsClustered Equal TRUE) AND powerstate Equal ON	All the virtual machines that are turned on in HV-serv1 and in clustered environments.

Query rules for virtual machine Notes that contain a newline character

If the virtual machine's Notes contain a newline character, the Query Builder's folder icon for browsing may not return the correct values. As a result, the query rule may not select the VM for backup.

For example: If the VM's Notes contain the following words with a newline in between them:

```
Server Location
Building A
```

Then the browsing icon returns "Server Location Building A". The resulting query rule is:

```
Notes Contains "Server Location Building A"
```

Since the newline character is not included in the query, the VM may not be backed up. To include the VM in the backup, create the query manually without using the browsing icon.

For this example, create the query: `Notes Contains "Server Location" AND Notes Contains "Building A"`:

Query Builder field reference

You can use the Query Builder to enter rules for the automatic selection of virtual machines for backup.

[Table 5-12](#) describes the drop-down fields and options for creating rules in the Query Builder.

Table 5-12 Query Builder drop-down options: Join, Field, Operator, Value

Query Builder drop-down fields	Description
Join	Selects a connector to join rules. For the first rule, choices are blank (none) or NOT . After you add a rule, the available connectors are AND , AND NOT , OR , OR NOT .
Field	Selects a parameter on which to build the rule. See Table 5-13 on page 69.
Operator	Selects an operator. See Table 5-15 on page 73.
Value(s)	Specifies value(s) for the Field parameter. The value(s) you enter must be enclosed in single quotes or double quotes. You can specify multiple comma-separated values. See Table 5-16 on page 74.
Browse	Allows browsing for values, depending on the selections that are made in the other drop-down fields.
Add	Adds the current drop-down selections to the Query pane as a new rule.
	Resets the query fields to the default values.

Field (keywords)

The following tables describe the keywords available in the **Field** drop-down. The tables also indicate whether the values for each keyword (in the **Values** field) are case-sensitive.

Note that the **Field** keyword does not determine by itself the inclusion or exclusion of virtual machines. Selection of virtual machines depends on the rule you construct: the combination of Join, Field, Operator, and Value(s).

The available keywords depend on the **Server Type** that is selected:

- For a description of the **Hyper-V Standalone/Cluster** keywords, see [Table 5-13](#).
- For a description of the **System Center Virtual Machine Manager** keywords, see [Table 5-14](#).

Table 5-13 For server type **Hyper-V Standalone/Cluster**: Keywords in the **Field** drop-down

Field keyword	Data type	Description
ConfigurationVersion	Numeric	The configuration version of the virtual machine.
Displayname	Alphanumeric string	The virtual machine's display name. Values are case-sensitive.
HypervServer	Alphanumeric string	The name of the Hyper-V server. Values are not case-sensitive.
IsClustered	Boolean	TRUE if the virtual machine resides in a Hyper-V server that is in a cluster.
Notes	Alphanumeric string	A note that was recorded about the virtual machine, in the virtual machine's Summary tab in Hyper-V Manager. Values are case-sensitive.
Powerstate	Alphabetic	The state of the virtual machine. Values are poweredOff, poweredOn, suspended, starting, offCritical.

Table 5-14 For server type **System Center Virtual Machine Manager**: Keywords in the **Field** drop-down

Field keyword	Data type	Description
BackupEnabled	Boolean	TRUE if the BackupEnabled property is enabled in Integration Services.
Cloud	Alphanumeric string	The name of the SCVMM cloud that the VM is a part of. Values are not case-sensitive.
CloudVMRoleName	Alphanumeric string	The name of the VM role for the SCVMM cloud. Values are not case-sensitive.
ComputerName	Alphanumeric string	The network host name of the VM. Values are not case-sensitive.
CostCenter	Alphanumeric string	The name of the VM's cost center. Values are not case-sensitive.

Table 5-14 For server type **System Center Virtual Machine Manager**:
Keywords in the **Field** drop-down (*continued*)

Field keyword	Data type	Description
Description	Alphanumeric string	The VM's description in SCVMM. This field is similar to the VM's Notes field in Hyper-V. Values are case-sensitive. Note: If the VM's description field contains a newline character, the Query Builder's folder icon for browsing may not return the correct values. See "Query rules for virtual machine Notes that contain a newline character" on page 67.
DRState	Alphanumeric string	The disaster recovery state of the VM. Values are Disabled, Enabled.
Generation	Numeric string	The numeric Generation (or type) of the VM that the SCVMM server manages.
HasPassThroughDisk	Boolean	TRUE if the VM has a pass-through disk configured.
HasSharedStorage	Boolean	TRUE if the VM is in a cluster that has shared storage configured.
HasVirtualFibreChannelAdapters	Boolean	TRUE if the VM has virtual Fibre Channel adapters. These adapters enable Hyper-V VMs to have direct access to Fibre Channel SAN array resources.
HostGroupPath	Alphanumeric string	The complete host group path to the VM. Values are not case-sensitive.
IsDREnabled	Boolean	TRUE if Microsoft Azure Site Recovery Provider (formerly Hyper-V Recovery Manager) manages the VM's disaster recovery.
IsFaultTolerant	Boolean	TRUE if the VM is marked for fault tolerance (if it can run without interruption in the case of a host failure).
IsHighlyAvailable	Boolean	TRUE if the virtual machine resides in a Hyper-V server that is in a CSV cluster.
IsPrimaryVM	Boolean	TRUE if the VM is a primary VM that is configured to be replicated to a secondary VMM site.
IsRecoveryVM	Boolean	TRUE if the VM is a replicated copy (of the primary VM) at a secondary Virtual Machine Manager (VMM) site.

Table 5-14 For server type **System Center Virtual Machine Manager**:
Keywords in the **Field** drop-down (*continued*)

Field keyword	Data type	Description
IsTestReplicaVM	Boolean	TRUE if the VM is a replicated copy that is designated in the Microsoft Azure Site Recovery Provider (formerly Hyper-V Recovery Manager) for failover test. Test failover is initiated on a replica VM to test the virtualized workload without interrupting the production site or ongoing replication. You can exclude such VMs from the backup by creating queries such as: IsTestReplicaVM Equal 'FALSE'
IsUndergoingLiveMigration	Boolean	TRUE if the VM is in migration from one Hyper-V server to another by means of the Hyper-V live migration feature.
Name	Alphanumeric string	The VM's display name in SCVMM. Values are case-sensitive.
OperatingSystem	Alphanumeric string	The VM's guest operating system. Values are not case-sensitive.
Owner	Alphanumeric string	The VM owner's name. Values are not case-sensitive.
RecoveryPointObjective	Numeric	The recovery point objective (RPO) value for this VM. RPO is the maximum acceptable data loss as measured in time. In backup storage, RPO is the maximum age of the data that is required to resume normal operations if a failure occurs. For example, if the RPO is set to 30 minutes, then a backup of the system is required every 30 minutes.
Tag	Alphanumeric string	The name of the tag. A tag is a string for logical grouping of VMs in NetBackup. Values are not case-sensitive.
TotalSize	Numeric	The total size on disk (in bytes) of all the VM's VHDs.
UserRole	Alphanumeric string	The user role the VM is a part of, such as Administrator, Fabric Administrator, or Tenant Administrator. Values are not case-sensitive.

Table 5-14 For server type **System Center Virtual Machine Manager**:
Keywords in the **Field** drop-down (*continued*)

Field keyword	Data type	Description
VirtualMachineState	Alphanumeric string	The power state of the virtual machine. Values are not case-sensitive. Hyper-V has many possible values for the VM state, such as PowerOff and Running.
VMConfigurationVersion	Numeric	The configuration version of the virtual machine. Note the following: This option works only with SCVMM 2016 and later. In SCVMM 2012, the VM's configuration version is not available, so NetBackup is unable to retrieve the configuration version. If the NetBackup primary server protects SCVMM 2016 as well as SCVMM 2012, you can use <code>VMConfigurationVersion</code> with the <code>IsSet</code> operator. For example: <pre>Name Contains "Production" AND VMConfigurationVersion IsSet AND VMConfigurationVersion Greater "5.0"</pre> In this example, no VMs in SCVMM 2012 are selected, because the <code>VMConfigurationVersion IsSet</code> rule returns "false." On SCVMM 2016, <code>VMConfigurationVersion IsSet</code> returns "true": The query can select any VM that contains "Production" in its name and is at a configuration version later than 5.0.
VMHost	Alphanumeric string	The name of the Hyper-V host for this VM. Values are not case-sensitive.
VMResource	Alphanumeric string	The resource for a highly available VM. Values are not case-sensitive.
VMResourceGroup	Alphanumeric string	The resource group for a highly available VM. Values are not case-sensitive.

Operators

[Table 5-15](#) describes the operators available in the **Operator** drop-down.

Table 5-15 Operators in the **Operator** drop-down

Operator	Description
AnyOf	Matches any of the specified values in the Value(s) field. For example: If the display names in the Value(s) field are "vm01", "vm02", "vm03", AnyOf matches any VM that has one of those names. If the names of your VMs are not identical to any of the specified values, no match occurs. A VM that is named "vm01A" is not a match.
Contains	Matches the value in the Value(s) field wherever that value occurs in the string. For example: If the Value(s) entry is "dev", Contains matches strings such as "01dev", "01dev99", "devOP", and "Development_machine".
EndsWith	Matches the value in the Value(s) field when it occurs at the end of a string. For example: If the Value(s) entry is "dev", EndsWith matches the string "01dev" but not "01dev99", "devOP", or "Development_machine".
Equal	Matches only the value that is specified in the Value(s) field. For example: If the display name to search for is "VMtest27", Equal matches virtual machine names such as "VMTest27" or "vmtest27" or "vmTEST27", and so forth. The name "VMtest28" is not matched.
Greater	Matches any value that is greater than the specified Value(s), according to the ASCII collating sequence.
GreaterEqual	Matches any value that is greater than or equal to the specified Value(s), according to the ASCII collating sequence.
IsSet	Determines whether a value is returned for the Field keyword. Use IsSet with another rule as a condition, to ensure that the query selects the appropriate virtual machines. Note that you do not make an entry under Value(s) for a rule that uses IsSet. See “The IsSet operator in queries” on page 63. See “Effect of Primary VM identifier parameter on Selection column in Test Query results” on page 76. See “Test Query: Failed virtual machines” on page 76.
Less	Matches any value that is less than the specified Value(s), according to the ASCII collating sequence.
LessEqual	Matches any value that is less than or equal to the specified Value(s), according to the ASCII collating sequence.
NotEqual	Matches any value that is not equal to the value in the Value(s) field.

Table 5-15 Operators in the **Operator** drop-down (*continued*)

Operator	Description
StartsWith	Matches the value in the Value(s) field when it occurs at the start of a string. For example: If the Value(s) entry is "box", StartsWith matches the string "box_car" but not "flat_box".

Value

[Table 5-16](#) describes the characters that can be entered in the **Value** field. The **Field** keyword determines case sensitivity.

Note: The character string you enter in the **Value** field must be enclosed in single quotes or double quotes.

Table 5-16 Characters you can enter for Value

Character types	String characters allowed
Alphanumerics	A to Z, a to z, 0 to 9 (decimal), and the following special characters: , ~ ! @ \$ % ^ & * () ` - _ = + [] { } \ : ; , . < > / ? Note: If the policy's Primary VM identifier option is set to VM display name , only the following characters are supported in the virtual machine's display name: A to Z, a to z, 0 to 9, hyphen (-), period (.), underscore (_), plus sign (+), left and right parentheses (), spaces.
Wildcards	* (asterisk) matches everything. For example: "*prod*" matches the string "prod" preceded or followed by any characters. ? (question mark) matches any single character. For example: "prod??" matches the string "prod" followed by any two characters.
Escape character	\ (backslash) escapes the wildcard or meta-character that follows it. For example: To search for a string that contains an asterisk (such as test*), enter "test\".
Quotation marks	Note: The characters you enter in Value(s) must be enclosed in single or double quotes. To search for a string that contains quotation marks, either escape each quote (") or enclose the entire string in the opposite type of quotes. For example: To search for a string that includes double quotes (such as "name"), enter ' "name" ' (enclosing it in single quotes) or "\"name\"".

Test Query screen for Hyper-V

This screen lists the virtual machines that NetBackup discovered in your virtual environment when you clicked **Test Query**. Later changes in the virtual environment may affect which virtual machines match the query rules. For example: if virtual machines are added, the test results may not be identical to the virtual machines that are selected for backup when the backup runs.

When the next backup runs from this policy, the following events occur: NetBackup re-discovers virtual machines, consults the query rules, and backs up the virtual machines that match the rules.

The list of backed up virtual machines is saved but the virtual machines are not displayed in the policy's **Clients** tab. You can use the Activity Monitor to view the virtual machine jobs.

The **Test Query** function runs in the background. You can continue to configure the policy while the test runs. Any changes you make in the Query Builder however are not included in the currently running test. You must re-initiate the test to see the results of your Query Builder changes.

Table 5-17 Test Query screen fields

Field	Description
Test query for policy	Lists the rules in the Query Builder that were used in this test. The rules are specified in the Query Builder on the policy Clients tab.
Test Query Results	VM Name: Shows the display name of all discovered virtual machines. Selection: Lists the virtual machines that were discovered, as follows: ■ INCLUDED: The virtual machine matches the rules in the query. ■ EXCLUDED: The virtual machine does not match the rules in the query. ■ FAILED: The virtual machine cannot be selected for backup because of a host name problem or other error. Also, the query cannot exclude the virtual machine. An explanation appears at the bottom of the Test Query screen. For example: VM does not have a host name to use as a client name, display name = See “Test Query: Failed virtual machines” on page 76. The operator <code>IsSet</code> can be used to filter out such virtual machines. More information is available on <code>IsSet</code>. See “The <code>IsSet</code> operator in queries” on page 63.

Table 5-17 Test Query screen fields (*continued*)

Field	Description
Included:	The bottom of the screen gives a tally of how many virtual machines were included, excluded, or failed in the test.
Excluded:	
Failed:	

Test Query: Failed virtual machines

If the query rules cannot exclude a virtual machine, and that virtual machine cannot be selected for backup, it is marked as FAILED. The virtual machine is listed as not run in the job details log.

For example: the virtual machine does not have the type of name specified by the **Primary VM identifier** parameter (such as host name or display name). Or the virtual machine name contains invalid characters. In any case, a virtual machine that is listed as FAILED should be investigated: it may be one that you want to back up.

To see the reason for the failure, click on the virtual machine in the Test Query Results. An explanation appears at the bottom of the screen.

Explanation: The virtual machine `Win%1` in the example does not have a host name. In the NetBackup policy, on the **Hyper-V** tab, the **Primary VM identifier** parameter may be set to **VM hostname**. In that case, NetBackup cannot refer to the virtual machine by its host name and thus cannot back it up.

To fix this problem, use the Hyper-V Manager to configure a host name for the virtual machine.

See [“The IsSet operator in queries”](#) on page 63.

Effect of Primary VM identifier parameter on Selection column in Test Query results

The NetBackup policy's **Primary VM identifier** parameter tells NetBackup how to identify virtual machines. For example, if the parameter is set to **VM hostname**, NetBackup identifies virtual machines by their host names. If they do not have a host name, the policy cannot back them up.

The **Primary VM identifier** parameter has a direct effect on the query test results. Note that for each virtual machine, the query test result is one of three possibilities: INCLUDED, EXCLUDED, or FAILED.

Effect of Primary VM identifier parameter on VM Name column in Test query results

If NetBackup cannot identify a virtual machine according to the **Primary VM identifier** parameter, one of two test results can occur:

- If the virtual machine is filtered out by the query rules, it is listed as EXCLUDED.
- If the virtual machine is not filtered out by the query rules, it is listed as FAILED. The following table gives the test query results from example combinations of the **Primary VM identifier** parameter and a query rule.

Table 5-18 Effect of Primary VM identifier parameter and query rules on test query results

Primary VM identifier setting on Hyper-V policy tab	Query rule in Query Builder	Test query result
VM hostname	Displayname Contains "VM"	INCLUDED: Any virtual machines that have a host name and that have a display name that contains "VM". EXCLUDED: Any virtual machines that do not have a display name that contains "VM". FAILED: Any virtual machines that have a display name that contains "VM" but that do not have a host name. Since the Primary VM identifier parameter is set to VM hostname, NetBackup cannot select the virtual machine for backup.
VM display name	Displayname Contains "VM"	INCLUDED: Any virtual machines with the display names that contain "VM". Since the Primary VM identifier parameter tells NetBackup to select the virtual machine by display name, it can back up the virtual machines. EXCLUDED: All other virtual machines.

Effect of Primary VM identifier parameter on VM Name column in Test query results

The policy's **Primary VM identifier** parameter affects the type of virtual machine name that appears in the **VM Name** column of the Test Query screen, as follows:

- If a virtual machine is EXCLUDED or FAILED, it is listed according to its virtual machine display name. The **Primary VM identifier** parameter does not matter.
- If a virtual machine is listed as INCLUDED, note: The name that appears under **VM Name** is the type of name that is specified on the **Primary VM identifier** parameter.

For example: If the **Primary VM identifier** parameter is **VM hostname**, the included virtual machine is listed according to its host name. Even if the query

rule specified Display name (such as `Displayname Equal "vm1"`), the virtual machine appears on the Test Query screen by its host name.

Restoring a VM that was backed up with a Hyper-V Intelligent Policy and that has a pass-through disk

If a Hyper-V VM with a pass-through disk was backed up with a Hyper-V intelligent policy (Query Builder), the restored VM may not start. The following message appears:

```
An error occurred while attempting to start the selected virtual machine(s) .
```

The message includes the name of the VM, its virtual machine ID, and related details.

Note: Although the VM does not start, the VM data (including the pass-through disk) is successfully restored.

To start a VM that is in a Hyper-V cluster:

- 1 In the Failover Cluster Manager, under **Actions** click **Configure Role...**
- 2 In the **Select Role** screen, select **Virtual Machine** as the role.
- 3 In the **Select Virtual Machine** screen, select the VM to configure for high availability.

Note: The VM was restored to a state of non high-availability.

When the restored virtual machine is set to high availability, it should start normally.

- 4 Right-click on the VM and click **Start**.

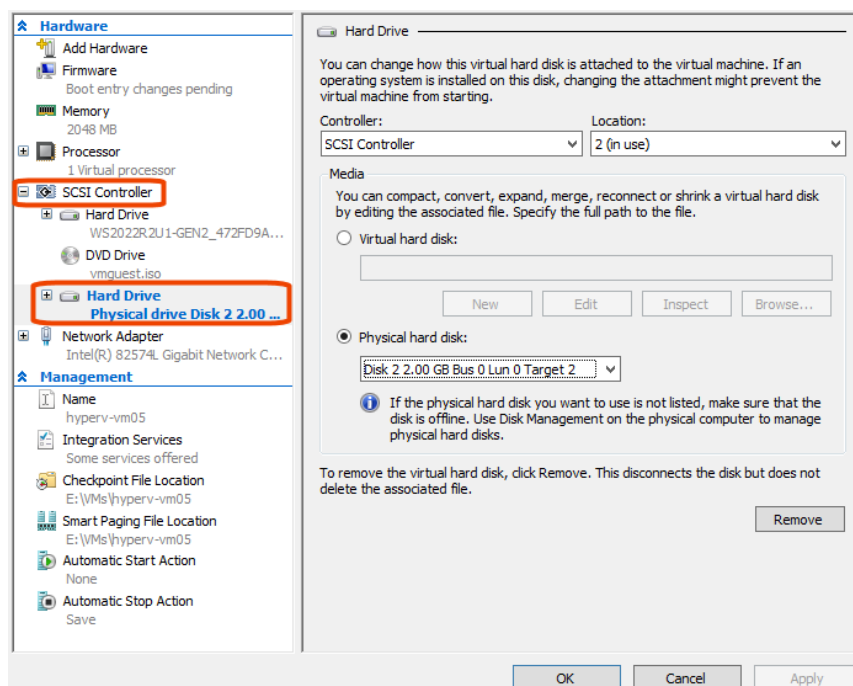
Restoring a VM that was backed up with a Hyper-V Intelligent Policy and that has a pass-through disk

To start a VM that is not in a Hyper-V cluster:

- 1 In the Hyper-V Manager, right-click the VM and click **Settings**.
- 2 Select the pass-through drive's **IDE Controller** (for Generation 1 VM) or the **SCSI Controller** (for Generation 2 VM).

The pass-through disk appears under the controller, as **Hard Drive Physical drive Disk x**.

For example:

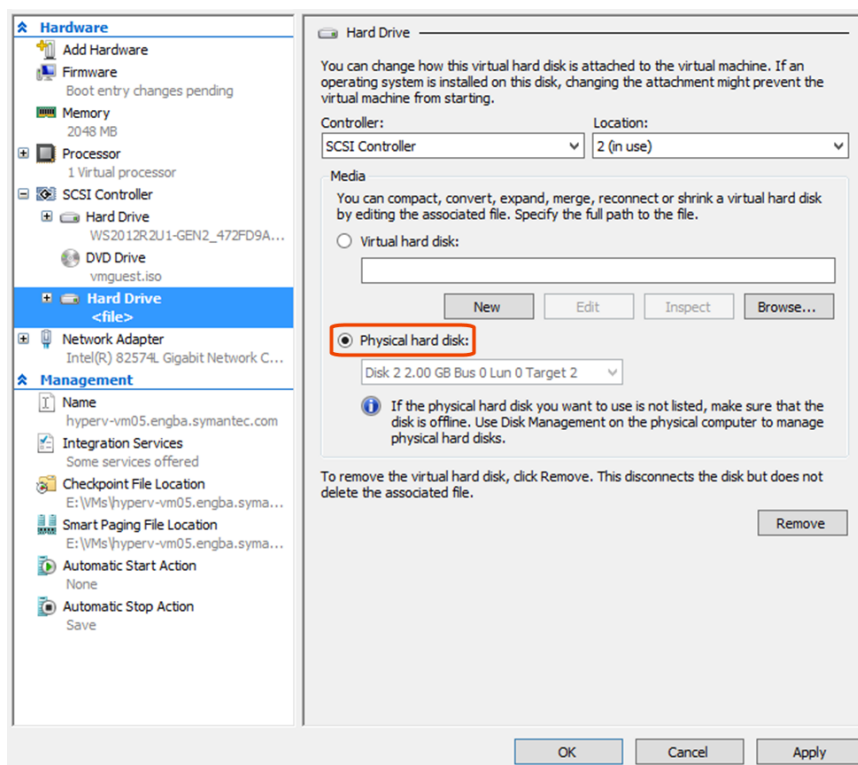


- 3 In the right panel under **Physical hard disk**, click **Remove**.
- 4 Click **Apply** to commit the change.
- 5 Reselect the pass-through drive's **IDE Controller** or **SCSI Controller**.
- 6 Select **Hard Drive** and click **Add**.

Beneath the IDE Controller or SCSI Controller appears **Hard Drive <file>**. The default selection in the **Media** panel on the right is **Virtual hard disk**.

Restoring a VM that was backed up with a Hyper-V Intelligent Policy and that has a pass-through disk

- 7 To add the pass-through disk, click **Physical hard disk**.



- 8 Click **Apply** and then click **OK**.
- 9 Right-click on the virtual machine and click **Start**.
- The virtual machine should start normally.

NetBackup Hyper-V for SCVMM

This chapter includes the following topics:

- [About backup of virtual machines in an SCVMM environment](#)
- [Notes on NetBackup for Hyper-V with SCVMM](#)
- [Creating a query to back up VMs in a localized SCVMM environment](#)

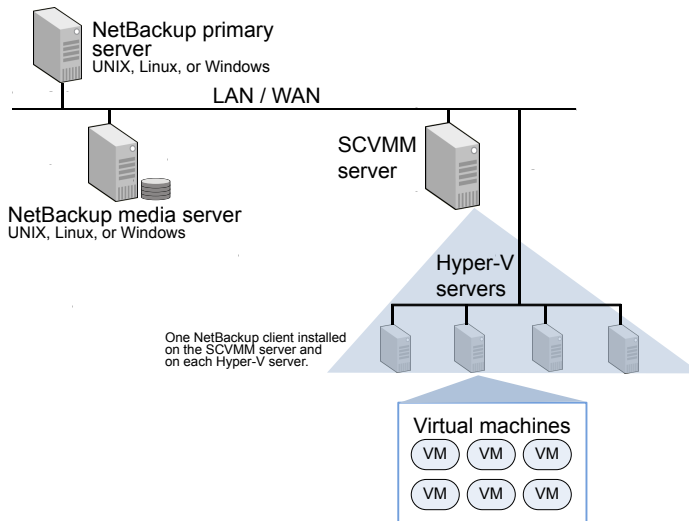
About backup of virtual machines in an SCVMM environment

A NetBackup Hyper-V Intelligent policy can protect VMs that Microsoft's System Center Virtual Machine Manager (SCVMM) manages. By means of queries in the policy's Query Builder, a policy can discover and back up the VMs on all the Hyper-V servers that SCVMM manages.

Note: To restore the VMs, you can use the NetBackup Backup, Archive, and Restore interface, or the NetBackup Add-in for SCVMM.

[Figure 6-1](#) shows NetBackup in an SCVMM environment. SCVMM manages multiple Hyper-V servers. A NetBackup policy can discover and back up the VMs on all the Hyper-V servers.

Figure 6-1 NetBackup for Hyper-V under SCVMM



Note: This SCVMM feature requires NetBackup's Hyper-V Intelligent Policy (automatic selection of VMs through a predefined query).

Note: This SCVMM feature adds a new capability: For VMs that reside under SCVMM, NetBackup can identify and back up VMs by their host name even if they are shut down.

Note: In an SCVMM managed environment, dynamic optimization can trigger more frequent migration. If there are frequent retries happening, configure VM optimization actions correctly to manage VM migrations.

The following topics contain further information on NetBackup for Hyper-V with SCVMM:

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

See [“Examples for the NetBackup Query Builder”](#) on page 61.

See [“Query Builder field reference”](#) on page 67.

See [“Notes on NetBackup for Hyper-V with SCVMM”](#) on page 83.

Notes on NetBackup for Hyper-V with SCVMM

Note the following about NetBackup for Hyper-V with SCVMM:

- Requires SCVMM 2012 R2 or later.
 For a list of supported versions of SCVMM, see the appropriate version of the NetBackup Software Compatibility List available from the following location:
[NetBackup Compatibility List for all Versions](#)
- NetBackup client software must be installed on the SCVMM server and on each Hyper-V server.
- Certain kinds of VMs are excluded from the backup list when the NetBackup Hyper-V policy runs:
 - Hyper-V VMs that are marked for deletion.
 - Hyper-V VM templates.
 - Hyper-V VMs that are stored on an SCVMM library server.
 - Any VMs that do not reside on a Hyper-V server, such as VMware VMs.

Note: SCVMM can manage non-Hyper-V VMs. NetBackup for Hyper-V does not back up these VMs. To back up VMware VMs for example, use NetBackup for VMware.

The **Test Query** dialog lists these types of VMs as **Excluded**, with a message that explains the reason for the exclusion. (The **Test Query** option is available on the policy **Clients** tab.)

- Changes that are made through Hyper-V Manager on individual Hyper-V hosts or clusters can take up to 24 hours to be reflected in SCVMM. This delay is due to the Microsoft SCVMM refresh cycle. In an SCVMM environment, Microsoft recommends making VM configuration changes through SCVMM (not through the Hyper-V Manager on individual hosts or clusters). Changes that are made through the SCVMM Console are reflected immediately in SCVMM.
- In an SCVMM environment, the VM GUID is referred to as the **VM ID**.

Caution: If the SCVMM environment includes multiple VMs that have the same VM ID, each SCVMM refresh cycle reports only one of the VMs. Any other VM with the same VM ID is not visible. The NetBackup policy can back up only the VM that is currently reported or visible. Any other VM that has the same VM ID is not visible and is not backed up.

To make sure that NetBackup can discover and back up all VMs, avoid duplicate VM IDs in the SCVMM environment.

- To back up VMs in an SCVMM environment, the NetBackup policy must use queries to select the VMs automatically (Hyper-V Intelligent Policy). If the query includes localized (non-English) values, the policy may not be able to select and back up the VMs.

See [“Creating a query to back up VMs in a localized SCVMM environment”](#) on page 84.

Creating a query to back up VMs in a localized SCVMM environment

This topic describes how to create a query in a Hyper-V Intelligent Policy to back up VMs in a localized (non-English) SCVMM environment.

To create a Hyper-V Intelligent Policy for a non-localized (English) SCVMM environment, see the following topic:

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

To create a query to back up VMs in a localized SCVMM environment

- 1 In the policy's **Query Builder**, select from the **Join**, **Field**, and **Operator** fields to begin building the query.
- 2 Use the browse button to retrieve the possible values for the **Field** keyword.
- 3 Click the value to use in the query.
- 4 Click **Save** to add a query with that value.

Windows Server failover cluster support

This chapter includes the following topics:

- [About virtual machines on Windows failover clusters](#)
- [Notes on CSV backup and restore](#)
- [Creating a policy for virtual machines in a cluster](#)
- [Location of the restored virtual machine in a cluster](#)
- [Virtual machine maintenance after a restore](#)

About virtual machines on Windows 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 88.
- 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 89.

Notes on CSV backup and restore

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

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.
- Cluster nodes can back up the same CSV simultaneously.
See [“Cluster shared volumes timeout \(Hyper-V with VSS\)”](#) on page 39.
- 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.
- For a successful backup of a virtual machine on a CSV, the virtual machine must use CSV volumes only. If a local disk on the Hyper-V server (not a CSV volume) is added to the virtual machine, the backup fails with status 156.
Reconfigure the virtual machine to use CSV volumes only, and retry the backup.

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”](#) on page 31.

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

- 1** Open the NetBackup web UI.
- 2** On the left, click **Protection > Policies**.
- 3** Select **Hyper-V** as the policy type.
- 4** Click the **Hyper-V** tab and select the backup method (VSS or WMI).
- 5** For the VSS backup method only: 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 of non-VSS VMs \(Hyper-V with VSS\)”](#) on page 38.

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 \(Hyper-V with VSS\)”](#) on page 39.

- 6** On the **Clients** tab, enter the name of the cluster in the **Hyper-V server** field.
- 7** On the **Clients** tab, click **Add**.

Note: This procedure describes how to select virtual machines manually. For automatic selection of virtual machines with a Hyper-V Intelligent policy, see the following topics:

See [“Creating a Hyper-V policy for automatic virtual machine selection”](#) on page 56.

See [“Changing the NetBackup Legacy Network Service logon \(vnetd.exe\) to the domain user account”](#) on page 23.

- 8** You can enter the host name, display name, or GUID of the virtual machine to back up, or click **Browse virtual machines**.

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 **Highly available** 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.
- 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.

9 When you have selected virtual machines, click **Add** or **Select**.

The selected virtual machines display 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 7-1 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	For both WMI and VSS: Restored to the node that owns the virtual machine at the time of restore.

Table 7-1 Decision chart for restore to original location in a cluster
(continued)

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	No	For both WMI and VSS: Restored to the node where the virtual machine resided at the time of backup.
Yes	Virtual machine does not exist.	For both WMI and VSS: Restored to the node where the virtual machine resided at the time of backup.
No	Yes	For both WMI and VSS: Restored to the node where the virtual machine resided at the time of backup. At the time of restore, if the virtual machine resides on a different node than where it resided when backed up, the restore fails.
No	No	For both WMI and VSS: Restored to the node where the virtual machine resided at the time of backup.
No	Virtual machine does not exist.	For both WMI and VSS: Restored to the node where 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 90.
- 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 Windows Server Failover Cluster (WSFC) 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 WSFC software automatically removes the virtual machine's group resources as well, as described in the following table.

Table 7-2 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](#)
- [WMI backup method: State of the virtual machine before and after restore](#)
- [Notes on individual file restore](#)
- [Notes on full virtual machine restore](#)
- [About restoring individual files](#)
- [Restoring individual Hyper-V files to a host that has a NetBackup client](#)
- [Restore options for restore of Hyper-V individual files \(NetBackup web UI\)](#)
- [Restoring individual Hyper-V files to a shared location on the virtual machine](#)
- [Restoring the full Hyper-V virtual machine](#)
- [Restore Options](#)
- [About restoring common files](#)
- [The BAR interface may list Hyper-V snapshot files when you browse to restore Hyper-V VM files](#)

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.

To create the policy, you can use the NetBackup web UI.

See [“Creating a Hyper-V policy”](#) on page 31.

To back up a virtual machine manually from an existing policy

- 1 Open the NetBackup web UI.
- 2 On the left, click **Protection > Policies**.
- 3 Select the policy.
- 4 Click **Manual backup**.
- 5 Select the type of schedule for the backup.
- 6 Select the clients (virtual machines) to back up.
- 7 Click **Backup** to start the backup.
- 8 To watch the backup progress, click **Activity monitor**.

WMI backup method: State of the virtual machine before and after restore

Unlike the VSS backup method, the WMI method (for Windows Server 2016 and later) does not employ online vs offline backups.

Table 8-1 WMI backup method: State of the virtual machine before and after restore

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

Notes on individual file restore

Note the following:

- If you are running antivirus protection on Hyper-V virtual machines, it is recommended 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 primary 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 Hyper-V files to a host that has a NetBackup client”](#) on page 97.

- 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 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.
- 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 146.

- 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 VMs on a Windows 2012 R2 Hyper-V server, the BAR interface may list Hyper-V snapshot files when you browse to restore VM files. In some cases, the snapshot file data is not application consistent and the file should not be restored.

To identify the snapshot file and to decide whether to restore it:

See [“The BAR interface may list Hyper-V snapshot files when you browse to restore Hyper-V VM files”](#) on page 110.

- For Linux, additional notes apply.
See [“Notes on Linux virtual machines”](#) on page 21.
- 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 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 [“Restored virtual machine fails to start”](#) on page 144.
- 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 virtual disk files on the destination server, the virtual disk files from the backup are not restored.

- (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 136.

- If you restore a virtual machine to a different Hyper-V server, 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 144.
- A restore of a virtual machine to an alternate location fails if any of its virtual disks has an ampersand (&) in its path. As a workaround, restore the virtual machine to its original location, or restore to a staging location and register the virtual machine manually.

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 Hyper-V virtual machine”](#) on page 102.

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

See [“Creating a Hyper-V policy”](#) on page 31.

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 Hyper-V files to a shared location on the virtual machine”](#) on page 100.
 See [“Setting up NetBackup Client Service for restore to a shared location on the virtual machine”](#) on page 101.
- 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 Hyper-V files to a host that has a NetBackup client”](#) on page 97.
- 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 Hyper-V files to a host that has a NetBackup client”](#) on page 97.

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 95.

See [“Notes on individual file restore”](#) on page 92.

Restoring individual Hyper-V 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 Hyper-V files to a host that has a NetBackup client

- 1 Open the NetBackup web UI.
- 2 On the left, click **Recovery > Regular recovery**. Then click **Start recovery**.

3 Select the following.

Server to use for backups and restores	Enter the NetBackup primary server that performed the Hyper-V backup.
Source client for restores	Enter the Hyper-V virtual machine that was backed up.
Destination client for restores	Enter 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 Hyper-V files to a shared location on the virtual machine" on page 100.
Policy type for restores	Enter Hyper-V .

4 On the **Basic properties** tab, select the following.

Policy type	Enter Hyper-V .
Restore type	Select Normal backups .
Source client	Enter the Hyper-V virtual machine that was backed up.
Destination client	Enter 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 Hyper-V files to a shared location on the virtual machine" on page 100.

5 Click **Next**.

6 NetBackup automatically displays the most recent backups available. Or, you can select a date range or **Use backup history**.

7 Select the files to restore.

8 Click **Next**.

9 Select the recovery options.

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 Hyper-V files to a shared location on the virtual machine”](#) on page 100.
 - **Restore individual directories 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.
- 10 Click **Next**.
- 11 Review the recovery details. Then click **Start recovery**.

Restore options for restore of Hyper-V individual files (NetBackup web UI)

Select from the following restore options.

Table 8-2 Options for individual file restore

Option	Description
Restore everything to its original location	Restores the folders and files to the location where they resided when the backup occurred.
Restore everything to a different location	Restores the folders and files with their original hierarchy, but to a different location. Use the Destination field to enter the restore location. 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 individual directories and files to different locations	Restores the folders and files to individually designated locations.

Table 8-2 Options for individual file restore (continued)

Option	Description
Allow overwrite of existing files	If any of the files that you want to restore already exist at the restore destination, the restore overwrites the existing files.
Media server	Defines the media server that has access to the storage unit that contains the backup image. An example of such an environment is a Media Server Deduplication Pool (MSDP) with multiple media servers. Note: If the storage unit that contains the backup image is not shared with multiple media servers, this option is grayed out.
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.

Restoring individual Hyper-V 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 In the NetBackup web UI, click **Recovery > Regular recovery > Start recovery**.

- On the **Basic properties** tab, enter the following details:.

Restore type	Specify the restore type as normal backup.
Source client	Specify the Hyper-V virtual machine that was backed up.
Destination client	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	Specify Hyper-V.

- Click **Next**.
- NetBackup automatically displays the most recent backups available. Or, you can select a date range or **Use backup history**.
- In the **Restore target** section, select **Restore everything to a different location**.

In the **Destination:** field, enter 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.

- 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 101.

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 Hyper-V virtual machine

This topic pertains to NetBackup for Hyper-V.

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:

See [“Notes on full virtual machine restore”](#) on page 95.

To restore the entire Hyper-V virtual machine

- 1 Start the **NetBackup** web UI.
- 2 On the left, click **Recovery > Regular recovery** and click **Start recovery**.
- 3 On the **Basic properties** tab, select the following.

Policy type	Enter Hyper-V .
Restore type	Select Virtual machine backups .
Source client	Enter the Hyper-V virtual machine that was backed up.
Destination client	Enter 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 Hyper-V files to a shared location on the virtual machine” on page 100.

- 4 Click **Next**.

- 5 NetBackup automatically displays the most recent backups available. Or, you can select a date range or **Use backup history**.
- 6 Select the backup of the virtual machine that you want to restore.
Click **Next**.
- 7 Select the recovery options. See the table below for different options:
- 8 **Hyper-V virtual machine GUID** Shows the Hyper-V hostname and 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 hostname.

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 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 on the destination server, that virtual machine is removed along with its configuration and snapshot files. Any existing .vhd 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 with NetBackup status code 5.
- If the **Overwrite virtual machine** option is not selected and .vhd file(s) for the virtual machine still exist on the destination: the .vhd file(s) from the backup are not restored.

See [“Problems with restore of the full virtual machine”](#) on page 147.

If you selected **Restore to staging location**, note the following:

- If the .vhd file you want to restore already exists on the destination server in the location specified for the restore, 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 location specified for the restore, 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

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 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 virtual machine configuration files (.xml, .vsv, and .bin files) and .avhd files are not de-selectable in restores other than staging restores.

Note: 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.

Note the following about the listed files:

- If you do not select any .vhd files, NetBackup tries to find them in their original location. If they are missing at the original location, the restore fails. If a parent .vhd file was in E:\myVhds\ on the original machine and is not selected during restore, NetBackup looks for the parent .vhd file in E:\myVhds\ on the target 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 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 staging location, enter the path on the server or other machine 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.

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.

9 Click **Next** dialog.

10 Review the details.

11 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 for VSS”](#) on page 153.

See [“About restoring individual files”](#) on page 96.

See [“NetBackup administrator tasks for Hyper-V”](#) on page 14.

See [“Problems with restore of the full virtual machine”](#) on page 147.

Restore Options

Select from the following restore options.

Note: The available options depend on the backup method that was used to make the backup: WMI or VSS.

Table 8-3 Restore Options

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. In an SCVMM environment, the VM GUID is referred to as the VM ID .
Restore Options	See the following fields.
Restore to original Hyper-V server	Restores the virtual machine to its original location on the original Hyper-V server.

Table 8-3 Restore Options (*continued*)

Option	Description
Restore to different location on the original or 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 volume or vhdx volume to a virtual machine. The virtual machine must not be 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 file(s) or vhdx file(s) from the backup are not restored. See “Problems with restore of the full virtual machine” on page 147. If you selected Restore to staging location, note the following: ■ If the vhd file or vhdx file already exists on the destination server in the 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.
Retain original GUID	Keeps the original GUID for the restored virtual machine. To generate a new GUID for the restored virtual machine, clear this option. Note: This option applies only to the virtual machines on Hyper-V Server 2016 (and later) that were backed up with the WMI method. Note: For restore to the original location (Restore to original Hyper-V server), the Retain Original GUID option is selected and cannot be deselected. Note: NetBackup does not generate a new GUID if you select Restore to staging location.

Table 8-3 Restore Options (*continued*)

Option	Description
Hyper-V virtual machine original GUID	Shows the virtual machine's original GUID. Note: This option applies only to virtual machines on Hyper-V Server 2016 and later.
Hyper-V virtual machine display name	You can enter a new display name for the restored virtual machine. Note: This option applies only to virtual machines on Hyper-V Server 2016 and later. Note: This option is not available if you select Restore to staging location .
Restore Destinations	See the following fields.
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), enter 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, deselect those files. Leave a check mark next to the files that you want to restore. The files that are not selected are not restored. Note that the following virtual machine configuration files are not de-selectable in restores other than staging restores: The 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, deselect the common files that you do not want to restore. Note the following about the listed files: ■ If you do not select any vhd files 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 deselect any vhd files or vhdx files in this list. All other files are pre-selected and cannot be deselected. ■ For Restore to staging location, you can deselect 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.

Table 8-3 Restore Options (*continued*)

Option	Description
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.
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.
Media Server	You can use this option to select a media server that has access to the storage unit that contains the backup image. An example of such an environment is a Media Server Deduplication Pool (MSDP) with multiple media servers. Note: If the storage unit that contains the backup image is not shared with multiple media servers, this option is grayed out.

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.

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.

The BAR interface may list Hyper-V snapshot files when you browse to restore Hyper-V VM files

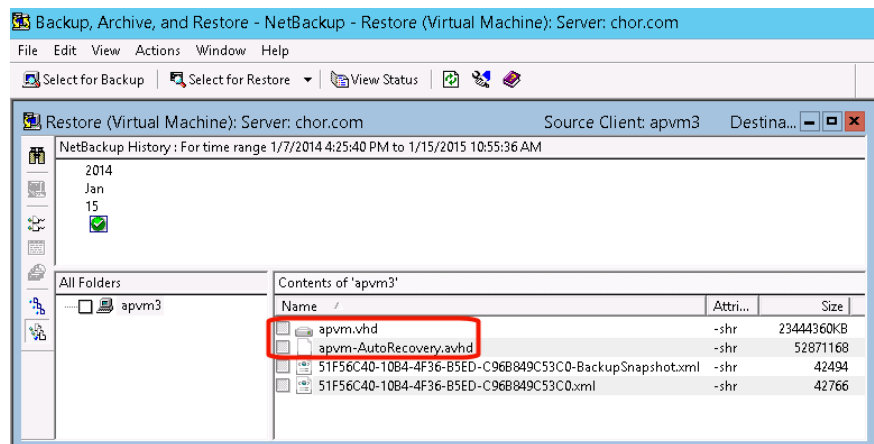
When restoring common files, note the following:

- 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, deselect the common vhd files or vhdx files under **List of backed up files**. The restore does not replace the files on the destination Hyper-V server that are not selected.
- To overwrite the existing common files, select 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 under **Restore everything to different directory**.

The BAR interface may list Hyper-V snapshot files when you browse to restore Hyper-V VM files

The NetBackup Backup, Archive, and Restore interface may list Hyper-V snapshot files when you browse to restore VM files.

For example:



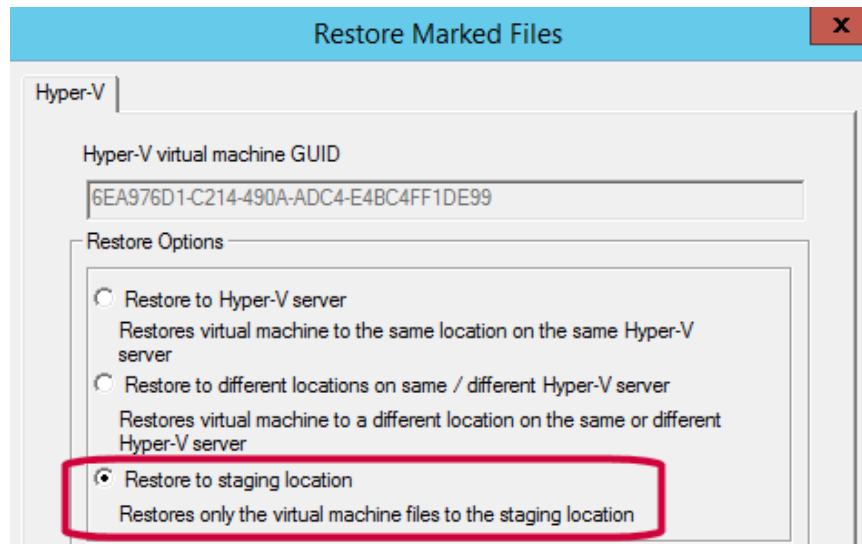
In this example, `apvm-AutoRecovery.avhd` is a Hyper-V snapshot file (`apvm.vhd` is the parent vhd file).

The BAR interface may list Hyper-V snapshot files when you browse to restore Hyper-V VM files

NetBackup automatically uses or ignores the snapshot data as appropriate when you restore the VM to its original location or to a different location.

However, in the following case you must decide whether to restore the Hyper-V snapshot file or to exclude it from the restore:

- In the BAR interface you select **Restore from Virtual Machine Backup**.
- And on the **Restore Marked Files** dialog, you select **Restore to staging location**.



In this case, use the following criteria (based on Hyper-V server version) to identify the snapshot file and to decide whether to restore it:

On a Windows 2012 R2 Hyper-V server

For VMs with a Linux guest OS: The Hyper-V snapshot file is `ChildVhd.avhd` or `ChildVhd.avhdx`. The data in this snapshot is not application consistent. In most instances it is best not to restore this file.

Note: If you select **Restore to Hyper-V server** or **Restore to different locations on same / different Hyper-V server**, NetBackup automatically excludes the snapshot file.

Note: In the snapshot's parent file (apvm.vhd in the example) and in the other VM files, the data is complete. To restore the VM data, you should restore those files.

The BAR interface may list Hyper-V snapshot files when you browse to restore Hyper-V VM files

On a Windows 2012 R2 Hyper-V server with the 2012 R2 update of April 2014

For VMs with a Linux guest OS: The Hyper-V snapshot file is named *vmname_guid.avhd* or *vmname_guid.avhdx*. The data in this snapshot is not application consistent. In most instances it is best not to restore this file.

Note: If you select **Restore to Hyper-V server** or **Restore to different locations on same / different Hyper-V server**, NetBackup automatically excludes the snapshot file.

Note: In the snapshot's parent file (apvm.vhd in the example) and in the other VM files, the data is complete. To restore the VM data, you should restore those files.

On a Windows 2012 R2 Hyper-V server with or without the 2012 R2 update of April 2014

For VMs with a Windows 2012/2012 R2 guest OS: The Hyper-V snapshot file is *AutoRecovery.avhd* or *AutoRecovery.avhdx*. The data in this snapshot is application consistent. To restore the VM data, you should restore this file along with the parent vhd(x) file.

Note: If you select **Restore to Hyper-V server** or **Restore to different locations on same / different Hyper-V server**, NetBackup automatically incorporates the snapshot data in the restore.

Use Accelerator to back up Hyper-V

This chapter includes the following topics:

- [About the NetBackup Accelerator for virtual machines](#)
- [Accelerator: full vs. incremental schedules](#)
- [How the NetBackup Accelerator works with virtual machines](#)
- [Accelerator notes and requirements for virtual machines](#)
- [Accelerator forced rescan for virtual machines \(schedule attribute\)](#)
- [Accelerator requires the OptimizedImage attribute](#)
- [Accelerator backups and the NetBackup catalog](#)
- [Accelerator messages in the backup job details log](#)
- [NetBackup logs for Accelerator with virtual machines](#)
- [About reporting the amount of Accelerator backup data that was transferred over the network](#)
- [Replacing the Accelerator image size with the network-transferred data in NetBackup command output](#)

About the NetBackup Accelerator for virtual machines

NetBackup Accelerator reduces the backup time for Hyper-V backups. NetBackup uses Hyper-V resilient change tracking (RCT) to identify the changes that were

made within a virtual machine. Only the changed data blocks are sent to the NetBackup media server, to significantly reduce the I/O and backup time. The media server combines the new data with previous backup data and produces a traditional full NetBackup image that includes the complete virtual machine files.

Note: Accelerator is most appropriate for virtual machine data that does not experience a high rate of change.

Accelerator has the following benefits:

- Performs the full backups faster than traditional backup. Creates a compact backup stream that uses less network bandwidth between the backup host and the server.
Accelerator sends only changed data blocks for the backup. NetBackup then creates a full traditional NetBackup image that includes the changed block data.
- If the **Enable file recovery from VM backup** option on the policy **Hyper-V** tab is enabled, you can restore individual files from the backup (full or incremental).
- Reduces the I/O on the backup host.
- Reduces the CPU load on the backup host.

Accelerator: full vs. incremental schedules

NetBackup Accelerator supports full and incremental backups.

Note: After an initial full backup, Accelerator backups with a full schedule have about the same effect on I/O and performance as traditional incremental backups. The NetBackup catalog however includes all catalog references that would be made if the backup was a traditional (non-Accelerator) full.

Note: After upgrade from any of the previous release, If the customer has configured accelerator enabled Hyper-v policy, then optimization will be lost only for first backup.

How the NetBackup Accelerator works with virtual machines

To enable acceleration of virtual machine backups from Hyper-V policies, in the NetBackup web UI click the policy's **Hyper-V** tab and select **Windows Management Instrumentation (WMI)**. Then select **Use Accelerator**.

See [“Creating a Hyper-V policy”](#) on page 31.

The NetBackup Accelerator creates the backup stream and backup image for each virtual machine as follows:

- If the virtual machine has no previous backup, NetBackup performs a full backup. Hyper-V resilient change tracking (RCT) is enabled to track the data in use for each virtual disk.
- At the next backup, NetBackup identifies data that has changed since the previous backup. Only changed blocks and the header information are included in the backup, to create a full virtual disk backup.
- The backup host sends to the media server a tar backup stream that consists of the following: The virtual machine's changed blocks, and the previous backup ID and data extents (block offset and size) of the unchanged blocks.
- The media server reads the virtual machine's changed blocks, the backup ID, and information about the data extents of the unchanged blocks. From the backup ID and data extents, the media server locates the rest of the virtual machine's data in existing backups.
- The media server directs the storage server to create a new full image that consists of the following: The newly changed blocks, and the existing unchanged blocks that reside on the storage server. The storage server may not write the existing blocks but rather link them to the image.

Accelerator notes and requirements for virtual machines

Note the following about Accelerator for virtual machines:

- Accelerator for Hyper-V is available for virtual machines on Hyper-V Server 2016 and later. In the web UI open the Hyper-V policy. Click the policy's **Hyper-V** tab and select **Windows Management Instrumentation (WMI)**. Then select **Enable block-level incremental backup** and **Use Accelerator**.
- Accelerator for virtual machines uses Hyper-V resilient change tracking (RCT) to identify the changes that were made within a virtual machine.
- After the first Accelerator backup: If you create a checkpoint on the VM (or delete a checkpoint), the next backup from that policy is a full backup. That is, the backup processing for the second backup is not limited to changed blocks: Under **Accelerator Optimization** in the NetBackup Activity Monitor, the optimization rate is 0%.

If you create another checkpoint and run a third Accelerator backup: The optimization rate may increase, depending on the amount of data that is captured

in the checkpoint (the size of the checkpoint file). The smaller the checkpoint file, the higher the rate of optimization in the third backup.

Similarly, if a checkpoint is deleted after the second backup, the optimization rate in the next backup depends on the size of the virtual disk that was affected by the checkpoint deletion.

- Supports the disk storage units that have the following storage destinations:
 - Cloud storage. Storage that a supported cloud storage vendor provides.
 - NetBackup Media Server Deduplication Pool. In addition to NetBackup media servers, NetBackup 5200 series appliances support Media Server Deduplication Pool storage.
 - Qualified third-party OpenStorage devices.

To verify that your storage unit supports Accelerator, refer to the NetBackup hardware compatibility list for the currently supported OST vendors:

[NetBackup Compatibility List for all Versions](#)

- It is recommended that you do not enable **Expire after copy** retention for any storage units that are used with storage lifecycle policies (SLP) in combination with Accelerator. The **Expire after copy** retention can cause images to expire while the backup runs. To synthesize a new full backup, the SLP backup needs the previous backup image. If the previous image expires during the backup, the backup fails.
- Update the NetBackup device mapping files if needed.
 The NetBackup device mapping files contain all storage device types that NetBackup can use. To add support for the new devices or upgraded devices that support Accelerator, download the current device mapping files from the Veritas Technical Support website.
 See the *NetBackup Administrator's Guide Volume I* for information on the device mapping files and how to download them.
- Storage unit groups are supported only if the storage unit selection in the group is Failover.
- Supports the full backups and incremental backups. Every Accelerator backup (from a full schedule or incremental schedule) results in a complete image of the virtual machine.
- You can use incremental backups (cumulative or differential) as follows: To reduce the file-mapping overhead and to reduce the number of files that are recorded in the NetBackup catalog. Cumulative backups may involve more file-mapping because they do not use the random indexing method to determine which files have changed. In some cases, differential backups may be faster than cumulative backups.

- If a backup of the virtual machine does not exist, NetBackup performs a full backup. This initial backup occurs at the speed of a normal (non-accelerated) full backup. Subsequent Accelerator backups of the virtual machine use resilient change tracking (RCT) to accelerate the backup.
- If the storage unit that is associated with the policy cannot be validated when you create the policy, note: The storage unit is validated later when the backup job begins. If Accelerator does not support the storage unit, the backup fails. In the `bpbrm` log, a message appears that is similar to one of the following:

```
Storage server %s, type %s, doesn't support image include.
```

```
Storage server type %s, doesn't support accelerator backup.
```

- Accelerator requires the storage to have the `OptimizedImage` attribute enabled. See [“Accelerator requires the `OptimizedImage` attribute”](#) on page 118.

Accelerator forced rescan for virtual machines (schedule attribute)

Accelerator for virtual machines uses Hyper-V resilient change tracking (RCT) to identify changed blocks. NetBackup requires the changed blocks when it creates a full virtual machine (synthesized) image. NetBackup is therefore dependent on RCT for correctly identifying changed blocks. To protect against any potential omissions by underlying Hyper-V resilient change tracking (RCT) using timestamps, the **Accelerator forced rescan** option conducts the backup by reading all allocated blocks from the virtual hard disk.

This option provides a safety net by establishing a new baseline for the next Accelerator backup.

When **Accelerator forced rescan** is used, all the data on the virtual machine is backed up. This backup is similar to the first Accelerator backup for a policy. For the forced rescan job, the optimization percentage for Accelerator is 0. The duration of the backup is similar to a non-Accelerator full backup.

As an example: You can set up a weekly full-backup schedule with the **Use Accelerator** option. You can supplement that policy with a second schedule that enables the **Accelerator forced rescan** option, to run every 6 months.

Note: **Accelerator forced rescan** is unavailable if the **Use Accelerator** option on the **Hyper-V** tab is not selected.

Accelerator requires the OptimizedImage attribute

Accelerator requires that the storage has the `OptimizedImage` attribute enabled.

To ensure that your storage is configured properly, see the documentation for your storage option:

- **NetBackup Media Server Deduplication Pool.**
 The `OptimizedImage` attribute is enabled by default. If you created the storage servers and pools in an earlier release, you must configure them for `OptimizedImage`.
 See the *NetBackup Deduplication Guide*.
- **Backups to a third-party disk appliance.**
 The storage device must support the `OptimizedImage` attribute.
 See the *NetBackup OpenStorage Solutions Guide for Disk*.
- **Cloud storage that NetBackup supports.**
 See the *NetBackup Cloud Administrator's Guide*.

Accelerator backups and the NetBackup catalog

Use of Accelerator does not affect the size of the NetBackup catalog. A full backup with Accelerator generates the same catalog size as a full backup of the same data without Accelerator. The same is true of incremental backups: use of Accelerator does not require more catalog space than the same backup without Accelerator.

A potential catalog effect does exist, depending on how often you use Accelerator with full backups. A full backup with Accelerator completes faster than a normal full. It may therefore be tempting to replace your incremental backups with Accelerator full backups. Note: Since a full backup requires more catalog space than an incremental, replacing incrementals with fulls increases the catalog size. When changing your incrementals to fulls, you must weigh the advantage of Accelerator fulls against the greater catalog space that fulls require compared to incrementals.

Accelerator messages in the backup job details log

When a virtual machine is first backed up, Accelerator is not used for that backup. The following messages appear in the job details log:

```

7/25/2012 4:45:35 PM - Info bpbrm(pid=6192) There is no complete
backup image match with track journal, a regular full backup will
be performed

...

7/25/2012 4:53:22 PM - Info bpbkar32(pid=5624) accelerator sent
5844728320 bytes out of 5844726784 bytes to server, optimization 0.0%

```

When subsequent backups of the virtual machine use Accelerator, the following messages appear in the job details log:

```

7/27/2012 4:40:01 AM - Info bpbrm(pid=412) accelerator enabled

...

7/27/2012 4:43:07 AM - Info bpbkar32(pid=4636) accelerator sent
74764288 bytes out of 5953504256 bytes to server, optimization 98.7%

```

This message is a key trace for Accelerator. In this example Accelerator was successful at reducing the backup data by 98.7%.

NetBackup logs for Accelerator with virtual machines

Accelerator does not require its own log directory. For log messages about Accelerator, see the following standard NetBackup log directories.

Table 9-1 NetBackup logs that may contain Accelerator information

Log directory	Resides on
UNIX: <code>/usr/opensv/netbackup/logs/bpbrm</code> Windows: <code>install_path\NetBackup\logs\bpbrm</code>	NetBackup primary or media server
UNIX: <code>/usr/opensv/netbackup/logs/bptm</code> Windows: <code>install_path\NetBackup\logs\bptm</code>	NetBackup media server
UNIX: <code>/usr/opensv/netbackup/logs/bpbkar</code> Windows: <code>install_path\NetBackup\logs\bpbkar</code>	Backup host
UNIX: <code>/usr/opensv/netbackup/logs/bpfis</code> Windows: <code>install_path\NetBackup\logs\bpfis</code>	Backup host

Table 9-1 NetBackup logs that may contain Accelerator information
(continued)

Log directory	Resides on
VxMS logs	See “NetBackup logs for Hyper-V and how to create them” on page 130.

To create the log directories, run the following command on the NetBackup servers and backup host:

On Windows:

```
install_path\NetBackup\logs\mklogdir.bat
```

On UNIX/Linux:

```
/usr/opensv/netbackup/logs/mklogdir
```

About reporting the amount of Accelerator backup data that was transferred over the network

For Accelerator backup reporting, several NetBackup commands can report the amount of data that is transferred over the network for each Accelerator backup. The amount of transferred data is often much less than the size of the Accelerator backup image.

For each Accelerator backup, NetBackup combines the client's (or VM's) changed blocks with the unchanged data from previous backups to synthesize a backup image. However, NetBackup sends only the changed data over the network when the backup occurs. The resulting backup image may be much larger than the amount of backup data that travels the network. For backup reporting, it may be important to distinguish between the backup image size and the amount of data that was transferred over the network.

For Accelerator backups, the network-transferred data can appear in the output of the following NetBackup commands: `bpdjobs`, `bpimagelist`, and `bpclimagelist`.

[Table 9-2](#) lists the default location of these commands.

Table 9-2 Default location of `bpdbjobs`, `bpimagelist`, and `bpclimagelist`

Command	Default location
<code>bpdbjobs</code> , <code>bpimagelist</code>	Windows: <i>install_path\NetBackup\bin\admincmd\</i> UNIX, Linux <i>/usr/opensv/netbackup/bin/admincmd/</i>
<code>bpclimagelist</code>	Windows: <i>install_path\NetBackup\bin\</i> UNIX, Linux <i>/usr/opensv/netbackup/bin/</i>

The following example uses the `bpimagelist` command to show the results of a backup of `acmevm2`:

```
bpimagelist -backupid acmevm2
```

Example output:

```
IMAGE acmevm2 0 0 12 acmevm2 accl_vmware 40 *NULL* root f 0 9 14344
79628 558 2147483647 0 0 7799632 28196 1 2 0 accl_vmware_1434479628_FULL.f *NULL
* *NULL* 0 1 0 0 0 *NULL* 0 0 1 0 0 1434479628 1434479628 *NULL* 0 0 0 *NULL* 9
0 0 3398732 0 0 *NULL* *NULL* 0 1434479620 0 0 *NULL* *NULL* 0 0 0 225792
HISTO 0 0 0 0 0 0 0 0 0 0
FRAG 1 -1 3319 76 0 0 0 @aaaab acmevm6.acme.com 262144 0 0 -1 102
4 1;PureDisk; acmevm6.acme.com;msdp_dp;PureDiskVolume;0 2147483647
0 65545 0 0 0 6 0 1434480186 1 1 *NULL* *NULL* 0 0
FRAG 1 1 7796313 0 0 0 0 @aaaab acmevm6.acme.com 262144 0 0 -1 10
28 1;PureDisk; acmevm6.acme.com;msdp_dp;PureDiskVolume;0 214748364
7 0 65545 0 0 0 6 0 1434480186 1 1 *NULL* *NULL* 0 0
```

Note: This example output is for a VMware backup, but the output formatting is the same for Hyper-V.

In this example, the backup image size in kilobytes is 7799632, and the amount of data that was transferred over the network is 225792.

You can use the following commands to show the amount of data that was transferred over the network for an Accelerator backup.

bpimagelist

`bpimagelist -backupid backup_id [-l | -L | -json | -json_compact]`

Brackets [] indicate optional elements, and the vertical bars | indicate that you can choose only one of the options within the brackets.

Table 9-3 describes how the network-transferred data field appears in the `bpimagelist` output.

Table 9-3 The **bpimagelist** options that show the amount of network-transferred data for Accelerator backups

bpimagelist option	How the network-transferred data field appears
No option	The field is unlabeled. For example: 225792 See the <code>bpimagelist</code> example output earlier in this topic.
-l	The field is unlabeled (same as no option). For example: 225792
-L	The field is labeled. For example: Kilobytes Data Transferred: 225792
-json	The field is labeled. For example: "kilobytes_data_transferred": 225792,
-json_compact	The field is labeled. For example: "kilobytes_data_transferred":225792,

bpdbjobs

`bpdbjobs -jobid job_id -report -most_columns`

or

`bpdbjobs -jobid job_id -report -all_columns`

The network-transferred data field appears at the end of the output.

bpclimagelist

`bpclimagelist -client client_name`

This command can only show the network-transferred data in the field that normally shows the Accelerator backup image size. To show the network-transferred data with this command, you must configure a NetBackup setting:

See [“Replacing the Accelerator image size with the network-transferred data in NetBackup command output”](#) on page 123.

Additional details on these commands are available in the *NetBackup Commands Reference Guide* or in the NetBackup man pages.

Replacing the Accelerator image size with the network-transferred data in NetBackup command output

You can configure the output of `bpimagelist`, `bpdjobs`, and `bpclimagelist` to show the amount of Accelerator backup data that was transferred over the network instead of the backup image size.

The following is the default `bpimagelist` output that shows the Accelerator image size (see the circled value 7799632). The amount of network-transferred data appears farther down in the output (225792):

```
IMAGE acmevm2 0 0 12 acmevm2 accl_vmware 40 *NULL* root f 0 9 14344
79628 558 2147483647 0 0 7799632 28196 1 2 0 accl_vmware_1434479628_FULL.f *NULL
* *NULL* 0 1 0 0 0 *NULL* 0 0 1 0 0 1434479628 1434479628 *NULL* 0 0 0 *NULL* 9
0 0 3398732 0 0 *NULL* *NULL* 0 1434479620 0 0 *NULL* *NULL* 0 0 0 225792
HISTO 0 0 0 0 0 0 0 0 0 0
FRAG 1 -1 3319 76 0 0 0 @aaaab acmevm6.acme.com 262144 0 0 -1 102
4 1;PureDisk; acmevm6.acme.com;msdp_dp;PureDiskVolume;0 2147483647
0 65545 0 0 0 6 0 1434480186 1 1 *NULL* *NULL* 0 0
FRAG 1 1 7796313 0 0 0 0 @aaaab acmevm6.acme.com 262144 0 0 -1 10
28 1;PureDisk; acmevm6.acme.com;msdp_dp;PureDiskVolume;0 214748364
7 0 65545 0 0 0 6 0 1434480186 1 1 *NULL* *NULL* 0 0
```

Note: This example output is for a VMware backup, but the output formatting is the same for Hyper-V.

You can configure NetBackup command output to show the network-transferred data in the image size field. In the output, the image size value is replaced with the network-transferred data value (see the following example). A script that reads the image size from the command output now reads the amount of network-transferred data.

In the following `bpimagelist` output, the image size field shows the network-transferred data (225792):

Replacing the Accelerator image size with the network-transferred data in NetBackup command output

```

IMAGE acmevm2 0 0 12 acmevm2 accl_vmware 40 *NULL* root f 0 9 14344
79628 558 2147483647 0 0 225792 28196 1 2 0 accl_vmware_1434479628_FULL.f *NULL
* *NULL* 0 1 0 0 0 *NULL* 0 0 1 0 0 1434479628 1434479628 *NULL* 0 0 0 *NULL* 9
0 0 3398732 0 0 *NULL* *NULL* 0 1434479620 0 0 *NULL* *NULL* 0 0 0 225792
HISTO 0 0 0 0 0 0 0 0 0 0
FRAG 1 -1 3319 76 0 0 0 @aaaab acmevm6.acme.com 262144 0 0 -1 102
4 1;PureDisk; acmevm6.acme.com;msdp_dp;PureDiskVolume;0 2147483647
0 65545 0 0 0 6 0 1434480186 1 1 *NULL* *NULL* 0 0
FRAG 1 1 7796313 0 0 0 0 @aaaab acmevm6.acme.com 262144 0 0 -1 10
28 1;PureDisk; acmevm6.acme.com;msdp_dp;PureDiskVolume;0 214748364
7 0 65545 0 0 0 6 0 1434480186 1 1 *NULL* *NULL* 0 0

```

Note: The same change occurs in the labeled output of the commands (such as with the `-L` option of `bpimagelist`). For example, the `Kilobytes` field shows the transferred data value (225792 in the example) rather than the Accelerator backup image size.

To enable the reporting of network-transferred data in the Accelerator image size field of `bpimagelist`, `bpdbjobs`, and `bpclimagelist`

- ◆ Use the `bpsetconfig` command to enable the output change.

To enable this change for the `bpclimagelist` command, enter the `bpsetconfig` command on the primary server. To enable this change for `bpimagelist` or `bpdbjobs`, enter the `bpsetconfig` command on the server where you intend to run `bpimagelist` or `bpdbjobs`.

Refer to [Table 9-4](#) for the `bpsetconfig` command to use based on the type of Accelerator backup that you want to report on.

Table 9-4 To enable the reporting of network-transferred data in the Accelerator image size field of **bpimagelist**, **bpclimagelist**, or **bpdbjobs** output

Type of backup to report on	Enter this command
Incremental Hyper-V Accelerator backups	Windows <pre>echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_INC_HYPERV install_path\NetBackup\bin\admincmd\bpsetconfig</pre> UNIX, Linux <pre>echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_INC_HYPERV" /usr/opensv/netbackup/bin/admincmd/bpsetconfig</pre>
All Hyper-V Accelerator backups (full and incremental)	Windows <pre>echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_ALL_HYPERV install_path\NetBackup\bin\admincmd\bpsetconfig</pre> UNIX, Linux <pre>echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_ALL_HYPERV" /usr/opensv/netbackup/bin/admincmd/bpsetconfig</pre>
Incremental Accelerator virtual machine backups (VMware and Hyper-V)	Windows <pre>echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_INC_VIRTUAL install_path\NetBackup\bin\admincmd\bpsetconfig</pre> UNIX, Linux <pre>echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_INC_VIRTUAL" /usr/opensv/netbackup/bin/admincmd/bpsetconfig</pre>
All Accelerator virtual machine backups (VMware and Hyper-V, full and incremental)	Windows <pre>echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_ALL_VIRTUAL install_path\NetBackup\bin\admincmd\bpsetconfig</pre> UNIX, Linux <pre>echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_ALL_VIRTUAL" /usr/opensv/netbackup/bin/admincmd/bpsetconfig</pre>

Table 9-4 To enable the reporting of network-transferred data in the Accelerator image size field of **bpimagelist**, **bpclimagelist**, or **bpdbjobs** output (*continued*)

Type of backup to report on	Enter this command
All incremental Accelerator backups (physical clients and virtual machines)	Windows <pre>echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_INC_ALL install_path\NetBackup\bin\admincmd\bpsetconfig</pre> UNIX, Linux <pre>echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_INC_ALL" /usr/opensv/netbackup/bin/admincmd/bpsetconfig</pre>
All Accelerator backups (full and incremental, physical clients and virtual machines)	Windows <pre>echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_ALL_ALL install_path\NetBackup\bin\admincmd\bpsetconfig</pre> UNIX, Linux <pre>echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED = REPLACE_IMAGE_SIZE_FOR_ACCL_ALL_ALL" /usr/opensv/netbackup/bin/admincmd/bpsetconfig</pre>

To reset the command output to the default setting

- ◆ To disable the reporting of network-transferred data in the Accelerator image size field (return to default), enter the following:

Windows

```
echo REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED =
REPLACE_IMAGE_SIZE_DISABLED |
install_path\NetBackup\bin\admincmd\bpsetconfig
```

UNIX, Linux

```
echo "REPLACE_IMAGE_SIZE_WITH_DATA_TRANSFERRED =
REPLACE_IMAGE_SIZE_DISABLED" |
/usr/opensv/netbackup/bin/admincmd/bpsetconfig
```

Best practices and more information

This chapter includes the following topics:

- [Best practices](#)

Best practices

It is recommended the following for NetBackup for Hyper-V:

- When creating virtual machines, use the same name for the VM's host name and display name. If the NetBackup policy's **Primary VM identifier** option is changed, the existing entries on the NetBackup policy **Clients** tab still work. See [“Primary VM identifier option \(Hyper-V\)”](#) on page 37.
- In a virtual desktop infrastructure where VMs share a common parent disk, do the following when restoring a VM to its original location: Restore the VM's differencing disk but not its parent disk. Make sure that the parent disk already exists on the same restore path.

On the **Restore Marked Files** dialog, under **List of backed up files**, clear the check mark from the parent disk. In the following example, the parent disk `vm1.vhdx` is unselected:

List of backed up files:	
Source	Backup Date
☐ C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\watchdogs...	Aug 15, 2016 12:28:39 AM
☒ C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\diff.vhdx	Aug 15, 2016 12:28:39 AM
☐ C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\vm1.vhdx	Aug 15, 2016 12:28:39 AM

Note: If you restore the parent disk to the original location, the other linked VMs that share the parent disk cannot be used. Their connection to the parent disk is lost. Instead, restore the differencing disk without the parent disk and make sure that the parent disk already exists on the same restore path. Otherwise, the restore fails because the parent disk does not exist.

Note: This issue does not apply when you restore the VM to an alternate location. As long as no other VMs at the restore location share the parent disk, you can restore the parent disk along with the differencing disk.

Caution: For restore to the original location: If you restore the parent disk and edit the linked VMs by reconnecting their differencing disks to the restored parent disk, VM data may be lost.

More information is available on NetBackup and Hyper-V.

- For a list of supported Hyper-V servers, see the appropriate version of the NetBackup Software Compatibility List available from the following location:
[NetBackup Compatibility List for all Versions](#)
- For additional details on NetBackup support for Hyper-V, see the following:
[Support for NetBackup in virtual environments](#)
- 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 for Hyper-V and how to create them
- Errors during policy creation
- 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
- Unable to log in to the NetBackup Administration Console
- 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
- Unable to change virtual disk settings for a VM after restore if the VM had user checkpoints during a backup that used the WMI method

- [Increasing the WMI create disk time-out value](#)
- [Linux VMs and persistent device naming](#)

NetBackup logs for Hyper-V and how to create them

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

Table 11-1 NetBackup logs that pertain to Hyper-V backup and restore

Log folder	Contains the messages on	Resides on
<i>install_path\NetBackup\logs\bpbrm</i>	Backup and restore	NetBackup primary or media server
<i>install_path\NetBackup\logs\bptm</i>	Backup and restore	NetBackup media server
<i>install_path\NetBackup\logs\bpacd</i>	Snapshot creation, backup, and restore	NetBackup client on the Hyper-V server
<i>install_path\NetBackup\logs\bpfis</i>	Snapshot creation and backup	NetBackup client on the Hyper-V server
<i>install_path\NetBackup\logs\bpbkar</i>	Backup	NetBackup client on the Hyper-V server
<i>install_path\NetBackup\logs\bprrd</i>	Restore	NetBackup primary server
<i>install_path\NetBackup\logs\ltar</i>	Restore	NetBackup client on the Hyper-V server
<i>install_path\NetBackup\logs\bpVMreq</i>	Restore	NetBackup primary or media server, and NetBackup client on the Hyper-V server
<i>install_path\NetBackup\logs\bpVMutil</i>	Policy configuration and on restore	NetBackup client on the Hyper-V server
<i>install_path\NetBackup\logs\bnbproxy</i>	Policy configuration	NetBackup primary or media server

Table 11-1 NetBackup logs that pertain to Hyper-V backup and restore
(continued)

Log folder	Contains the messages on	Resides on
<code>install_path\NetBackup\logs\vxms</code>	File mapping during backup and VxMS APIs. This folder also contains the 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
<code>\Program Files\Common Files\Symantec Shared\VxFl\4\logs\</code>	Snapshot creation and VSS APIs.	NetBackup client on the Hyper-V server See “Enabling VxFl logging” on page 131.

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 primary or media servers):

```
/opt/opensv/netbackup/logs/mklogdir
```

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

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

Enabling VxFl logging

By default, VxFl 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 `emcclearionfi.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 for NetBackup.

Except as noted in this topic, you can also use the Logging Assistant (in the NetBackup Administration Console) to configure VxMS logging.

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

VxMS and vhd logging 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.

Note: If you have run the NetBackup `mklogdir.bat` command, the VxMS log directory already exists.

See [“NetBackup logs for Hyper-V and how to create them”](#) on page 130.

- 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.

See [Table 11-2](#) for the available logging levels.

- 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.

VxMS logging levels

Table 11-2 lists the VxMS logging levels.

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

Note: Logging 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.

Table 11-2 VxMS logging levels

Level	Description
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). You can set the logging level for the VDDK messages.
6	VIX (VMware virtual machine metadata) dumps only.
7	VHD (Hyper-V virtual machine metadata) dumps only.
> 7	Full verbose + level 5 + level 6 + level 7.

Format of the VxMS core.log and provider.log file names

For the log files `core.log` and `provider.log` created by default during VxMS logging, the NetBackup administrator's user name is inserted into the log file name.

Table 11-3 describes the format of the log file names.

Table 11-3 Format of VxMS core.log and provider.log file names

Platform	VxMS log-file-name format
Windows	<code>VxMS-thread_id-user_name.mmddyy_tag.log</code> For example: <code>VxMS-7456-ALL_ADMINS.070214_core.log</code> <code>VxMS-7456-ALL_ADMINS.070214_provider.log</code>
UNIX, Linux	<code>VxMS-thread_id-user_name.log.mmddyy_tag</code> For example: <code>VxMS-27658-root.log.081314_core</code> <code>VxMS-27658-root.log.081314_provider</code>

See “Configuring VxMS and vhd logging” on page 132.

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 primary server.
Add a port entry for the NetBackup primary server.
See the *NetBackup Administrator's Guide*.

NetBackup status codes related to Hyper-V

Table 11-4 describes the NetBackup status codes that are related to Hyper-V.

For additional details on all NetBackup status codes, refer to the *NetBackup Status Codes Reference Guide*, available here:

<http://www.veritas.com/docs/000003214>

Table 11-4 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 142. ■ 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 143. ■ 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 157.
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 141.
48, client hostname could not be found	The problem may be one of the following: ■ The NetBackup primary 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: <pre>Error bpbrm(pid=8072) Nameuse [0], VM [<vm name>] not found on any node. Is either powered off or does not exist.</pre> 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.

Table 11-4 NetBackup status codes related to Hyper-V (*continued*)

NetBackup status code	Explanation and recommended action
84, media write error	Incremental backups of the VM may fail if the NTFS file system in the guest OS is corrupted and the backup uses MSDP storage. This error may occur in the following case: ■ The VMware or Hyper-V backup policy specifies Media Server Deduplication Pool (MSDP) storage. ■ The backup schedule includes incrementals (differential or cumulative). ■ The NTFS file system in the VM's guest OS is corrupted. For example, the file system contains orphaned file record segments. The <code>bptm</code> debug log contains messages similar to the following: <pre>16:24:04.604 [5720.7068] <16> 6:bptm:5720:win2012-2.hrousen.com: [ERROR] PDSTS: fbu_fill_bitmap: (1945) stream_offset(610848768) + length(8192) > (1946) stream_offset(610848768) 16:24:04.604 [5720.7068] <16> 6:bptm:5720:win2012-2.hrousen.com: [ERROR] PDSTS: fbu_scan_buf: fbu_fill_bitmap() failed (2060022:software error)</pre> Use the <code>chkdsk</code> command to examine the file system in the guest OS and repair it as needed. Then restart the VM and rerun the backup.
156, snapshot error encountered	See "Snapshot error encountered (status code 156)" on page 139.
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 11-4 NetBackup status codes related to Hyper-V (*continued*)

NetBackup status code	Explanation and recommended action
2821 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. Note: In an SCVMM environment, the VM GUID is referred to as the VM ID. ■ 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 147. ■ 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 147. ■ 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 144. ■ From a backup that was made with the WMI method, the restore failed because it took too long to write the virtual disk. This error may occur if the VM has a large fixed virtual disk. See “Increasing the WMI create disk time-out value” on page 150.
4207, Could not fetch snapshot metadata or state files	For details on this status code, refer to the <i>NetBackup Status Codes Reference Guide</i>: http://www.veritas.com/docs/000003214
4287, A NetBackup snapshot of the virtual machine exists and the policy option specifies aborting the backup	See “Existing snapshot handling parameter (WMI)” on page 42. For additional details on this status code, refer to the <i>NetBackup Status Codes Reference Guide</i>: http://www.veritas.com/docs/000003214

Snapshot error encountered (status code 156)

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

Table 11-5 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.
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 142.

Table 11-5 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: <pre> 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 </pre> 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 <code>vssadmin list writers</code> 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: <pre> VssNode::prepareCsvsForBackup: CSV TimeOut expired, Not all required CSV available in required state. </pre> One or more of 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 the backup, or try the backup at another time. See "Cluster shared volumes timeout (Hyper-V with VSS)" on page 39.

Table 11-5 Possible causes of status code 156 (*continued*)

Causes of status code 156	Description and recommended action
A local disk has been added to a VM that is on CSV	For a successful backup of a virtual machine on a CSV, the virtual machine must use CSV volumes only. If a local disk on the Hyper-V server (not a CSV volume) is added to the virtual machine, the backup fails. Reconfigure the virtual machine to use CSV volumes only, and rerun the backup.
The Enable offline backup for non-VSS VMs option is disabled	The bpfis log contains the following: <pre>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.</pre> 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 of non-VSS VMs (Hyper-V with VSS)" on page 38.

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

Note: This topic applies to the VSS backup method only (not to WMI).

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.

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. Otherwise, the backup fails with status code 156.

For details on the proper versions, see "Hyper-V online backups require proper version of Hyper-V integration services in the VM" in the following document:

[Support for NetBackup 7.7.x and 8.x in virtual environments](#)

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.

Unable to log in to the NetBackup Administration Console

For a policy that automatically selects VMs in a Hyper-V cluster, the NetBackup primary server should not reside on any Hyper-V nodes in the cluster. If the primary server resides on one of the nodes, you cannot log in to the NetBackup Administration Console.

Use a primary server that is not installed on a Hyper-V cluster node.

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.

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 `diskshadow` command to rule out any configuration issues. Refer to Microsoft documentation for assistance.

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 the virtual machine was not in the Off state at the time of backup.
- 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 11-6 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: <pre>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</pre> 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 Hyper-V files to a shared location on the virtual machine” on page 100.
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: <pre>ERR - Unable to read metadata for index: 379023, VFM error = 6.</pre> 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 Hyper-V 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.

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. (The node that owns the virtual machine 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\
```

Restore of a Windows 2016 Hyper-V VM to an SMB 3.0 file share may complete with only partial success.

If sufficient permissions are not set on the destination file share, the restore completes with status 1, "The requested operation was partially successful." Messages similar to the following appear in the NetBackup job details log:

```
Unable to set VHD/VHDX metadata which includes alternate data streams
and permissions. If VM does not boot, check the permissions of the
VM's virtual disk files.
```

Note: The VM's files are restored, but NetBackup was unable to restore the owner of the vhd or vhdx file(s).

For a fully successful restore, do the following:

- Add permissions to the share and to the underlying file system where the data resides. The permissions must give Full Control to the Hyper-V server and to the Hyper-V cluster.
- On the Hyper-V server to which the VM is to be restored: Make sure that the NetBackup Client Service is running as `Domain\Administrator` and not as the `LocalSystem` user account.

When these changes are complete, rerun the restore. The restore job should return status 0, "the requested operation was successfully completed."

Unable to change virtual disk settings for a VM after restore if the VM had user checkpoints during a backup that used the WMI method

If a virtual machine has any user-created checkpoints when a NetBackup WMI backup starts, NetBackup includes the checkpoint `.avhdx` files in the backup image. When the VM is restored from that backup, the `.avhdx` files are not automatically merged back to the VM's parent disks. As a result, certain settings for the restored VM cannot be changed (such as the virtual hard disk). The Hyper-V Manager states: "Edit is not available because checkpoints exist for this virtual machine."

This problem is due to a Microsoft issue. As a workaround, manually create and delete a user checkpoint for the restored VM. This action triggers an automatic disk merge for all the `.avhdx` files. After the merge, the VM settings can be changed.

Increasing the WMI create disk time-out value

It can take a long time to create a large virtual disk of type fixed (as opposed to a dynamic virtual disk). If a Hyper-V VM with a large fixed disk was backed up with the WMI method and is then restored, note: The restore job may time out before the restored virtual disk is fully written. The restore job fails with status 2821 and the VM's data is not restored.

Note: The default time-out period for Hyper-V disk creation is 24 hours.

Do the following to allow the restore job to complete.

To increase the WMI create disk time-out value

- 1 Use the NetBackup `nbsetconfig` command as follows:

```
nbsetconfig -h host
```

Where `host` is the name of the NetBackup primary server where the configuration is to be updated.

- 2 At the `nbsetconfig` prompt, enter the following to allow more time for creation of the virtual disk.

This example sets the period to 48 hours:

```
HYPERV_WMI_CREATE_DISK_TIMEOUT = 48
```

The range for `HYPERV_WMI_CREATE_DISK_TIMEOUT` is 0 hours to 240 hours.

Note: A value of 0 means the restore job never times out during virtual disk creation.

- 3 To escape the command, enter the following:

On UNIX: `ctl-D`

On Windows: `ctl-Z`

More information on the `nbsetconfig` command is available in the *NetBackup Commands Reference Guide*.

<http://www.veritas.com/docs/000003214>

Linux VMs and persistent device naming

For Linux VMs without persistent device naming, multiple disk controllers (such as IDE, SCSI, and SATA) may complicate the recovery of individual files. This issue occurs because non-persistent device naming, such as `/dev/sda` and `/dev/sdb`, may cause unexpected mount point changes after a restart. If the VM has a SCSI disk and SATA disk, the Backup, Archive, and Restore interface may show incorrect mount points for the VM's files. For example, the files originally under `/vol_a` might appear under `/vol_b` when you browse to restore them. The restore is successful, but the restored files may not be in their original directories.

As a workaround, search for the files on the restored VM and move them to the proper locations.

To prevent this issue on Linux VMs with multiple disk controllers, it is recommended a persistent device-naming method for mounting the file systems. When persistent naming is in place, device mounting is consistent and this issue does not occur when you restore files from future backups.

For persistent device naming, you can mount devices by UUIDs. The following is an example of the `/etc/fstab` file that contains the devices that are mounted by UUIDs:

```
UUID=93a21fe4-4c55-4e5a-8124-1e2e1460fece /boot ext4 defaults 1 2
UUID=55a24fe3-4c55-4e6a-8124-1e2e1460fadf /vola ext3 defaults 0 0
```

Note: Limit the number of characters for each `fstab` entry to 90 on a VMware VM.

To find the device UUIDs, you can use either of the following commands:

```
blkid
ls -l /dev/disk/by-uuid/
```

Note: NetBackup also supports the by-LABEL method for persistent device naming.

VSS backup method: Hyper-V online and offline backups

This appendix includes the following topics:

- [About Hyper-V online and offline backups for VSS](#)
- [Conditions that determine online vs. offline backup for VSS](#)
- [Additional notes on offline backups with VSS](#)
- [Hyper-V 2012 R2 virtual machines may be in the Off state when restored](#)

About Hyper-V online and offline backups for VSS

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 for the VSS backup method:

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 (online or offline) when you use the VSS backup method.

Table A-1 VSS backup: 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

Note: The WMI backup method (for Hyper-V Server 2016 and later) does not employ online vs offline backups.

See [“WMI backup method: State of the virtual machine before and after restore”](#) on page 92.

Conditions that determine online vs. offline backup for VSS

This topic applies to the NetBackup Hyper-V VSS backup method only (not to WMI).

With the VSS backup method, 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 with VSS

This topic applies to the NetBackup Hyper-V VSS backup method only (not to WMI).

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 2012 R2 virtual machines may be in the Off state when restored

This topic applies to the NetBackup Hyper-V VSS backup method only (not to WMI).

For Hyper-V server 2012 R2 and later, the virtual machine is restored in the Off state (not the Saved state) in either of the following cases:

- The virtual machine's operating system does not support Windows Volume Shadow Copy Service (VSS).
- The virtual machine does not have Hyper-V integration services enabled.

During the backup, the virtual machine is not placed in the Saved state (the bin file and vsv file are not generated or backed up). The Hyper-V VSS writer instead creates a checkpoint of the virtual machine. As a result, the virtual machine remains in the Off state when it is restored.

The following MSDN article contains more information:

[Hyper-V Backup doesn't interrupt running virtual machines \(anymore\)](#)

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 Hyper-V pass-through disks](#)
- [About alternate client backup of pass-through disks](#)
- [Configuring an alternate client backup of Hyper-V 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 *NetBackup Snapshot Manager for Data Center 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.

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 Hyper-V pass-through disks

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

- 1 Open the NetBackup web UI .
- 2 On the left, click **Protection > Policies**. Then 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 snapshot for Instant Recovery or SLP management**.

- 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 *NetBackup Snapshot Manager for Data Center 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 \(VSS\)"](#) on page 40.

See ["Restrictions for Hyper-V pass-through disks"](#) on page 159.
 - **Snapshot Attribute:** The selection depends on your VSS hardware provider. For the supported snapshot methods and hardware types, see the NetBackup Software Compatibility List available from the following location: [NetBackup Compatibility List for all Versions](#)
 - **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, see the *NetBackup Snapshot Manager for Data Center 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 Hyper-V pass-through disks

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

- 1 Open the NetBackup web UI .
- 2 On the left, click **Protection > Policies**. Then 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 snapshot for Instant Recovery or SLP management**.
- 6 Click **Perform off-host backup**.
- 7 In the **Use** 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).
- 9 Click **Snapshot options**.
- 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 *NetBackup Snapshot Manager for Data Center 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 Manager for Data Center Administrator's Guide* guide for information on disk arrays.

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 \(VSS\)”](#) on page 40.

See [“Restrictions for Hyper-V pass-through disks”](#) on page 159.

See [“Important note on VSS and disk arrays”](#) on page 162.

- **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 *NetBackup Snapshot Manager for Data Center Administrator's Guide* 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.

NetBackup commands to back up and restore Hyper-V virtual machines

This appendix includes the following topics:

- [Using NetBackup commands to create a Hyper-V policy](#)
- [Using NetBackup commands to create a Hyper-V Intelligent Policy](#)
- [The bpplinfo options for Hyper-V policies](#)
- [bpplinclude options for modifying query rules in Hyper-V policies](#)
- [Examples of nbrestorevm for restoring VMs to Hyper-V](#)
- [The nbrestorevm -R rename file for Hyper-V](#)
- [Notes on troubleshooting the nbrestorevm command for Hyper-V](#)
- [Logs for troubleshooting the nbrestorevm command](#)

Using NetBackup commands to create a Hyper-V policy

This topic describes how to use NetBackup commands to create a backup policy that includes the new features for Hyper-V on Windows Server 2016: Block-level incremental backup and Accelerator. Note that this topic explains how to create a policy that selects virtual machines manually.

For a policy that automatically selects virtual machines through a query rule, see the following:

See [“Using NetBackup commands to create a Hyper-V Intelligent Policy”](#) on page 166.

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

Windows: `install_path\Veritas\NetBackup\bin\admincmd`

UNIX or Linux: `usr/opensv/netbackup/bin/admincmd`

Run these commands on the NetBackup primary server.

Note: To run 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 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 "HV"  
-blkincr 1 -use_accelerator 1
```

To specify additional options, enter the following with `-snapshot_method_args`:

```
bpplinfo policyName -set -pt Hyper-V -use_virtual_machine 2  
-hyperv_server "Hyper-V_server" -fi 1 -snapshot_method "HV"  
-blkincr 1 -use_accelerator 1 -snapshot_method_args "nameuse=1,  
Virtual_machine_backup=2,file_system_optimization=1,exclude_swap=1,  
drive_selection=0,snapact=3,hv_snapshot_consistency_level=0"
```

Notes:

- The `-hyperv_server` option specifies the Hyper-V host, Hyper-V cluster, or SCVMM server that contains the VMs to back up.
- The option `-snapshot_method "HV"` specifies the WMI snapshot method for VMs on Hyper-V Server 2016. (`-snapshot_method "Hyper-V_v2"` specifies the VSS method, which does not support block-level incremental backup or Accelerator.)
- The option `-blkincr: 1` enables block-level incremental backup (BLIB).

- The option `-use_accelerator: 1` enables Accelerator. (This option also enables BLIB.)
- The `-snapshot_method_args` option is a comma-delimited list of keywords that define the Hyper-V snapshot and policy.
The available keywords and values for `-snapshot_method_args` are described in a separate topic:
See [“The bpplinfo options for Hyper-V policies”](#) on page 169.

3 Create a policy schedule.

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

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

For example:

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

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 GUID. You can use the Hyper-V management console to obtain the display name or GUID.

For example:

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

In this example, `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`, which 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
```

6 Use the `bpbackup` command to start the backup.

For details on `bpbackup`, see the *NetBackup Commands Reference Guide*.

The following topic contains examples of the `nbrestorevm` command to restore Hyper-V virtual machines:

See [“Examples of nbrestorevm for restoring VMs to Hyper-V”](#) on page 174.

Using NetBackup commands to create a Hyper-V Intelligent Policy

This topic describes how to use NetBackup commands to create a policy to back up virtual machines automatically through a query rule. It includes features for Hyper-V on Windows Server 2016: Block-level incremental backup and Accelerator.

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

Windows: `install_path\Veritas\NetBackup\bin\admincmd`

UNIX or Linux: `usr/opensv/netbackup/bin/admincmd`

Run these commands on the NetBackup primary server.

Note: To run virtual machine backups, a NetBackup client must be installed on the Hyper-V server, and on the SCVMM server (if any).

To use NetBackup commands to create a Hyper-V policy for auto selection of VMs

1 Create a policy.

```
bppolicynew policy_name
```

For example:

```
bppolicynew p1_auto_select_VMs
```

2 Set the policy attributes.

```
bpplinfo policy_name -set -pt Hyper-V -use_virtual_machine 2  
-hyperv_server "Hyper-V_server" -fi 1 -application_discovery 1  
-snapshot_method "HV" -blkincr 1 -use_accelerator 1  
-snapshot_method_args "nameuse=1,Virtual_machine_backup=2,  
file_system_optimization=1,exclude_swap=1,drive_selection=0,  
snapact=3,hv_snapshot_consistency_level=0"
```

Notes:

- The `-hyperv_server` option specifies the Hyper-V host, Hyper-V cluster, or SCVMM server that contains the VMs to back up.
- The option `-snapshot_method "HV"` specifies the WMI snapshot method for Hyper-V Server 2016. (`-snapshot_method "Hyper-V_v2"` specifies the VSS method, which does not support block-level incremental backup or Accelerator.)

- The option `-blkincr: 1` enables block-level incremental backup.
- The option `-use_accelerator: 1` enables Accelerator. (This option also enables BLIB.)
- `-snapshot_method_args` is a comma-delimited list of keywords that define the Hyper-V snapshot and policy. The keywords and values for `-snapshot_method_args` are described in a separate topic:
 See [“The bplinfo options for Hyper-V policies”](#) on page 169.

3 Create a policy schedule.

```
bpplsched policy_name -add sched_label -st sched_type
```

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

```
bpplsched p1_auto_select_VMs -add Full -st FULL
```

4 Specify the host that is to perform virtual machine discovery.

- To specify a Hyper-V server:

```
bpplclients policy_name -add Hyper-V_server  
Hyper-V_server_hardware_type Hyper-V_server_OS
```

For example:

```
bpplclients Accel_policy_auto_select1 -add scvmmserver3 Windows-x64  
Windows
```

In this example, the host to perform virtual machine discovery is `scvmmserver3`.

- To specify a Hyper-V cluster:

```
bpplclients policy_name -add Hyper-V_cluster
```

Note: To allow the policy to search all nodes of the cluster, you must set the Netbackup Legacy Network Service logon to the domain user account.

See [“Changing the NetBackup Legacy Network Service logon \(vnetd.exe\) to the domain user account”](#) on page 23.

- To specify a System Center Virtual Machine Manager (SCVMM) that manages Hyper-V servers or clusters:

```
bpplclients policy_name -add SCVMM_server  
SCVMM_server_hardware_type SCVMM_server_OS
```

To specify a Hyper-V server:

```
bpplclients pl_auto_select_VMs -add hvserver3 Windows-x64 Windows
```

To find the hardware type and operating system for your server, run the following on the NetBackup primary server:

```
bpplclients
```

For further information, see the examples under `bpplclients` in the *NetBackup Commands Reference Guide*.

5 Create a query rule to select virtual machines automatically.

```
bpplinclude policy_name -add  
"hyperv:;/server_type=value?filter=query_rule"
```

The possible values for `server_type=value` are the following (these values are not case-sensitive):

- **Hyperv**
NetBackup discovers the VMs by communicating with the Hyper-V server or cluster. The Hyper-V server or Hyper-V cluster must contain the NetBackup client software.
- **Scvmm**
NetBackup discovers the VMs by communicating with the SCVMM server. The SCVMM server (as well as each of the Hyper-V hosts) must contain the NetBackup client software.

For example:

```
bpplinclude Accel_policy_auto_select1 -add  
"hyperv:;/server_type=Scvmm?filter=Displayname Contains  
'Production'"
```

This query rule selects from the virtual machines that an SCVMM server manages. This example selects only the virtual machines with the display names that contain the word "Production". `Contains` means that other characters can also appear in the display names.

For the filter options that you can use in a Hyper-V query rule, refer to the **Field** keywords in the following:

See [“Query Builder field reference”](#) on page 67.

6 Validate the policy.

```
bpclient -policy policy_name -validate -fi
```

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

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

7 Use the bpbbackup command to start the backup.

For details on bpbbackup, see the *NetBackup Commands Reference Guide*.

For a policy that lets you select virtual machines manually:

See [“Using NetBackup commands to create a Hyper-V policy”](#) on page 163.

To test the bpplinclude query rule before you run the backup

- ◆ Run the following on the Hyper-V server or SCVMM server that is designated in the policy:

```
install_path\NetBackup\bin nbdiscover -noxmloput "query  
filter=query_rule" -noreason
```

Where “query filter=query_rule” is the actual query to test. For example:

```
"hyperv:/;server_type=Hyperv?filter=Displayname Contains  
'Production'"
```

A plus sign (+) appears before the virtual machines that the query rule selects for the backup: those virtual machines are included in the backup when the policy runs.

The virtual machines to exclud from the backup appear with a minus sign (-).

The -noreason option omits explanations as to why the query excluded a virtual machine or why the query failed. For explanations, omit -noreason.

For more details on most of the command options, see the man page or the *NetBackup Commands Reference Guide*.

The bpplinfo options for Hyper-V policies

[Table C-1](#) describes the options that are available on the NetBackup bpplinfo command.

Table C-1 The bplinfo options for Hyper-V

Option	Backup method	Values	Required?	Navigation in policy editor of NetBackup Administration Console
-use_virtual_machine	WMI, VSS	2	Y	
-hyperv_server	WMI, VSS	The name of the Hyper-V server	Y	Clients tab > Hyper-V server
-application_discovery	WMI, VSS	0 disabled, 1 enabled	N (only for automatic selection of VMs through a query rule)	Clients tab > Select automatically through Hyper-V Intelligent Policy query
-blkincr	WMI	For block-level incremental backup 0 disabled, 1 enabled	N (required for Accelerator)	Hyper-V tab
-use_accelerator	WMI	0 disabled, 1 enabled	N	Hyper-V tab
-snapshot_method	WMI, VSS	HV (for WMI) Hyper-V_v2 (for VSS)	Y	Hyper-V tab
-offhost_backup	VSS	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	VSS	0 No alternate client 1 Use an alternate client	Y (with -offhost_backup option)	Attributes tab > Perform off-host backup > Use
alt_client_name	VSS	The name of the alternate client	Y (with use_alt_client)	Attributes tab > Perform off-host backup > Machine
snapshot_method_args	WMI, VSS	keyword=value, keyword=value,... Table C-2	N	

[Table C-2](#) describes the keywords for -snapshot_method_args.

Table C-2 Keywords and values for snapshot_method_args

Keyword	Backup method	Values	Navigation in policy editor of NetBackup Administration Console
Virtual_machine_backup=	WMI, VSS	1 Disable file-level recovery 2 Enable file-level recovery	Hyper-V tab > Enable file recovery from VM backup
nameuse=	WMI, VSS	0 Use VM host name to identify backup image 1 Use VM display name to identify backup image 2 Use VM GUID to identify backup image	Hyper-V tab > Primary VM identifier
allow_offline_backup=	VSS	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 of non-VSS VMs
csv_timeout=	VSS	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. 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
prov_type=	VSS	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=	VSS	0 (default) 1 Differential. Use copy-on-write snapshot method. 2 Plex. Use clone or mirror snapshot method.	Hyper-V tab > Advanced > Snapshot Attribute

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

Keyword	Backup method	Values	Navigation in policy editor of NetBackup Administration Console
file_system_optimization=	WMI	0 Disable file system optimization 1 Enable file system optimization	File system optimization is enabled if either or both of the following are selected: Hyper-V tab > Exclude deleted blocks Hyper-V tab > Exclude swap and paging files
exclude_swap=	WMI	Reduces the size of the backup image by excluding the data in the guest OS system paging file (Windows) or the swap file (Linux). 0 Disable 1 Enable	Hyper-V tab
snapact=	WMI	3 Abort if NetBackup snapshots exist	Hyper-V tab > Advanced > Existing snapshot handling
drive_selection=	WMI	0 Include all disks 1 Exclude boot disk 2 Exclude data disks	Hyper-V tab > Advanced > Virtual disk selection
hv_snapshot_consistency_level=	WMI	Determines whether the VM's file system data is consistent (quiesced) before the backup starts. 0 Application Consistent Then Crash Consistent 1 Application Consistent 2 Crash Consistent	Hyper-V tab > Advanced > Consistency level

bpplinclude options for modifying query rules in Hyper-V policies

The bpplinclude command has options for modifying the query rules in an existing policy.

Table C-3 **bpplinclude options for modifying query rules**

Option	Description
-addtoquery <i>query_string</i> ...	Adds the specified query string to the end of the policy query rules, or creates a query if none exists. Quotes (") must be escaped (\). Examples: To add <code>vm17</code> to the list of values in the query rules of policy1: <pre>bpplinclude policy1 -addtoquery ,\"vm17\"</pre> To create a query in a policy that does not have a query: <pre>bpplinclude policy1 -addtoquery hyperv:/?filter=Displayname AnyOf \"grayfox7\", \"grayfox9\"</pre> Note: Each quote (") is escaped with a backslash (\).
-addtoquery -f <i>file_name</i>	Adds the entries to the query rules from the specified file, or creates a query if none exists. In the file, quotes (") do not need to be escaped. Example: To create a query in a policy that does not have a query: <pre>bpplinclude policy1 -addtoquery -f qfile1</pre> where the contents of <code>qfile1</code> are: <pre>hyperv:/?filter=Displayname Contains "VM" AND HypervServer Contains "ROS"</pre> Note: The values "VM" and "ROS" are not escaped. Note: You can place entries on multiple lines in the file. All entries are added to the end of the query (if a query already exists).

Table C-3
bpllinclude options for modifying query rules *(continued)*

Option	Description
-deletefromquery <i>query_string</i> ...	Deletes the specified query string from the policy query rules. Examples: To delete <code>vm27</code> from the list of values in the query rule of policy1: <pre>bpllinclude policy1 -deletefromquery \"vm27\"</pre> This example also deletes the comma preceding <code>vm27</code> if such a comma exists in the query rules. Note: The <code>-deletefromquery</code> option deletes a comma if: the phrase in the <code>query_string</code> does not begin or end with a comma and the character preceding the deleted string is a comma. To delete an entire query from the policy: <pre>bpllinclude policy1 -deletefromquery hyperv:/?filter=Displayname AnyOf "grayfox7","grayfox9"</pre>
-deletefromquery -f <i>file_name</i>	Deletes the file entries from the query rules. Example: To delete a query from a policy: <pre>bpllinclude policy1 -deletefromquery -f qfile1</pre> where the contents of <code>qfile1</code> are: <pre>hyperv:/?filter=Displayname Contains "VM" AND HypervServer Contains "ROS"</pre> Note: The values <code>"VM"</code> and <code>"ROS"</code> are not escaped.

Note: paths that contain wildcards must be enclosed in quotes.

Examples of nbrestorevm for restoring VMs to Hyper-V

To restore VMs, you can use the `nbrestorevm` command on the primary server or on the recovery host. The command is located in the following directory:

Windows

`install_path\NetBackup\bin\nbrestorevm.exe`

UNIX and Linux:

/usr/opensv/netbackup/bin/nbrestorevm

The following `nbrestorevm` options are used in the examples in this topic:

- `-vmhv`
Indicates a restore to the original location.
- `-vmhvnew`
Indicates a restore to a different location (instead of `-vmhv`).
- `-vmhvstage`
Indicates a restore to a staging or temporary location.
- `-vmncf`
For a VM that uses files in common with other VMs, this option restores the VM but does not restore the common files.
- `-C virtual_machine_to_restore`
Identifies the VM to restore. The VM name must match the type of name that was selected in the **Primary VM identifier** option of the backup policy. For example, if the VM was backed up by its VM display name, use the VM's display name on the `-C` option.

Note: Spaces in the VM name must be represented as %20 on the `-C` option. If the VM's name is `acme vm1`, enter `acme%20vm1`.

- `-vmid`
For restore to an alternate location, retains the original GUID for the restored VM (prevents the creation of a new GUID).
- `-R absolute_path_to_rename_file`
For restore to an alternate location, describes the path to a text file (the rename file) that contains directives for restoring the VM's files. The rename file specifies the original paths and the new paths for the restored VM files (xml, bin, vsv, vhd). The rename file must specify paths for all four VM file types. See [“Hyper-V examples of restore to alternate locations”](#) on page 177. Further notes are available on the rename file: See [“The nbrestorevm -R rename file for Hyper-V”](#) on page 179.
- `-vmserver Hyper-V_server`
Specifies a different server as the target for the restore. The default is the Hyper-V server that backed up the VM. To restore to the Hyper-V server that backed up the VM, omit this option.
- `-S primary_server`

Specifies the primary server that made the backup (if different from the current primary server).

- `-O`
Overwrites the VM and the associated resources if they already exist. This option is required if the VM exists in the target location.
- `-w [hh:mm:ss]`
The `nbrestorevm` command waits for completion of the restore before it returns to the system prompt.
Without the `-w` option, `nbrestorevm` initiates the restore and exits. You can verify the job completion status in the Activity Monitor of the NetBackup Administration Console.
- `-L progress_log_file [-en]`
Specifies an existing file to contain debug information about the restore. If the server where you run `nbrestorevm` is configured for a non-English locale, the `-en` option creates an additional log file in English.

Following are examples for `nbrestorevm`.

Hyper-V examples of restore to original location

For restore to the original location, NetBackup 8.0 adds a new feature for VMs that were backed up with the WMI method: You can specify a new display name for the restored a VM.

A. Restore to the original location and overwrite the VM

```
nbrestorevm -vmhv -C VM_to_restore -O
```

The `-O` option overwrites the existing VM. This option is required if the VM already exists.

B. From a backup that was made with the WMI method, restore to the original location and change the virtual machine's display name

```
nbrestorevm.exe -vmhv -C vm1.acme.com -O -R \C:\vmadmin\renamefile2
```

The file `renamefile2` specifies the new display name. The following example rename file changes the display name to `vm6`:

```
change /F/VMs/vm1/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.VMRS
to /F/VMs/vm1/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.VMRS
change /F/VMs/vm1/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.vmcx
to /F/VMs/vm1/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.vmcx
```

```
change /F/VMs/vml/Virtual Hard Disks/vml.vhdx
to /F/VMs/vml/Virtual Hard Disks/vml.vhdx
change vmname to vm6
```

Note: The paths in the rename file should be identical for both `change` and `to`. Only the last directive (`change vmname to vm6`) specifies the new display name, where `vmname` is a required literal entry, and `to` specifies the new name.

C. Restore to the original location, overwrite the VM, and create a progress log

```
nbrestorevm -vmhv -C VM_to_restore -O -L progress_log_file
```

D. Restore to the original location, overwrite the VM, but do not restore the common files

```
nbrestorevm -vmncf -C VM_to_restore -O
```

E. Restore to the original location from a VM backup that a different primary server made, and overwrite the VM

```
nbrestorevm -vmhv -C VM_to_restore -S primary_server -O
```

The `-s` option identifies the server that made the backup.

Hyper-V examples of restore to alternate locations

For restore to an alternate location, NetBackup 8.0 adds new restore features for VMs that were backed up with the WMI method:

- A new VM GUID is generated by default when you restore a VM to an alternate location.
As an option, you can choose to keep the original GUID.
- You can specify a new display name when you restore the VM.

A. Restore to a different location on the same Hyper-V server

```
nbrestorevm -vmhvnew -C VM_to_restore -R absolute_path_to_rename_file
```

In the `-R` option rename file, enter the full path to a text file that contains the following kinds of entries:

```
change /original_VM_GUID.xml_path to /new_VM_GUID.xml_path
change /original_VM_GUID.bin_path to /new_VM_GUID.bin_path
change /original_VM_GUID.vsv_path to /new_VM_GUID.vsv_path
change /original_VM.vhd_path to /new_VM.vhd_path
```

Make sure to include all four change entries to specify locations for the VM's files (xml, bin, vsv, vhd). If any of the VM file paths are omitted, the restore may not succeed.

Note: From the backups that were made with the WMI method, nbrestorevm generates a new VM GUID by default when you restore to an alternate location. To retain the original GUID, add the `-vmid` option.

Note: Each `change` line must end with a carriage return.

Note: If the `-R` option is omitted, the VM is restored to its original location.

See “[The nbrestorevm -R rename file for Hyper-V](#)” on page 179.

B. From a backup that a different primary server made with the WMI method, restore to an alternate location and retain the VM's original GUID

```
nbrestorevm.exe -vmhvnew -C vml.acme.com -S primary44.acme.com
-vmserver HVserver6.acme.com -vmid -R C:\vmadmin\renamefile1
```

- The `-vmserver` option specifies the restore destination (HVserver6.acme.com).
- The `-s` option specifies the primary server that made the WMI backup (different from the current primary server).
- The `-vmid` option retains the original GUID for the restored VM. To generate a new GUID, omit the `-vmid` option.
- The `-R` option identifies a text file that uses `change` directives to specify file paths for restore to the alternate location.

Note: The `-R` option must specify the absolute path to the rename file. In this example, `renamefile1` contains the following directives to change the VM's file paths at the alternate restore location:

```
change /F/VMs/vml/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.VMRS
to /D/VMs/vml/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.VMRS
change /F/VMs/vml/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.vmcx
to /D/VMs/vml/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.vmcx
change /F/VMs/vml/Virtual Hard Disks/vml.vhdx
to /D/VMs/vml/Virtual Hard Disks/vm2.vhdx
```

C. Restore to a different Hyper-V server, and wait for completion status from the server before returning to the system prompt

```
nbrestorevm -vmhvnew -C VM_to_restore -R absolute_path_to_rename_file
-vm_server Hyper-V_server -w
```

The `-vm_server` option specifies the target server for the restore.

See example A or B for rename file examples.

D. Restore the virtual machine files to a staging location

```
nbrestorevm.exe -vmhvstage -S primary44.acme.com -C vm6.acme.com -O
-vmserver HVserver6.acme.com -R "C:\Program Files\Veritas\NetBackup
\Logs\44\Admin\logs\rfile4.tmp.chg" -L "C:\Program Files\Veritas\NetBackup
\Logs\44\Admin\logs\rfile4.tmp.log"
```

- The `-vmhvstage` option restores the virtual machine files to a staging location.
- The `-vmserver` option specifies the host for the staging location.
- The `-L` option specifies the name of an existing file in which to write progress information.
- For restore to a staging location, NetBackup does not generate a new GUID.
- The file `rfile4.tmp.chg` specifies the new paths for the virtual machine files at the staging location:

```
change /F/VMs/vm6/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.VMRS
to /E/VMs/vm6/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.VMRS
change /F/VMs/vm6/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.vmcx
to /E/VMs/vm6/2D7C007E-90FB-44EC-ABB2-6733D42A51F5.vmcx
change /F/VMs/vm6/Virtual Hard Disks/vm1.vhdx
to /E/VMs/vm6/Virtual Hard Disks/vm2.vhdx
```

The nbrestorevm -R rename file for Hyper-V

The `-R` rename file is a text file that uses `change` directives to specify file paths for restore to a different location. The `change` directives specify the original paths of the VM's files (xml, bin, vsv, vhd) and the paths to the files when they are restored.

Note: The `-R` option and rename file are not required when you restore the VM to its original location with all its original settings.

Note the following about restoring the VM to a different location:

- You must use the `-vmhvnnew` option on `nbrestorevm` (instead of the `-vmhv` option).
- The `-R` option must specify the absolute path to the rename file.
- Each `change` directive in the `-R` rename file must end with a carriage return.
- The `change` directives can be in any order in the rename file.
- The `change` directives take the following form:
`change /original_VM_file_path to /target_VM_file_path`
Use forward slashes (/) in the paths. See [Table C-4](#).
- Unlike the Backup, Archive, and Restore interface, `nbrestorevm` does not validate its command options and rename file directives before the restore job begins. Make sure to include all required options and rename file change directives.

Table C-4 Change directives for the `-R` rename file

-R rename file directives	Description and notes
<code>change /original_VM_GUID.xml_path to /new_VM_GUID.xml_path</code>	The path to the VM's original .xml file and to the restored .xml file.
<code>change /original_VM_GUID.bin_path to /new_VM_GUID.bin_path</code>	The path to the VM's original .bin file and to the restored .bin file.
<code>change /original_VM_GUID.vsv_path to /new_VM_GUID.vsv_path</code>	The path to the VM's original .vsv file and to the restored .vsv file.
<code>change /original_VM.vhd_path to /new_VM.vhd_path</code>	The path to the VM's original vhd file and to the restored vhd file.

Notes on troubleshooting the nbrestorevm command for Hyper-V

This topic describes NetBackup status codes relating to the `nbrestorevm` command for Hyper-V.

Table C-5 NetBackup status codes on nbrestorevm and Hyper-V

NetBackup status code	Explanation and recommended action
2821, Hyper-V policy restore error	The VM already exists at the restore location. On nbrestorevm, include the <code>-o</code> option to overwrite the existing VM.
23, socket read failed	The time span that is specified on the <code>-w</code> option is earlier than the time of the restore. You can use <code>-w</code> without time values. The nbrestorevm job waits for the restore to complete and then exits.
135, client is not validated to perform the requested operation	The media server or recovery host where you are running nbrestorevm is not allowed to access the NetBackup primary server. Add the media server or recovery host to the primary server's Additional Servers list. In the NetBackup Administration Console, click Host Properties > Master Servers > double-click the primary server > Servers.
144, invalid command usage	One or more required options were omitted on nbrestorevm. For example, nbrestorevm requires either <code>-vmhv</code> (restore to original location) or <code>-vmhvnew</code> (restore to different location). See the nbrestorevm man page or the <i>NetBackup Commands Reference Guide</i> for more details.
190, found no images or media matching the selection criteria	A name or value that is supplied with nbrestorevm does not match the VM's actual name or value. The VM name as specified on nbrestorevm must match the type of name that was selected in the Primary VM identifier option of the backup policy. For example, if the VM was backed up by its VM display name, use the VM's display name on the <code>-C</code> option. Note: Spaces in the VM name must be represented as <code>%20</code> on the nbrestorevm <code>-C</code> option. For example, if the VM's name is <code>acme vm1</code>, enter <code>acme%20vm1</code> on the <code>-C</code> option.

Logs for troubleshooting the nbrestorevm command

The following logs may contain helpful messages on nbrestorevm.

Table C-6 Logs with messages on nbrestorevm

Log directory	Contains the messages on	Resides on
Windows <i>install_path</i> \NetBackup\logs\bprd Linux, UNIX <i>/usr/opensv/netbackup/logs/bprd</i>	The restore operation, such as for status code 2821.	Primary server
<i>install_path</i> \NetBackup\logs\tar	The restore operation, such as for status code 2821.	Recovery host (Hyper-V server)
Windows <i>install_path</i> \NetBackup\logs\nbrestorevm Linux, UNIX <i>/usr/opensv/netbackup/logs/nbrestorevm</i>	Incorrect usage of the nbrestorevm command, such as omission of a required option.	Host where nbrestorevm is run