Dell EMC Avamar for Hyper-V VSS

User Guide

19.1

Dell Inc.

November 2020
Rev. 02

Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your product.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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Preface

As part of an effort to improve the product lines, revisions of the software and hardware are periodically released. Therefore, some functions that are described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact the technical support professional when a product does not function correctly or does not function as described in this document.

NOTE: This document was accurate at publication time. To find the latest version of this document, go to Online Support (https://www.dell.com/support).

Purpose

This guide describes how to install Avamar™ in a Microsoft™ Hyper-V™ environment, and how to back up and restore virtual machines using Avamar with Microsoft Volume Shadow Copy Service (VSS) technology.

Audience

This document is intended for the system administrators who manage Microsoft Hyper-V environments and are responsible for backing up and restoring Hyper-V Servers.

Revision history

The following table presents the revision history of this document:

Revision	Date	Description
02	November, 2020	Updated the "Granular level recovery" and "Image-level backup and restore" sections.
01	May, 2019	GA release of Avamar 19.1

Related documentation

The following publications provide additional information:

- *E-LAB Navigator* at https://elabnavigator.emc.com/eln/elnhome
- *Avamar Release Notes*
- *Avamar Administration Guide*
- *Avamar for Windows Server User Guide*
- *Avamar and Data Domain System Integration Guide*
- *Avamar Operational Best Practices Guide*
- *Avamar for IBM DB2 User Guide*
- *Avamar for Exchange VSS User Guide*
- *Avamar for Lotus Domino User Guide*
- *Avamar for Oracle User Guide*
- *Avamar for SharePoint VSS User Guide*
- *Avamar for SQL Server User Guide*

Typographical conventions

These type style conventions are used in this document.

Table 1. Typographical conventions

Bold	Used for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
Italic	Used for full titles of publications that are referenced in text
`Monospace`	Used for: ● System code ● System output, such as an error message or script ● Pathnames, filenames, prompts, and syntax ● Commands and options
Monospace italic	Used for variables
`Monospace bold`	Used for user input
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means "or"
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information that is omitted from the example

Where to get help

The Avamar support page provides access to licensing information, product documentation, advisories, and downloads, as well as how-to and troubleshooting information. This information may resolve a product issue before contacting Customer Support.

To access the Avamar support page:

1. Go to https://www.dell.com/support.
2. Type a product name in the **Enter a Service Tag, Serial Number, Service Request, Model, or Keyword** search box.
3. Select the product from the list that appears. When you select a product, the **Product Support** page loads automatically.
4. (Optional) Add the product to the **My Products** list by clicking **Add to My Saved Products** in the upper right corner of the **Product Support** page.

Documentation

The Avamar product documentation provides a comprehensive set of feature overview, operational task, and technical reference information. To supplement the information in product administration and user guides, review the following documents:

- Release notes provide an overview of new features and known limitations for a release.
- Technical notes provide technical details about specific product features, including step-by-step tasks, where necessary.
- White papers provide an in-depth technical perspective of a product or products as applied to critical business issues or requirements.

Knowledgebase

The Knowledgebase contains applicable solutions that you can search for either by solution number (for example, KB000xxxxxx) or by keyword.

To search the Knowledgebase:

1. Go to https://www.dell.com/support.
2. Under the **Support** tab, click **Knowledge Base**.

3. Type either the solution number or keywords in the search box. Optionally, you can limit the search to specific products by typing a product name in the search box and then selecting the product from the list that appears.

Online Communities

Go to Community Network at https://www.dell.com/community/ for peer contacts, conversations, and content on product support and solutions. Interactively engage online with customers, partners, and certified professionals for all products.

Live chat

To engage Customer Support by using live interactive chat, click **Join Live Chat** on the **Service Center** panel of the Avamar support page.

Service Requests

For in-depth help from Customer Support, submit a service request by clicking **Create Service Requests** on the **Service Center** panel of the Avamar support page.

NOTE: To open a service request, you must have a valid support agreement. Contact a sales representative for details about obtaining a valid support agreement or with questions about an account.

To review an open service request, click the **Service Center** link on the **Service Center** panel, and then click **View and manage service requests**.

Enhancing support

It is recommended to enable ConnectEMC and Email Home on all Avamar systems:

- ConnectEMC automatically generates service requests for high priority events.
- Email Home sends configuration, capacity, and general system information to Customer Support.

Comments and suggestions

Comments and suggestions help to continue to improve the accuracy, organization, and overall quality of the user publications. Send comments and suggestions about this document to DPAD.Doc.Feedback@emc.com.

Please include the following information:

- Product name and version
- Document name, part number, and revision (for example, 01)
- Page numbers
- Other details to help address documentation issues

1

Introduction

Topics:

- Architecture
- Backup
- Restore

Architecture

You can use Avamar to back up and restore virtual machines and other Microsoft Hyper-V data in a variety of environments.

Hyper-V is a hypervisor-based server virtualization product for Microsoft Windows. Hyper-V enables you to create multiple virtual machines on a single physical server to consolidate workloads.

A Hyper-V Server is separated into individual partitions that the hypervisor supports. The parent partition performs all virtual machine and hardware management. From the parent partition, you create a child partition for each virtual machine.

A child partition can run one of the many operating systems that Hyper-V supports, including Windows server and client operating systems, SUSE Linux Enterprise Server, Red Hat Enterprise Linux, and CentOS. The Microsoft Hyper-V documentation provides a complete list of system requirements and supported guest operating system versions.

How Avamar works with Hyper-V

There are two ways to back up and restore Hyper-V data with Avamar software:

- Guest backup and restore
- Image-level backup and restore

NOTE: Avamar AUI procedures are only supported for stand-alone environments.

Guest backup and restore

With guest backup and restore, you install an Avamar file system client on each virtual machine on the Hyper-V Server. Avamar considers each virtual machine to be a separate client. You can perform individual backups of each virtual machine.

If there are databases or specific applications, such as Microsoft Exchange or Microsoft SharePoint, that run on the virtual machine, then you can use an Avamar plug-in to protect the application data.

The following figure illustrates Hyper-V guest backup with Avamar.

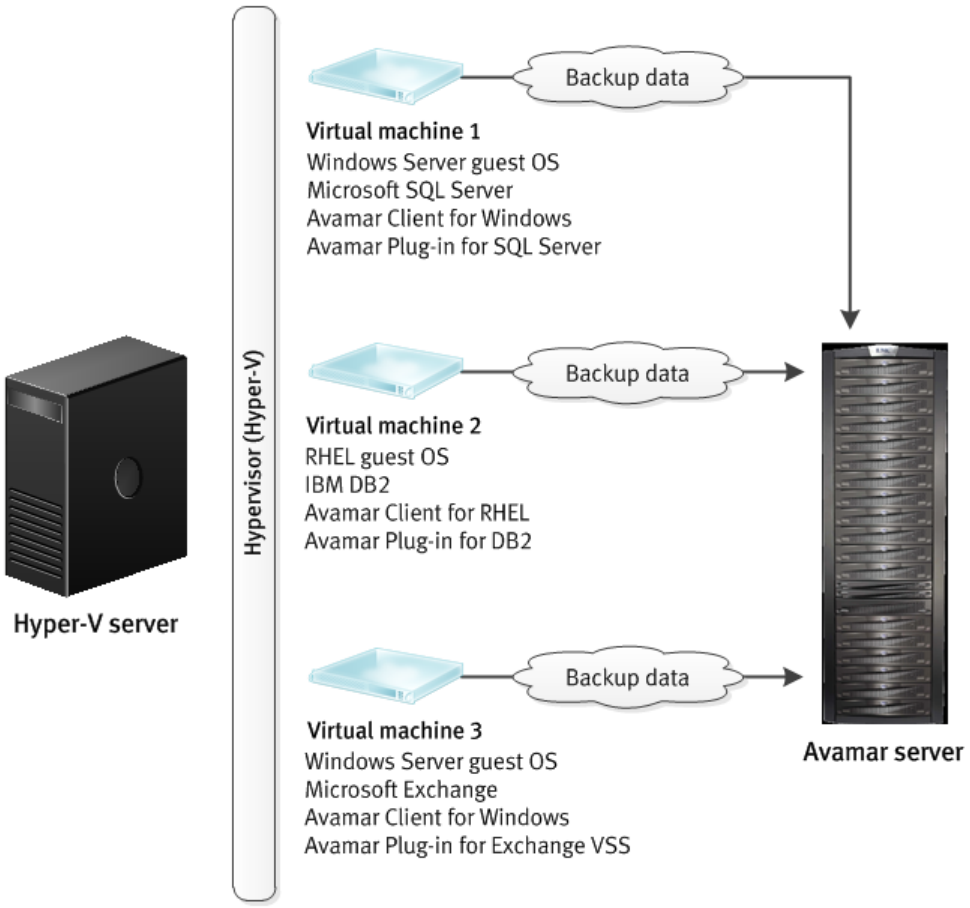

Figure 1. Guest backup environment

Image-level backup and restore

With image-level backup and restore, you install the Avamar Client for Windows and the Avamar Plug-in for Hyper-V VSS on the Hyper-V management OS (parent partition).

The Avamar Plug-in for Hyper-V VSS uses Microsoft Volume Shadow Copy Service (VSS) technology to perform backups. VSS is a framework that enables volume backups while applications on a system continue to write to the volumes. The VSS writer enables the creation of image backups for virtual machines by quiescing the Windows operating system and applications within the guest for operating system and application consistency.

The following figure illustrates an Avamar and Hyper-V configuration that uses image-level backup.

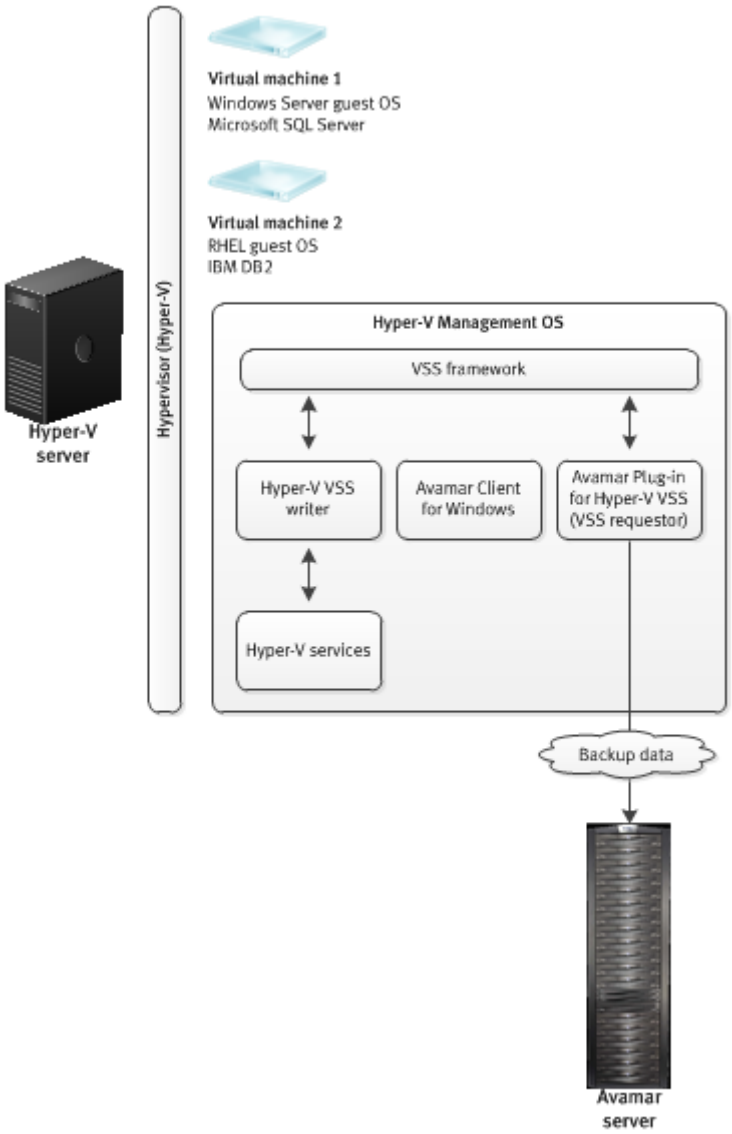

Figure 2. Image-level backup environment

NOTE: As part of the VSS Incremental backup feature, a checkpoint (recovery snapshot) is created and the backup is taken. At the end of the backup, the checkpoint is not deleted. When the next backup is taken, the existing checkpoint is merged and a new checkpoint is created. If you do not want the recovery snapshot to be retained on the host machine, set the `--enable-incremental` flag to `false` in the `avhypervvss.cmd` of primary var directory. This flag always promotes backups to *Full Backup*.

You can perform full image-level backups of individual virtual machines or the Host Component, which contains the role-based security configuration for Hyper-V. Image-level backups occur from the Hyper-V management OS instead of the individual virtual machines.

Comparing guest and image-level backup and restore

The following table provides a comparison of guest and image-level backup and restore of Hyper-V data.

Table 2. Comparison of guest and image-level backup and restore

Criterion	Guest backup and restore	Image-level backup and restore
Guest operating system support	Supports all guest operating systems that Hyper-V supports by using Avamar file system clients	Supports all guest operating systems that Hyper-V supports
Avamar software installation	Requires installation of the Avamar file system client and optional application plug-in on each virtual machine	Requires installation of the Avamar Client for Windows and Avamar Plug-in for Hyper-V VSS on only the management OS
Avamar server network connection	Required for each virtual machine	Required only for the management OS
Deduplication	Data within each virtual machine	Data at image level
Support for iSCSI/pass-through SCSI	Yes	No
Virtual hard disk sharing	Yes	No
Support for individual backup of each virtual machine	Yes	Yes
OS consistent	Yes	Yes
Application-consistent	Yes	• Yes, if the guest OS is Microsoft Windows and Hyper-V Integration Components are installed in the guest OS. • No, if the guest OS does not support VSS or if the guest OS is Microsoft Windows and Integration Components are not installed in the guest OS.
Application-aware backup and restore	Yes, through Avamar plug-ins for applications such as: • DB2 • Microsoft Exchange • Oracle • Microsoft SharePoint • Microsoft SQL Server • And more	No
Application backup type	Depends on the Avamar application plug-in	Full or copy backups for Hyper-V.
Virtual machine status for backup	Virtual machine must be running	Virtual machine does not need to be running
Backup consumption of CPU, RAM, and disk resources	On the virtual machine	On the management OS
Backup customization, including exclusion of certain files or file types	Yes	No
Backup of unused file system space	No	Yes
Restore of individual files and folders	Yes	Yes, through granular level recovery (GLR)
Disaster recovery requirements	Two-step recovery: 1. Load a known good operating system image on the virtual machine. 2. Restore backup data from Avamar.	One-step restore of backup data from Avamar. However, backups may be a "crash-consistent" snapshot of the full virtual machine image, which might not reliably support a full system restore without data loss.

How Avamar works with Hyper-V in a cluster

To prevent a Hyper-V Server from becoming a single point of failure, you can create a failover cluster. In a failover cluster, all servers (nodes) run Hyper-V and can host one or more virtual machines. A virtual machine can run on multiple nodes in the cluster, but can only be active on one node at a time.

You can use Avamar to perform image-level backups of Hyper-V in a failover cluster environment. The following topics provide details on supported cluster environments.

Windows Hyper-V Server clusters with CSV and a single proxy

Avamar uses a proxy architecture to back up and restore virtual machines on a Clustered Shared Volume (CSV) in a Windows Hyper-V Server cluster.

In single proxy configuration, install client and plugin on any one physical node, which is acting as the single proxy.

Install the Avamar Client for Windows and the Avamar Plug-in for Hyper-V VSS on one physical node in the cluster, which acts as the single proxy. To configure the Avamar proxy cluster client, turn the Cluster Configuration Tool

The Avamar server communicates with the Avamar proxy cluster client to perform backups and restores of virtual machines on CSV. This action is performed regardless of which node is managing the virtual machines at the time of the operation.

The following figure illustrates a Windows Hyper-V Server cluster with virtual machines on CSV where the Avamar proxy cluster client facilitates image-level backups.

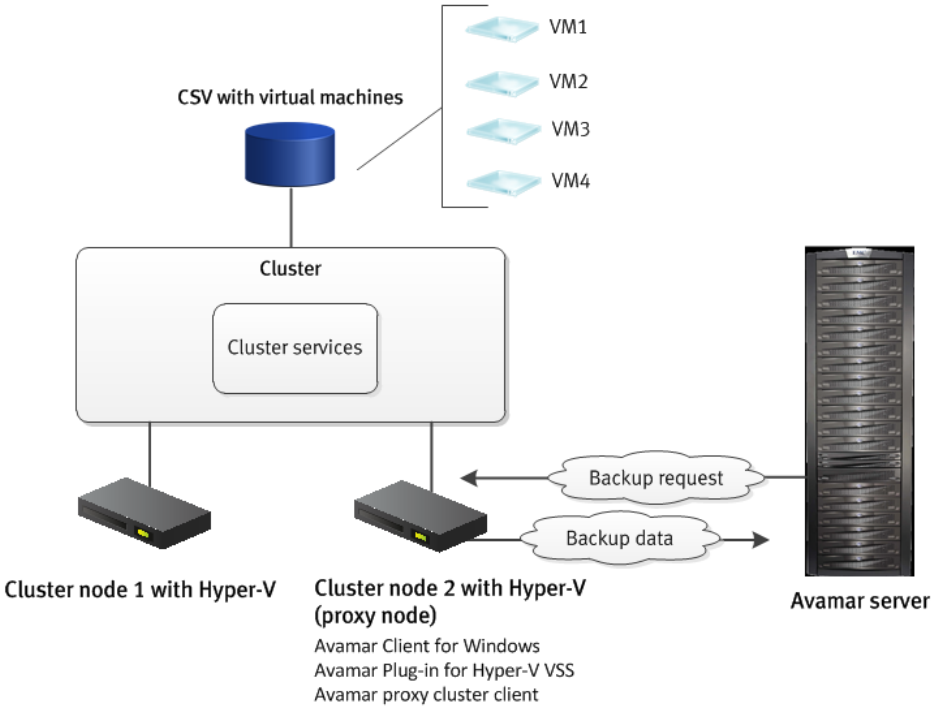

Figure 3. Image-level backups with a single proxy in a Windows Hyper-V Server cluster with CSV

In the Avamar Administrator, select the cluster client with the Avamar single-proxy cluster client as the client for backups and restores, and use the Hyper-V VSS plug-in. You can back up any of the virtual machines on CSV, but you cannot back up virtual machines on local volumes or on SMB file shares.

For restores, the Avamar proxy cluster client uses Windows Management Instrumentation (WMI) remote management to restore a virtual machine on behalf of a cluster node.

NOTE: If the node with the Avamar proxy cluster client fails, then backups and restores do not occur. Bring the node back online to continue backup and restore activity.

Windows Hyper-V Server clusters with CSV and multiple proxies

In Windows Hyper-V Server clusters with multiple CSVs, you can improve backup performance by 60 to 70 percent by deploying multiple proxy nodes.

Install the Avamar Client for Windows and the Avamar Plug-in for Hyper-V VSS on each physical node in the cluster that acts as a proxy. On the node that serves as the primary proxy node, run the Cluster Configuration Tool to configure the Avamar proxy cluster client, which manages the backup process in the cluster.

The following figure illustrates a Windows Hyper-V Server cluster with virtual machines on CSV where the Avamar proxy cluster client on the primary proxy node facilitates image-level backups with multiple proxy nodes.

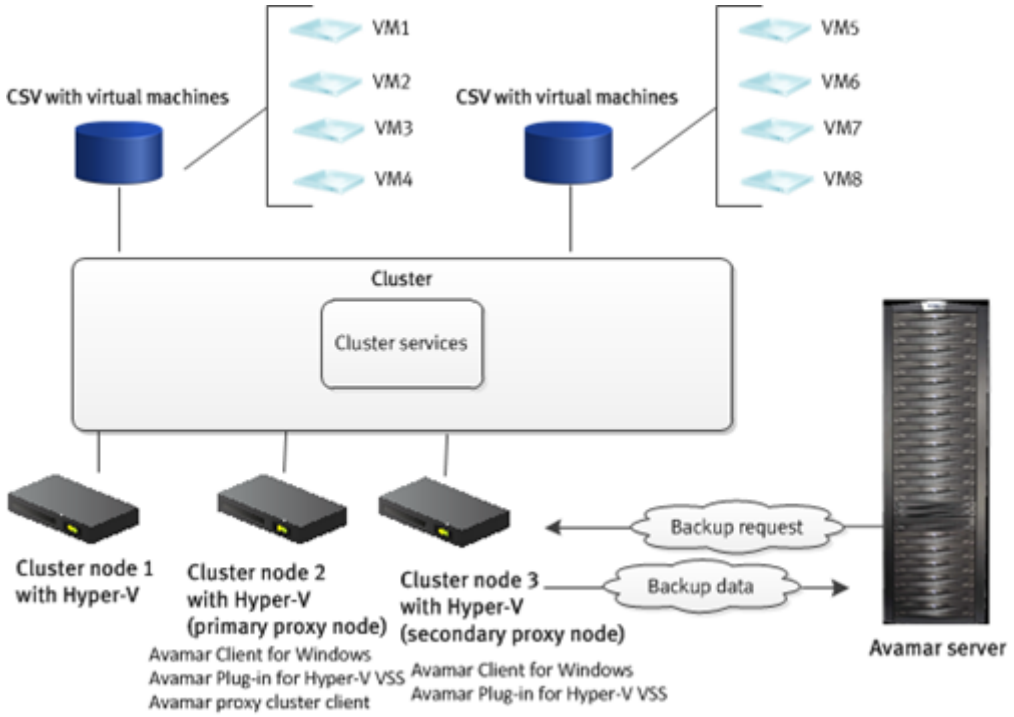

Figure 4. Image-level backups with multiple proxies in a Windows Hyper-V Server cluster with CSV

Select the Avamar primary proxy cluster client as the client for backups and restores, and use the Hyper-V VSS plug-in. You can back up any of the virtual machines on CSV, but you cannot back up virtual machines on local volumes or on SMB file shares.

For restores, the Avamar proxy cluster client uses Windows Management Instrumentation (WMI) remote management to restore a virtual machine on behalf of a cluster node.

NOTE: If the primary proxy node with the Avamar proxy cluster client fails, then backups and restores do not occur. Bring the node back online to continue backup and restore activity.

Balancing the backup load with the Avamar CSV algorithm

The proxy cluster client on the primary proxy node uses an Avamar CSV algorithm to divide the backup load evenly among the proxy nodes.

The CSV algorithm creates a list of all CSVs in the backup and sorts the list that is based on the amount of data to back up on each CSV. The list of CSVs and the amount of backup data from each CSV are derived from the size and location of the VHDs in the target list of virtual machines.

Best practices for environments with multiple proxies

To maximize performance in a Windows Hyper-V Server cluster with multiple proxies, implement the following best practices:

- To minimize the need for CSV ownership changes, divide virtual machine data as evenly as possible among CSVs.
- Increase the number of proxy nodes.

- To prevent backups from impacting production activities, proxy nodes should have the maximum number of resources available and minimal live data movement.

  Consider using a dedicated cluster node that does not actively host and manage virtual machines as the primary proxy node. You can also use dedicated nodes for the secondary proxy nodes.

- The proxy cluster client on the primary proxy node uses an Avamar CSV algorithm to divide the backup load evenly among the proxy nodes. If the **Change CSV Ownership** option is selected while configuring a multi-proxy setup, ownership of the CSVs is automatically reassigned to the proxy nodes that perform the backups. The proxy nodes perform backups of the CSVs in parallel. After the backup is complete, CSV ownership is reverted to the original ownership.

  The backup process must stream backup data from the owner node to the proxy node when the following actions occur:

  - When the Change CSV ownership option is not selected.
  - When a proxy node is not the owner node of the CSV that it is backing up.

  The process should be performed before sending the backup to the Avamar server or a Data Domain system. As a result, backup performance depends on network performance between cluster nodes. Backups are faster and more efficient when a proxy node owns the CSV and backup data streams directly from the proxy node to backup storage.

Windows Hyper-V Server clusters with SMB file shares

If you store virtual machines on SMB 3.0 file shares in a Windows Hyper-V Server cluster, then Avamar uses a federated architecture to back up and restore the virtual machines. The SMB file shares can be on either a Scale-Out File Server (SOFS) or on a clustered file server for general use.

To perform image-level backups of virtual machines on SMB file shares, install the Avamar Client for Windows and the Avamar Plug-in for Hyper-V VSS on each node in the cluster. Then use the Cluster Configuration Tool to configure the Avamar federated cluster client.

The federated cluster client receives backup and restore requests from the Avamar server, and forwards the requests to the Hyper-V plug-in on the cluster nodes. The plug-in on the node performs the backup and sends the backup data and metadata to the Avamar server. The federated cluster client manages requests for all Hyper-V plug-ins in the cluster and ensures that you can back up all virtual machines on SMB file shares in the cluster.

The following figure illustrates a Windows Hyper-V Server cluster with virtual machines on SMB file shares where the federated cluster client facilitates image-level backups.

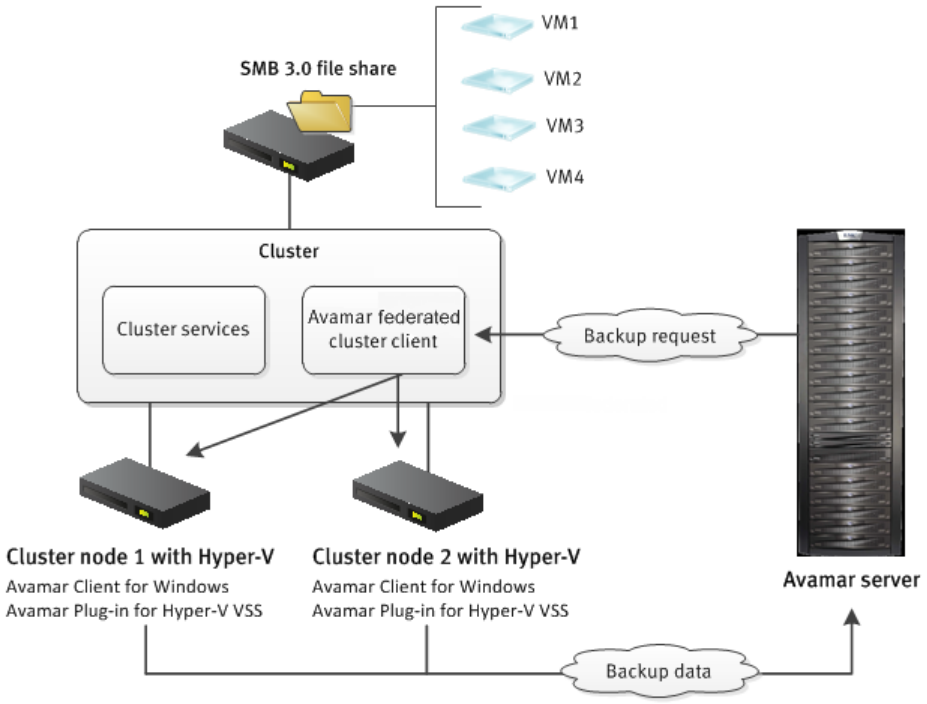

Figure 5. Image-level backups in a Windows Hyper-V Server cluster with SMB

Select the Avamar federated cluster client as the client for backups and restores. You can back up any of the virtual machines on SMB file shares in the cluster, but you cannot back up virtual machines on local volumes or on CSV.

Avamar plugin service for Windows

The Avamar plug-in service for Windows, `Winclustersvc`, is the plug-in service that the Avamar cluster client uses for backup and restore operations.

In case of proxy or multi-proxy configurations, the account that runs the Avamar plug-in service for Windows must be a domain administrator or an account. These options should perform WMI queries and copy files to the CSVs during a restore. This service is also used for Windows proxy cluster backups.

Configuring a proxy client without using the domain administrator account

You can configure a proxy client to perform backup and restores without using the domain administrator account.

Steps

1. Create a domain user for Hyper-V backups and recoveries.

   Follow Microsoft documentation for instructions.
2. Configure the domain user to be a member of the following Active Directory security groups:
   - Domain Users
   - Group Policy Creator Owners
   - Hyper-V Administrators
   - Remote Desktop Users
   - Users
   - Windows Authorization Access Group
3. On each cluster node of Hyper-V CSV environment, log in and add the new domain user account to the following groups on the local nodes:
   - Administrators
   - Backup Operators
   - Hyper-V Administrators
   - Remote Desktop Users
   - Remote WMI Users
4. On each cluster node, open PowerShell and type the following command:

   `PS C:\Users\...>Grant-ClusterAccess -User domain\username -Full`

   where *domain* is the domain of the new domain user and *username* is the name of the new domain user.

Differences between single proxy, multiple proxies, and federated configurations

The following table describes the differences between single proxy, multiple proxy, and federated configurations.

Table 3. Differences between single proxy, multiple proxy, and federated configurations

Configuration Type	VSS Writer(s) Involved	Snapshot Type	Rollover	Comments
Single Proxy	• CSV writer: For remote highly available VMs. • Hyper-V writer: For local highly available VMs.	Single snapshot, for all involved CSVs.	From the single (primary) proxy.	For smaller environments where the CSV writer is stable.

Table 3. Differences between single proxy, multiple proxy, and federated configurations (continued)

Configuration Type	VSS Writer(s) Involved	Snapshot Type	Rollover	Comments
Multiple Proxies	• CSV writer: For remote highly available VMs. • Hyper-V writer: For local highly available VMs.	Single snapshot on primary proxy, for all involved CSVs	From the proxy nodes. The **Change CSV Ownership** checkbox in the **Windows Cluster Configuration Wizard** determines behavior during rollover: • If set, distributes CSV ownership among the proxy nodes for rollover. After backup, ownership changes back to original. • If unset, for remote CSVs, data is read via the LAN by the proxy nodes.	For smaller environments where the CSV writer is stable.
Federated	Hyper-V writer: Covers all highly available VMs on all cluster nodes.	Multiple snapshots in sequential order on all involved cluster nodes, for all involved CSVs or SMB share	Parallel rollover from all involved cluster nodes.	For larger environments where the CSV writer may become unstable.

Scheduling considerations in a cluster

Ensure that backups and restores in a cluster for the following Avamar plug-ins do not overlap:

- Avamar Plug-in for Hyper-V VSS
- Avamar Plug-in for Windows File System
- Avamar Plug-in for Windows VSS
- Avamar Plug-in for Windows Cluster File Server
- Avamar Plug-in for SQL Server

When the backups or restores overlap, failures occur.

How Avamar works in an SCVMM environment

System Center Virtual Machine Manager (SCVMM) and Virtual Machine Manager (VMM) provide centralized administration and management of a virtual environment. You can use Avamar to back up the components in an SCVMM or VMM environment, including virtual machines on a Hyper-V host.

Granular level recovery

Granular level recovery (GLR) enables you to mount an image backup to a temporary file system, and then browse and restore individual files and folders. You can also use the GLR feature to perform granular level recoveries of application databases for Microsoft Exchange servers, SQL servers, and SharePoint farms.

NOTE: Avamar does not support GLR restore operations on dynamic disks in Hyper-V environments.

Granular level recovery for filesystems

The temporary file system mounts in the `C:\Program Files\avs\var` folder, where *C:\Program Files\avs* is the Avamar installation folder.

You can mount the temporary file system on the management OS of the Hyper-V Server. However, the best practice is to use a separate (non-Hyper-V) Windows computer or a virtual machine to host the temporary file system. Using a separate computer

or virtual machine offloads the GLR activities from the Hyper-V host. The separate Windows computer or virtual machine must use a supported operating system.

NOTE: Performance problems and other issues can occur if you install the Hyper-V GLR feature on the management OS of the Hyper-V Server.

To prepare the virtual machine or Windows client computer for GLR, install the Avamar Client for Windows and the Avamar Plug-in for Hyper-V VSS. When you install the Hyper-V VSS plug-in, select the option to install the Hyper-V GLR feature.

The following figure illustrates a GLR environment.

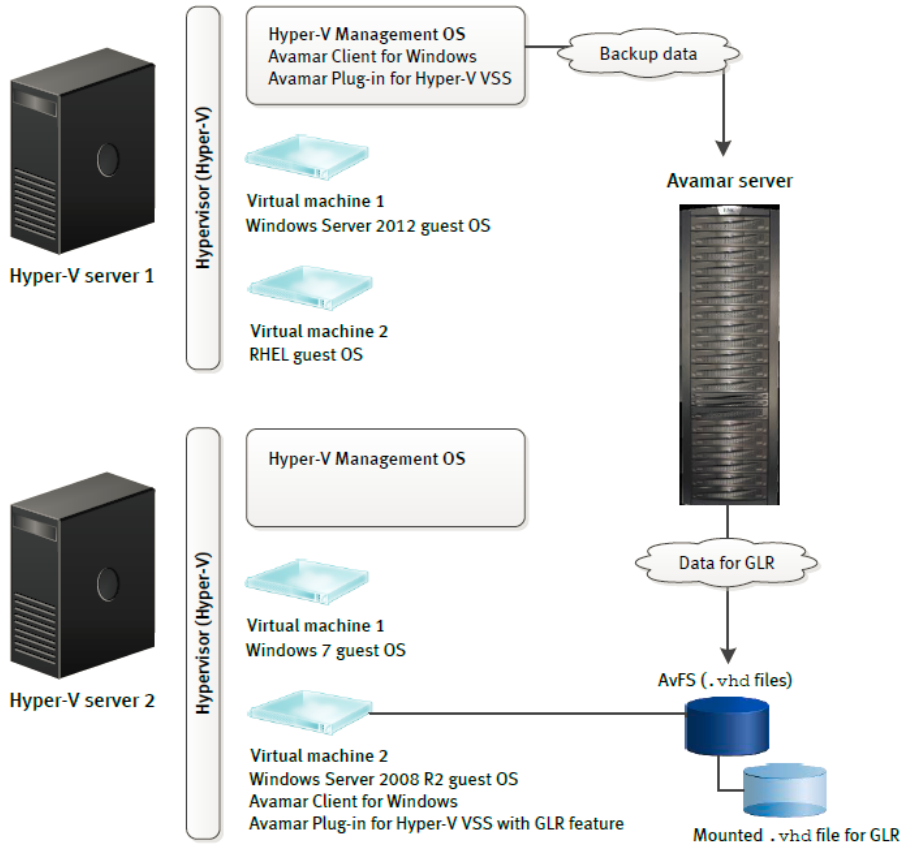

Figure 6. Granular level recovery environment

In the previous figure, the Avamar Plug-in for Hyper-V VSS on Hyper-V Server 1 backs up Virtual machine 1 and Virtual machine 2.

The Avamar Plug-in for Hyper-V VSS with the GLR feature is installed on Virtual machine 2 on Hyper-V Server 2.

During GLR, restore the backup to the temporary file system that mounts on Virtual machine 2 on Hyper-V Server 2. Then restore the files to Virtual machine 1 on Hyper-V Server 1 by copying the files from the temporary file system and pasting them to the target location.

Granular level recovery of application databases

The Avamar Plug-in for Hyper-V VSS with the GLR feature can be used with the ItemPoint software to provide GLR for Microsoft Exchange, SQL, and SharePoint databases.

The following configuration issues apply to GLR of application databases in a Hyper-V environment:

- The supported Microsoft application (Exchange, SQL, or SharePoint) must be installed and configured in a guest VM on a Hyper-V node or cluster.
- The Avamar Plug-in for Hyper-V VSS with the GLR feature must be installed on the Hyper-V node or cluster.
- ItemPoint and the Avamar plug-in for the application itself must be installed on the node that is used for GLR.

Data Domain system support

You can store backups on either the Avamar server or a Data Domain® system. Backup metadata is stored on the Avamar server.

Before you can store backups on a Data Domain system, add the Data Domain system to the Avamar configuration by using Avamar Administrator. Then select the Data Domain system in the plug-in options when you perform an on-demand backup or when you create a dataset for a scheduled backup. You can also use the command line interface (CLI) to perform backups to a Data Domain system.

The steps to restore backups are the same whether you restore from the Avamar server or a Data Domain system. The restore process determines the location of the backup and restores the backup.

Avamar also supports Data Domain Cloud Tier. DD Cloud Tier moves data from Data Domain to the cloud. From the Avamar Administrator, you can configure cloud tiering to move Avamar backups from Data Domain to the cloud, and perform seamless recovery of these backups.

The *Avamar and Data Domain System Integration Guide* provides more information about Data Domain systems in an Avamar environment, including detailed steps to add a Data Domain system to the Avamar configuration.

Backup

You can perform full and incremental image-level backups of individual virtual machines or the Host Component, which contains the role-based security configuration for Hyper-V. Perform these backups regularly on either an on-demand or scheduled basis.

NOTE: Avamar image-level backups do not protect the Hyper-V management OS. To protect the Hyper-V management OS, perform a bare metal recovery (BMR) backup with the Avamar Plug-in for Windows VSS. The *Avamar for Windows Server User Guide* provides details.

The following topics provide details on image-level backups with the Avamar Plug-in for Hyper-V VSS.

For details on performing guest backups with an Avamar file system or application plug-in, review the backup instructions in the user guide for the Avamar plug-in that you install on the virtual machine.

Backup methods

You can perform both on-demand and scheduled backups with the Avamar Plug-in for Hyper-V VSS:

- Use the Avamar AUI to perform both on-demand and scheduled backups. "Image Level Backups" provides more information.
- Use the `avhypervvss` command line interface on the Hyper-V Server to perform on-demand backups. "Command Line Interface" provides more information.

Backup types

The Avamar Plug-in for Hyper-V VSS performs both application-consistent and crash-consistent image-level backups.

The Hyper-V VSS Writer in the management OS determines if the backup image is application-consistent or crash-consistent. You do not need to select the backup type when you perform on-demand or scheduled backups.

Application-consistent backups

An application-consistent backup requires the virtual machine to be online and VSS capable, and to have Microsoft Integration Components (IC) installed. VSS runs in the guest operating system and freezes the operating system and the state of all applications.

You can specify whether to promote the backup type from copy to full for the in-guest shadow copy for Windows Hyper-V Server. The **Promote backup within virtual machine from copy to full** checkbox in the Hyper-V VSS plug-in options enables you to control whether to perform a copy or full backup. A copy backup does not update the backup history of each file.

Windows Hyper-V Server does not support live migration and storage migration during an application-consistent backup.

Crash-consistent backups

Crash-consistent backups do not communicate with the Hyper-V VSS Writer in the virtual machine. As a result, the backups ensure crash consistency, not application consistency, of the writers running in the virtual machine.

Crash-consistent backups occur when a virtual machine meets one or more of the following criteria:

- The virtual machine is offline.
- IC is not installed in the guest OS.
- The guest operating system does not support VSS. For example, Linux does not support VSS.

A crash-consistent backup puts the virtual machine into a Saved State before shadow copy creation, and resumes the virtual machine after shadow copy creation.

Files included in backups

The following table lists the files that the Hyper-V VSS Writer reports for backup for each virtual machine during image-level backups with the Avamar Plug-in for Hyper-V VSS.

Table 4. Virtual machine files supported by the VSS Hyper-V Writer

File type	File name or extension	Description
Virtual hard disk (VHD) files	`.vhd`, `.vhdx`	Hyper-V uses the Microsoft Virtual Hard Disk (VHD) specification for storing virtual hard disks for virtual machines. A virtual machine can have one or more virtual disks.
Virtual machine configuration	• Windows 2016 Hyper-V Server: `.vmcx` • Previous versions of Hyper-V Server: `.xml`	Virtual machine settings (for example, CPU, memory, VHDs) are stored in VMCX format (Windows 2016 Hyper-V Server) or XML format (previous versions) in the virtual machine configuration file.
Virtual machine running state files	• Windows 2016 Hyper-V Server: `.vmrs` • Previous versions of Hyper-V Server: `.bin`, `.vsv`	Virtual machine running state (memory) files are stored in a folder as `.vmrs` (Windows 2016 Hyper-V Server) or `.bin` and `.vsv` files (previous versions).
Virtual hard disk differencing files	`.avhd`, `.avhdx`	A virtual machine snapshot creates one differencing VHD file per virtual machine VHD.
Virtual machine configuration snapshots	• Windows 2016 Hyper-V Server: `.vmcx` • Previous versions of Hyper-V Server: `.xml`	A virtual machine snapshot creates a copy of the current virtual machine configuration and saves it to enable rollback.
Host Component	`InitialStore.xml`, `ResourceType.xml`	Description files that contain the authorization store for Hyper-V. The files also contain a description of the host resource type XML files.

Multi-streaming

Multi-streaming enables parallel processing of backup jobs by using multiple processors. You can use as many as 10 streams for backups and four streams for restores.

Each stream requires a separate processor. If you have multiple processors, multi-streaming enables you to improve backup performance when you store backups on either the Avamar server or on a Data Domain system.

Restore

Avamar supports the following restore types when you perform image-level backups in a Hyper-V environment.

- Restore of virtual machine files and the Host Components to the original location on the original Hyper-V Server.
- Restore of virtual machine files to a different file system location on the original Hyper-V Server.
- Restore of virtual machine files to a different Hyper-V Server to create a new virtual machine.
- Restore of virtual machine files for manual provisioning.
- Granular level recovery of individual files and folders.

Details on performing guest restore using an Avamar file system or application plug-in are available in the restore instructions in the user guide for the plug-in.

Restore to the original Hyper-V Server

You can restore a virtual machine to its original location on the original Hyper-V Server if one of the following scenarios occurs:

- You need to roll back the virtual machine because a patching or virus issue occurred.
- You need to perform disaster recovery of the virtual machine after a disk failure.
- The virtual machine was accidentally deleted.

The restore process deletes or overwrites the original virtual machine files if the files remain in the original location. In addition, you cannot move or rename the virtual machine during the restore if any of the original files remain.

When you restore a virtual machine in a cluster, the restore makes the virtual machine highly available and sets the owner node for the virtual machine to the owner node at the time of the backup.

You can also restore Host Components to the original location. You might need to restore the Host Components if the files are corrupt or if you need to roll back the Hyper-V authorization settings.

NOTE: Avamar System State backups with the Avamar Plug-in for Windows VSS include Host Components. You might need to restore the Host Components from a Hyper-V VSS plug-in backup after a bare metal restore of the Hyper-V Server when the Hyper-V VSS plug-in backup is more recent than the Windows VSS plug-in backup.

Restore to a different location on the original Hyper-V Server

You can restore a virtual machine to the original Hyper-V Server but change the file system location of the virtual machine files. This type of restore is necessary if the virtual machine files moved after the selected backup time and you want to preserve the new locations.

When you restore a virtual machine in a cluster, the restore makes the virtual machine highly available and sets the owner node for the virtual machine to the owner node at the time of the backup.

If the original virtual machine is present, then the restore process overwrites the virtual machine.

Restore to create a virtual machine on a different Hyper-V Server

You can restore a virtual machine to a different Hyper-V Server and create a new virtual machine. During the restore, you select the file system location for the virtual machine files.

Hyper-V recognizes each virtual machine by an internal GUID. If a virtual machine with the same GUID already exists on the system, then the restore overwrites the virtual machine. However, it is unlikely that the same GUID is assigned to virtual machines on different Hyper-V Servers in the same environment.

When you restore a virtual machine to a cluster from a backup of a cluster, the restore makes the virtual machine highly available and sets the owner node for the virtual machine to the first node in the list of nodes for the cluster.

When you restore a virtual machine to a cluster from a backup of a stand-alone server, you must use the Microsoft Cluster Manager to make the virtual machine highly available after the restore.

Restrictions for redirected restore in mixed environments

You might not be able to perform a redirected restore of a virtual machine from one type of environment to another when the environment includes clustered Hyper-V Servers with different operating systems and types of virtual machine storage (CSV and SMB file shares).

Restore of virtual machine files for manual provisioning

You can restore virtual machine files to a file system location without restoring them to Hyper-V. You can either restore individual virtual hard disks, or you can restore all files for the selected virtual machine, including the virtual machine configuration files, virtual hard disks, and virtual machine snapshots.

After the restore, you can use the virtual machine files in one of the following ways:

- Import the virtual machine.
- Attach the virtual hard disk file to an existing virtual machine for inspection.
- Manually create a virtual machine that points to the restored virtual hard disk files.

These manual steps for the virtual machine files in Hyper-V after the restore are called *manual provisioning*.

When you restore virtual machine files for manual provisioning, the restore process does not remove the original virtual machine files, if the files exist.

Restoring virtual machine files for manual provisioning enables you to avoid overwriting an existing virtual machine on the original Hyper-V Server during the restore.

Granular level recovery

The Avamar Plug-in for Hyper-V VSS enables you to perform granular level recovery (GLR) of files and folders from image-level backups. You can also use the GLR feature to perform granular level recoveries of application databases for Microsoft Exchange servers, SQL servers, and SharePoint farms.

With filesystem GLR, you can restore an image backup to a temporary file system on a different client, and then browse and restore files and folders. You can restore individual files and folders to any folder on the Hyper-V Server from the following action:

- If you installed the Hyper-V VSS plug-in with the GLR feature on the Hyper-V Server that you are backing up, you can restore individual files and folders to any folder on the Hyper-V Server,.
- If you installed the Hyper-V VSS plug-in with the GLR feature on a separate virtual machine or Windows client computer than the Hyper-V Server that you are backing up, you can restore individual files and folders to any folder on the virtual machine or Windows client.

With application database GLR, mount a temporary version of the database and use ItemPoint with the Avamar plug-in for the application to perform the GLR.

NOTE: You cannot perform GLR in the Linux based Virtual Machines.

2

Installation

Topics:

- Preparing to install the Avamar client software
- Installing the Avamar client software
- Upgrading the Avamar client software
- Uninstalling the Avamar client software

Preparing to install the Avamar client software

Review the system requirements for the Avamar client software, and ensure that the environment meets the requirements before you install Avamar client software. The Avamar Config Checker for Microsoft Windows provides an additional automated verification of the environment. You also must download the Avamar Client for Windows and application plug-in installation package from the Avamar server.

System requirements

The environment must meet client compatibility requirements before you install Avamar client software.

See the *E-lab Navigator* at https://elabnavigator.emc.com/eln/modernHomeDataProtection for client compatibility requirements and supported operating systems and application versions.

The Avamar file system client and the plug-ins that you install on the host must have the same version number.

Hardware requirements

The following table lists the hardware requirements for the Avamar Plug-in for Hyper-V VSS and the Avamar Plug-in for Hyper-V VSS with the GLR feature.

Table 5. Hardware requirements

Plug-in	Minimum amount of RAM	Minimum amount of hard drive space
Hyper-V VSS	2 GB	8 MB
Hyper-V VSS with the GLR feature	2 GB	22 MB

Hyper-V requirements

For image-level backups of a virtual machine with a Microsoft Windows guest OS, the Integration Components version for the backup Hyper-V Server and the guest virtual machine must match. If the versions do not match, then the virtual machine might not start when you restore it to a different Hyper-V Server.

Virtual machine requirements

The Avamar Plug-in for Hyper-V VSS supports image-level backup and restore of data on virtual machines with all guest operating systems that Hyper-V supports.

The guest operating system must have a valid license. Otherwise, the virtual machines shut down automatically.

When you perform image-level backups and restores of Hyper-V data, the Avamar Plug-in for Hyper-V VSS supports the following types of storage for virtual machine files:

- Local volumes on a stand-alone server with Windows Hyper-V Server
- Cluster Shared Volumes (CSV) on a Windows Hyper-V Server
- Server Message Block (SMB) 3.0 file shares on the following file servers:
  - Stand-alone file server
  - Scale-Out File Server (SOFS)
  - Clustered file server for general use

You can create a virtual machine by restoring a System State backup of a physical machine to a virtual machine. This type of restore is called a physical to virtual (P2V) restore. The *Avamar for Windows Server User Guide* provides instructions on how to perform a System State restore as part of bare metal recovery (BMR).

SMB file share requirements

When you store Hyper-V virtual machines on SMB file shares, you must configure the environment before you install the Avamar Plug-in for Hyper-V VSS.

Steps

1. If the SMB file shares are on a clustered file server for general use, then install the File Server VSS Agent Service server role on all cluster nodes. Otherwise, backups fail when the Avamar federated cluster client is not the owner node of the virtual machines.

   The Windows Hyper-V Server documentation on the Microsoft TechNet website provides instructions to install the File Server VSS Agent Service server role.
2. Configure the permissions for each SMB file share to add full permissions for each Hyper-V Server. The “Deploy Hyper-V over SMB” article on the Microsoft TechNet website provides instructions on how to configure the file share using either Server Manager or Windows PowerShell commands.
3. Add the Hyper-V Server to the Backup Operators group on the SMB file server:
   a. In the **Administrative Tools** for the SMB file server, open the **Computer Management** window.
   b. Expand the **Local Users and Groups** node in the left pane, and select **Groups**.
   c. Right-click **Backup Operators** in the right pane, and select **Properties**.
      The **Backup Operators Properties** dialog box appears.
   d. Click **Add.**
      The **Select Users, Service Accounts, or Groups** dialog box appears.
   e. Click **Object Types**.
      The **Object Types** dialog box appears.
   f. Select the **Computers** checkbox and click **OK.**
   g. Type the name of the Hyper-V Server and click **OK.**
   h. Click **OK** on the **Backup Operators Properties** dialog box.
   i. In a cluster, repeat these steps for each node.
   j. Restart the SMB server or the **Server** service for the changes to take effect.
4. When you configure a virtual machine to store files on the SMB file share, use only one of the following formats to specify the path to the share for each file:

   ```
   \\fileserver\fileshare\
   \\fileserver.emc.com\fileshare\
   \\10.25.10.255\fileshare\
   \\fc00-aaaa-bbbb-0000-0000-0000-0000-0001.emc.com\fileshare\
   ```

   Do not use multiple formats for the path for the same virtual machine. Otherwise, issues can occur during restore.

Cluster requirements

The Avamar Plug-in for Hyper-V VSS supports the use of CSV and SMB for clustered virtual machine storage.

The Hyper-V VSS plug-in does not support storage of virtual machines on local volumes of a cluster node.

"How Avamar works with Hyper-V in a cluster" provides more information on Avamar system architecture with Hyper-V in a cluster.

Do not perform backups or restores for multiple plug-ins in a cluster simultaneously. When the backups or restores overlap, failures occur.

VSS requirements

The Avamar Plug-in for Hyper-V VSS uses Microsoft Volume Shadow Copy Service (VSS) technology to perform backups. VSS is a framework that enables volume backups to be performed while applications on a system continue to write to the volumes.

The VSS writer enables the creation of image backups for virtual machines by quiescing the Windows operating system and applications within the guest for operating system and application consistency.

Supported VSS providers and writers

The Avamar Plug-in for Hyper-V VSS uses the VSS providers and writers in the following table to perform backups, depending on the environment.

Table 6. Supported VSS providers and writers

Environment	Virtual machine storage	VSS provider	VSS writer
Stand-alone server	Local volumes	Microsoft Software Shadow Copy Provider	Hyper-V VSS Writer
Cluster	SMB file shares	Microsoft File Share Shadow Copy Provider	Hyper-V VSS Writer
	CSV	Microsoft CSV Shadow Copy Provider	• Hyper-V VSS Writer for virtual machines that the primary proxy node owns • Cluster VSS Writer for virtual machines that all other nodes own
	SMB file shares	Microsoft File Share Shadow Copy Provider	Hyper-V VSS Writer

If you manually install the iSCSI Target VDS or VSS hardware provider, then perform the credential configuration steps in the "iSCSI Target Storage (VDS/VSS) Provider" blog post on Microsoft TechNet at http://blogs.technet.com/b/filecab/archive/2012/10/08/iscsi-target-storage-vds-vss-provider.aspx.

VSS snapshot volume requirements

Microsoft VSS framework allows up to 64 volumes in a VSS snapshot. When creating a dataset, do not include more than 64 volumes. If a snapshot includes more than 64 volumes, then the backup fails and the Microsoft event log lists a `VSS_E_MAXIMUM_NUMBER_OF_VOLUMES_REACHED` error.

The VSS framework also limits the number of shadow copies to 64 per volume. If the number of shadow copies in a volume exceeds 64, then the backup fails and the Microsoft event log lists a `VSS_E_MAXIMUM_NUMBER_OF_SNAPSHOTS_REACHED` error.

GLR requirements

Do not use encryption on files and folders that you might need to restore with GLR. The GLR restore fails when you select encrypted files and folders for restore.

Support for symbolic links

Backups with the Avamar Plug-in for Hyper-V VSS fail if the path to virtual machine files includes symbolic links (symlinks) or directory junctions. Exclude virtual machines available through symlinks or directory junctions from backups with the Hyper-V VSS plug-in.

Downloading the software

Download the installation packages for the Avamar Client for Windows, the Avamar Plug-in for Hyper-V VSS, and the Avamar Config Checker from the Avamar server. Then save the installation packages to a temporary folder.

Steps

1. Log in to the Hyper-V management OS as an administrator.

   If Hyper-V is on a Windows Server Core installation, then log in to a computer that can connect to the Avamar server by using a web browser.
2. Open a web browser and type the following URL:

   `https://Avamar_server/dtlt/home.html`

   where *Avamar_server* is the DNS name or IP address of the Avamar server.

   The **Avamar Web Restore** page appears.
3. Click **Downloads.**
   The **Downloads** list appears.
4. Click **+** next to the operating system headings until the applicable software installation packages appear.
5. Click the **Avamar Client for Windows** installation package:

   `AvamarClient-windows-x86_64-version.msi`

   where *version* is the Avamar client version.
6. Save the installation package to a temporary folder.
7. Click the **Hyper-V installation** package:

   `AvamarHypervVSS-windows-x86_64-version.msi`

   where *version* is the Avamar plug-in version.
8. Save the installation package to a temporary folder.
9. Click the **Avamar Config Checker** installation package:

   `Avamar_ConfigChecker_win_x64.zip` (64-bit)
10. Save the installation package to a temporary folder.

Verifying the environment

Use the Avamar Config Checker for Microsoft Windows to verify that you correctly configured the Windows environment for Avamar backup and recovery. The Config Checker checks the configuration for problems that can lead to installation, backup, or recovery failures. These failures can affect the operating system for the application host or the application itself.

About this task

You can run the Avamar Config Checker either before or after you install Avamar software on the client computer.

The Config Checker supports only English language operating systems.

Steps

1. Unzip the Avamar Config Checker installation package. To install the software, run the setup program.

2. Start the Config Checker:
   a. Open the **Start** screen.
   b. Select **Avamar Config Checker**.
3. Click **Next** on the welcome page.
   The **Avamar Application and User Settings** page appears.
4. Select the version number from the **Avamar version** list.
5. In the application list, select the checkbox next to the applications on the client computer. Specify credentials, if required.
6. Click **Next**.
7. Review the summary information.
8. Click **Run Tests**.
   When the verification completes, the **Config Check Results** window appears.
9. Save or open the results in HTML format.

   NOTE: The Config Checker does not automatically save the results. If you do not save the results, you must rerun the Config Checker to view them.

10. Click **Finish** to exit the Config Checker.
11. Review the HTML result file, and correct all failed checks.
12. Rerun the Config Checker to ensure that all the checks are successful.
    The *Avamar Config Checker for Microsoft Windows Technical Note*, available on Online Support at https://support.EMC.com, provides troubleshooting information and details about the results that appear for each application.

Installing the Avamar client software

You can install the Avamar client software on a stand-alone server or in a cluster environment.

Installation road maps

The steps to install the Avamar software for image-level backups of Hyper-V depend on whether the Hyper-V Server is on a stand-alone server or in a cluster environment.

Installation road map for a stand-alone server

Steps

1. Install and configure Hyper-V according to Microsoft guidelines.
2. Install the Avamar Client for Windows in the Hyper-V management OS.
3. Install the Avamar Plug-in for Hyper-V VSS in the Hyper-V management OS.
4. Register the Hyper-V Server as a client with the Avamar server.
5. If you plan to perform file-level restores with GLR, then prepare a virtual machine or a separate Windows computer for GLR:
   a. Install the Avamar Client for Windows.
   b. Install the Avamar Plug-in for Hyper-V VSS, and select the Hyper-V GLR feature during the installation.
   c. Register the virtual machine or Windows computer for GLR as a client with the Avamar server.

Installation road map for a Windows Hyper-V Server cluster with SMB

Steps

1. Install and configure the cluster according to Microsoft guidelines.
2. Install and configure Hyper-V according to Microsoft guidelines.
3. Enable the Remote Management feature on each cluster node.
4. Install the Avamar Client for Windows in the same folder in the Hyper-V management OS on each cluster node.
5. Install the Avamar Plug-in for Hyper-V VSS in the Hyper-V management OS on each cluster node.
6. Register each node as a client with the Avamar server.

7. On an active node, use the Cluster Configuration Tool to configure the federated cluster client for the Hyper-V VSS plug-in.
8. If you plan to perform GLR, which is used for file-level restores, then prepare a virtual machine or a separate Windows computer for GLR:
   a. Install the Avamar Client for Windows.
   b. Install the Avamar Plug-in for Hyper-V VSS, and select the Hyper-V GLR feature during the installation.
   c. Register the virtual machine or Windows computer for GLR as a client with the Avamar server.

Installation road map for a Windows Hyper-V Server cluster with CSV

Steps

1. Install and configure the cluster according to Microsoft guidelines.
2. Install and configure Hyper-V according to Microsoft guidelines.
3. (Optional; not necessary for proxy cluster configuration) Install the Avamar Client for Windows in the same folder in the Hyper-V management OS on each cluster node.
4. Install the Avamar Plug-in for Hyper-V VSS in the Hyper-V management OS on each cluster node.
5. Register each node as a client with the Avamar server.
6. On an active node, use the Cluster Configuration Tool to configure the federated cluster client or proxy cluster client for the Hyper-V VSS plug-in.
7. If you plan to perform GLR, which is used for file-level restores, then prepare a virtual machine or a separate Windows computer for GLR:
   a. Install the Avamar Client for Windows.
   b. Install the Avamar Plug-in for Hyper-V VSS, and select the Hyper-V GLR feature during the installation.
   c. Register the virtual machine or Windows computer for GLR as a client with the Avamar server.

Installing the Avamar Client for Windows

The Avamar Client for Windows includes the Avamar agent and the Avamar Plug-in for Windows File System. The Avamar agent is required for backups and restores with application plug-ins. You can use the Windows File System plug-in to back up operating system and application binary files, which are required for disaster recovery.

The steps to install the Avamar Client for Windows depend on whether the client has a full Windows Server installation or a Windows Server Core installation.

Installing the Windows client on full Windows Server installations

A setup wizard leads you through the steps to install the Windows client. If the User Account Control (UAC) feature is enabled on the client computer, then you must start the setup wizard by using administrator privileges. Otherwise, the software does not install correctly. This procedure provides one method to bypass UAC. The Microsoft documentation provides other methods and more information.

Steps

1. Log in as administrator:
   - On a Hyper-V Server, log in to the Hyper-V management OS as an administrator.
   - On a separate Windows computer or virtual machine for GLR, log in as an administrator.
2. Go to the temporary folder that contains the Avamar installation files that you downloaded.
3. Start the installer:
   - If UAC is disabled, double-click the installation file to open it.
   - If UAC is enabled, open a command prompt as an administrator, change directory to the location of the installation package, and then type the following command:

     msiexec /i AvamarClient-windows-x86_64-*version*.msi

     where *version* is the Avamar client version.

   The welcome page appears.

4. Click **Next**.
   The **End-User License Agreement** page appears.
5. Review the license agreement.
6. Select the checkbox to accept the terms in the license agreement, and click **Next.**
   The **Custom Setup** page appears.
7. Ensure that **Avamar Client User Interface** is selected for installation.
8. (Optional) To specify a folder for the Avamar client installation, click **Browse** and select a location.
9. Click **Next** on the **Custom Setup** page.
   The **Ready to Install Avamar for Windows** page appears.
10. Click **Install.**
11. When the installation completes, click **Finish.**

Installing the Windows client on Windows Server Core installations

Steps

1. Log in to the Hyper-V management OS as an administrator.
2. Use `WinSCP` or `FTP` to copy the Windows client install package from the download temporary folder to a temporary folder on the Windows Server Core computer.

   Alternatively, use the `net use` command from the Server Core computer to connect to a shared folder with the client install package file.
3. Use the `cd` command to browse to the temporary folder with the client install package.
4. Start the software installation by typing the following command:

   `msiexec /i AvamarClient-windows-x86_64-`*`version`*`.msi`

   where *version* is the Avamar client version.

   The installation wizard appears.
5. Follow the instructions in "Installing the Windows client on full Windows Server installations" .

Installing the Avamar Plug-in for Hyper-V VSS

The Avamar Plug-in for Hyper-V VSS enables you to back up and restore Hyper-V data. The steps to install the Avamar Plug-in for Hyper-V VSS depend on whether the client has a full Windows Server installation or a Windows Server Core installation. The installation steps also depend on whether you install the GLR feature for file-level restores.

Installing the Hyper-V VSS plug-in on full Windows Server installations

A setup wizard leads you through the steps to install the plug-in. If UAC is enabled on the client computer, then you must start the setup wizard by using administrator privileges. Otherwise, the software does not install correctly. This procedure provides one method to bypass UAC. The Microsoft documentation provides other methods and additional information.

About this task

The plug-in automatically installs in the same folder as the Avamar Client for Windows.

Steps

1. Log in to the Hyper-V management OS as an administrator.
2. Go to the temporary folder that contains the Avamar installation files that you downloaded.
3. Start the Hyper-V VSS plug-in installation:
   - If UAC is disabled, double-click the file to open it.
   - If UAC is enabled, open a command prompt as an administrator, change directory to the location of the installation package, and then type the following command:

     `msiexec /i AvamarHypervVSS-windows-x86_64-`*`version`*`.msi`

     where *version* is the Avamar plug-in version.

The welcome page appears.

4. Click **Next.**
   The **Avamar Backup Plug-in for Hyper-V VSS Setup** page appears.
5. Select **Avamar Backup Plug-in for Hyper-V VSS**.
   The Hyper-V GLR feature is typically installed on a separate computer and is not selected for installation.
6. Click **Next**.
   The **Ready to Install Avamar Backup Plug-in for Hyper-V VSS** page appears.
7. Click **Install**.
8. When the installation completes, click **Finish**.

Installing the Hyper-V VSS plug-in on Windows Server Core installations

Steps

1. Log in to the Hyper-V management OS as an administrator.
2. Use `WinSCP` or `FTP` to copy the Hyper-V VSS plug-in install package from the download temporary folder to a temporary folder on the Windows Server Core computer.

   Alternatively, use the `net use` command from the Server Core computer to connect to a shared folder with the Hyper-V VSS plug-in install package file.
3. Use the `cd` command to navigate to the temporary folder with the Hyper-V VSS plug-in install package.
4. Start the software installation by typing the following command:

   `msiexec /i AvamarHypervVSS-windows-x86_64-`*`version`*`.msi`

   where *version* is the Hyper-V VSS plug-in version.

   The installation wizard appears.
5. Follow the instructions in "Installing the Hyper-V VSS plug-in on full Windows Server installations".

Installing the Avamar Plug-in for Hyper-V VSS plug-in with the GLR feature

Installing the Hyper-V VSS plug-in with the GLR feature enables you to perform granular level recovery (GLR) of individual files and folders. The computer that you use for GLR should be a separate computer or virtual machine from the Hyper-V management OS. You can also use the GLR feature to perform granular level recoveries of application databases for Microsoft Exchange servers, SQL servers, and SharePoint farms.

Steps

1. Log in as an administrator on the virtual machine or Windows computer that you use for GLR.
2. Go to the temporary folder that contains the Avamar installation files that you downloaded.
3. Start the Hyper-V VSS and GLR plug-in installation:
   - If UAC is disabled, double-click the file to open it.
   - If UAC is enabled, open a command prompt as an administrator, change directory to the location of the installation package, and then type the following command:

     `msiexec /i AvamarHypervVSS-windows-x86_64-`*`version`*`.msi`

     where *version* is the Avamar plug-in version.

   The welcome page appears.
4. Click **Next.**
   The **Avamar Backup Plug-in for Hyper-V VSS Setup** page appears.
5. Select **Avamar Backup Plug-in for Hyper-V VSS and Hyper-V GLR**, and then click **Next**.
   The **Hyper-V GLR WriteCache Folder** page appears.
6. Type or browse to the location for the `WriteCache` folder. The folder must be on an NTFS partition. Do not specify the target location as a folder on a ReFS volume.
7. Click **Next**.
   The **Ready to Install Avamar Backup Plug-in for Hyper-V VSS** page appears.
8. Click **Next**.
   The **Ready to Install Avamar Backup Plug-in for Hyper-V VSS** page appears.

9. Click **Install**.
   If this action is the first time that you are installing the Avamar Plug-in for Hyper-V VSS with GLR, a Windows Security dialog box prompts whether to install the device software for GLR.
10. Click **Install**.
    The **Completed the Avamar Backup Plug-in for Hyper-V VSS Setup Wizard** page appears.
11. Click **Finish**.
    A message prompts you to restart the computer.
12. Click **Yes** to restart the computer.

Registering the client

Before you can back up or restore Hyper-V data, you must register the Hyper-V Server as a client with the Avamar server.

About this task

Specify the name of the Avamar server, the Avamar domain for the client, and the port on the Avamar server for client/server communication. Avamar domains enable you to group clients and limit backup, restore, and monitoring privileges for the group to certain accounts.

In a Windows Hyper-V Server cluster with CSV, register the primary proxy node. In a Windows Hyper-V Server cluster with SMB, register each node in the cluster.

The steps to register a client depend on whether the client is a full Windows Server installation or a Windows Server Core installation.

Registering a full Windows Server client

Steps

1. Log in to the Hyper-V management OS as an administrator.
2. Right-click the Avamar client system tray icon, and select **Manage** > **Activate Client**.
   The **Activate Client Setup** dialog box appears.
3. In the **Administrator Server Address** box, type the DNS name for the Avamar server.
4. In the **Administrator Server Port** box, specify the port on the Avamar server for client/server communication.
5. In the **Client Domain** box, type the name of the Avamar domain for the client.

   The default domain is **`clients`**. Do not use a slash (/) as the first character when you type a subdomain. If you use a slash, an error occurs and you cannot register the client.
6. Click **Activate.**
   A confirmation message appears.
7. Click **OK**.

Registering a Windows Server Core client

Steps

1. Open a DOS prompt on the client computer.
2. Type the following command:

   C:\Program Files\avs\bin\avregister.bat MCS_name domain

   where:

   - *C:\Program Files\avs\bin* is the Avamar client installation path.
   - *MCS_name* is the network hostname defined in DNS for the Avamar server.
   - *domain* is the Avamar domain for the client.

     Do not use a slash (/) as the first character when you type a subdomain. If you use a slash, an error occurs and you cannot register the client.

Configuring the cluster client

The steps to configure the cluster client depend on the cluster operating system and whether you store virtual machines on CSV or SMB file shares.

NOTE: Using RCT, you can perform backup of all highly available virtual machines (CSV, SMB, or both) together.

Configuring the Avamar proxy cluster client on Windows Hyper-V Server installations with CSV

Steps

1. Log in to the primary proxy node as a domain administrator. The account must also be a member of the local Administrators group.
2. Open the **Start** screen and select **Cluster Configuration Tool**.
   The wizard opens at the **Welcome to Avamar Windows Cluster Configuration** page.
3. Click **Next**.
   The **Plug-ins** page appears.
4. Select **Hyper-V VSS** and click **Next.**
   The **Cluster Nodes** page appears with a list of nodes and their status.
5. Ensure that the environment meets the following requirements:
   - All Hyper-V nodes are in an Up status.
   - The installation status of the Windows client on the proxy node is Installed.
   - The installation status of the Hyper-V VSS plug-in on the proxy node is Installed.

   NOTE: In the case of Microsoft Windows Server 2016, the **Configuration Selection** page appears. Select **Traditional Configuration**.

6. Click **Next.**
   The **Operations** page appears.
7. Select **Configure a proxy cluster client(s) over CSV**, and click **Next.**
   The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the environment meets the prerequisite.
8. Ensure that the environment meets all prerequisites on the **Prerequisites** page.

   If the environment does not meet a prerequisite, then exit the wizard, resolve the issue, and restart the wizard.
9. Select the Internet Protocol version that the environment uses, and then click **Next.**
   The **Summary** page appears.
10. Review the settings that you specified in the wizard, and then click **Configure.**
    A dialog box prompts you for credentials.
11. Type the username and password for the service account for the Avamar Plug-in Service for Windows, which is the plug-in service that the Avamar proxy cluster client uses for backup and restore. The account must be a domain administrator or an account that can perform WMI queries and copy files to the CSV during a restore.
    The **Progress** page provides the status of the configuration. When the configuration is complete, the **Results** page appears.
12. Click **Close.**

Configuring the federated cluster client on Windows Hyper-V Server installations with SMB

Steps

1. Log in to an active node in the cluster as a domain administrator. The account must also be a member of the local Administrators group on each cluster node.
2. Open the **Start** screen and select **Cluster Configuration Tool**.
   The wizard opens at the **Welcome to Avamar Windows Cluster Configuration** page.
3. Click **Next.**
   The **Plug-ins** page appears.
4. Select **Hyper-V VSS** and click **Next.**

The **Cluster Nodes** page appears with a list of nodes and their status.

5. Ensure that the environment meets the following requirements:
   - All Hyper-V nodes are in an Up status.
   - The installation status of the Windows client on each of the Hyper-V nodes is Installed.
   - The installation status of the Hyper-V VSS plug-in on each of the Hyper-V nodes is Installed.

   NOTE: In the case of Microsoft Windows Server 2016, the **Configuration Selection** page appears. Select **Traditional Configuration**.

6. Click **Next.**
   The **Operations** page appears.
7. Select **Configure a new cluster client over SMB/CSV for all nodes**.
8. Select **SMB** for the **Storage Type** and click **Next.**
   The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the environment meets the prerequisite.
9. Ensure that the environment meets all prerequisites on the **Prerequisites** page.

   If the environment does not meet a prerequisite, then exit the wizard, resolve the issue, and restart the wizard.
10. Select the Internet Protocol version that the environment uses, and then click **Next.**
    The **Cluster Client Settings** page appears.
11. Type the group name in the **Group name for the cluster client** box.
12. Type the cluster client name in the **Cluster client name** box.
13. Specify whether to automatically bring the cluster client online and activate it with the Avamar server by selecting or clearing the **Bring the cluster client online and activate it with the Avamar server** checkbox.
14. Specify the IP address and network mask for the network to use:
    a. Select the network in the network list.
    b. Type the IP address for the cluster client in the **Cluster client IPv4/IPv6 address** box.
    c. Type the network mask for the cluster client in the **Cluster client IP subnet mask** box.
15. Click **Next**.
    The **Server Settings** page appears.
16. Specify the settings for the Avamar server:
    a. Type either the DNS name of the Avamar server in the **Name** box or the IP address in the **IPv4/IPv6 address** box.
    b. Type the name of the Avamar domain for the cluster client in the **Avamar client domain for the cluster client** box.
    c. Type the data port for Avamar client/server communication in the **Port number** box.

       NOTE: If you change the port number from the default of 28001, then you must change the port number on the Avamar server.

    d. Type the name of the shared network folder or volume in the **Cluster client's var directory** box, or click **Browse** to select a shared network folder or volume.

       The shared network folder or volume stores the cluster client configuration and log files. All nodes in the cluster must have write access to this folder or volume. Select a volume that the cluster owns instead of a remote pathname on the network.
    e. Type the name of the client's SYSDIR directory in the **Cluster client's SYSDIR directory box**, or click **Browse** to select a shared network folder or volume.
17. Click **Next.**
    The **Summary** page appears.
18. Review the settings that you specified in the wizard, and then click **Configure.**
    The **Progress** page provides the status of the configuration. When the configuration is complete, the **Results** page appears.
19. Click **Close.**
20. Specify the SMB file shares on which the virtual machines are stored:
    a. Open the `avtar.cmd` file for the cluster client in a text editor. The `avtar.cmd` file is located in the cluster client `var` folder that you specified in the Cluster Configuration Tool.
    b. Add the following flag to the `avtar.cmd` file:

       `--browse-smb-shares-list=\\`*`SMB-file-server\share1`*`,\\`*`SMB-file-server\share2`*

       where *\\SMB-file-server\share1* and *\\SMB-file-server\share2* are the UNC paths to two SMB shares. Separate the UNC paths for the shares with a comma.

c. (Optional) Configure the cluster client so that the Hyper-V VSS plug-in restores virtual machine files with their original access control list (ACL) permissions instead of the ACL permissions of the destination folder for the restore. Restoring virtual machines to SMB file shares on page 49 provides instructions.
d. Save and close the file.

Configuring the federated cluster client on Windows Hyper-V Server installations with CSV

Steps

1. Log in to an active node in the cluster as a domain administrator. The account must also be a member of the local Administrators group on each cluster node.
2. Open the **Start** menu and select **Program Files** > **Avamar** > **Cluster Configuration Tool**.
   The wizard opens at the **Welcome to Avamar Windows Cluster Configuration** page.
3. Click **Next.**
   The **Plug-ins** page appears.
4. Select **Hyper-V VSS** and click **Next**.
   The **Cluster Nodes** page appears with a list of nodes and their status.
5. Ensure that the environment meets the following requirements:
   - All Hyper-V nodes are in an Up status.
   - The installation status of the Windows client on each Hyper-V node is Installed.
   - The installation status of the Hyper-V VSS plug-in on each Hyper-V node is Installed.

   NOTE: In the case of Microsoft Windows Server 2016, the **Configuration Selection** page appears. Select **Traditional Configuration**.

6. Click **Next**.
   The **Operations** page appears.
7. Select **Configure a new cluster client over SMB/CSV for all nodes**.
8. Select **CSV** for **Storage Type** and click **Next**.
   The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the environment meets the prerequisite.
9. Ensure that the environment meets all prerequisites on the **Prerequisites** page.

   If the environment does not meet a prerequisite, then exit the wizard, resolve the issue, and restart the wizard.
10. Select the Internet Protocol version that the environment uses, and then click **Next.**
    The **Cluster Client Settings** page appears.
11. Type the group name in the **Group name for the cluster client** box.
12. Type the cluster client name in the **Cluster client name** box.
13. Specify whether to automatically bring the cluster client online and activate it with the Avamar server by selecting or clearing the **Bring the cluster client online and activate it with the Avamar server** checkbox.
14. Specify the IP address and network mask for the network to use:
    a. Select the network in the network list.
    b. Type the IP address for the cluster client in the **Cluster client IPv4/IP6 address** box.
    c. Type the network mask for the cluster client in the **Cluster client IP subnet mask** box.
15. Click **Next**.
    The **Server Settings** page appears.
16. Specify the settings for the Avamar server:
    a. Type either the DNS name of the Avamar server in the **Name** box or the IP address in the **IPv4/IPv6 address** box.
    b. Type the name of the Avamar domain for the cluster client in the **Avamar client domain for the cluster client** box.
    c. Type the data port for Avamar client/server communication in the **Port number** box.

       NOTE: If you change the port number from the default of 28001, then you must change the port number on the Avamar server.

    d. Type the name of the shared network folder or volume in the **Cluster client's var directory** box, or click **Browse** to select a shared network folder or volume.

The shared network folder or volume stores the cluster client configuration and log files. All nodes in the cluster must have write access to this folder or volume. Select a volume that the cluster owns instead of a remote pathname on the network.

e. Type the name of the client's SYSDIR directory in the **Cluster client's SYSDIR directory box**, or click **Browse** to select a shared network folder or volume.

17. Click **Next.**
    The **Summary** page appears.
18. Review the settings that you specified in the wizard, and then click **Configure**.
    The **Progress** page provides the status of the configuration. When the configuration is complete, the **Results** page appears.
19. Click **Close**.

Configuring the Avamar cluster client on Windows Hyper-V Server 2016 installations with RCT

Steps

1. Log in to an active node in the cluster as a domain administrator. The account must also be a member of the local Administrators group on each cluster node.
2. Open the **Start** menu and select **Program Files** > **Avamar** > **Cluster Configuration Tool**.
   The wizard opens at the **Welcome to Avamar Windows Cluster Configuration** page.
3. Click **Next.**
   The **Plug-ins** page appears.
4. Select **Hyper-V VSS** and click **Next**.
   The **Cluster Nodes** page appears with a list of nodes and their status.
5. Ensure that the environment meets the following requirements:
   - All Hyper-V nodes are in an Up status.
   - The proxy node has the Windows client and the Hyper-V VSS plug-in installed.
6. Click **Next**.
   The **Configuration Selection** page appears.
7. Select **Resilient Change Tracking (RCT) Configuration** to use RCT during backup operations.
   - Select **Configure a new cluster client** to configure a new cluster.
   - Select **Modify the existing cluster client configuration** to make changes to an existing configuration.
   - Select **Remove the cluster client configuration from all nodes** to remove an existing configuration.
8. Select **Traditional Configuration**, if you do not want to use RCT during backup operations.

   Configuring the federated cluster client on Windows Hyper-V Server installations with SMB and Configuring the federated cluster client on Windows Hyper-V Server installations with CSV provides additional information.
9. Click **Next**.
   The **Proxy Nodes** page appears.
10. Select the additional proxy nodes that are required for data rollover. By default, the node on which the **Windows Cluster Configuration Wizard** is run, is selected as the proxy node.
11. Click **Next**.
    The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the environment meets the prerequisite.
12. Ensure that the environment meets all prerequisites on the **Prerequisites** page.

    If the environment does not meet a prerequisite, then exit the wizard, resolve the issue, and restart the wizard.
13. Click **Next**.
    The **Cluster Client Settings** page appears.
14. Type the cluster client name in the **Cluster client name** box.
15. Type the IP address that must be used in the **IP that has to be used for Cluster client** box.
16. Click **Next**.
    The **Server Settings** page appears.
17. Specify the settings for the Avamar server:
    a. Type either the DNS name of the Avamar server in the **Name** box or the IP address in the **IPv4/IPv6 address** box.
    b. Type the name of the Avamar domain for the cluster client in the **Avamar client domain for the cluster client** box.
    c. Type the data port for Avamar client/server communication in the **Port number** box.

NOTE: If you change the port number from the default of 28001, then you must change the port number on the Avamar server.

18. Click **Next.**
    The **Client Settings** page appears.
19. Type the name of the shared network folder or volume in the **Cluster client's var directory** box, or click **Browse** to select a shared network folder or volume.

    The shared network folder or volume stores the cluster client configuration and log files. All nodes in the cluster must have write access to this folder or volume. Select a volume that the cluster owns instead of a remote pathname on the network.
20. Type the name of the client's SYSDIR directory in the **Cluster client's SYSDIR directory box**, or click **Browse** to select a shared network folder or volume.
21. Click **Next.**
    The **Summary** page appears.
22. Review the settings that you specified in the wizard, and then click **Configure**.
    A dialog box prompts you for credentials.
23. Type the username and password for the service account for the Avamar Plug-in Service for Windows, which is the plug-in service that the Avamar cluster client uses for backup and restore. The account must be a domain administrator or an account that can perform WMI queries.
    The **Progress** page provides the status of the configuration. When the configuration is complete, the **Results** page appears.
24. Click **Close**.

Configuring the cluster client on Windows Server Core installations

Steps

1. Open a DOS prompt:
   - In a Windows Hyper-V Server environment with CSV, open a DOS prompt on the primary proxy node.
   - In a Windows Hyper-V Server environment with SMB, open a DOS prompt on an active node.
2. Type the following command:

   ***C:\Program Files\avs\bin*av_cluster_config_wizard.exe**

   where *C:\Program Files\avs\bin* is the Avamar client installation path.

   The Cluster Configuration Tool appears.
3. Follow the instructions in the previous topics to configure the cluster client by using the Cluster Configuration Tool.

Adding nodes for the cluster client

If you already configured the cluster client in a cluster, you can add nodes to the configuration. The nodes that you add might be new nodes in the cluster, or they might have been offline when you configured the cluster client.

About this task

You can add nodes in a Windows Hyper-V Server environment with SMB or with CSV.

Steps

1. Install the Avamar Client for Windows on the new node.
2. Install the Avamar Plug-in for Hyper-V VSS on the new node.
3. Log in to the node with the cluster client as a domain administrator. The account must also be a member of the local Administrators group on each cluster node.
4. Open the Cluster Configuration Tool:
   a. Open the **Start** screen.
   b. Select **Cluster Configuration Tool**.

   The wizard opens at the **Welcome to Avamar Windows Cluster Configuration** page.
5. Click **Next**.
   The **Plug-Ins** page appears.

6. Select **Hyper-V VSS**, and then click **Next**.
   The **Cluster Nodes** page appears with a list of nodes and their status.
7. Ensure that all nodes are in an Up status, and then click **Next**.
   The **Operations** page appears.
8. Select **Configure new nodes with the existing cluster client configuration** and click **Next**.
   The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the environment meets the prerequisite.
9. Ensure that the environment meets all prerequisites on the **Prerequisites** page.

   If the environment does not meet a prerequisite, then exit the wizard, resolve the issue, and restart the wizard.
10. Select the Internet Protocol version that the environment uses, and then click **Next**.
    The **Summary** Page appears.
11. Review the settings that you specified in the wizard, and then click **Configure**.
    The **Progress** page provides the status of the configuration. When the configuration is complete, the **Results** page appears.
12. Click **Close**.

Upgrading the Avamar client software

Upgrading steps depend on whether the installation is on a stand-alone server or in a cluster.

Upgrading on a stand-alone server

Steps

1. Ensure that the environment meets all system requirements for the new version.
2. Log in to the Hyper-V management OS as an administrator.
3. Uninstall the earlier version of the Avamar Plug-in for Hyper-V VSS by using **Programs and Features**.

   When you uninstall the plug-in with the GLR feature, you must restart the computer.
4. Upgrade the Avamar Client for Windows by running the Windows client installation wizard for the new version on the Windows server.
5. Install the new version of the Avamar Plug-in for Hyper-V VSS by running the plug-in installation wizard for the new version on the Hyper-V Server.

Upgrading in a cluster

Steps

1. Uninstall the current version of the Avamar client and plug-in:
   a. Use the earlier version of the Cluster Configuration Tool to uninstall the Avamar cluster client.
   b. Uninstall the earlier version of the Avamar Plug-in for Hyper-V VSS from each node by using **Programs and Features**.

      When you uninstall the plug-in with the GLR feature, you must restart the computer.
   c. Uninstall the earlier version of the Avamar Client for Windows from each node by using **Programs and Features**.

   The user guides for the earlier versions of the software provides instructions for each of these steps.
2. Install the new version of the Avamar client and plug-in:
   a. Install the Avamar Client for Windows in the same folder on each node in the cluster.
   b. Install the Avamar Plug-in for Hyper-V VSS in the same folder on each node in the cluster.
   c. Configure the Avamar cluster client.

Uninstalling the Avamar client software

When you uninstall Avamar plug-in and client software from a client computer, scheduled backups no longer occur for the client. You cannot restore backups to the client after you uninstall the software.

About this task

When you uninstall the Avamar client software, you can keep or delete the backups for the client:

- To keep the backups for the client so that you can restore the backups to a different client, retire the client by using Avamar Administrator.
- To delete the backups for the client, delete the client by using Avamar Administrator.

Retire or delete the client either before or after you uninstall the plug-in. The *Avamar Administration Guide* provides more information.

Uninstall roadmap

Steps

1. (Cluster only) Uninstall the Avamar cluster client using the Cluster Configuration Tool.
2. Uninstall the Avamar Plug-in for Hyper-V VSS.
3. Uninstall the Avamar Client for Windows.
4. (Cluster only) Repeat the previous two steps on each node in a Windows Hyper-V Server cluster with SMB or CSV.

Uninstalling the cluster client

The steps to uninstall the Avamar cluster client depend on whether the server is a full Windows Server installation or a Windows Server Core installation.

Uninstalling the cluster client from a Windows Server installation

Steps

1. Log in as a domain administrator:
   - In a Windows Hyper-V Server cluster with CSV proxy or multi-proxy configuration, log in to the primary proxy node as a domain administrator.
   - In a Windows Hyper-V Server cluster with SMB/CVS federated configuration, log in to the active node as a domain administrator.

   The domain administrator account must also be a member of the local Administrators group on each cluster node.
2. Open the Cluster Configuration Tool:
   a. Open the **Start** screen.
   b. Select **Cluster Configuration Tool**.

   The wizard opens at the **Welcome to Avamar Windows Cluster Configuration** page.
3. Click **Next**.
   The **Plug-Ins** page appears.
4. Select **Hyper-V VSS**, and then click **Next**.
   The **Cluster Nodes** page appears with a list of nodes and their status.
5. Ensure that the status of each Hyper-V node is **Up**, and then click **Next**.

   NOTE: In the case of Microsoft Windows Server 2016, the **Configuration Selection** page appears. Do the following:

   a. Select **Remove the cluster client configuration from all nodes** to remove an existing RCT cluster client configuration.
   b. Select **Traditional Configuration** to remove CSV proxy, SMB/CSV federated client configuration, and click **Next**.

   The **Operations** page appears.

6. Select the option to remove the cluster client:
   - On a Windows Hyper-V Server cluster with CSV proxy or multi-proxy configuration, select **Remove the proxy cluster client over CSV**.
   - On a Windows Hyper-V Server cluster with SMB/CSV federated configuration, select **Remove the cluster SMB/CSV client from all nodes**.
7. Click **Next**.
   The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the environment meets the prerequisite.
8. Ensure that the environment meets all prerequisites on the page, and then click **Next**.
   The **Summary** page appears.
9. Review the settings that you specified in the wizard, and then click **Uninstall**.
   The **Progress** page provides the status of the uninstall. When the uninstall is complete, the **Results** page appears.
10. Click **Close**.

Uninstalling the cluster client from a Windows Server Core installation

Steps

1. Open a DOS prompt:
   - In a Windows Hyper-V Server environment with CSV with proxy or multi-proxy configuration, open a DOS prompt on the primary proxy node.
   - In a Windows Hyper-V Server environment with SMB/CSV federated configuration, open a DOS prompt on the node with the cluster client.
2. Type the following command:

   ```
   C:\Program Files\avs\bin\av_cluster_config_wizard.exe --uninstall
   ```

   where *C:\Program Files\avs\bin* is the Avamar client installation folder.

Uninstalling the Avamar Plug-in for Hyper-V VSS

Steps

- On a full Windows Hyper-V Server installation, use **Programs and Features**.
- On a Windows Server Core installation, open a command prompt, browse to the folder with the installation file, and type the following command:

  ```
  msiexec /uninstall AvamarHypervVSS-windows-x86_64-version.msi
  ```

  where *version* is the version number of the installation package.

  If you do not have the installation file, follow the steps in "Downloading the software" and "Installing the Windows client on Windows Server Core installations". These steps are to download the file and copy it to the client computer.

  NOTE: When you uninstall the plug-in with the GLR feature, you must restart the computer.

Uninstalling the Avamar Client for Windows

Steps

- On a full Windows Hyper-V Server installation, use **Programs and Features**.
- On a Windows Server Core installation, open a command prompt, browse to the folder with the installation file, and type the following command:

  ```
  msiexec /uninstall AvamarClient-windows-x86_64-version.msi
  ```

  where *version* is the version number of the installation package.

  If you do not have the installation file, follow the steps in "Downloading the software" and "Installing the Windows client on Windows Server Core installations". These actions are performed to download the file and copy it to the client computer.

3

Image-Level Backups

Topics:

- Perform an on-demand Hyper-V backup by using AUI
- Backup of virtual machines using RCT
- Scheduling backups using the AUI Policy wizard
- Synthetic full backups
- Excluding virtual machines from backups
- Monitoring backups
- Cancel backups

Perform an on-demand Hyper-V backup by using AUI

You can perform a client backup that is independent of existing schedules and policies.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
2. In the domain tree, select the domain for the client.
3. In the list of clients, select the client computer to back up.
4. Click the **Backup** tab.
   The Backup wizard is displayed. In the **Plugin** pane, a list of plug-ins on the client is displayed.
5. In the **Plugins** pane, perform the following steps:
   a. Select the **Windows Hyper-V VSS** plug-in.

      NOTE: The Host Component is not available for backup when you use a cluster client in a Windows Hyper-V Server cluster with SMB or CSV.

      A list of virtual machines and the Host Component is displayed in the right pane.
   b. Browse to and select the check box next to the items that you want to back up.
      - To back up all virtual machines and the Host Components for a Hyper-V Server, select the **Windows Hyper-V VSS plug-in** check box.
      - To back up individual virtual machines, select the check boxes for the virtual machines in the right pane.
      - To back up the Host Components on Windows Hyper-V Server, select the **Host Component** check box.
   c. Click **NEXT**.

   The **Basic Configuration** pane is displayed.
6. In the **Basic Configuration** pane, perform the following steps:
   a. Select the backup retention policy settings:
      - To automatically delete this backup from the Avamar server after a specific amount of time, select **Retention period**. Specify the number of days, weeks, months, or years for the retention period.
      - To automatically delete this backup from the Avamar server on a specific calendar date, select **End date** and browse to that date on the calendar.
      - To keep this backup for as long as this client remains active in the Avamar server, select **No end date**.
   b. In the **Avamar encryption method** list, select the encryption method to use for data transfer between the client and the Avamar server during the backup.

      The encryption technology and bit strength for a client/server connection depends on several factors, including the client operating system and Avamar server version. The *Avamar Product Security Guide* provides additional information.
   c. In the **Optionally select a proxy to perform backup** list, select the proxy.

The default setting is **Automatic**, which enables the Avamar server to choose the best proxy for this operation.

d. Click **NEXT**.

The **More Options** window is displayed.

7. In the **More Options** pane, set the plug-in options:

Hyper-V VSS plug-in backup options provides more information about the basic backup options.

a. (Optional) Toggle the **Show Advanced Options** switch to view advanced configuration options.
b. Select whether you want to perform incremental backups.
c. Select whether to promote the backup from copy to full for the in-guest shadow copy that occurs during an image-level backup:
   - To perform a full backup, select the **Promote backup within virtual machine from copy to full** checkbox. During a full backup, the backup history of each file on the virtual machine updates. The update process causes log truncation in some applications, such as Microsoft Exchange.
   - To perform a copy backup, clear the **Promote backup within virtual machine from copy to full** checkbox. A copy backup does not update the backup history of each file.
d. To store the backup on a Data Domain system instead of the Avamar server, select **Store backup on Data Domain system** checkbox, and then select the Data Domain system from the list.
e. To store the backup on a Data Domain system, select the encryption method for data transfer between the client and the Data Domain system during the backup from the **Encryption method to Data Domain system** list.
f. (Optional) Enable multi-streaming and specify multi-streaming settings:
   i. Select the **Enable multi-streaming** check box.
   ii. Select the maximum number of streams to use for the backup from the **Maximum number of streams** list. Specify a maximum of one stream for each virtual machine in the backup set.
   iii. Select the method by which Avamar groups data for multi-streaming from the **Group by** list:
      - To create one stream for each virtual machine, select **Virtual machine**.
      - To create one stream for each CSV or SMB file share, select **Volume**.
g. Specify whether to exclude offline virtual machines from the backup by selecting or clearing the **Exclude offline virtual machines from backup** checkbox.
h. (Optional) Specify whether to write maximum information to log files by selecting or clearing the **Enable debugging messages** check box. If selected, the backup process creates large log files.
i. (Optional) Specify the number of minutes to wait for an application-consistent snapshot to complete on nodes where the federated cluster client is not running in the **Minutes to wait for application-consistent snapshot to complete** box.

   The default value is 20 minutes. An application-consistent snapshot of approximately 15 virtual machines on a node can complete in 20 minutes.

   If the snapshot does not complete in the specified amount of time, the backup operation proceeds on the remaining cluster nodes and the backup completes with exceptions.
j. (Enable synthetic full backups by selecting the **Perform Synthetic Full Backups** checkbox. This checkbox is cleared by default. Synthetic full backups on page 46 contains further information about synthetic full backups.

8. Click **FINISH**.
The following status message is displayed:

```
Backup request initiated.
```

Backup of virtual machines using RCT

You can use the resilient change tracking (RCT) feature to back up virtual machines on Microsoft Windows Server 2016 and later.

A virtual disk consists of blocks. When you perform a full backup, all these blocks are copied to a repository. For the next backup, you only require the changed blocks. However, if there is no option to track changes that occur in between backups, the source virtual machine must be scanned, a hash calculated for each block, and then the changes between the virtual machine in your backup repository and the original virtual machine must be verified. The backup solution has to process an entire virtual machine and rescan each block's hash. This requires a significant amount of resources and time.

An efficient backup solution uses very limited resources during backup operations. One such mechanism is the use of change block tracking (CBT). Change block tracking creates a bitmap of all the blocks on a virtual hard drive. After you have changed the data in a certain block, it is marked as changed. During backup, the backup solution checks the bitmap for all the changed blocks since the last backup, and only copies the changed blocks.

RCT is a feature that provides integrated change block tracking capability for Hyper-V virtual machines. Hyper-V uses RCT to track changes to virtual machines that occur in between backups. Only blocks that have changed since the last backup are considered for the next incremental backup.

Configuring the Avamar cluster client on Windows Hyper-V Server 2016 installations with RCT provides additional information about configuring the cluster client with RCT.

NOTE: For a Microsoft Windows Server 2016 stand-alone host, the default backup type is RCT. If you want to backup using VSS, add the flag `--target-rct-server=""` to the `avhypervvss.cmd` file in the `var` folder. The Host Component is not available for backup when the Backup type is RCT.

Scheduling backups using the AUI Policy wizard

Scheduled backups run automatically to ensure that backups occur on an ongoing basis. You can schedule backups to run daily, weekly, or monthly.

About this task

You can schedule backups by using the Policy wizard to create a backup policy.

Perform the following steps within the **Policy** wizard. The *Avamar Administration Guide* provides more information about policies, datasets, schedules, and retention settings.

Steps

1. Assign members to the new backup policy.
2. Assign a dataset to the new backup policy.
   To create a dataset, use the Policy wizard or select **Settings** > **Dataset** > **Add**.
3. Assign a schedule to the new backup policy.
   To create a schedule, use the Policy wizard or select **Settings** > **Schedule** > **Add**.
4. Assign a retention policy to the new backup policy.
   To create a retention policy, use the Policy wizard or select **Settings** > **Retention** > **Add**.
5. Enable scheduling for the backup policy.

Creating a dataset

A dataset specifies the data to include in a scheduled backup and the options to use for the backup. Create at least one dataset for scheduled backups on a client or group of clients. Create multiple datasets to segregate client data.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Settings**.
   The **Setting** pane is displayed.
2. Click the **Dataset** tab.
3. Click **ADD**.
   The **Create Dataset** window is displayed.
4. In the **Dataset Name** field, type a name for the dataset.
   The name can include alphanumeric characters (A-Z, a-z, 0–9) and the following special characters: period (.), hyphen (-), and underscore (_). Do not use Unicode characters or the following special characters: ` ~ ! @ # $ % ^ & * ( ) = + [ ] { } | \ / ; : ' " < > , ?
5. From the **Plugins** list, select the **Windows Hyper-V VSS** plug-in.
   The Windows Hyper-V VSS plug-in options are displayed.
6. Click the **Options** tab, and then set the plug-in options:
   a. To view advanced options, select **Show Advanced Options**.
   b. In the **Backup level** field, select whether you want to perform incremental backup or full backups.
   c. In the **Promote backup within virtual machine from copy to full** field, select whether to promote the backup from copy to full for the in-guest shadow copy that occurs during an image-level backup:

- To perform a full backup, select the **Promote backup within virtual machine from copy to full** check box.

  During a full backup, the backup history of each file on the virtual machine updates. The update process causes log truncation in some applications, such as Microsoft Exchange.

- To perform a copy backup, clear the **Promote backup within virtual machine from copy to full** check box.

  A copy backup does not update the backup history of each file.

d. To store the backup on a Data Domain system instead of the Avamar server, select **Store backup on Data Domain system** check box, and then select the Data Domain system from the list.
e. In the **Encryption method to Data Domain system** list, select the encryption method to use for data transfer between the client and the Data Domain system during the backup.
f. To enable multi-streaming, select the **Enable multi-streaming** check box.
g. If you enable multi-streaming:

   i. In the **Maximum number of streams** list, select the maximum number of streams to use for the backup.
   ii. Specify whether to enable multi-streaming by selecting or clearing.

h. If you enable multi-streaming, select the method by which Avamar groups data for multi-streaming from the **Group by** list:

   - To create one stream for each virtual machine, select **Virtual Machine**.
   - To create one stream for each CSV or SMB file share, select **Volume**.

i. Specify whether to exclude offline virtual machines from the backup by selecting or clearing the **Exclude offline virtual machines from backup** checkbox.
j. Specify whether to write maximum information to log files by selecting or clearing the **Enable debugging messages** checkbox. If selected, the backup process creates large log files.
k. In the **Minutes to wait for application-consistent snapshot to complete** filed, specify the number of minutes to wait for an application-consistent snapshot to complete on nodes where the federated cluster client is not running.

   The default value is 20 minutes. An application-consistent snapshot of approximately 15 virtual machines on a node can complete in 20 minutes.

   If the snapshot does not complete in the specified amount of time, the backup operation proceeds on the remaining cluster nodes and the backup completes with exceptions.

l. Enable synthetic full backups by selecting the **Perform Synthetic Full Backups** checkbox. This checkbox is unselected by default.

   Synthetic full backups on page 46 contains further information about synthetic full backups.

7. Click the **Source Data** tab and set the following plug-in options:

   - To include all virtual machines and the Host Components, select **All Hyper-V Data**.
   - To limit the dataset to specific items, perform the following steps:

   a. In the **File/Folder Path**, type the file path.
   b. Click **ADD**.

8. Click **SUBMIT**.

Creating a backup policy

A backup policy is a collection of Avamar clients that use the same dataset, schedule, and retention settings to implement scheduled backups.

About this task

Member clients must all be in the same Avamar domain. When you create a backup policy, you define the dataset, schedule, and retention settings that apply for scheduled backups. These settings comprise the backup policy, which controls backup behavior for all members of the backup policy unless you override these settings at the client level.

The *Avamar Administration Guide* provides information about creating and editing backup policies, schedules, or retention settings.

Enabling a scheduled backup for a backup policy

Scheduled backups occur only for enabled backup policies. Backup policies are disabled by default unless you select the **Enabled** check box on the first page of the **New Policy** wizard. If you did not enable the backup policy when you created it, use the menu options in the **Policy** window to enable backups.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Backup Policy**.
   The **Policy** page is displayed.
2. In the domain tree, select a domain or subdomain for the backup policy.
   To select a subdomain for the backup policy, toggle the **Include Sub-domain** switch to on.
3. Select a backup policy from the list.
4. To enable a backup policy, click **MORE ACTIONS** > **Enable Policy**.
5. To disable a backup policy, click **MORE ACTIONS** > **Disable Policy**.

Synthetic full backups

Synthetic full backups use the incremental backup data to synthesize a full backup on the server.

With nonsynthetic full backups, backups are file-based, where each incremental backup backs up the appropriate files to the Avamar server, and these files are linked to the backup data already present on the Avamar server.

With synthetic full backups, data is backed up as streams. As a result, data from each backup is present on the server in the form of a single disk, instead of a chain of parent and child disks.

Synthetic full backups provide many inherent benefits, such as:

- Faster recovery of guest VMs: A Synthetic full Backup can be restored in a single step, which results in faster recovery.
- Faster Granular Level Recovery (GLR): GLR operations take less time with synthetic full backups.

Excluding virtual machines from backups

Steps

- To exclude specific virtual machines from both on-demand and scheduled image-level backups of a Hyper-V Server, use a text editor to add the following flag to the `avhypervvss.cmd` file before the backup:

  `--excludelist=vm1, vm2, vm3`

  where *vm1*, *vm2*, and *vm3* are the names of the virtual machines to exclude. To specify a unique virtual machine, use the format *vm<guid>*, where *vm* is the virtual machine name and *guid* is the unique GUID for the virtual machine.

  NOTE: Because the value for **`excludelist`** is a comma-separated list, VMs with commas in their names fail. Other special characters in VM names may also cause the names to fail. To resolve this issue, encapsulate each *vm<guid>* value in quote marks.

  The `avhypervvss.cmd` file is located in the `var` folder of the Avamar installation folder, which is usually `C:\Program Files\avs\`. To exclude virtual machines in a cluster, edit the `avhypervvss.cmd` file in the `var` folder for the cluster client, such as `C:\ClusterStorage\Volume1\var`. You specify the cluster client `var` folder when you configure the cluster client.

  If you specify a virtual machine name with non-ASCII characters in the exclude list in the `avhypervvss.cmd` file, then the backup includes the virtual machine. To exclude a virtual machine with non-ASCII characters in the name, use the command line interface for the backup.

Monitoring backups

You can monitor and view status information for backup and restore operations in the **Activity** window.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Activity**.
   The **Activity** window is displayed with a list of activities.
2. To filter the results to display only backups activity:
   a. Click ▼ next to the **Type** column.
   b. Type **`All Backups`**.
   c. Press **Enter**.
3. View the status of the backup job:
   - The job completes with success if all items are backed up.
   - The job completes with exceptions if some items were successfully backed up but other items failed or were skipped for valid reasons.
   - The job completes with an error if failures occur, but items still might have been backed up.

   If the job completes with exceptions or fails with an error, review the activity log to determine the cause of the error.

   If the backup client is a federated cluster client, the activity log only displays the workflow messages for the primary process. Review the activity report to determine if the failure occurred in the primary process or to identify the secondary clients where the failure occurred. Failures typically occur in the secondary clients, so manually review the logs on each secondary client that failed. The logs are in the `C:\Program Files\avs\var` folder of the cluster node, where *C:\Program Files\avs* is the Avamar installation folder.

Cancel backups

You can cancel a backup any time before it completes. The cancellation might take 5 minutes or longer. The backup might complete before the cancellation finishes.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Activity**.
   The **Activity Monitor** appears with a list of activities.
2. Select the backup from the list.
3. Click **CANCEL**.
   A confirmation dialog box is displayed.
4. Click **YES**.

4

Image-Level Restores

Topics:

- Restore requirements
- Restoring to the original client
- Restoring to a different location on the original Hyper-V Server
- Restoring to create a virtual machine on a different Hyper-V server
- Restoring virtual machine files for manual provisioning
- Restoring the Host Components
- Monitoring restores
- Cancel restores

Restore requirements

Review the requirements in the following topics before you perform an image-level restore of Hyper-V data.

Software requirements for restore

Ensure that the software in the environment meets the following requirements:

- The following software must be running on both the source and target systems:
  - Avamar Client for Windows
  - Avamar Plug-in for Hyper-V VSS
- The target must be registered with the same Avamar server as the source.
- If the environment is a cluster, then configure the Avamar cluster client.

Requirements to restore to the original location

When you restore virtual machines to the original location, ensure that you configured the original drive letters, mount points, or directory junctions for the virtual machines. It is not necessary to create the folder paths. The restore process re-creates the folders, if necessary.

Redirected restore requirements

Perform the following tasks before you perform a redirected restore to create a virtual machine on a different Hyper-V Server:

- Ensure that the original Hyper-V Server and the target Hyper-V Server use the same version of Integration Services.

  If the versions do not match, then errors can appear when you restart the virtual machine after the restore.
- If the environment includes SCVMM, then ensure that both the source and target servers are SCVMM hosts.

  The Initial Store file name is different on an SCVMM host than on a Hyper-V Server that is not an SCVMM host.
- To replicate the authorization configuration of the original Hyper-V Server, prepare the Host Components on the target Hyper-V Server by using one of the following methods:
  - Overwrite the authorization settings on the target Hyper-V Server by restoring the Host Components from the Avamar backup of the source Hyper-V Server. Restore the Host Components first, and then restore the virtual machines separately.
  - To avoid overwriting any customized authorization settings on the target Hyper-V Server, re-create the customized authorization settings from the source Hyper-V Server.

The best practice is to perform a redirected restore of virtual machines to Hyper-V Servers of the same or later release as the Hyper-V Server where the virtual machine was created. Although you can restore a virtual machine to an earlier release of a Hyper-V Server, it may not fully function on that server.

Restoring virtual machines to SMB file shares

When you restore virtual machines to SMB file shares, the virtual machine files automatically inherit file and folder ACL permissions from the restore destination folder. You can configure the Hyper-V client so that the Hyper-V VSS plug-in restores virtual machine files with their original ACL permissions.

Steps

1. Use a text editor to create or open the `avtar.cmd` file in the Avamar `var` folder:
   - On a stand-alone server, the `var` folder is located in the Avamar installation folder on the Hyper-V management OS. The default Avamar installation folder is `C:\Program Files\avs\`.
   - In a cluster, specify the `var` folder for the cluster client when you configure the cluster client with the Avamar Cluster Configuration Tool.
2. Add the following flag to the`avtar.cmd` file:

   `--ignoreacls=false`
3. Save and close the file.

Restoring to the original client

Steps

1. Ensure that the environment meets the requirements in "Restore requirements".
2. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
3. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
4. In the list of clients, select the client that you want to restore.
5. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.
   c. In the **From** and **To** fields, specify the date range.
   d. Click **RETRIEVE**.
   e. In the list of backups, select a backup.

   The list of backups for the date range is displayed.
6. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.
7. In the **Destination Client** pane, perform the following steps:
   a. Select **Restore to original client**.
   b. Click **NEXT**.

   The **Backup Content** pane is displayed.
8. In the **Backup Content** pane, perform the following steps:
   a. In the hierarchical Domain tree, select the VMs from the backup that you want to restore.

      The **Contents of Backup** pane displays the list of backed up files that are contained within the selected backup for the restore.

   b. In the right pane, select the virtual machine backup that you want to restore.
   c. Click **NEXT**.

   The **Destination Location** pane is displayed.

9. In the **Destination Location** pane, perform the following steps:
   a. Select **Restore to the original Hyper-V Server**.
   b. Click **NEXT**.

      The **More Options** pane is displayed.
10. In the **More Options** pane, set the plug-in options:
    a. If the backup is stored on a Data Domain system, select the encryption method for data transfer between the Data Domain system and the client from the **Encryption method from Data Domain system** list.
    b. Select the **Allow virtual machine overwrite** check box.

       NOTE: If you leave this option clear and a virtual machine with the same GUID exists on the Hyper-V Server, the restore completes with errors or fails, and does not restore any virtual machines.

    Hyper-V VSS plug-in restore options provides the complete list of plug-in options.
11. Click **NEXT**.

    The **Summary** pane is displayed.
12. In the **Summay** pane, review the provided information, and then click **FINISH**.
    The following status message is displayed:

    ```
    Restore request initiated.
    ```

Restoring to a different location on the original Hyper-V Server

Steps

1. Ensure that the environment meets the requirements in "Restore requirements".
2. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
3. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
4. In the list of clients, select the client that you want to restore.
5. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.
   c. In the **From** and **To** fields, specify the date range.
   d. Click **RETRIEVE**.
   e. In the list of backups, select a backup.

   The list of backups for the date range is displayed.
6. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.
7. In the **Destination Client** pane, perform the following steps:
   a. Select **Restore to original client**.
   b. Click **NEXT**.

   The **Backup Content** pane is displayed.
8. In the **Backup Content** pane, perform the following steps:
   a. In the hierarchical domain tree, select the VMs from the backup that you want to restore.

      The **Contents of Backup** pane displays a list of backed up files that are contained within the selected backup for the restore.
   b. In the right pane, select the virtual machine backup that you want to restore.
   c. Click **NEXT**.

   The **Destination Location** pane is displayed.
9. In the **Destination Location** pane, select **Restore to a different Hyper-V Server or location**.

Specify the file path of the target location where you want to restore the data:

- To type the file path, in the **Restore Location** field, type the file path of the target location where you want to restore the data and then click **NEXT**. For example: `E:/vmrestore_dir/`
- To select a location, perform the following steps:
  a. In the **Restore Location** field, click **CHOOSE**.

     The **Choose** restore location window is displayed.

  b. In the **Browse** pane, select a location.

     The chosen location is displayed in the **Restore Location** field.

  c. Click **NEXT**.

The **More Options** pane is displayed.

10. In the **More Options** pane, set the plug-in options:
    a. Select the **Allow virtual machine overwrite** checkbox.

       NOTE: If you leave this option clear and a virtual machine with the same GUID exists on the target Hyper-V Server, the restore completes with errors or fails and does not restore any virtual machines.

    b. If the backup is stored on a Data Domain system, select the encryption method for data transfer between the Data Domain system and the client from the **Encryption method from Data Domain system** list.

    Hyper-V VSS plug-in restore options provides the complete list of plug-in options.
11. Click **NEXT**.

    The **Summary** pane is displayed.
12. In the **Summay** pane, review the provided information, and then click **FINISH**.
    The following status message is displayed:

    ```
    Restore request initiated.
    ```
13. After the restore completes, validate that the virtual machine is visible in Hyper-V Manager. Review the Hyper-V logs for errors if the virtual machine is not present.
14. In Microsoft Hyper-V Manager, repair the virtual device settings of the virtual machine with the new Hyper-V Server virtual devices, if necessary.

Restoring to create a virtual machine on a different Hyper-V server

About this task

When restoring Virtual Machines to a different Hyper-V server in clustered environments in a proxy/multi-proxy configuration:

- If a virtual machine is restored as a highly available virtual machine, it should be restored to the primary proxy node. Ownership is assigned to the same node as the one on which it was running at the time of backup. If that node owner is not available, ownership is assigned to the primary proxy node.
- If restore is done on a secondary node, the virtual machine must be made highly available manually.

Steps

1. Ensure that the environment meets the requirements in "Restore requirements".
2. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
3. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
4. In the list of clients, select the client that you want to restore.
5. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.

c. In the **From** and **To** fields, specify the date range.
d. Click **RETRIEVE**.
e. In the list of backups, select a backup.

The list of backups for the date range is displayed.

6. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.

7. In the **Destination Client** pane, perform the following steps:
   a. Select **Restore to a different client**.
   b. In the domain tree, select the domain for the client.
   c. From the list of clients, select the target client.
      The client is displayed in the **Destination Client** field.
   d. Click **NEXT**.

      The **Backup Content** pane is displayed.

8. In the **Backup Content** pane, perform the following steps:
   a. In the hierarchical Domain tree, select the VMs from the backup that you want to restore.

      The **Contents of Backup** pane displays a list of backed up files that are contained within the selected backup for the restore.

   b. In the right pane, select the virtual machine backup that you want to restore.
   c. Click **NEXT**.

   The **Destination Location** pane is displayed.

9. In the **Destination Location** pane, select **Restore to a different Hyper-V Server or location**.

   Specify the file path of the target location where you want to restore the data:

   - To type the file path, in the **Restore Location** field, type the file path of the target location where you want to restore the data and then click **NEXT**. For example: `E:/vmrestore_dir/`
   - To select a location, perform the following steps:
     a. In the **Restore Location** field, click **CHOOSE**.

        The **Choose** restore location window is displayed.

     b. In the **Browse** pane, select a location.

        The chosen location is displayed in the **Restore Location** field.

     c. Click **NEXT**.

   The **More Options** pane is displayed.

10. In the **More Options** pane, set the plug-in options:
    a. Select the **Allow virtual machine overwrite** check box.

       NOTE: If you leave this option clear and a virtual machine with the same GUID exists on the target Hyper-V Server, the restore completes with errors or fails and does not restore any virtual machines.

    b. If the backup is stored on a Data Domain system, select the encryption method for data transfer between the Data Domain system and the client from the **Encryption method from Data Domain system** list.

    Hyper-V VSS plug-in restore options provides the complete list of plug-in options.

11. Click **NEXT**.

    The **Summary** pane is displayed.

12. In the **Summay** pane, review the provided information, and then click **FINISH**.
    The following status message is displayed:

    ```
    Restore request initiated.
    ```

13. After the restore completes, validate that the virtual machine is visible in Hyper-V Manager. Review the Hyper-V logs for errors if the virtual machine is not present.
14. In Microsoft Hyper-V Manager, repair the virtual device settings of the virtual machine with the new Hyper-V Server virtual devices, if necessary.

Restoring virtual machine files for manual provisioning

You can restore virtual machine files as files to a file system location without restoring them to Hyper-V. After the restore, you can import the virtual machine or attach the virtual hard disk file to an existing virtual machine for inspection. You can also manually create a virtual machine and point that machine at the restored virtual hard disk files. These manual steps for the virtual machine files in Hyper-V after the restore are called manual provisioning.

About this task

NOTE: When you restore virtual machine files for manual provisioning, the restore process does not remove the original virtual machines, if the files exist.

Steps

1. Ensure that the environment meets the requirements in "Restore requirements".
2. Verify that the target folder for the restore exists. You cannot create folders during the restore.
3. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
4. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
5. In the list of clients, select the client that you want to restore.
6. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.
   c. In the **From** and **To** fields, specify the date range.
   d. Click **RETRIEVE**.
   e. In the list of backups, select a backup.

   The list of backups for the date range is displayed.
7. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.
8. In the **Destination Client** pane, perform the following steps:
   - To restore to the original location, perform the following steps:
     a. Select **Restore to original client**.
     b. Click **NEXT**.
   - To restore to a different client, perform the following steps:
     a. Select **Restore to a different client**.
     b. In the domain tree, select the domain for the client.
     c. In the list of clients, select the target client.
        - To restore to shared storage in a cluster, specify the cluster client.
        - To restore to a local disk on a cluster node, specify the hostname of the physical node.

        The client appears in the **Destination Client** field.
     d. Click **NEXT**.
9. In the **Backup Content** pane, perform the following steps:
   a. In the hierarchical Domain tree, select the VMs from the backup that you want to restore.

      The **Contents of Backup** pane displays a list of backed-up files that are contained within the selected backup for the restore.
   b. In the right pane, select the virtual machine backup or the VHD files that you want to restore.
   c. Click **NEXT**.

   The **Destination Location** pane is displayed.

10. In the **Destination Location** pane, select **Restore virtual machine files for manual provisioning**.

    Specify the file path of the target location where you want to restore the data:

    - To type the file path, in the **Restore Location** field, type the file path of the target location where you want to restore the data and then click **NEXT**. For example: `E:/vmrestore_dir/`

      a. To restore to an SMB file share, type the UNC path to the share.
      b. To restore to a CSV on a Windows Hyper-V Server, type the path of the CSV.

    - To select a location, perform the following steps:

      a. In the **Restore Location** field, click **CHOOSE**.

         The **Choose** restore location window is displayed.

      b. In the **Browse** pane, select a location.

         The chosen location is displayed in the **Restore Location** field.

      c. Click **NEXT**.

    The **More Options** pane is displayed.

11. In the **More Options** pane, set the plug-in options:

    In the **Avamar encryption method** list, select the encryption method for data transfer between the Avamar server and the client during the restore.

    The encryption technology and bit strength for a client/server connection depend on several factors, including the client operating system and Avamar server version. The *Avamar Product Security Guide* provides additional information.

    Hyper-V VSS plug-in restore options provides the complete list of plug-in options.

12. Click **NEXT**.

    The **Summary** pane is displayed.

13. In the **Summay** pane, review the provided information, and then click **FINISH**.
    The following status message is displayed:

    ```
    Restore request initiated.
    ```

Results

The restore process creates a folder for the restored files in the target folder that you specified during the restore. The folder name comprises the date and time of the restore, such as 20140317_103711. The restore preserves the original folder structure of the virtual machine or individual VHD file. The restore also converts drive letters to folders. For example, if the original virtual machine location is `D:\MyVM` and you specify `E:\CopyOfMyVM` as the target folder, the restore creates a folder that is called `E:\CopyOfMyVM\20140317_103711\D\MyVM`.

Restoring the Host Components

The Host Components contain the role-based security configuration for Hyper-V. These components normally do not need restoring, except in the event of Hyper-V host data corruption or a disaster recovery scenario. You can restore the Host Components to the original location on a stand-alone Hyper-V Server or to a different stand-alone Hyper-V Server.

In a Windows Hyper-V Server cluster with CSV, you can use the proxy cluster client to back up and restore the Host Components on the proxy node.

You cannot use the federated cluster client to back up or restore the Host Components in a Windows Hyper-V Server. To back up or restore Host Components on cluster nodes, use the Hyper-V VSS plug-in on the individual nodes to perform stand-alone backup or restore of Host Components.

You can also use Avamar Plug-in for Windows VSS on each node to perform a bare metal recovery backup and restore, which re-images the system and includes Hyper-V Host Components.

During a redirected restore, re-create the customized authorization settings from the source Hyper-V Server instead of restoring the Host Components from a backup. Re-creating the customized authorization settings enables you to avoid overwriting settings on the target Hyper-V Server.

Restoring Host Components on a stand-alone server

Steps

1. Stop the Virtual Machine Management Service (VMMS) for the Hyper-V Server:
   a. In Hyper-V Manager, right-click the server and select **Stop Service**.
   b. Click **Turn Off** on the confirmation message.
2. Follow the steps in Restoring to the original client on page 49 or Restoring a virtual machine to a different server on page 77. Select only the Host Components for restore. Do not restore virtual machines at the same time as the Host Components.
3. Restart the VMMS service after the restore by right-clicking the server in Hyper-V Manager and selecting **Start Service**.

Restoring Host Components on a cluster proxy node

To restore the Host Components on the proxy node in a Windows Hyper-V Server cluster with CSV:

1. Use one of the following procedures to restore the Host Components:
   - "Restoring to the original location"
   - "Restoring to create a virtual machine on a different Hyper-V Server"
2. Select the proxy cluster client as the source client for the restore operation.

To restore the backup to a different Hyper-V Server:

1. Restore only the Host Components.
2. Restore the virtual machines separately.

Monitoring restores

You can monitor and view status information for backup and restore operations in the **Activity** window.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Activity**.
   The **Activity** window is displayed with a list of activities.
2. To filter the results to display only restore activity:
   a. Click ▼ next to the **Type** column.
   b. Type `Restore`.
   c. Press **Enter**.
3. Select the **Activity Monitor** tab.

   A list of all activities is displayed.

   NOTE: The **Proxy** column on the **Activity Monitor** tab displays `N/A` for all Hyper-V VSS plug-in activities. The column is used only for VMware proxy activities.
4. View the status of the restore.

   If the job completes with exceptions or the job fails with error, review the activity log to determine the cause of the error.

   If you are restoring to shared storage in a cluster by using a federated cluster client, the activity log only displays the workflow messages for the cluster node where the cluster client is running. To determine if the failure occurred on the node with the cluster client or on a different node, review the activity report.

   If the failure occurred on a different node or the activity log is not conclusive as to the cause of failure, each failed cluster node should manually review the logs. The logs are in the `C:\Program Files\avs\var` folder of each node, where *C:\Program Files\avs* is the Avamar installation folder. You cannot use Notepad to open the log file when the file is on a CSV. Copy the log file to a non-CSV to open it with Notepad.

Cancel restores

You can cancel a restore any time before it completes. The cancellation might take 5 minutes or longer. The restore might complete before the cancellation finishes.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Activity**.
   The **Activity Monitor** appears with a list of activities.
2. Select the restore from the list.
3. Click **CANCEL**.
   A confirmation dialog box is displayed.
4. Click **YES**.

5

Granular level recovery

Topics:

- Granular level recovery to the original location
- Granular level recovery to a different location
- Setting a custom GLR timeout value
- Performing granular level recovery of application databases

Granular level recovery to the original location

If you installed the Avamar Plug-in for Hyper-V VSS with the GLR feature on the Hyper-V Server that you are backing up, you can restore individual files and folders to any folder on the Hyper-V Server for granular level recovery.

Steps

1. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
2. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
3. In the list of clients, select the client that you want to restore.
4. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.
   c. In the **From** and **To** fields, specify the date range.
   d. Click **RETRIEVE**.
   e. In the list of backups, select a backup.

   The list of backups for the date range is displayed.
5. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.
6. In the **Destination Client** pane, perform the following steps:
   a. Select **Restore to original client**.
   b. Click **NEXT**.

   The **Backup Content** pane is displayed.
7. In the **Backup Content** pane, perform the following steps:
   a. To perform a granular level recovery, toggle the **GLR** switch to **ON**.
      Avamar mounts the image. Mounting the image might take some time.
   b. In the hierarchical Domain tree, select VMs in the backup and browse to the files that you want to restore.

      The **Contents of Backup** pane displays a list of files that are contained within the VMs inside the selected backup for the restore.

   c. In the right pane, select the files or folders to restore.

      If you browse to a folder that contains more than 40,000 objects, only the first 40,000 objects are displayed. To access all objects in the folder, restore the entire folder and its contents.

      Do not select encrypted files and folders. The GLR restore fails when you select encrypted files and folders for restore.
   d. Click **NEXT**.

   The **Destination Location** pane is displayed.
8. In the **Destination Location** pane, perform the following steps:

a. Select **Restore everything to its original location**.
b. Click **Next**.

The **More Options** pane is displayed.

9. In the **More Options** pane, set the plug-in options:
   a. In the **Amount of time to leave AvFS mounted** list, select when to dismount the temporary file system:
      - **Dismount after restore completes**
      - **Dismount after 1 hour of inactivity**
      - **Dismount after 2 hours of inactivity**
   b. In the **Restore folder where files will be restored** field, type the target folder. This folder must exist.

   Hyper-V VSS plug-in restore options provides the complete list of plug-in options.
10. Click **NEXT**.

    The **Summary** pane is displayed.

    The restore writes the data to the target location in a folder named `Recovered Items datetime`, where *datetime* is the day of the week, month, date, time, and year of the restore. For example, data that you restore on Tuesday March 11, 2014 at 3:13:56 p.m. restores to a folder named `Recovered Items Tue Mar 11 03:13:56 2014`.
11. In the **Summay** pane, review the provided information, and then click **FINISH.**
    The following status message is displayed:

    ```
    Restore request initiated.
    ```
12. Copy and paste the restored files and folders from the folder in the temporary file system to the target location.

Granular level recovery to a different location

If you installed the Avamar Plug-in for Hyper-V VSS with the GLR feature on a separate virtual machine or Windows client computer than the Hyper-V Server that you are backing up, you can restore individual files and folders to any folder on the virtual machine or Windows client for granular level recovery.

Steps

1. Ensure that the environment meets the requirements in "Restore requirements".
2. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
3. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
4. In the list of clients, select the client that you want to restore.
5. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.
   c. In the **From** and **To** fields, specify the date range.
   d. Click **RETRIEVE**.
   e. In the list of backups, select a backup.

   The list of backups for the date range is displayed.
6. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.
7. In the **Destination Client** pane, perform the following steps:
   a. Select **Restore everything to a different client**.
   b. In the domain tree, select the domain for the client.
   c. From the list of clients, select the target client.
      The client is displayed in the **Destination Client** field.
   d. Click **NEXT**.

      The **Backup Content** pane is displayed.
8. In the **Backup Content** pane, perform the following steps:

a. To perform a granular level recovery, toggle the **GLR** switch to **ON**.
Avamar mounts the image. Mounting the image might take some time.

b. In the hierarchical Domain tree, select VMs in the backup and browse to the files that you want to restore.

The **Contents of Backup** pane displays a list of files that are contained within the VMs inside the selected backup for the restore.

c. In the right pane, select the files or folders to restore.

If you browse to a folder that contains more than 40,000 objects, only the first 40,000 objects are displayed. To access all objects in the folder, restore the entire folder and its contents.

Do not select encrypted files and folders. The GLR restore fails when you select encrypted files and folders for restore.

d. Click **NEXT**.

The **Destination Location** pane is displayed.

9. In the **Destination Location** pane, select **Restore virtual machine files for manual provisioning**.

Specify the file path of the target location where you want to restore the data:

- To type the file path, in the **Restore Location** field, type the file path of the target location where you want to restore the data and then click **NEXT**. For example: `E:/vmrestore_dir/`
- To select a location, perform the following steps:

  a. In the **Restore Location** field, click **CHOOSE**.

  The **Choose** restore location window is displayed.

  b. In the **Browse** pane, select a location.

  The chosen location is displayed in the **Restore Location** field.

  c. Click **NEXT**.

The **More Options** pane is displayed.

10. In the **More Options** pane, set the plug-in options:

In the **Amount of time to leave AvFS mounted** list, select when to dismount the temporary file system:

- **Dismount after restore completes**
- **Dismount after 1 hour of inactivity**
- **Dismount after 2 hours of inactivity**

Hyper-V VSS plug-in restore options provides the complete list of plug-in options.

11. Click **NEXT**.

The **Summary** pane is displayed.

The restore writes the data to the target location in a folder named `Recovered Items` *`datetime`*, where *datetime* is the day of the week, month, date, time, and year of the restore. For example, data that you restore on Tuesday March 11, 2014 at 3:13:56 p.m. restores to a folder named `Recovered Items Tue Mar 11 03:13:56 2014`.

12. In the **Summay** pane, review the provided information, and then click **FINISH.**
The following status message is displayed:

```
Restore request initiated.
```

13. Copy and paste the restored files and folders from the folder in the temporary file system to the target location.

Setting a custom GLR timeout value

You can control how long the temporary file system for GLR remains mounted by setting a custom GLR timeout value. Set the timeout value before you perform the GLR restore.

Steps

- To set the timeout value, log in as an administrator on the virtual machine or Windows computer that you use for GLR, and then type the following command:

  C:\Program Files\avs\bin*avhypervglr --set-glr-timeout=*n

  where *C:\Program Files\avs\bin* is the Avamar client installation folder and *n* is the timeout value in minutes. The minimum value is 5, and the maximum value is 1440, which is equivalent to 24 hours.

- To view the current timeout value, type the following command:
  C:\Program Files\avs\bin\avhypervglr --get-glr-timeout

Performing granular level recovery of application databases

The Avamar Plug-in for Hyper-V VSS with the GLR feature can be used with the ItemPoint software to provide GLR for Microsoft Exchange, SQL, and SharePoint databases.

Prerequisites

To perform this procedure:

- The supported Microsoft application (Exchange, SQL, or SharePoint) must be installed and configured in a guest VM on a Hyper-V node or cluster.
- The Avamar Plug-in for Hyper-V VSS with the GLR feature must be installed on the Hyper-V node or cluster.
- ItemPoint and the Avamar plug-in for the application itself must be installed on the node that is used for GLR of the application (Microsoft Exchange, SQL, or SharePoint) data. The Avamar plug-in documentation for the appropriate application contains plug-in installation information.

Steps

1. Ensure that the environment meets the requirements in "Restore requirements".
2. In the AUI navigation pane on the left, click ≫, and then click **Asset Management**.
   The **Asset Management** window is displayed.
3. In the domain tree, select the domain that contains the Windows Hyper-V VSS server.

   You cannot view clients outside the domain for the login account. To view all clients, log in to the root domain.

   A list of Avamar clients is displayed in the pane below the domains list.
4. In the list of clients, select the client that you want to restore.
5. (Optional) To locate backups by date:
   a. In the right pane, click **VIEW MORE**.
   b. Click **SEARCH**.
   c. In the **From** and **To** fields, specify the date range.
   d. Click **RETRIEVE**.
   e. In the list of backups, select a backup.

   The list of backups for the date range is displayed.
6. Click the **Restore** tab.

   The **Restore** wizard is displayed and the **Destination Client** pane is displayed on the right.
7. In the **Destination Client** pane, perform the following steps:
   - To restore to the original location, perform the following steps:
     a. Select **Restore to original client**.
     b. Click **NEXT**.
   - To restore to a different client, perform the following steps:
     a. Select **Restore to a different client**.
     b. In the domain tree, select the domain for the client.
     c. In the list of clients, select the target client.
        - To restore to shared storage in a cluster, specify the cluster client.
        - To restore to a local disk on a cluster node, specify the hostname of the physical node.

        The client appears in the **Destination Client** field.
     d. Click **NEXT**.
8. In the **Backup Content** pane, toggle the **GLR** switch to **ON**.

   Avamar mounts the image. Mounting the image might take some time.

9. On the target application VM for Microsoft Exchange, SQL, or SharePoint, open ItemPoint from the Microsoft Windows **Start** menu:
   a. Select **Programs**.
   b. Select the ItemPoint folder appropriate for the application (for example, the **ItemPoint for Microsoft Exchange** folder).
   c. Select the ItemPoint program appropriate for the application (for example, the **ItemPoint for Microsoft Exchange** program).

   The **Data Wizard** opens at the **Source Selection** window.
10. In the **Source Selection** window:
    a. Browse to the mount location of the VHD which was created by using the Avamar Plug-in for Hyper-V VSS for GLR.

       For example: `C:\Program Files\avs\var\vmsql\`
    b. Browse to and select one of the following:
       - For Microsoft SQL and SharePoint, select the `.mdf` and `.ldf` files.

         For example:
         - C:\Program Files\avs\var\vmsql\Disk 0\Partition 1\Program Files\Microsoft SQL Server\MSSQL12.HVSQL\MSSQL\DATA\charan.mdf
         - C:\Program Files\avs\var\vmsql\Disk 0\Partition 1\Program Files\Microsoft SQL Server\MSSQL12.HVSQL\MSSQL\DATA\charan_log.ldf
       - For Microsoft Exchange, select the `.ebd` file.
11. Proceed to complete the granular level recovery as described in the ItemPoint documentation for the appropriate application plug-in.

A

Plug-in Options

Topics:

- How to set plug-in options
- Hyper-V VSS plug-in backup options
- Hyper-V VSS plug-in restore options
- Hyper-V GLR plug-in options

How to set plug-in options

Plug-in options enable you to control specific actions for on-demand backups, restores, and scheduled backups. The available plug-in options depend on the operation type and plug-in type.

Specify plug-in options in the AUI for on-demand backup or restore wizards, or when a dataset for a scheduled backup is created. Set plug-in options with the graphical user interface (GUI) controls (text boxes, check boxes, radio buttons, and so forth). Type an option and its value in the **Key** and **Value** fields.

NOTE: The Avamar software does not check or validate the information that is typed in the **Show Free Form** section of the **More Options** pane. The values in the **Key** and **Value** fields override settings that are specified with the GUI controls for the options.

Hyper-V VSS plug-in backup options

The following options are available for the Avamar Plug-in for Hyper-V VSS when you perform an on-demand backup or when you configure a dataset for scheduled backups.

Table 7. Hyper-V VSS plug-in backup options

Option	Description
Backup Level	To perform incremental backups, select the **Incremental**. If **Full** is selected, only full backups are performed. If **Incremental** is selected and no full backup exists, a full backup is then performed.
Promote backup within virtual machine from copy to full	Select the checkbox to promote the backup type from copy to full for the in-guest shadow copy that occurs during an image-level backup. During a full backup, the backup history of each file on the virtual machine updates. The update process causes log truncation in some applications, such as Microsoft Exchange. A copy backup does not update the backup history of each file. The default setting is to leave the checkbox clear and set the in-guest backup type to copy. This setting prevents truncation of application logs on the virtual machine.
Store backup on Data Domain system	To store the backup on a Data Domain system instead of the Avamar server, select the checkbox, and then select the Data Domain system from the list. **NOTE:** To enable this option, add a Data Domain system to the Avamar configuration. The *Avamar and Data Domain System Integration Guide* provides instructions.
Encryption method to Data Domain system	Specifies the encryption method for data transfer between the client and the Data Domain system during the backup.

Table 7. Hyper-V VSS plug-in backup options (continued)

Option	Description
Enable multi-streaming	To enable multi-streaming, which is parallel processing of backup jobs by using multiple processors, select the checkbox, and then select the maximum number of streams from the **Maximum number of streams** list. Multi-streaming can improve system performance in environments with multiple processors.
Maximum number of streams	If you enable multi-streaming, select the maximum number of streams from the list. Each stream requires a separate processor.
Group by	If you enable multi-streaming, select the method that Avamar uses to group data for multi-streaming: ● Select **Virtual machine** to create one stream for each virtual machine. ● Select **Volume** to create one stream for each CSV or SMB file share.
Exclude offline virtual machines from backup	Select the checkbox to exclude offline virtual machines from the backup.
Advanced Options	
Enable debugging messages	Select the checkbox to write maximum information to the log files for debugging. Use caution when you select this option. The backup process creates large log files.
Minutes to wait for application-consistent snapshot to complete	Specify the number of minutes to wait for an application-consistent snapshot to complete on nodes where the federated cluster client is not running. The default value is 20 minutes. An application-consistent snapshot of approximately 15 virtual machines on a node can complete in 20 minutes. If the snapshot does not complete in the specified amount of time, then the backup operation proceeds on the remaining cluster nodes and the backup completes with exceptions. This option only applies to the following cluster environments: ● Windows Hyper-V Server with virtual machine storage on SMB file shares ● Windows Hyper-V Server with virtual machine storage on CSV
Backup Targets	Select one of the following virtual machines for RCT backups: ● **All Virtual Machines** ● **Only CSV Virtual Machines** ● **Only SMB Virtual Machines** The default backup target is **All Virtual Machines**.
Snapshot Consistency Level	The consistency level for snapshots in RCT backups can be **Application Consistent** or **Crash Consistent**. The default is **Application Consistent**.
Perform Synthetic Full Backups	Enables synthetic full backups. This checkbox is unselected by default.

Hyper-V VSS plug-in restore options

The following options are available when you perform an image-level restore with the Avamar Plug-in for Hyper-V VSS.

Table 8. Hyper-V VSS plug-in restore options

Option	Description
Allow virtual machine overwrite	Select the checkbox to overwrite the virtual machine if an existing virtual machine on the Hyper-V Server has the same GUID as the virtual machine that you are restoring.

Table 8. Hyper-V VSS plug-in restore options (continued)

Option	Description
Encryption method from Data Domain system	Specifies the encryption method for data transfer between the Data DOmain system and the client during the restore.
Advanced Options	
Enable debugging messages	Select the checkbox to write maximum information to the log files for debugging. Use caution when you select this option. The restore process creates large log files.
Restore virtual machine with new GUID	Select this option to restore a virtual machine with a new GUID. This is applicable only for redirected restores from RCT backups. This option is not selected by default.

Hyper-V GLR plug-in options

The following plug-in options are available when you perform granular level recovery for Hyper-V.

Table 9. Hyper-V GLR plug-in options

Option	Description
Amount of time to leave AvFS mounted	Select when to automatically dismount the temporary file system from the virtual machine or Windows client for GLR: • **Dismount after restore completes** • **Dismount after 1 hour of inactivity** • **Dismount after 2 hours of inactivity**
Restore folder where files are to be restored	Type the path to the target folder for the folders and files for GLR.

B

Command Line Interface

Topics:

- Overview of the Hyper-V VSS plug-in CLI
- Command reference
- Specifying command line options
- CLI examples

Overview of the Hyper-V VSS plug-in CLI

The Hyper-V VSS plug-in enables you to use a command line interface (CLI) with the `avhypervvss` command instead of Avamar Administrator to back up and restore Hyper-V data.

When you use the CLI to perform a backup or restore, specify the command options for the Hyper-V VSS plug-in binary at the command prompt. The plug-in interacts with the `avtar` process to write backup data to or read backup data from the Avamar server or a Data Domain system.

The `avhypervvss` binary is available in the `C:\Program Files\avs\bin` folder, where *C:\Program Files\avs* is the Avamar client installation folder.

To use the CLI, open a command prompt and change directory to the `bin` folder. Then type the command at the command prompt.

Command reference

The `avhypervvss` command enables you to browse for Hyper-V data to back up or restore, perform the backup, or perform the restore.

Synopsis

```
avhypervvss --operation={browse | backup | restore} [options]
```

Operations

The operation that you specify with the `avhypervvss` command controls the task that `avhypervvss` performs. Available operations include `browse`, `backup`, and `restore`.

Supply one of the operations in the following table for the `avhypervvss` command by using the `--operation` option.

Table 10. Operations for the `avhypervvss` command

Operation	Description
`browse`	Returns an alphabetic list of virtual machines on the Hyper-V Server that are available for backup. On a stand-alone server, the list includes only the virtual machine names. In a cluster, the list includes the virtual machine names, resource names, and the current owner node of the virtual machine. The command results appear as standard output in the command window.
`backup`	Performs an on-demand backup of the specified data.

Table 10. Operations for the avhypervvss command (continued)

Operation	Description
	Include options with the backup operation to specify the data to back up, the Avamar server for the backup, Avamar login credentials, a label for the backup, and other options to control backup behavior.
restore	Restores the specified data. Include options with the restore operation to specify the data to restore, the Avamar server for the restore, Avamar login credentials, the target location for the restore, and other options to control restore behavior.

Options

The options that you specify with the avhypervvss command control browse, backup, and restore behavior. Some options are available for multiple operations, such as the account options for connecting to the Avamar server. Other options apply only to backups or restores.

Common options

Common options for the avhypervvss command are general options that are available for multiple operations.

The following common options are available for the avhypervvss command.

Table 11. Common avhypervvss options

Option	Description
--backup-type=*type*	Internal use only.
--exclude-pluginid-list=*string* --excludepluginids=*string*	Internal use only.
--version	Displays the build version of the Avamar Plug-in for Hyper-V VSS.

Account options

Account options for the avhypervvss command enable you to specify credentials to connect to the Avamar server for backups and restores.

The following account options are available for the avhypervvss command.

Table 12. Account options for the avhypervvss command

Option	Description
--account=*domain/client* --path=*domain/client* --acnt=*domain/client*	Required for all backup and restore operations. Specifies the client to back up or restore from by using the format *domain/client*, where *domain* is the Avamar domain for the client, and *client* is the name of the client computer.
--id=*user*	Required for all backup and restore operations. Specifies the Avamar username for authentication. **NOTE:** You can specify the values for the --id and --account options simultaneously by specifying --id=*user@domain/client*.

Table 12. Account options for the avhypervvss command (continued)

Option	Description
--password=*password* --ap=*password* --pswd=*password*	Required for all backup and restore operations. Specifies the password for the Avamar account.
--server=*Avamar_server* --hfsaddr=*Avamar_server*	Required for all backup and restore operations. Specifies the hostname or IP address of the Avamar server.

Logging options

Logging options for the avhypervvss command enable you to specify the path and file name for the avhypervvss log file, and to control how much information the plug-in writes to the log file.

The following logging options are available for the avhypervvss command.

Table 13. Logging options for the avhypervvss command

Option	Description
--informationals=*n*	Sets the information level for status messages, where *n* is a number such as 0, 1, 2.
--log	Redirects and appends output to an alternative log file specified by the --logfile option
--logfile=*file*	Used with the --log option to specify the full path and file name of the alternative log file.
--noinformationals	Disables all status messages.
--nostdout	Disables output to STDOUT. However, if you supply --log and --logfile, then output still goes to the log file.
--nowarnings	Disables warning messages.
--quiet	Suppresses all debugging messages.
--verbose --v	Enables all messages, including status and warning messages.

Browse options

There are no browse options for the avhypervvss command.

Backup options

Backup options for the avhypervvss command enable you to control backup behavior. Many of these options are the same as the plug-in options that you specify in Avamar Administrator when you perform an on-demand backup or create a dataset for scheduled backups.

The following avhypervvss options are available for the backup operation.

Table 14. Backup options for the avhypervvss command

Option	Description
--[avtar]ddr-encrypt-strength={high | medium | none}	When you store the backup on a Data Domain system, specify the encryption method for data transfer between the client and the Data Domain system during the backup.

Table 14. Backup options for the `avhypervvss` command (continued)

Option	Description
`--brtype={full | incremental}`	Specifies whether the backup level should be full or incremental.
`--clusternode={`*node1(node1 IP address)*`}`	Specifies the node information in a federated cluster backup flow. *node1 IP address* is the IP address being used for running federated backup or recovery.
`--ddr={true | false}`	Specifies whether to store the backup on a Data Domain system instead of the Avamar server. To store the backup on a Data Domain system, specify `true`, and then specify the Data Domain system by using `--ddr-index`.
`--ddr-index=`*n*	Specifies the index number (1, 2, 3, and so forth) of the Data Domain system on which to store the backup. The index number is assigned to the Data Domain system when you add it to the Avamar server configuration.
`--enable-incremental={true | false}`	Specifies whether incremental backups should be performed. By default, incremental backups are enabled.
`--exclude-offline-vms={true | false}`	Specifies whether to exclude offline virtual machines during backup. To exclude offline virtual machines, specify `true`.
`--excludelist=`*vm1,vm2,vm3*	Excludes the specified virtual machines from the backup, where *vm1*, *vm2*, and *vm3* are the names of the virtual machines to exclude. To specify a unique virtual machine, use the format *vm<guid>*, where *vm* is the virtual machine name and *guid* is the unique GUID for the virtual machine.
`--expires=`*{days | timestamp}*	Specifies backup expiration as a number of *days* from today or an absolute *timestamp*.
`--federated={true | false}`	Specify `true` to back up a high-availability virtual machine in a federated cluster environment (Windows Hyper-V Server CSV or Windows Hyper-V Server with SMB).
`--incr-chain-threshold=`*n*	Specifies the number of incremental backups that will occur, after which the backup is promoted to full. By default, after 38 incremental backups, the backup is promoted to full. To specify that backups should be incremental forever, set this option to **0**.
`--max-streams=`*n*	Specifies the maximum number of streams, where *n* is a value between 2 and 10.
`--multi-proxy=`*proxy_node1, proxy_node2*	Specifies the short names of the proxy nodes to use in Windows Hyper-V Server clusters with CSV and multiple proxies. You can optionally specify the IP address for the node after the short name of the node.
`--parallel-type={by-target | by-volume}`	Specifies how to group streams: ● Specify `by-target` to group by virtual machine ● Specify `by-volume` to group by CSV or SMB share
`--parallel={true | false}`	Specifies whether to use multi-streaming. To use multi-streaming, specify `true`, and then specify values for the `--max-streams` and `--parallel-type` options.
`--promote-child-copy-to-full={true | false}`	Specifies whether to promote the backup type from copy to full for the in-guest shadow copy that occurs during an image-level backup:

Table 14. Backup options for the `avhypervvss` command (continued)

Option	Description
	• Specify `true` to perform a full backup. During a full backup, the backup history of each file on the virtual machine updates. The update causes log truncation for some applications, such as Microsoft Exchange. • Specify `false` to perform a copy backup. The backup history of each file does not update during a copy backup. This value prevents truncation of application logs on the virtual machine.
`--retention-type=`*type* `--retentiontype=`*type*	Assigns advanced retention to the backup. Specify one of the following values: • `none` — Do not assign any retention type to this backup. Treat the backup as a normal on-demand backup. • `daily` — Designate this backup as a daily backup. • `weekly` — Designate this backup as a weekly backup. • `monthly` — Designate this backup as a monthly backup. • `yearly` — Designate this backup as a yearly backup.
`--vss-snapshot-timeout=`*minutes*	Specify the number of minutes to wait for an application-consistent snapshot to complete on nodes where the federated cluster client is not running. The default value is 20 minutes. An application-consistent snapshot of approximately 15 virtual machines on a node can complete in 20 minutes. If the snapshot does not complete in the specified amount of time, then the backup operation proceeds on the remaining cluster nodes and the backup completes with exceptions. This option only applies to the following cluster environments: • Windows Hyper-V Server with virtual machine storage on SMB file shares • Windows Hyper-V Server with virtual machine storage on CSV

Restore options

Restore options for the `avhypervvss` command enable you to control restore behavior. Many of these options are the same as the plug-in options that you specify in Avamar Administrator when you perform a restore.

The following `avhypervvss` options are available for the `restore` operation.

Table 15. Restore options for the `avhypervvss` command

Option	Description
`--[avtar]ddr-encryption-strength={high | medium | none}`	When the backup is stored on a Data Domain system, specify the encryption method for data transfer between the Data Domain system and the client during the restore.
`--allowoverwrite={true | false}`	Specify `true` to overwrite a virtual machine with the same GUID during restore, if one exists on the target Hyper-V Server. A restore fails if you omit this option or if you specify `--allowoverwrite=false`, in which there is a virtual machine with the same GUID as a virtual machine that you are restoring.

Table 15. Restore options for the `avhypervvss` command (continued)

Option	Description
`--clusternode={`*node1(node1 IP address)*`}`	Specifies the node information in a federated cluster backup flow. *node1 IP address* is the IP address being used for running federated backup or recovery.
`--federated={true | false}`	Specify `true` to restore a high availability virtual machine in a federated cluster environment (Windows Hyper-V Server CSV or Windows Hyper-V Server with SMB). The virtual machine must be from a backup of a high availability virtual machine. When you omit this option or set it to `false`, the virtual machine is restored as a non-high availability machine to local storage on the node where you run the command.
`--labelnum=`*n*	Specifies the label number of the backup to restore.
`--restore-destination={original | multiple | single}`	Specifies the target restore location using one of the following values: • `original` — The original Hyper-V Server. • `multiple` — A different location. Specify the location by using the --redirect option. • `single` — Virtual machine files for manual provisioning. Specify the location by using the `--target` option.
`--redirect=`*string*	Specifies the new file system location for virtual machine files when `--restore-destination=multiple`. The *string* value contains the original file name and the target path and file name: `--redirect=`*original_file=target_path\new_file* To restore multiple files to multiple different locations, separate the string values with commas: `--redirect=`*original_file1= target_path1\new_file1, original_file2=target_path2\ new_file2,original_file3= target_path3\new_file3* To restore a file to its original location, specify only the original file name: `--redirect=`*original_file* This option is not supported with the `--federated` option.
`--target=`*path*	Specifies the path for the restored virtual machine files when `--restore-destination=single`.

Help option

The `--help` option displays a list of available operations and options for the `avhypervvss` command. You can view all help output for `avhypervvss`, or only the options for a specific operation.

The following command displays all help output for the `avhypervvss` command:

`avhypervvss --help`

The following command provides a list of options for the `backup` operation:

`avhypervvss --help --operation=backup`

Specifying command line options

The method that you use to specify options for the `avhypervvss` command depends on the complexity of the command value and the frequency with which you use the options.

Type options directly on the command line when you perform command line operations on an occasional basis or use a limited set of simple options. Use a command file, option file, or environment variables when you frequently perform command line operations or use a complex set of options.

The following methods are available for specifying options for the `avhypervvss` command:

- Type the individual options on the command line.
- List the options in the `avhypervvss.cmd` file, which is located in the `C:\Program Files\avs\var` folder, where *C:\Program Files\avs* is the Avamar client installation folder. List each option on its own line, as shown in the following example:

  ```
  --debug
  --logfile=avamarclient.log
  --verbose=5
  ```
- Create an option file as a text file, and then specify the option file on the command line by using the `--flagfile=`*path* option, where *path* is the full path and file name of the option file.
- Pass options to the CLI as environment variables. For example, if you specify `AvamarServer=12.34.56.78` in the environment variables, then you can specify the environment variable instead of the IP address of the Avamar server in the command. This step is shown in the following example:

  ```
  avhypervvss --operation=backup --server=%AvamarServer%
  --id=AvamarAdmin --password=password
  --path=/clients/hyperv-server
  ```

CLI examples

Review the `avhypervvss` command examples for details on how to use options to control browse, backup, and restore behavior.

Example browse commands

These command examples illustrate how to use options to browse different types of data in backups with the `avhypervvss` command.

The following command returns a list of all local data that is available for backup on a stand-alone Hyper-V Server:

```
avhypervvss --operation=browse
```

Type the following command on the proxy node to return a list of all Hyper-V data that is available for backup on CSV in a Windows Hyper-V Server cluster:

```
avhypervvss --operation=browse
```

Type the following command on the cluster node with the federated cluster client to return a list of all Hyper-V data that is available for backup:

```
avhypervvss --operation=browse --federated=true
```

Example backup commands

These command examples illustrate how to use options to perform different types of backups with the `avhypervvss` command.

Backing up all Hyper-V data

To back up all Hyper-V data, specify the name of the Hyper-V Server by using the `--path` option.

Type the following command on the stand-alone Hyper-V Server named `hyperv-server` to back up all Hyper-V data and store the backup on the Avamar server with an IP address of `12.34.56.78`:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server
```

Backing up specific virtual machines

To back up specific virtual machines, run the command on the Hyper-V Server that owns the virtual machines. Specify the virtual machine name and GUID in quotation marks (“ ”) in the command by using the format “*name<guid>*”. To specify multiple virtual machines in a single backup, enclose each virtual machine name and GUID in a separate set of quotation marks.

In the examples in the following topics, run the commands on a stand-alone Hyper-V Server named `hyperv-server`. The backup process stores the backup on the Avamar server with an IP address of `12.34.56.78`.

NOTE: The command to back up specific virtual machines is the same regardless of the operating system or type of virtual machine storage. If the virtual machines are on shared storage in a cluster, then include the options that are described in “Backing up Hyper-V data in a cluster”.

Backing up a single virtual machine

To back up the `Windows-1` virtual machine, type the following command:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
```

Backing up multiple virtual machines

To back up the `Windows-1` and `Windows-2` virtual machines, type the following command:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Backing up Host Components

To back up Host Components, specify `"Host Component"`. You cannot use the cluster client to back up Host Components in a Windows Hyper-V Server cluster with SMB or CSV.

In the following examples, the backup process stores the backup on the Avamar server with an IP address of `12.34.56.78`.

Backing up Host Components on a stand-alone server

Type the following command on the Hyper-V Server that is named `hyperv-server` to back up the Host Components:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server "Host Component"
```

Backing up Host Components in a cluster with CSV

In a Windows Hyper-V Server cluster, you can only back up the Host Components on the proxy node. Specify the physical node name in the `--path` option, and specify `"Host Component"`.

Type the following command on the proxy node that is named `hyperv-proxynode` to back up Host Components on the node:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-proxynode "Host Component"
```

Backing up specific virtual machines and Host Components

To back up specific virtual machines and Host Components in a single backup on a stand-alone server, specify the virtual machine name and GUID in quotation marks, and then specify `"Host Component"`. You cannot use a single backup set to back up Host Components and virtual machines on shared storage in a cluster.

In the following examples, run the commands on a stand-alone Hyper-V Server named `hyperv-server`. The backup process stores the backup on the Avamar server with an IP address of `12.34.56.78`.

Backing up specific virtual machines and Host Components

To back up the Host Components and the virtual machines named `Windows-1` and `Windows-2`, type the following command:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server "Host Component"
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Backing up Hyper-V data in a cluster

To back up Hyper-V data in a cluster, specify the cluster client name by using the `--path` option. In a Windows Hyper-V Server cluster with SMB or CSV, you must also specify `--federated=true`.

In the examples in the following topics, the backup process stores the backup on the Avamar server with an IP address of `12.34.56.78`.

Backing up Hyper-V data on a Windows Hyper-V Server cluster with SMB

To back up Hyper-V data on SMB file shares in a Windows Hyper-V Server cluster, specify the federated cluster client as the client to back up, and add the `--federated=true` option to the command.

Type the following command on the cluster node with the `hyperv-SMBcluster` federated cluster client to back up the `Windows-1` virtual machine on an SMB file share:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-SMBcluster --federated=true
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
```

Backing up all Hyper-V data on a Windows Hyper-V Server with CSV

To back up Hyper-V data on CSV in a Windows Hyper-V Server cluster, specify the federated cluster client as the client to back up, and add the `--federated=true` option to the command.

Type the following command on the cluster node with the `hyperv-CSVcluster` federated cluster client to back up the `Windows-1` and `Windows-2` virtual machines on CSV in a Windows Hyper-V Server cluster:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-CSVcluster --federated=true
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Backing up virtual machines with multi-streaming

To back up virtual machines with multi-streaming, specify the `--parallel=true`, `--max-streams=n`, and `--parallel-type={by-target | by-volume}` options.

Type the following command on the Hyper-V Server that is named `hyperv-server` to back up the `Windows-1`, `Windows-2`, and `Windows-3` virtual machines. This action is done by using a maximum of three streams, with one stream for each virtual machine:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --parallel=true
--max-streams=3 --parallel-type=by-target
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
"Windows-3<AFF22366-41A0-4AA7-A9A1-57618C79BCBC>"
```

Type the following command on the proxy node to back up the `Windows-1` and `Windows-2` virtual machines, which are on two separate CSVs in a Windows Hyper-V Server cluster. This action is done by using the proxy cluster client that is named `hyperv-CSVcluster`, with a maximum of two streams and one stream for each CSV:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-CSVcluster --parallel=true
--max-streams=2 --parallel-type=by-volume
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Backing up Hyper-V data to a Data Domain system

To store a backup on a Data Domain system instead of the Avamar server, use the `--ddr=true` and `--ddr-index=n` options. The value for `--ddr-index` is assigned to a Data Domain system when you add the Data Domain system to the Avamar configuration by using Avamar Administrator.

Type the following command on the Hyper-V Server that is named `hyperv-server` to back up the `Windows-1` and `Windows-2` virtual machines. Store the backup on the Data Domain system with an index number of 1:

```
avhypervvss --operation=backup --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --ddr=true
--ddr-index=1 "Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Example restore commands

These command examples illustrate how to use options to perform different types of restores with the `avhypervvss` command.

Restoring to the original location

To restore Hyper-V data to the original location on a Hyper-V Server, specify the name of the Hyper-V Server by using the `--path` option and the label number of the backup by using the `--labelnum` option.

Specify also the `--allowoverwrite=true` option to overwrite any existing virtual machines with the restored virtual machines. Otherwise, the restore fails.

Restoring all Hyper-V data to the original location

Type the following command on the Hyper-V Server that is named `hyperv-server` to restore all Hyper-V data, including all virtual machines and Host Components, to the original location. The backup label number is 33.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=33
--allowoverwrite=true
```

Restoring specific virtual machines to the original location

To restore specific virtual machines, specify the virtual machine name and GUID in quotation marks (“ ”) in the command by using the format *“name<guid>”*. To specify multiple virtual machines in a single backup, enclose each virtual machine name and GUID in a separate set of quotation marks.

Type the following command on the Hyper-V Server that is named `hyperv-server` to restore the `Windows-1` virtual machine to the original location. The backup label number is 15.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=15
--allowoverwrite=true "Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
```

Type the following command on the Hyper-V Server that is named `hyperv-server` to restore the `Windows-1` and `Windows-2` virtual machines to the original location. The backup label number is 55.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=55
--allowoverwrite=true "Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Restoring Host Components to the original location

To restore Host Components, specify `“Host Component”`.

Type the following command on the Hyper-V Server named `hyperv-server` with Windows Hyper-V Server to restore the Host Components to the original location. The backup label number is 85.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=85
"Host Component"
```

Restoring to the original location on a Windows Hyper-V Server cluster with SMB

To restore virtual machines to the original location on a Windows Hyper-V Server cluster with SMB, specify the federated cluster client as the client from which to restore. Specify the `--federated=true` option to restore the virtual machine as highly available.

To restore the `Windows-1` and `Windows-2` virtual machines to the original location, type the following command on the cluster node with the `hyperv-SMBcluster` federated cluster client. The backup label number is 154.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-SMBcluster --labelnum=154
--allowoverwrite=true --federated=true
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Restoring to the original location on a Windows Hyper-V Server cluster with CSV

To restore virtual machines to the original location on a Windows Hyper-V Server cluster with CSV, specify the federated cluster client as the client from which to restore. Specify the `--federated=true` option to restore the virtual machine as highly available.

To restore the `Windows-1` and `Windows-2` virtual machines to the original location, type the following command on the cluster node with the `hyperv-CSVcluster` federated cluster client. The backup label number is 109.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-CSVcluster --labelnum=109
--allowoverwrite=true --federated=true
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Restoring to a different location

When you restore virtual machines to a different location, you can restore only one virtual machine at a time with a single command. To restore multiple virtual machines, use multiple commands. Do not use special characters in the target path for the restore. Do not restore the same source file to two different locations.

You can restore to a different location on the original Hyper-V Server or on a different Hyper-V Server. Run the `restore` command on the target server for the restore.

Determining the original locations and file names

When you restore a virtual machine to a different location, you must specify the original location and file name of each file, as well as the target folder and file name.

To view the source locations for files in a backup, type the following command:

```
avtar --hfsaddr=Avamar_server --id=user@domain/client
--password=password --path=/domain/client
--list --labelnum=n --view=redirect
```

where:

- *Avamar_server* is the hostname or IP address of the Avamar server.
- *user@domain/client* is the Avamar username for authentication.
- *password* is the password for the Avamar user account.
- */domain/client* is the Avamar domain and name of the client.
- *n* is the label number of the backup.

Format for source and target locations and file names

To specify the original location and file name of each file, as well as the target folder and file name, use the following option when you restore a virtual machine to a different location:

`--redirect=`*original_file=target_path\new_file*

For example:

```
--redirect="C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\W2K8R2.vhd=C:\Users\Public
\Documents\Hyper-V\Virtual Hard Disks"
```

To restore multiple files to a different location, separate the values with commas, as shown in the following example:

```
--redirect="C:\ClusterStorage\Volume1\Windows-1=C:\ClusterStorage\Volume2\Alternate
\Windows-1,C:\ClusterStorage\Volume1\Windows-1\W2K8R2.vhd=C:\ClusterStorage
\Volume2\Alternate\Windows-1"
```

Requirements to restore to a different location in a cluster

You might not be able to perform a redirected restore of a virtual machine from one type of environment to another in the following scenarios:

- An environment includes both stand-alone and clustered Hyper-V Servers.
- An environment includes clustered Hyper-V Servers with different operating systems and types of virtual machine storage (CSV and SMB file shares).

Redirected restore requirements on page 48 provides details on supported scenarios.

To restore a virtual machine from a backup with a federated cluster client to a different location on shared storage in the original cluster, add the `--federated=true` option to make the virtual machine highly available during the restore. The federated cluster client applies to Windows Hyper-V Server clusters with SMB and Windows Hyper-V Server clusters with CSV.

After you restore a virtual machine to shared storage in a cluster from a backup of a stand-alone server, use Microsoft Cluster Manager to make the virtual machine highly available.

Restoring a virtual machine to a different location on the original server

To restore a virtual machine to a different location on the original Hyper-V Server, run the CLI on the original Hyper-V Server.

Type the following command to restore the `Windows-1` virtual machine to the target locations in the table below. The backup label number is `39`.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=39
--allowoverwrite=true --restore-destination=multiple
--redirect="C:\ProgramData\Microsoft\Windows\Hyper-V\Windows-1=
C:\ProgramData\Microsoft\Windows\Hyper-V\alternate\Windows-1,
C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\W2K8R2.vhd=
C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks"
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
```

Table 16. Source and target locations for redirected restore on the original server

Source location on the original server	Target location on the original server
`C:\ProgramData\Microsoft\Windows\ Hyper-V \Windows-1`	`C:\ProgramData\Microsoft\Windows\Hyper-V \alternate\Windows-1`
`C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\W2K8R2.vhd`	`C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks`

Restoring a virtual machine to a different server

To restore a virtual machine to a different Hyper-V Server, run the CLI on the target Hyper-V Server.

Type the following command to restore the `Windows-1` virtual machine to the target locations in the following table. The backup label number is `39`.

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=39
--allowoverwrite=true --restore-destination=multiple
--redirect="C:\ProgramData\Microsoft\Windows\Hyper-V\Windows-1=
C:\ProgramData\Microsoft\Windows\Hyper-V\alternate\Windows-1,
C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\ W2K8R2.vhd=
C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks"
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
```

Table 17. Source and target locations for redirected restore to a different server

Source location on the original server	Target location on a different server
`C:\ProgramData\Microsoft\Windows\Hyper-V \Windows-1`	`C:\ProgramData\Microsoft\Windows\Hyper-V \alternate\Windows-1`
`C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\W2K8R2.vhd`	`C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks`

Restoring virtual machine files for manual provisioning

To restore virtual machine files for manual provisioning, specify the `--restore-destination=single` and `--target` options.

To restore from a backup on shared storage in a cluster, specify the cluster client in the `--path` option, even if you are restoring to a stand-alone server.

To restore from a backup on a stand-alone server, specify the client name of the stand-alone server in the `--path` option, even if you are restoring to a cluster.

NOTE: You do not need to specify the `--federated=true` option when you restore to or from a cluster. The `--federated=true` option does not apply when you restore virtual machine files for manual provisioning.

Restoring a virtual machine for manual provisioning

Type the following command on the target Hyper-V Server to restore the `Windows-1` virtual machine to the `L:\Windows-1` folder for manual provisioning on the target Hyper-V Server:

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=39
--restore-destination=single --target="L:\Windows-1"
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
```

Restoring multiple virtual machines to the same folder for manual provisioning

Type the following command on the target Hyper-V Server to restore the `Windows-1` and `Windows-2` virtual machines to the `L:\Windows-1` folder for manual provisioning on the target Hyper-V Server:

```
avhypervvss --operation=restore --server=12.34.56.78 --id=AvamarAdmin
--password=password --path=/clients/hyperv-server --labelnum=39
--restore-destination=single --target="L:\Windows-1"
"Windows-1<D0A1863D-A25C-4FE7-B383-3D78A9901208>"
"Windows-2<E0322387-67A0-4BF8-A9A1-57618C791DF6>"
```

Restoring multiple virtual machines to different folders for manual provisioning

On the target Hyper-V Server, type a separate command to restore each virtual machine for manual provisioning. Specify the target path by using the `--target` option. Specify the `--restore-destination=single` option.

Restoring from a Data Domain system

The steps to restore backups are the same whether you restore from the Avamar server or a Data Domain system. You do not need to specify the `--ddr` or `-ddr-index` options.

C

Backup and Restore in SCVMM Environments

Topics:

- Overview of Avamar in SCVMM environments
- Backing up and restoring a VMM server
- Backing up and restoring a VMM host
- Backing up and restoring a VMM library server
- Backing up and restoring a VMM database server
- Disaster recovery of a VMM environment

Overview of Avamar in SCVMM environments

You can use Avamar to back up and restore components in an environment with Microsoft System Center Virtual Machine Manager (SCVMM) or Virtual Machine Manager (VMM), including the VMM server, host, library server, and database server.

NOTE: The term *VMM* in this appendix refers to both SCVMM and VMM environments.

Backing up and restoring a VMM server

The VMM server is the hub of a VMM implementation through which all other VMM components interact.

Use the Avamar Plug-in for the Windows File System to back up and restore file system data on the VMM server. Use the Avamar Plug-in for Windows VSS to back up System State and critical disks. The *Avamar for Windows Server User Guide* provides details.

If you install other VMM components, including the library server or the database server, on the VMM server, use the instructions for those components for backups and restores.

Backing up and restoring a VMM host

The VMM host is a physical computer that hosts one or more virtual machines. VMM supports several types of virtualization software, including Hyper-V and VMware, on a VMM host.

The Avamar plug-in that you use to back up a VMM host depends on the virtualization software:

- To back up and restore virtual machines on a VMM host with Hyper-V, use the Avamar Plug-in for Hyper-V VSS.
- To back up and restore virtual machines on a VMM host with VMware, implement one of the backup strategies that are described in the *Avamar for VMware User Guide*.
- To back up and restore virtual machines on a VMM host with other supported virtualization software, use the Avamar Plug-in for the Windows File System for file system data, and the Avamar Plug-in for Windows VSS for backups of System State and critical disks. The *Avamar for Windows Server User Guide* provides details.

Backing up and restoring a VMM library server

A VMM library is a catalog of resources that are not running or associated with a host. The library contains files that are stored on library shares, as well as templates, operating system profiles, and hardware profiles stored in a VMM database.

The VMM server is the default library server. However, you also can configure separate VMM library servers. The VMM library server can be a stand-alone server or a server in a cluster.

Use the Avamar Plug-in for the Windows File System or the Avamar Windows Cluster File Server plug-in, depending on the environment, to perform file system backups of data on a VMM library server. To back up System State and critical disks, use the Avamar Plug-in for Windows VSS. The *Avamar for Windows Server User Guide* provides details.

Backing up and restoring a VMM database server

A VMM database is a SQL Server database that contains VMM configuration information.

The VMM server is the default database server. However, you also can configure separate database servers. The VMM database server can be a stand-alone server or a server in a cluster.

Use the Avamar Plug-in for SQL Server to back up and restore the VMM database on either a stand-alone server or a server in a cluster. Ensure that you back up the SCVMM database. The default name of the SCVMM database is `MICROSOFT$VMM$`. The *Avamar for SQL Server User Guide* provides details on using the SQL Server plug-in for backups and restores of databases.

If the VMM database server is on a Hyper-V virtual machine, then use the Avamar Plug-in for Hyper-V VSS to back up the virtual machine. You do not need to install the Avamar Client for Windows and the Avamar Plug-in for SQL Server on the guest operating system.

Disaster recovery of a VMM environment

Steps

1. Recover the VMM server by using the bare metal recovery (BMR) steps in the *Avamar for Windows Server User Guide*.
2. Recover the VMM library server:
   a. Restore System State and critical disks by using the BMR steps in the *Avamar for Windows Server User Guide*.
   b. If necessary, install the Avamar Client for Windows.
   c. Use the Avamar Plug-in for the Windows File System to restore the file system that is shared as the VMM library. The *Avamar for Windows Server User Guide* provides instructions.
3. Recover the VMM database server:
   a. Restore System State and critical disks by using the BMR steps in the *Avamar for Windows Server User Guide*.
   b. If necessary, install the Avamar Client for Windows and the Avamar Plug-in for SQL Server.
   c. Use the Avamar Plug-in for SQL Server to restore the VMM database.
4. Recover VMM hosts:
   a. Restore System State and critical disks by using the BMR steps in the *Avamar for Windows Server User Guide*.
   b. Recover the rest of the VMM host files:
      - To restore virtual machines on a VMM host with Hyper-V, use the Avamar Plug-in for Hyper-V VSS.
      - To restore virtual machines on a VMM host with VMware, use the steps in the *Avamar for VMware User Guide*.
      - To restore virtual machines on a VMM host with other supported virtualization software, use the Avamar Plug-in for the Windows File System for file system data. The *Avamar for Windows Server User Guide* provides details.

D

Troubleshooting

Topics:

- Backup problems and solutions
- Restore problems and solutions

Backup problems and solutions

The following topics provide troubleshooting information for issues that can occur during backups with the Hyper-V VSS plug-in.

Browse request fails for cluster client

A `Client refused browse request` error might appear if you try to browse a cluster client for data to back up.

The error appears in the following situations:

- The Avamar cluster client is not functioning. Start the cluster client, and then continue with the backup.
- The Avamar cluster client is migrating from one cluster node to another. If this step is the case, then wait for the migration to complete. Try to browse for data again.
- Another client is using the same IP address as the Avamar cluster client. This issue can occur if you specify the incorrect IP address for the cluster client during configuration. The issue can also occur if you change the cluster client name without first correctly deleting the registration for the client on the Avamar server. To resolve this issue, delete the client with the incorrect IP address from the Avamar server.

Paused virtual machine is in a Saved State after backup

If a virtual machine is paused when a backup occurs, then the state changes to a Saved State after the backup. You can reset the state of the virtual machine after the backup.

Virtual machines are skipped during backup

If a virtual machine is in a `Cannot connect to virtual machine configuration storage` state, then the virtual machine is skipped during the backup. Resolve the issue that prevents the virtual machine from connecting to virtual machine configuration storage, and then retry the backup.

Improving backup performance in Windows Hyper-V Server clusters with CSV

Use the following strategies to improve performance when you use an Avamar proxy cluster client for image-level backups of Hyper-V data on CSVs in a Windows Hyper-V Server cluster:

- Maximize network bandwidth between the cluster nodes.
- Add one or more secondary proxy nodes to perform parallel backups and balance the backup load. Then allow the backup process to automatically change CSV ownership during the backup to the proxy node that is performing the backup.
- Consider using a dedicated cluster node that does not actively host and manage virtual machines as the primary proxy node. You can also use dedicated nodes for the secondary proxy nodes.
- When a proxy node is not the owner node of the CSV that it is backing up, the backup process must stream backup data from the owner node to the proxy node before sending the backup to the Avamar server or a Data Domain system. As a

result, backup performance depends on network performance between cluster nodes. Backups are faster and more efficient when a proxy node owns the CSV and backup data streams directly from the proxy node to backup storage.

If the environment includes a single proxy node and you cannot add proxy nodes, you can manually move CSV ownership to the proxy node. However, review the following considerations:

- Changing the ownership of a CSV to a single cluster node may negatively impact the performance of all virtual machines on the CSV.
- The proxy node should be a robust physical node.
- The CSV owner node is responsible for file system metadata updates to the NTFS partition. The proxy node must have the capacity to accommodate these updates for the CSVs.
- Ensure that the CSV is in a healthy state before you move ownership.
- The CSV must be online and in full access mode when you move ownership.

The Microsoft cluster documentation provides instructions for moving ownership of CSVs.

Avamar virtual client is registered to a different Avamar server and backups fail

Standard Avamar plug-ins can be re-activated to a different server without uninstalling the clients first. To re-register the virtual cluster client to a different server, uninstall the virtual client. Then rerun the Cluster Configuration Tool and select the new server name.

Backup of Windows Hyper-V Server with SMB and non-SMB target VMs is not supported

Due to an known issue with Microsoft Hyper-V, backup of SMB and non-SMB VMs fails. Microsoft KB article 2853422 contains information about a hotfix for this problem.

Hyper-V federated backup and recovery in a multiple IP or multiple NIC environment

When running a federated (CSV or SMB) backup or recovery in a multiple IP or multi-NIC environment, specify the node information for the Hyper-V cluster:

1. Open the `avhypervvss.cmd` file for the cluster client in a text editor. The `avhypervvss.cmd` file is located in the cluster client `var` folder that you specified in the Cluster Configuration Tool.
2. Add the following flags to the `avhypervvss.cmd` file:

```
--clusternode=Clusternode1(IP address)
--clusternode=Clusternode2(IP address)
```

3. Save and close the file.

Virtual machine file path or name with special characters

- If the path of a virtual machine file contains an ampersand (&) or semi-colon (;), backup of the virtual machine fails
- If the name of a virtual machine contains a less than (<), greater than (>), colon (:), double quote ("), forward slash (/), back slash (\), pipe (|), question mark (?), or an asterisk (*), backup of the virtual machine fails

  In the case of a failure, the following message is displayed:

```
Virtual machine 'spl_chars?*.,^$#@!%(){}[]';<F38BEE0A-1E3C-4127-8DCE-0B1D73444E82>'
has one or more unsupported characters '<>:"/\|?*' in the Virtual Machine name or
'&;' in the Virtual Machine file paths and will not be backed up with image level
backup
```

- If the name of a virtual machine ends with `..`, GLR browse fails with the following error:

```
Failed to browse the directory '\\?\Volume{c90bf39d-984a-11e7-80fd-3c08f66088b1}\*',
no file were found
```

Mixed cluster environments not supported

Mixed environments of clustered Hyper-V server 2016 and 2012 R2 are not supported.

Backups with mixed absolute and relative paths will fail

Backups that contain VMs that have both absolute and relative paths will fail.

When selecting VMs for backups, if one or more VM uses an absolute path, and one or more VM uses a relative path (for example, one VM uses the absolute path `C:\VM-Data-01\Fixed-VM1` and another VM uses the relative path `Fixed-VM2`), the backup will fail with an error similar to the following:

```
avtar Error <8012>: Error in path list: Path arguments must all be absolute or all
relative (as indicated by first argument), but not both.
```

To workaround this issue, make sure you always use absolute paths for VMs, or always use relative paths.

Incremental backups

If you use the flag `--enable-incremental=false` after running few incremental backups, then you must manually merge the recovery checkpoints that were created during the previous incremental backups before starting a new backup with this flag.

Backups failing when Data Domains are switched between consecutive backups

When you switch to another Data Domain during a subsequent backup, avtar is not able to locate backup history and gives an error `avtar Error <5195>: Path ".system_info\HyperVBackupHistoryInfo.xml" not found in backup. (Exception looking up '.system_info\HyperVBackupHistoryInfo.xml')`. To mitigate this error add the following flag to `avhypervvss.cmd` file in primary var folder:

```
--force-backup-history-reset=true
```

Once the current backup passes after addition of this flag, remove the flag and proceed normally.

Restore problems and solutions

The following topics provide troubleshooting information for issues that can occur during image-level restores with the Hyper-V VSS plug-in.

Browse request fails for a cluster client

A `Client refused browse request` error might appear if you try to browse a cluster client for data to restore.

The error appears in the following situations:

- The Avamar cluster client is not functioning. Start the cluster client, and then continue with the backup.
- The Avamar cluster client is migrating from one cluster node to another. If this is the case, then wait for the migration to complete. Try to browse for data again.
- Another client is using the same IP address as the Avamar cluster client. This issue can occur if you specify the incorrect IP address for the cluster client during configuration. This issue can also occur if you change the cluster client name without

first correctly deleting the registration for the client on the Avamar server. To resolve this issue, delete the client with the incorrect IP address from the Avamar server.

Access denied error when restoring a cluster

If a cluster backup is being restored to the same or a different cluster, and an access denied error is seen in the log file, ensure that the HyperV server that is initiating the restore has been added to the Backup Operator group on all the HyperV servers of the cluster.

SMB file share requirements on page 26 contains further information about the Backup Operator group.

Virtual machine fails to start after redirected restore

If you restore a virtual machine to a different Hyper-V Server and you cannot start the virtual machine because it remains in a Saved State, delete the Saved State files and restart the virtual machine.

This issue can occur when the Integration Components (IC) version for the backup Hyper-V Server and the guest virtual machine do not match. To prevent this issue, ensure that the IC versions on the Hyper-V Server and virtual machine match.

Virtual machine configuration file is hidden after restore

If you specify the default location when you create a virtual machine, and then you restore the virtual machine as files for manual provisioning, the configuration XML file for the virtual machine restores as a hidden file.

To view the file, select the option in Windows Explorer to show hidden files.

Restored virtual machine fails to start after live migration

After you restore a virtual machine with a snapshot to a different Hyper-V Server on a CSV, you can start the virtual machine by applying the snapshot from the CSV node that runs the master agent. The virtual machine does not start if you apply the snapshot after a live migration of the virtual machine to another CSV node.

In the virtual machine settings, update the network adapter to a valid adapter in the host, and restart the virtual machine.

If you cannot perform the live migration after restoring the virtual machine to a different Hyper-V Server on a CSV, turn off the virtual machine before you perform the live migration.

Conflict between Hyper-V host and guest backup application

If you install backup applications on a Hyper-V virtual machine and perform image-level backups with the Hyper-V VSS plug-in, then the two backups may conflict.

To work around this issue, exclude virtual machines with backup applications from image-level backups.

Restore takes a long time when restoring virtual machines on multiple CSVs in an environment with multiple proxies

When you restore multiple virtual machines on multiple CSVs in an environment with multiple proxies, the restore might take a long time.

To improve restore performance, ensure that the primary proxy node is the owner of the CSV to which you restore the virtual machines.

Redirected restore of VMs shown as failed in Avamar Administrator

When a backup is attempted immediately after one or more VHDs attached to the VM are removed from the VM configuration, redirected restore of VMs will be shown as failed in Avamar Administrator. However, the restore will then be successful.

When one or more VHDs are removed from the VM configuration, the VHD file list corresponding to the removed VHDs is not immediately excluded from the Hyper-V VSS Writer metadata after the removal operation. Because of this option, the VHD files for the removed disk are still being backed up by the Hyper-V plug-in. These VHD files are not part of any active VHD chain that is attached to the VM at the time of backup, resulting in subsequent restores being reported as failed.

The solution to this problem is to ignore the reported assertions, verify that the VM starts correctly after the restore operation, and restart Hyper-V VSS Writer before next backup

Glossary

A

application-consistent backup
A type of backup where the virtual machine is online and is VSS capable. Microsoft Integration Components must be installed on the guest operating system. VSS runs in the guest operating system and freezes the operating system and the state of all applications for the backup.

avagent
The name of the *client agent* process.

Avamar Administrator
A graphical management console software application that is used to remotely administer an Avamar system from a supported Windows or Linux client computer.

Avamar client
A computer or workstation that runs Avamar software and accesses the Avamar server over a network connection. Avamar client software comprises a *client agent* and one or more *plug-ins*.

Avamar server
The server component of the Avamar client/server system. Avamar server is a fault-tolerant, high-availability system that efficiently stores the backups from all protected clients. It also provides essential processes and services required for data restores, client access, and remote system administration. Avamar server runs as a distributed application across multiple networked storage nodes.

avhypervvss
The command-line interface for the Avamar Plug-in for Hyper-V VSS. You can use `avhypervvss` to perform on-demand image-level backups and restores of Hyper-V data.

avtar
The Avamar process that performs backups and restores.

B

backup policy
In the AUI, a backup policy specifies a dataset, schedule, and retention settings that are applied to a client or a group of clients. A backup policy must contain at least one Avamar client. If the backup policy contains two or more clients, the clients must belong to the same Avamar domain. You can override backup policy settings at the client level.

bare metal recovery (BMR)
The process of restoring data from a backup to recover a computer system from “bare metal,” or without previously installed software or operating system.

C

child partition

A logical hard drive division in the Microsoft Hyper-V environment that runs an isolated operating system.

The VMware equivalent of *child partition* is *guest OS*.

See also guest operating system, virtual machine

client activation
The process of passing the client ID (CID) back to the client, where it is stored in an encrypted file on the client file system.

See also activation

client agent
A platform-specific software process that runs on the client and communicates with the Management Console Server (MCS) and with any plug-ins installed on that client.

client registration
The process of establishing an identity with the Avamar server. When Avamar recognizes the client, it assigns a unique client ID (CID), which it passes back to the client during *client activation*.

See also registration

cluster
Two or more independent network servers, usually with exact copies of the same software and data, that operate and appear to clients as if they are a single unit. A cluster configuration enables work to be shifted from one server to another, providing high availability, which allows application services to continue despite most hardware or software failures.

Cluster Configuration Tool
Avamar configuration wizard to configure the cluster client.

clustered disk failover model

The original Hyper-V failover model uses clustered disks. Each virtual machine is configured as a failover resource. VHD and configuration files are stored on clustered disks. The clustered disks are in the failover group for the virtual machine.

The VMware equivalent of *clustered disk failover model* is *VMware File System (VMFS)*.

cluster shared volumes (CSV)

A shared disk that contains an NTFS volume that is accessible for read and write operations by all nodes within the cluster. A virtual machine stored on CSV can change ownership from one node to another.

The VMware equivalent of *CSV* is *clustered disk*.

Cluster VSS Writer
In a Windows Hyper-V Server cluster with virtual machine storage on CSV, the Cluster VSS Writer reports components for backup for virtual machines that are owned by nodes other than the proxy node.

crash-consistent backup

A type of backup where the virtual machine is offline or where Integration Components are not installed. The virtual machine is paused before shadow copy creation and resumed after shadow copy creation.

This type of backup is also called an *image-level Saved State* or *offline* backup.

CSV Shadow Copy Provider
The VSS provider that performs the snapshot for virtual machines that are owned by nodes other than the proxy node in a Windows Hyper-V Server cluster with virtual machine storage on CSV.

D

Data Domain system
Disk-based deduplication appliances and gateways that provide data protection and disaster recovery (DR) in the enterprise environment.

dataset
A policy that defines a set of files, directories, and file systems for each supported platform that are included or excluded in backups across a group of clients. A dataset is a persistent and reusable Avamar policy that can be named and attached to multiple groups.

DNS
Domain Name Server. A dynamic and distributed directory service for assigning domain names to specific IP addresses.

domain
A feature in Avamar Administrator that is used to organize large numbers of clients into named areas of control and management.

dynamic VHD (DVHD)

A virtual hard disk that grows in size as needed. This type of virtual hard disk starts as a 3 KB `.vhd` file and can grow as large as the maximum size specified when the file was created.

The VMware equivalent of *DVHD* is *dynamic disk (thin provisioned disk)*.

F

federated cluster client
A virtual client that runs on a cluster node in a Windows Hyper-V Server cluster with virtual machine storage on SMB file shares or a Windows Hyper-V Server with virtual machine storage on CSV. The federated cluster client communicates with the Avamar server to perform backups and restores of virtual machines in the cluster, regardless of which node is managing the virtual machine at the time of the operation.

File Server for general use
A type of clustered file server where the file server, and therefore all shares associated with the file server, are online on one node at a time. A cluster configuration with this type of storage is sometimes referred to as active-passive or dual-active. File shares associated with this type of clustered file server are called clustered file shares.

fixed-size virtual hard disk

A virtual hard disk with a fixed size. The disk space for the specified fixed size is allocated when the disk is created. The size of the disk does not change when you add or delete data.

The VMware equivalent of *fixed-size virtual hard disk* is *fixed disk (thick provisioned disk)*.

G

granular level recovery (GLR)
The ability to restore individual mailboxes, mail folders, or messages from a database backup.

group
A level of organization in Avamar Administrator for one or more Avamar clients. All clients in an Avamar group use the same group policies, which include the *dataset*, *schedule*, and *retention policy*.

group policy
In Avamar Administration, a group policy is defined as a *dataset*, *schedule*, and *retention policy* for all clients in an Avamar group.

guest backup and restore
A backup and restore architecture where an Avamar file system client and optionally, an Avamar application plug-in, run on the guest operating system of a virtual machine. You perform individual backups of each virtual machine.

guest operating system

The operating system on a virtual machine.

The VMware equivalent of *guest operating system* is *guest OS*.

GUID
The globally unique identifier of a virtual machine.

H

Host Components
Description files that contain the authorization store for Hyper-V. The files also contain a description of the host resource type XML files.

Hyper-V (hypervisor)
A layer of software that exists above the hardware and below one or more operating systems. The Hyper-V software creates partitions to provide isolated execution environments. The Hyper-V software also manages access to hardware resources for each partition.

Hyper-V Manager

An MMC snap-in for managing the Hyper-V role on both local and remote Hyper-V Servers. Management functions include virtual network management, virtual machine provisioning and management, and virtual hard disk provisioning and management.

The VMware equivalent of *Hyper-V Manager* is *vCenter*.

Hyper-V VSS Writer

The VSS writer that enables creation of image-level backups of virtual machines by using Integration Components.

The VMware equivalent of the *Hyper-V VSS Writer* is *VADP (VMware API for Data Protection)*.

I

image-level backup and restore
A backup and restore architecture where you install the Avamar Client for Windows and the Avamar Plug-in for Hyper-V VSS on the management operating system of the Hyper-V Server. You can perform backups of multiple virtual machines and the Host Components simultaneously.

Initial Store

An XML file on the management operating system that contains role-based security configuration details for Hyper-V.

Integration Components
A collection of services and software drivers that maximize performance and provide a better user experience within a virtual machine. Integration services are only available through Integration Components for supported guest operating systems.

L

live migration

A Hyper-V feature that enables you to transparently move running virtual machines from one node of a failover cluster to another node in the same cluster without a dropped network connection or perceived downtime.

The VMware equivalent of *live migration* is *VMotion*.

M

Management Console Server (MCS)
The MCS provides centralized administration (scheduling, monitoring, and management) for the Avamar server. The MCS also runs the server-side processes that the Avamar Administrator graphical management console uses.

management operating system (management OS)

The operating system on the physical machine when the Hyper-V role is enabled. After installing the Hyper-V role, this operating system is moved into the parent partition. The management operating system automatically starts when you reboot the physical machine.

The management operating system runs in a special kind of virtual machine that can create and manage the virtual machines that are used to run workloads and different operating systems.

The management operating system provides management access to the virtual machines and an execution environment for the Hyper-V services. The management operating system also provides the virtual machines with access to the hardware resources that it owns.

The VMware equivalent of the *management OS* is *ESX server*.

manual provisioning
The process of importing restored virtual machine files to create a virtual machine in Hyper-V Manager, or of attaching restored virtual machine files to an existing virtual machine.

metadata
Hash information that identifies stored subfile information for deduplication, and is required to revert deduplicated client backup data to the normal nondeduplicated format.

multi-streaming
The process of backing up or restoring data using multiple parallel data streams. Multi-streaming enables you to improve backup and restore performance in most environments.

N

Natively Attached iSCSI
Natively Attached iSCSI enables guest operating systems to attach iSCSI devices without knowledge of the parent operating system.

P

parent partition

The partition for the management operating system on a Hyper-V Server.

The VMware equivalent of the *parent partition* is *Service Console (ESX Server)*.

partition
A logical unit of isolation, supported by the hypervisor, in which operating systems execute. A hypervisor instance must have at least one parent partition. The virtualization stack runs in the parent partition and has direct access to the hardware devices. The parent partition then creates the child partitions, which host the guest operating systems.

pass-through SCSI

Pass-through SCSI enables the guest OS to directly attach to physical SCSI disks. The physical SCSI disks that can be attached are visible to the SCSI controller in the management OS.

The VMware equivalent of *pass-through SCSI* is *raw device mapping (RDM)*.

plug-in
Avamar client software that recognizes a particular kind of data resident on that client.

plug-in options
Options that you specify during backup or restore to control backup or restore functionality.

policy
A set of rules for client backups that can be named and applied to multiple groups. Groups have dataset, schedule, and retention policies.

proxy cluster client
A virtual client that runs on a single node (the proxy node) in a Windows Hyper-V Server cluster with virtual machine storage on CSV. The proxy cluster client communicates with the Avamar server to perform backups and restores of virtual machines on CSV, regardless of which node is managing the virtual machine at the time of the operation.

proxy node
The node with the proxy cluster client in a Windows Hyper-V Server cluster with virtual machine storage on CSV.

See also proxy cluster client

R

redirected restore
The process of restoring a backup to a different location than the original location where the backup occurred.

registration
The process of establishing an identity with the Avamar server. When Avamar recognizes the client, it assigns a unique client ID (CID), which it passes back to the client during *client activation*.

See also client registration

retention
The time setting to automatically delete backups on an Avamar server. Retention can be set to permanent for backups that should not be deleted from an Avamar server. Retention is a persistent and reusable Avamar policy that can be named and attached to multiple groups.

S

Saved State

A manner of storing a virtual machine so that it can resume quickly (similar to a hibernated laptop). When you place a running virtual machine in a Saved State, Virtual Server and Hyper-V stop the virtual machine, write the data that exists in memory to temporary files, and stop the consumption of system resources. Restoring a virtual machine from a Saved State returns it to the same condition it was in when its state was saved.

The VMware equivalent of *Saved State* is *virtual machine working location*.

Scale-Out File Server (SOFS)
A type of clustered file server in Windows Hyper-V Server that lets you store server application data, such as Hyper-V virtual machine files, on file shares. All file shares are online on all nodes simultaneously. File shares associated with this type of clustered file server are called scale-out file shares. A cluster configuration with this type of storage is sometimes referred to as active-active.

schedule
The ability to control the frequency and the start and end time each day for backups of clients in a group. A schedule is a persistent and reusable Avamar policy that can be named and attached to multiple groups.

Server Core
A scaled back version of a Microsoft Windows server, where no Windows Explorer shell is installed. You perform all configuration and maintenance entirely through a command line interface, or by connecting to the machine remotely using Microsoft Management Console.

Server Manager
A Windows tool for installing, configuring, and managing server roles and features. You can enable and configure the Hyper-V role by using Server Manager.

Server Message Block (SMB) 3.0 file shares
File shares that use the SMB 3.0 protocol. You can store virtual machines on SMB 3.0 file shares for a stand-alone Windows Hyper-V Server or for a Windows Hyper-V Server cluster.

shadow copy volume

A backup volume created through VSS.

The VMware equivalent for *shadow copy volume* is *VMware API for Data Protection (VADP)*.

System Center Virtual Machine Manager (SCVMM)

A Microsoft tool for managing large numbers of virtual servers.

The VMware equivalent for *SCVMM* is *vSphere*.

V

virtual hard disk (VHD) files

The file format for a virtual hard disk, which is the storage medium for a virtual machine. A VHD file can reside on any storage topology that the management operating system can access, including external devices, storage area networks, and network-attached storage. The file extension is `.vhd`.

The VMware equivalent for *VHD files* is *VMDK files*.

virtualization server

A physical computer with the Hyper-V role installed. This server contains the management operating system and provides the environment for creating and running virtual machines. Sometimes referred to as a server running Hyper-V.

The VMware equivalent for *virtualization server* is *ESX server*.

virtual machine (VM)
A computer that is a software implementation of a computer. Virtual machines are used to run different operating systems at the same time on one physical computer. Each operating system runs in its own isolated execution environment.

virtual machine configuration
The virtual machine configuration is the hardware configuration for the virtual machine, including number of CPUs, memory size, network adapter, disk controller, and virtual disks.

virtual machine snapshot
A file-based snapshot of the state, disk data, and configuration of a virtual machine at a specific point in time. A virtual machine snapshot is not the same as a shadow copy volume.

Volume Shadow Copy Service (VSS)
A technology in Microsoft Windows that enables manual or automatic backup copies or snapshots of data, even if there is a lock on the data, on a specific volume at a specific point in time over consistent intervals. VSS is implemented as a Windows service called the Volume Shadow Copy service.

VSS requestor
A backup application that uses the VSS API to request the services of VSS to create and manage shadow copy volumes. The Avamar Plug-in for Windows VSS is a VSS requestor.

VSS writer
A process that provides metadata about application data for backup, and specific methods for correctly handling components and applications during backup and restore. A VSS writer also identifies the type of application or service in the backup, such as System Boot or System Services. A VSS writer does not play a role in backing up the file system.