

IBM Tivoli Storage FlashCopy Manager for VMware  
Version 4.1

*Installation and User's Guide*





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**Note:**

Before using this information and the product it supports, read the information in "Notices" on page 137.

**First edition (December 2013)**

This edition applies to version 4, release 1, modification 0 of IBM Tivoli Storage FlashCopy Manager for VMware (5608-W07, 5724-X94 and 5641-A06) and to all subsequent releases and modifications until otherwise indicated in new editions.

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## About this publication

This publication provides information about installing, configuring, administering, and using IBM® Tivoli® Storage FlashCopy® Manager for VMware.

This publication describes how to use Tivoli Storage FlashCopy Manager for VMware with the following IBM storage systems:

- IBM System Storage® Disk Storage Model DS8000®
- IBM System Storage SAN Volume Controller
- IBM XIV® Storage Systems
- IBM Storwize® v7000
- IBM System Storage N series, including protocol support for network-attached storage (NAS) and storage area network (SAN)
- NetApp systems, including protocol support for NAS and SAN

This publication describes how Tivoli Storage FlashCopy Manager for VMware performs online or offline backups of virtual machines. Information about offloaded backups to Tivoli Storage Manager storage with IBM Tivoli Storage Manager for Virtual Environments is included.

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## Who should read this publication

This publication is intended for vCenter administrators, system administrators, and system programmers who are responsible for implementing a backup solution in one of the supported environments.

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## Publications

Publications for the Tivoli Storage Manager family of products are available online. The Tivoli Storage Manager product family includes IBM Tivoli Storage FlashCopy Manager, IBM Tivoli Storage Manager for Space Management, IBM Tivoli Storage Manager for Databases, and several other storage management products from IBM Tivoli.

To search across all publications or to download PDF versions of individual publications, go to the Tivoli Storage Manager information center at <http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1>.

You also can find the Tivoli Storage Manager product family information centers and other information centers that contain official product documentation for current and previous versions of Tivoli products at Tivoli Documentation Central. Tivoli Documentation Central is available at [http://www.ibm.com/developerworks/community/wikis/home/wiki/Tivoli Documentation Central](http://www.ibm.com/developerworks/community/wikis/home/wiki/Tivoli%20Documentation%20Central).



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## New for Tivoli Storage FlashCopy Manager Version 4.1

IBM Tivoli Storage FlashCopy Manager for VMware includes several new features and changes.

### **Access Tivoli Storage FlashCopy Manager for VMware GUI by using a web browser GUI**

You can now access the vCenter Server through a stand-alone web browser graphic user interface (GUI) in addition to the existing interface that integrates with the VMware vSphere Client. For more information, see Chapter 6, “Backing up and restoring virtual machines from Tivoli Storage FlashCopy Manager for VMware GUI,” on page 59.

### **Instant restore processing**

Unlike a virtual machine or single virtual disk restore operation, an instant restore operation provides access to volume content while the restore process is in progress. Less downtime is required before a recovered volume can be used. After you start an instant restore operation, you can use data on the disk while the restore operation is in progress. You can restore all datastores that are included in a backup and all virtual machines are registered. For more information, see “Restoring datastores” on page 75.

### **Special Publication (SP) 800-131 compliant encryption**

Tivoli Storage FlashCopy Manager for VMware uses IBM Global Security Kit (GSKit), for Secure Socket Layer and Transport Layer Security TCP/IP connections. GSKit supports Federal Information Processing Standards (FIPS 140-2) and now incorporates the new security standards, as defined in the Special Publications (SP) 800-131. For more information about GSKit, see “GSKit configuration” on page 51.

### **Tivoli Storage FlashCopy Manager for VMware integration with VMware vCenter Site Recovery Manager**

Tivoli Storage FlashCopy Manager for VMware can now protect data in VMware vSphere environment at the protected site where VMware vCenter Site Recovery Manager (SRM) is installed. For more information, see “Integration with VMware vCenter Site Recovery Manager” on page 20.

## **New and updated parameters**

The following parameters are new, modified, or removed for Tivoli Storage FlashCopy Manager for VMware:

### **New parameters**

The **ENFORCE\_TLS12** parameter must be enabled for SP 800-131 compliant encryption to be enforced. For information about how to configure this parameter, see the “GLOBAL section” on page 81 of the Tivoli Storage FlashCopy Manager for VMware profile file.

### **Modified parameters**

The **COPYSERVICES\_HARDWARE\_TYPE** parameter specifies the storage system where the data is stored.

The XIV option is modified for this parameter. This option is specified when the application data is on an IBM XIV Storage System. Beginning with this release, the storage adapter for the XIV Storage System is based

on a new generic framework. As a result, any notifications on the console are displayed as `COPYSERVICES_HARDWARE_TYPE=GENERIC` when this option is selected. Similarly, when you view the log or trace files in the `ACS_DIR/logs` directory, any references are displayed as `COPYSERVICES_HARDWARE_TYPE=GENERIC`. For information about how to configure this parameter, see the “`DEVICE_CLASS` section” on page 89 of the Tivoli Storage FlashCopy Manager for VMware profile file.

**Removed `GRACE_PERIOD` parameter**

The `GRACE_PERIOD` parameter is not present in the Tivoli Storage FlashCopy Manager for VMware profile file in V4.1. This parameter is removed after you upgrade to or install this version of Tivoli Storage FlashCopy Manager for VMware.

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## Chapter 1. Tivoli Storage FlashCopy Manager for VMware overview

IBM Tivoli Storage FlashCopy Manager for VMware is a data management solution that you can use to streamline storage management in a VMware vSphere environment. You can back up, restore, and implement disaster recovery solutions for virtual machines in a VMware environment. When you use Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments, you can store VMware image backups on Tivoli Storage Manager server storage.

With Tivoli Storage FlashCopy Manager for VMware, you can create non-disruptive off-host backups for VMware virtual machines in a vSphere environment. This off-host approach facilitates faster backup operations. You can protect and back up virtual machines at the datastore level. The datastore can be a VMFS datastore or a Network File System (NFS) datastore when you use IBM System Storage N series or NetApp storage systems. You can restore a single virtual machine and virtual disk to its original location or to an alternative location. In addition, you can restore an entire datastore or datastores.

Tivoli Storage FlashCopy Manager for VMware provides the following benefits:

- Simplifies the backup, restore, and disaster recovery operations of virtual machines in a VMware environment.
- Provides the following user interfaces to manage back up and restore operations:
  - A graphical user interface (GUI) that accesses VM data on vCenter server. This plug-in is accessed as a vCenter Server extension in the Solutions and Applications panel of your vCenter Server System. The GUI can also be accessed by using a web browser-based interface. Click **Learn More** in any of the GUI windows to open the online help for task assistance.
  - Using a command-line interface, you can manage backup and restore operations that access virtual machine data on the vCenter server.
- Manages the scheduling of backup operations. Alternatively, you can run backup operations immediately.
- Offload backups to Tivoli Storage Manager when Tivoli Storage FlashCopy Manager for VMware is used with Tivoli Storage Manager for Virtual Environments. This method enables block level incremental backups when VMware change block tracking feature is enabled.

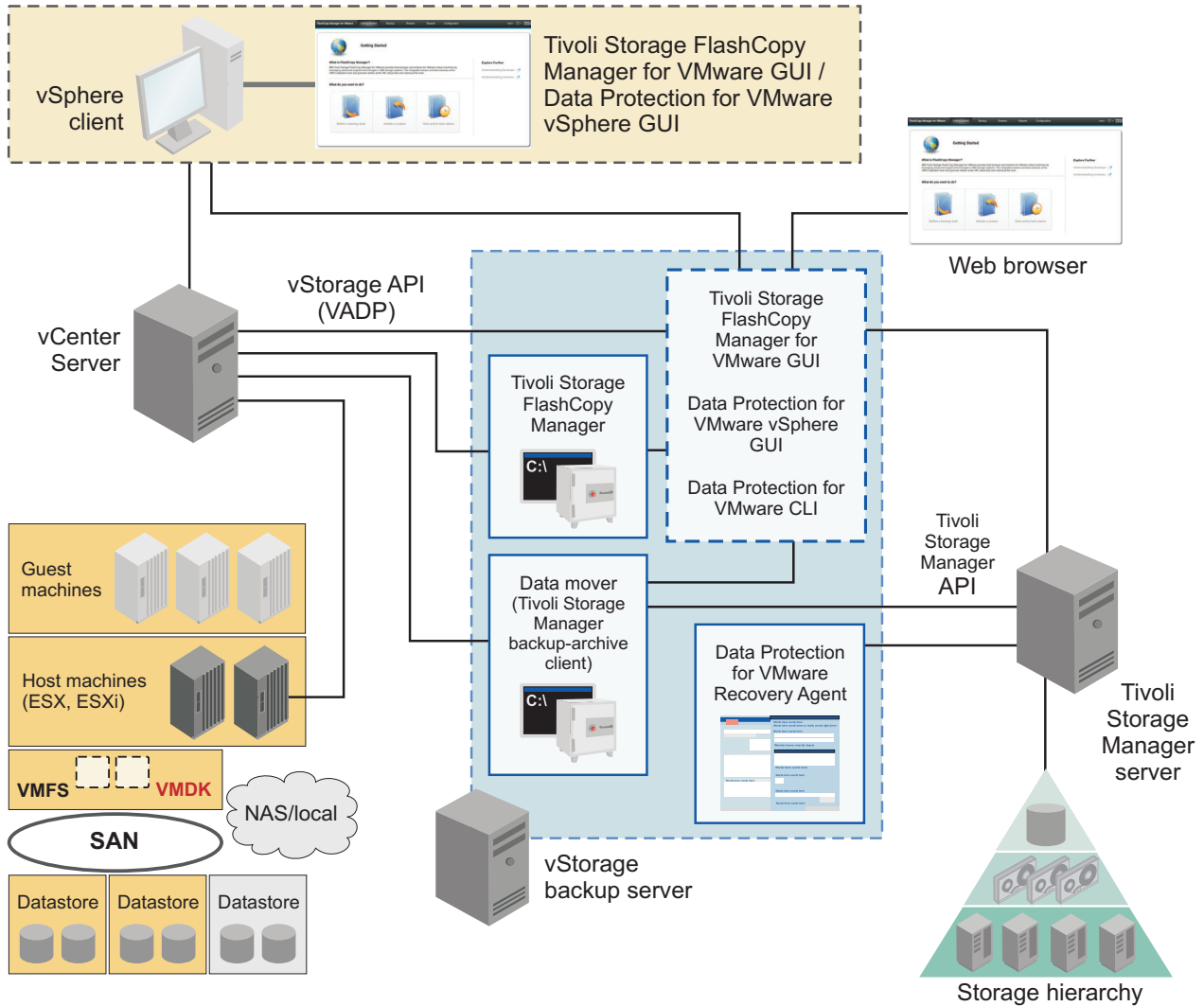


Figure 1. Tivoli Storage FlashCopy Manager for VMware system components and user environment

## Backups in virtual environments

In a virtual environment, virtual machines can migrate from one physical server to another based on workload balancing or failover requirements. This mobility must be considered when you are planning the storage management of a virtual environment.

### VMware storage architecture

The VMware vCenter Server is the central point for configuring, provisioning, and managing a virtualized environment. A VMware datacenter is a structure under which you add hosts and their associated virtual machines to the virtual environment inventory. VMware virtual machines are software computers that run operating systems and applications. Multiple virtual machines can run on the same host at the same time. Virtual machines that are managed by the VMware vCenter Server can also run on a cluster of hosts.



## Backup domains

Large virtualized environments are divided into backup domains, each managed by a separate installation of Tivoli Storage FlashCopy Manager for VMware. A domain consists of one or more data centers in a vCenter environment. In a default configuration, a domain consists of all the data centers in a vCenter. Using the Tivoli Storage FlashCopy Manager for VMware GUI, you can limit the number of data centers in a domain to protect. Tivoli Storage FlashCopy Manager for VMware administration plug-in is displayed in the VMware vSphere Client. Alternatively, you can access vCenter Server through a stand-alone web browser GUI.

**Attention:** You can add the same datacenter to multiple backup domains. However, doing so can cause problems if two backup operations that contain the same datacenter are started simultaneously. Also, if a datacenter is reassigned to another domain, the metadata about previous backups and tasks is not moved.

## VMware Storage vMotion can cause live migration of virtual disks across storage arrays

VMware Storage vMotion enables live migration of virtual disks across storage arrays. This feature can potentially cause a virtual machine to be moved to a different datastore during a hardware snapshot operation. For example, if a migration starts immediately before a hardware snapshot, a file or files of a virtual machine can be moved to another datastore. If this movement occurs before the hardware snapshot finishes, it can render the virtual machine backup unusable. Therefore, Tivoli Storage FlashCopy Manager for VMware removes this virtual machine from the backup. To avoid this issue, schedule backups to occur when none or few storage migrations are occurring.

**Note:** Tivoli Storage FlashCopy Manager for VMware issues a warning for any affected virtual machines. If this issue applies to all the virtual machines, then an error that the backup was not successful is issued.

The following activities also can interfere and render the virtual machine backup unusable:

- VMware snapshots
- Changing the power state of a virtual machine for example, Power off, Power on, Reset, or Suspend.

Tivoli Storage FlashCopy Manager for VMware issues a warning message if these events occur.

---

## Backup types in virtualized environments

Backups in virtualized environments can be separated into in-guest backup, on-host backup, and off-host backup types. Tivoli Storage FlashCopy Manager for VMware uses the off-host backup approach when you protect your environment.

Tivoli Storage FlashCopy Manager for VMware supports data protection of virtualized environments by providing off-host storage hardware snapshot backups for VMware virtual machines. You can install Tivoli Storage FlashCopy Manager for VMware on one of the following systems, a physical computer outside the vCenter or a dedicated virtual machine. The location where Tivoli Storage FlashCopy Manager for VMware is installed is referred to as the vStorage backup server. Unlike the in-guest backup approach, backup agents are not required to run

in each virtual machine. This off-host approach facilitates faster backup operations and is non-disruptive to production applications.

The following list includes the major features when off-host backups are started on a dedicated vStorage backup server or virtual machine:

- The backup agent is installed on the vStorage backup server and this agent uses the vStorage API.
- File-level and guest-level image backups can be created and recovered.
- Centralized management of backup data is provided.
- Backups are offloaded from the ESX host, to another host to free the production server resources.
- File system consistent backups can be created by using snapshots.
- Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments backups use the VMware vStorage API for Data Protection.

---

## Backup and restore granularity

With Tivoli Storage FlashCopy Manager for VMware, VMware datastores are backed up. With the data that is backed up, you can restore data to virtual machines and virtual disks. The data can be restored to both original and alternative datastore locations. Only virtual machines that you explicitly select for backup at backup time can be restored.

When you back up data, Tivoli Storage FlashCopy Manager for VMware uses VMware vSphere APIs and the storage hardware snapshot mechanism. A single storage hardware snapshot includes data for all virtual machines in a VMware datastore.

When you restore data with Tivoli Storage FlashCopy Manager for VMware, the following options are available:

- Restore to either the original datastore or to a different datastore at the virtual machine level.
- Restore a single virtual disk to the original location or a different virtual machine. This restore occurs by attaching a virtual disk from within a backup to a target virtual machine.
- Attach single virtual disks in the backup to the original or a different virtual machine to enable file level restore operations.
- Restore one or more datastores by using the **instant\_restore** command or from the graphical user interface (GUI). You can select which datastore to restore and check the dependencies of virtual machines that are stored in this datastore to other datastores in the environment. If a distributed virtual machine is present, a list of extra datastores are identified and you can select more datastores to restore for consistency.

### Datastore backups

You can select virtual machines in a datastore and exclude them from a Tivoli Storage FlashCopy Manager for VMware datastore backup. The excluded virtual machines are included in the hardware snapshot but when you use Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments they are not offloaded to the Tivoli Storage Manager for Virtual Environments server. A VMware software snapshot is not performed for the

excluded virtual machines during the backup. The excluded virtual machines are not suspended, and are not restorable with Tivoli Storage FlashCopy Manager for VMware.

---

## Virtual machine and datastore restore operations

You can restore a virtual machine, a single virtual disk, individual files, or a datastore with its stored virtual machines from an IBM Tivoli Storage FlashCopy Manager for VMware backup.

### Virtual machine restore operations

When you restore a virtual machine, the data can be restored to the following locations:

- The original location.
- The same datastore and a new virtual machine with a new name.
- A different datastore and the same virtual machine name. The virtual machine must be in a different folder than the original virtual machine with the same name.
- A different datastore and a new virtual machine with a new name.

**Note:** If a VM was renamed or deleted after the backup was taken, Tivoli Storage FlashCopy Manager for VMware restores the VM by using its original name if no name is given.

You can restore individual files from a snapshot backup by attaching virtual disk images from a backup to a guest virtual machine. Entire disks can be restored to their original virtual machine or added to another target virtual machine.

A virtual machine can be distributed. In this situation, the virtual machine contains one or more disks on a datastore other than the datastore that contains the virtual machine configuration files. The following figure shows an example of a distributed virtual machine.

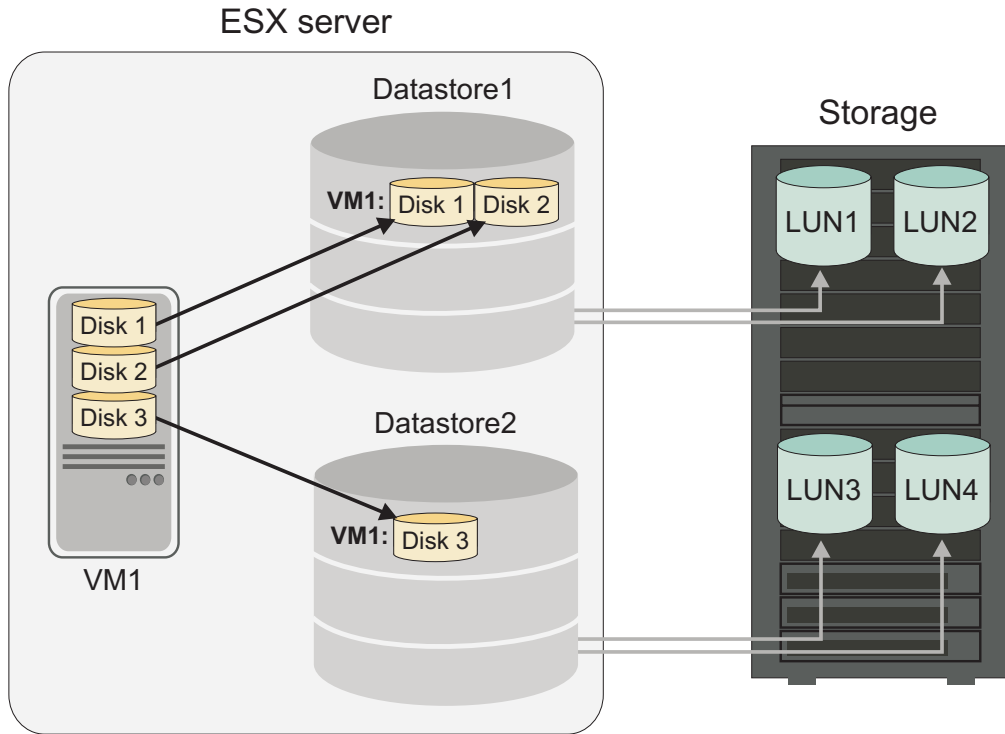


Figure 2. An example of a distributed virtual machine

When you are restoring a distributed virtual machine, some limitations apply.

- A distributed virtual machine can be restored to only its original location.
- A distributed virtual machine cannot be restored if an offloaded Tivoli Storage Manager backup is in progress.
- A distributed virtual machine cannot be restored if the mounted datastore is already in use by another VM.

### Datastore restore operations

You can restore a datastore or datastores by using the Data Protection for VMware **instant\_restore** command or from the GUI. Unlike a virtual machine restore, this method restores the whole VMFS or NFS datastore and its stored virtual machines from a Tivoli Storage FlashCopy Manager for VMware backup. The restore operation is carried out at the logical unit number (LUN) level of the datastore. After the restore, all virtual machines are registered with the vCenter server.

You must restore the entire datastore, you cannot do a partial restore of a datastore. All datastores must belong to the same backup when you are restoring multiple datastores. You can specify not to restore a virtual machine from a datastore. This virtual machine is not registered with the vCenter server after the instant restore operation. If a virtual machine is added to a datastore after a backup, a subsequent instant restore of this backup results in the virtual machine not being available.

## Supported storage systems

Tivoli Storage FlashCopy Manager for VMware can operate with several different storage systems and employs the copy-services or snapshot capabilities of the storage system in use. When you configure Tivoli Storage FlashCopy Manager for VMware, you can customize the profile configuration file. Each section of the profile includes parameters and options that determine how the Tivoli Storage FlashCopy Manager backs up and restores data in your environment. The `DEVICE_CLASS` section of this profile, contains parameters that determine the characteristics of a storage device that are used.

Tivoli Storage FlashCopy Manager for VMware is provided as a single installation package that uses the copy-services or snapshot capabilities of the storage systems that are listed in the table. The abilities of Tivoli Storage FlashCopy Manager for VMware are dependent on the storage system in use. The table shows the storage systems Tivoli Storage FlashCopy Manager for VMware supports and the FlashCopy types you can use with each storage system.

*Table 1. Supported storage subsystems and FlashCopy Types*

Device	COPY	INCR	NO COPY	Space-efficient snapshots	Changes that are made to a mounted snapshot backup
IBM System Storage DS8000	Yes	Yes	Yes	N/A	Remains persistent and alters the content of the backup.
IBM System Storage SAN Volume Controller 5.1, or later	Yes	Yes	Yes Includes space-efficient copies if configured.	N/A	Remains persistent and alters the content of the backup.
IBM XIV Storage Systems	N/A	N/A	N/A	Yes	Reverted during unmount and does not alter the backup, or remains persistent and alters the content of the backup.
IBM Storwize v7000	Yes	Yes	Yes Includes space-efficient copies if configured.	N/A	Remains persistent and alters the content of the backup
IBM System Storage N series	N/A	N/A	N/A	Yes	Reverted during unmount and does not alter the backup, or remains persistent and alters the content of the backup.
NetApp systems	N/A	N/A	N/A	Yes	Reverted during unmount and does not alter the backup, or remains persistent and alters the content of the backup.

## SAN Volume Controller, DS8000 and Storwize V7000 devices

The available Tivoli Storage FlashCopy Manager for VMware features are dependent on the level of the storage system that you use.

A FlashCopy creates a point-in-time copy in which the target volume contains a copy of the data on a source volume. Data that existed on the target volume is replaced by the copied data. Tivoli Storage FlashCopy Manager for VMware uses the following FlashCopy types:

*Table 2. FlashCopy types and supported devices*

FlashCopy Type	Description	Supported Devices
COPY	A COPY type FlashCopy is a point-in-time copy of a volume, followed by a subsequent background copy operation that creates a physical copy of the source volume.	DS8000, SAN Volume Controller, Storwize V7000
INCR	Similar to a COPY type FlashCopy except that a reduced amount of data is copied between two consecutive FlashCopy backups. Only the blocks that have changed since the previous FlashCopy are copied to the target.	DS8000, SAN Volume Controller, Storwize V7000 see note 1.
NOCOPY	FlashCopy image that contains only those changes that occurred after the original FlashCopy was created. There is no background copying, only those parts that are changing in the source data since the FlashCopy was established are copied. You must use a NOCOPY FlashCopy for a space-efficient FlashCopy to SAN Volume Controller.	DS8000, SAN Volume Controller, Storwize V7000 see note 2
FlashCopy to Space-Efficient Volumes	For SAN Volume Controller, a FlashCopy can be performed to a space-efficient target. To prevent the volume size from increasing because of background copying, run the FlashCopy to a space-efficient target with the option NOCOPY.	SAN Volume Controller, Storwize V7000
<p><b>Note:</b></p> <ol style="list-style-type: none"> <li>1. DS8000 creates one incremental FlashCopy per source volume. For DS8000, there must be only one target set specified in the target volumes file, the .fct file, for incremental snapshots. Common Information Model (CIM) errors might occur when more than one target set is specified.</li> <li>2. FlashCopy to space-efficient volumes must be created with the NOCOPY parameter.</li> </ol>		

## Remote access to FlashCopy images

You can attach a FlashCopy backup image to another host by using Tivoli Storage FlashCopy Manager for VMware. This image is writable and any changes made to that image are reflected in the backup, and are included in the subsequent restore.

## XIV Storage System devices

IBM XIV Storage System snapshots differ from FlashCopy copy services.

When Tivoli Storage FlashCopy Manager for VMware creates a snapshot backup on the XIV system, the snapshot is always a space-efficient read-only copy of the application data. During the Tivoli Storage FlashCopy Manager for VMware configuration process, if you set the **USE\_WRITABLE\_SNAPSHOTS** parameter to NO, this snapshot image is not attached directly to another host. Instead, Tivoli Storage FlashCopy Manager for VMware creates a space-efficient logical copy of the snapshot as part of the attach procedure, which is removed after the backup is unattached. The copy of the snapshot is writable. Alternatively, you can set the **USE\_WRITABLE\_SNAPSHOTS** parameter to YES to create a writable snapshot. When you enable this option, the original snapshot is attached to another host. All changes to the snapshot are preserved, and a subsequent attach, or backup operation, presents all changes that occurred to the snapshot while attached.

## Remote access to snapshot backups

Several Tivoli Storage FlashCopy Manager for VMware operations attach a backup image to an ESX host. When you use XIV Storage System, Tivoli Storage FlashCopy Manager for VMware creates a duplicate or a space-efficient logical copy from the snapshot, which is then attached to the host. Changes to the duplicate are not reflected in the snapshot. As a result, the attached image can be altered without affecting the backup image and any subsequent restore of that backup. Tivoli Storage FlashCopy Manager for VMware removes the duplicate during the unattach operation. All changes that occurred on the duplicate are undone. A subsequent attach operation shows the image as created when the snapshot occurred.

For information about how to configure the **USE\_WRITABLE\_SNAPSHOTS** parameter, see the “DEVICE\_CLASS section” on page 89 of the Tivoli Storage FlashCopy Manager for VMware profile file.

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## Software components

Tivoli Storage FlashCopy Manager for VMware is composed of several software components.

The following Tivoli Storage FlashCopy Manager for VMware software components use the VMware vSphere APIs:

- Tivoli Storage FlashCopy Manager for VMware GUI.
- Tivoli Storage FlashCopy Manager for VMware application agent, `fccli`.
- Tivoli Storage FlashCopy Manager for VMware device and operating system agent, `acsgen`.

The following agents are used by Tivoli Storage FlashCopy Manager for VMware:

### Application agent

The application agent provides support for the snapshot-based protection

of the vSphere environments. The Tivoli Storage FlashCopy Manager for VMware application agent, `fmcli`, provides the following capabilities:

- Identifies the application objects that must be protected by Tivoli Storage FlashCopy Manager for VMware by using the vSphere API.
- Processes the virtual machines as suspend, resume, create, or delete snapshots by using the vSphere API.

#### **Management agent**

The management agent, `acsd`, coordinates the backup operation. This agent controls the flow of information between the application and device agents. The management agent also provides access to the snapshot backup repository that contains information about the valid snapshot backups and their relationships to snapshot-capable storage devices. This component is application, device, and operating system independent.

#### **Device agent**

The `acsgen` device agent is a generic device agent that interacts with operating system-specific and storage device-specific adapters. This agent sends and requests updates on the progress and usability of the information that is stored in the local snapshot backup repository. The component is operating system-dependent and device independent.

The following lists the storage device-specific agents that communicate with the `acsgen` agent:

- The CIM adapter, `fmcima`, is used with the generic device agent, `acsgen`. This adapter issues commands to the supported storage device by using the CIM interface. Examples of supported storage include DS8000, Storwize V7000, and SAN Volume Controller.
- The XIV storage adapter is used with the generic device agent `acsgen`. This adapter communicates with the `acsgen` agent and issues commands to the XIV Storage System by using the command-line interface XCLI.
- The N series and NetApp storage adapter `fmna` is used with the generic device agent `acsgen`. This adapter issues commands to the storage device by using the ONTAPI interface.

#### **Tivoli Storage FlashCopy Manager for VMware GUI**

The GUI is integrated with the VMware vSphere Client.

There are two methods to access the GUI:

- A plug-in that integrates with the VMware vSphere Client. This plug-in is accessed as a vCenter Client extension in the **Solutions and Applications** panel of the vSphere windows client or the **Classic Solutions** panel in the vSphere web Client.
- A stand-alone web browser GUI. This GUI is accessed through a URL bookmark to the GUI web server. For example:  
`https://guihost.mycompany.com:9081/TsmVMwareUI/`

**Note:** The port number to access the GUI web server is specified during the installation.

Use this GUI to complete these tasks:

- Schedule or initiate a backup of your virtual machines.
- Initiate a full recovery of your virtual machines or virtual machine disks.
- Attach and detach single virtual machine disks of a Tivoli Storage FlashCopy Manager for VMware backup to virtual machines.
- Manage your virtual machines in the vCenter.



- Issue reports concerning backup, restore, and configuration activity.
- Inquire information about existing backups.

#### **Data Protection for VMware command-line interface, VMCLI**

This command-line interface is installed with the Tivoli Storage FlashCopy Manager for VMware GUI. You can use Data Protection for VMware command-line interface commands to complete the following tasks:

- Initiate a backup of your virtual machines or schedule a backup for a later time.
- Initiate a full restore of your virtual machines, virtual machine files, or virtual machine disks.
- View configuration information about the backup database and environment.
- Inquire information about existing backups.
- Attach and detach single virtual machine disks of a Tivoli Storage FlashCopy Manager for VMware backup to virtual machines.

The Tivoli Storage FlashCopy Manager for VMware GUI is the primary task interface. The Data Protection for VMware command-line interface provides a useful secondary interface. Use the Data Protection for VMware command-line interface for tasks such as implementing a scheduling mechanism that is different from the one implemented by the Tivoli Storage FlashCopy Manager for VMware GUI.

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## **Additional information**

Addition resources are available to discover and share information about Tivoli Storage FlashCopy Manager for VMware.

The following list identifies the various ways that you can find information online:

- IBM Tivoli Storage FlashCopy Manager wiki on the developerWorks® site at [http://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/Tivoli Storage FlashCopy Manager](http://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/Tivoli%20Storage%20FlashCopy%20Manager).
- Service Management Connect site at <https://www.ibm.com/developerworks/servicemanagement/sm/index.html>.
- IBM Tivoli Storage FlashCopy Manager product support at <http://www.ibm.com/software/tivoli/products/storage-flashcopy-mgr/>. Enter the search term, such as an authorized program analysis report (APAR) number, release level, or operating system to narrow the search criteria.



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## Chapter 2. Preparing your Tivoli Storage FlashCopy Manager for VMware environment

Information is provided about preparing the applications, files, parameters, and devices in your Tivoli Storage FlashCopy Manager for VMware environment.

### About this task

Before installing Tivoli Storage FlashCopy Manager for VMware, you must validate the hardware, software, and environmental requirements.

The following information is required during the installation of Tivoli Storage FlashCopy Manager for VMware:

- Configuration parameters
- Storage device parameters
- Passwords

For the current requirements, review the *Hardware and Software Requirements* technote that is associated with the Tivoli Storage FlashCopy Manager release. This technote is available in the *Tivoli Storage FlashCopy Manager - All Requirement Documents* website at: <https://www.ibm.com/support/docview.wss?uid=swg21427692>. Follow the link to the requirements technote for your specific release or update level and review the pre-installation checklist and planning worksheet. Complete the installation planning sheet and use it as a reference during the installation process.

These conditions are the minimum environment requirements:

- A suitable disk layout for the VMFS datastores.
- Correctly defined storage definitions on the storage system
- Correct connectivity from the ESX hosts of your vSphere environment to the storage system

After you complete the checklist and planning sheet, review the following installation requirements.

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### Capacity planning

Information is provided to help you estimate the storage capacities that are required to install and use Tivoli Storage FlashCopy Manager for VMware.

The storage space required for Tivoli Storage FlashCopy Manager for VMware can be divided into the following categories:

- Space required for the product installation on a system
- Space required on the storage device for the actual snapshot backups

### Global product installation

The following table shows the default installation path and the average space that is required.

Table 3. Space requirements for a global product installation of Tivoli Storage FlashCopy Manager for VMware

Operating system	Default installation path	Space required (GB)
Linux	/opt/tivoli/tsm/tdpvmware/	1.9  A temporary directory is used during the installation. This directory requires 1GB of space and is removed after the installation.

Additional space is required for log files and trace files. Log and trace files are written continuously. The older files are not deleted automatically. The amount of storage that is required for log and trace files can grow to several hundred megabytes. You must delete log and trace files by using a custom script.

### Snapshot copies

The snapshot copies of your application data require the most space. The actual amount of space required depends on the following factors:

- The total size of all the source volumes consisting of the datastores to protect.
- The type of snapshot, full copy versus space-efficient.
- The rate that the source volumes are altered after a snapshot is taken. This applies only to space-efficient snapshots.

On SAN Volume Controller, Storwize V7000, and DS8000, full snapshot copies require the same amount of space as the corresponding source volumes. Space-efficient copies on SAN Volume Controller, Storwize V7000 and IBM XIV Storage System initially require a small amount of space for metadata. This space demand grows with every block that is being changed on the corresponding source volume. Accordingly, the more source volume blocks that are changed, the more space is required for the target volumes that represent a snapshot copy of those applications.

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## Installation options and requirements

Before you install Tivoli Storage FlashCopy Manager for VMware on any system, review the general installation requirements and considerations.

Tivoli Storage FlashCopy Manager for VMware must be installed and configured on one of the following systems:

- A physical server that is running Red Hat or SUSE Linux.
- A virtual machine on an ESX or ESXi host in a datacenter, with a guest Red Hat or SUSE Linux operating system.

You can use an existing virtual machine or physical server. However, the datastore on which this virtual machine is running cannot be a part of a Tivoli Storage FlashCopy Manager for VMware hardware snapshot operation. To ensure this prerequisite, create a dedicated datastore for this virtual machine. The server or virtual machine is referred to as the vStorage Backup Server.

Both Tivoli Storage FlashCopy Manager for VMware and IBM Tivoli Storage Manager for Virtual Environments can be installed on an existing server or virtual machine. However, it is recommended to install on a dedicated server physical or virtual machine where only Tivoli Storage FlashCopy Manager for VMware, Tivoli Storage Manager for Virtual Environments, or both are installed.

Tivoli Storage FlashCopy Manager for VMware integrates with the VMware vSphere environment. The Linux system on which Tivoli Storage FlashCopy Manager for VMware is running must have an IP connection to the VMware vCenter Server.

Tivoli Storage FlashCopy Manager for VMware creates hardware snapshot of virtual machines. In addition, it works with IBM Tivoli Storage Manager for Virtual Environments to send the hardware snapshots to the IBM Tivoli Storage Manager server.

**Related concepts:**

“Configuring the environment for the installation” on page 25

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## Storage solutions

Before you install and configure IBM Tivoli Storage FlashCopy Manager for VMware, review the storage solution setup. The device class section of the Tivoli Storage FlashCopy Manager for VMware profile configuration file, determines what features of the storage solution are used.

### IBM XIV Storage System

An auxiliary host, is an ESX host that is used by IBM Tivoli Storage FlashCopy Manager for VMware during restore operations. Tivoli Storage FlashCopy Manager for VMware mounts or attaches the target volumes temporarily to this host to extract virtual machines for restore purposes. The IBM XIV Storage System must be accessible from one or more ESX hosts when you have an auxiliary ESX host in your environment.

You must install the IBM XIV Storage System command-line interface (XCLI) on all hosts where Tivoli Storage FlashCopy Manager for VMware is installed. You do not need to install a Common Information Model (CIM) server.

During Tivoli Storage FlashCopy Manager for VMware configuration process, you can configure the device class profile parameters for use with the IBM XIV Storage System. The following example shows a typical XIV device class section from a sample Tivoli Storage FlashCopy Manager for VMware profile:

```
>>>
DEVICE_CLASS XIV
COPYSERVICES_HARDWARE_TYPE XIV
PATH_TO_XCLI path where XCLI is installed
COPYSERVICES_SERVERNAME xiv_hostname
COPYSERVICES_USERNAME admin
RECON_INTERVAL 12
USE_WRITABLE_SNAPSHOTS AUTO
<<<
```

When you configure Tivoli Storage FlashCopy Manager for VMware you can configure the following profile parameters for the XIV system:

- The **USE\_WRITABLE\_SNAPSHOTS** profile parameter. This parameter specifies whether writable snapshots are used for attach and restore operations. If writable snapshots are used, no duplicates are created during attach operations and all changes that are applied to the snapshot are preserved.
- The **RECON\_INTERVAL** profile parameter. This parameter specifies the reconciliation interval in hours. Reconciliation is the process where Tivoli Storage FlashCopy Manager for VMware periodically verifies that backups on the storage system

are valid. During reconciliation snapshots backups that are deleted or are invalid on the storage system are removed from Tivoli Storage FlashCopy Manager for VMware repository.

During the backup process, all storage volumes are unified into one consistency group. The snapshot of all volumes within this consistency group occurs at the same point in time therefore avoiding any inconsistencies.

## **IBM System Storage N series and NetApp storage systems**

All ESX hosts must have access to the storage system and its storage volumes to create datastores. In addition, an auxiliary ESX host must be able to access the storage system. The auxiliary ESX host is used by Tivoli Storage FlashCopy Manager for VMware to temporarily mount a snapshot backup.

An IBM System Storage N series and NetApp snapshot is a space efficient and read-only copy of the application data. Tivoli Storage FlashCopy Manager for VMware creates a clone volume from the snapshot as part of the attach procedure, which is removed after the backup is unattached. This clone volume is writeable.

You can set up policies within the IBM System Storage N series and NetApp to delete snapshots that are created with Tivoli Storage FlashCopy Manager for VMware. Tivoli Storage FlashCopy Manager for VMware periodically checks whether backups on the storage subsystem are valid. When snapshots are no longer present on the storage device, they are removed from Tivoli Storage FlashCopy Manager repository. This process is called reconciliation. The reconciliation interval is specified in hours by the parameter **RECON\_INTERVAL** in the **DEVICE\_CLASS** section of the Tivoli Storage FlashCopy Manager for VMware profile. When you configure Tivoli Storage FlashCopy Manager for VMware you can specify this interval.

During the backup process, all storage volumes are unified into one consistency group. The snapshot of all volumes within this consistency group occurs at the same point in time, therefore avoiding any inconsistencies.

## **DS8000, Storwize V7000, and SAN Volume Controller**

Tivoli Storage FlashCopy Manager for VMware uses a Common Information Model (CIM) server to communicate with a storage cluster. The CIM server and target volumes must be configured when you use Tivoli Storage FlashCopy Manager for VMware with SAN Volume Controller, DS8000, and Storwize V7000 in your environment.

For SAN Volume Controller V5.1 and later, DS8000 R4.1 and later, and Storwize V7000 storage systems, the CIM server is embedded into the storage device. The CIM server does not need to be installed and configured separately. Earlier releases of DS8000 require a proxy CIM server that must be installed and configured separately to manage storage clusters. Refer to your storage device documentation for configuration details. Tivoli Storage FlashCopy Manager for VMware supports both configurations: both a proxy CIM server and an embedded CIM server.

Unlike other storage systems, Tivoli Storage FlashCopy Manager for VMware requires that FlashCopy backup target volumes are created in advance on SAN Volume Controller, DS8000, and Storwize V7000. To provide a target set definition to Tivoli Storage FlashCopy Manager for VMware, organize target volumes into target sets. Each target set represents one backup generation. Tivoli Storage FlashCopy Manager for VMware automatically matches source volumes to

qualified target volumes. For the source volume to be backed up, each target set must contain at least one target volume. Although extra target volumes are allowed in a target set, these target volumes are ignored.

## Reconciliation of FlashCopy backups

Reconciliation is the process where Tivoli Storage FlashCopy Manager for VMware periodically verifies that FlashCopy backups that are stored on storage systems are valid.

Depending on the storage system, FlashCopy snapshots can be deleted, withdrawn, or stopped by certain operations on the storage system. When these events occur, it invalidates the FlashCopy backup. During reconciliation FlashCopy backups that are no longer present or are invalid on the storage system are removed from Tivoli Storage FlashCopy Manager repository.

Manual intervention on a storage system can cause the source and target volume relationship to be withdrawn.

- During a backup that specifies the **FLASHCOPY\_TYPE** parameter as *NOCOPY* or *INCR* type, the source volume and target volume relationship is validated as part of the backup operation. Using these FlashCopy types, when a source and target volume relationship is withdrawn, the target volume goes offline or is left in an inconsistent state. During the process of reconciliation, Tivoli Storage FlashCopy Manager for VMware identifies when this action occurs.
- During a backup that specifies the **FLASHCOPY\_TYPE** parameter as *COPY*, Tivoli Storage FlashCopy Manager for VMware is unable to distinguish if the relationship was withdrawn before or after the background copy process completed. You must ensure that the backup on the storage system is in a consistent state. This situation can occur when you use the following storage devices:
  - SAN Volume Controller
  - DS8000
  - Storwize V7000

### Related concepts:

“Selecting the FLASHCOPY\_TYPE” on page 46

### Related reference:

“DEVICE\_CLASS section” on page 89

## SAN Volume Controller and Storwize V7000 features

SAN Volume Controller 5.1 (or later) and Storwize V7000 provide a cascade feature that can be used with Tivoli Storage FlashCopy Manager for VMware.

These storage systems provide a FlashCopy cascading feature that can restore FlashCopy backups before completion of a background copy. This feature allows the target volume in one mapping to become the source volume in another mapping. You must use space-efficient volumes as backup targets because the background copy rate must be set to zero to prevent the FlashCopy target from becoming fully allocated.

The following list summarizes information that you must know before you use the cascading feature of SAN Volume Controller 5.1 (or later) and Storwize V7000 with Tivoli Storage FlashCopy Manager for VMware operations:

### Physical capacity

The physically allocated capacity of a space-efficient target volume must

contain sufficient space. It must be large enough to contain all changes that occur to your production environment between the current and the subsequent backup. If it is not large enough, the target volume goes offline and the corresponding backup becomes invalid.

**Tip:** You can use the SAN Volume Controller and Storwize V7000 AUTOEXPAND option to create “auto-expandable” target volumes. In this case, extra storage is assigned to the target whenever storage capacity decreases and sufficient extra capacity is available.

### Target sets

Tivoli Storage FlashCopy Manager for VMware cannot reuse a target set as the source for a new FlashCopy backup unless it corresponds to the last FlashCopy mapping in a cascaded FlashCopy relation. This situation implies that whenever Tivoli Storage FlashCopy Manager for VMware reuses a target set, it deletes all backups that are created before this point in time. This situation occurs when the following settings exist:

- The same profile for your Tivoli Storage FlashCopy Manager for VMware backups is used.
- This profile contains only one DEVICE\_CLASS statement.

Tivoli Storage FlashCopy Manager for VMware issues a warning that the target set is not available. This warning is issued when a target volume in one mapping is a source volume in another mapping but is not the last mapping in the cascade.

### Recommendations

Recommendations for SAN Volume Controller 5.1 or later, and Storwize V7000 environments:

- Do not use space-efficient volumes as source volumes.
- Decide whether you want to use space-efficient or fully allocated backup targets.

Complete parameter descriptions are available in Chapter 8, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 81.

### Examples

The following extract shows a sample profile with two different device classes. One is used for Tivoli Storage FlashCopy Manager for VMware only and the other is used for Tivoli Storage FlashCopy Manager for VMware backups that are offloaded to tape by using Tivoli Storage Manager for Virtual Environments. The device classes that are used in the different backup runs can be configured in the backup wizard of the Tivoli Storage FlashCopy Manager for VMware GUI.

```
>>> DEVICE_CLASS DISK_ONLY
  COPYSERVICES_HARDWARE_TYPE SVC
  FLASHCOPY_TYPE NOCOPY # space efficient targets
  TARGET_SETS 1 2 3
  TARGET_NAMING %SOURCE_%TARGETSET
  ...
  <<<
>>> DEVICE_CLASS DISK_TSM
  COPYSERVICES_HARDWARE_TYPE SVC
  FLASHCOPY_TYPE NOCOPY # space efficient targets
  TARGET_SETS DUAL
  TARGET_NAMING %SOURCE_%TARGETSET
  ...
  <<<
```



## Space-efficient targets on SAN Volume Controller and Storwize V7000

SAN Volume Controller and Storwize V7000 requires special considerations when you use space-efficient target volumes.

With space-efficient volumes, applications can grow dynamically, but consume only the space that they are actually using. Space-efficient targets that belong to a multiple target FlashCopy cascade might be deleted if other targets, in the same cascade, are restored or overwritten by a new snapshot. In a SAN Volume Controller 5.1, or later, and Storwize V7000 environment, the following situations might cause space-efficient targets to be deleted:

### Backup operations

Tivoli Storage FlashCopy Manager for VMware backup operation uses the oldest target set that is available for the specified `DEVICE_CLASS`. However, that target set might not be the oldest target set that is associated with the source volumes. This scenario is possible when more than one `DEVICE_CLASS` is specified for each `FLASHCOPY_TYPE` value in the Tivoli Storage FlashCopy Manager for VMware profile. When the FlashCopy backup that is available on the target set is not the oldest backup, then the older backups are deleted during the backup operation.

### Target volume storage space exceeded

When the available storage capacity of a space-efficient FlashCopy target volume is exceeded, the target volume status changes to offline. As a result, the data that is on the target volume is deleted.

### Related reference:

“`DEVICE_CLASS` section” on page 89

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## Data replication between sites

IBM Tivoli Storage FlashCopy Manager for VMware can protect data at the source site when data is replicated between two sites.

## Integration with Metro Mirror and Global Mirror

IBM Tivoli Storage FlashCopy Manager for VMware backs up data on SAN Volume Controller, DS8000, and Storwize V7000 storage systems that are used as Metro Mirror and Global Mirror sources.

Metro Mirror and Global Mirror are two types of remote-copy operations where you can set up a relationship between two sites. Updates that are made to one site are mirrored on the other site. Tivoli Storage FlashCopy Manager for VMware can protect data on source sites but cannot protect data on Metro Mirror and Global Mirror target sites.

See the *Installation Planning Sheet* for any prerequisites that are required before you install Tivoli Storage FlashCopy Manager for VMware with storage systems that are used as Metro Mirror and Global Mirror sources. For the most current requirements, review the Hardware and Software Requirements technote that is associated with the level of your Tivoli Storage FlashCopy Manager for VMware. This technote is available in the Tivoli Storage FlashCopy Manager - All Requirement Documents website at <https://www.ibm.com/support/docview.wss?uid=swg21427692>. Follow the link to the requirements technote for your specific release or update level.

## Integration with VMware vCenter Site Recovery Manager

IBM Tivoli Storage FlashCopy Manager for VMware backs up data at the protected site where VMware vCenter Site Recovery Manager (SRM) product is installed.

SRM is a disaster recovery product for virtualized environments. Using SRM, remote data replication occurs between the protected (primary) site and the recovery (secondary) site. Tivoli Storage FlashCopy Manager for VMware can protect data at the protected site.

To back up and restore data at the protected site, install Tivoli Storage FlashCopy Manager for VMware on one of the following systems:

- A physical system that has network access to the vCenter Server.
- A virtual machine on an ESX or ESXi host that has access to the vCenter Server.

The physical or virtual machine where Tivoli Storage FlashCopy Manager for VMware is installed is referred to as the vStorage backup server. The Linux system on which Tivoli Storage FlashCopy Manager for VMware is running must have an IP connection to the VMware vCenter Server.

The following figure shows how Tivoli Storage FlashCopy Manager for VMware can be integrated in a typical VMware SRM recovery solution.

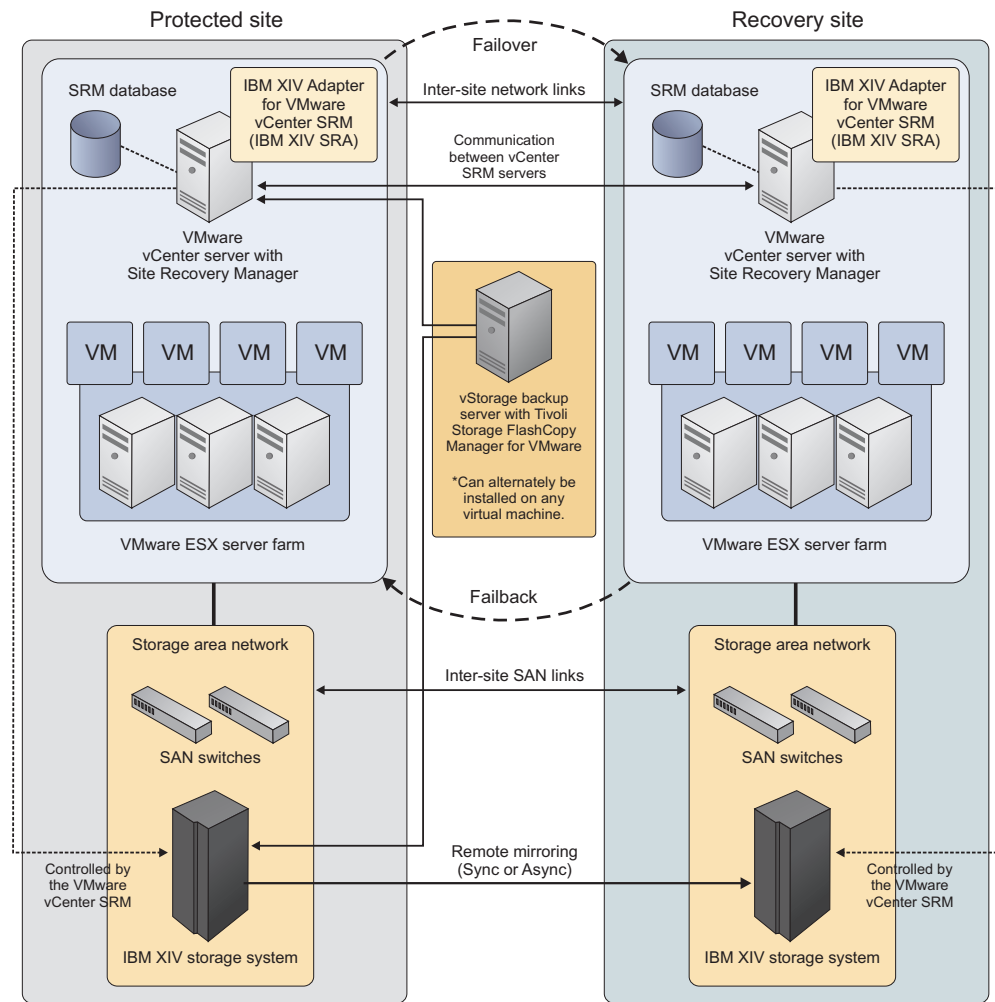


Figure 3. Tivoli Storage FlashCopy Manager for VMware in a VMware vCenter Site Recovery Manager environment

## Raw device mapping

You can use Tivoli Storage FlashCopy Manager for VMware to back up virtual machines that contain raw device-mapping disks. However, only standard virtual disks can be restored or attached.

Raw device mapping allows a special mapping file in a Virtual Machine File System (VMFS) volume to act as a proxy for a logical unit number (LUN) on a storage device. The mapping file, not the LUN, is referenced in the virtual machine configuration. When a LUN is accessed, the mapping file is read to obtain the reference to the LUN. Using the reference to the LUN, read and write operations can access the LUN directly rather than accessing it through the mapping file.

During the initial configuration, you can decide on the default backup mode. This mode determines how virtual machines selected for backup are processed before the actual hardware snapshot of the datacenter occurs. However, when you create a new backup task, you can override the type of backup mode to use. Depending on the defined backup mode, the following actions are taken when you backup a virtual machine that contains raw device-mapping disks:

**VM Backup mode:** *SNAPSHOT\_INCL\_MEM* or *SNAPSHOT\_EXCL\_MEM*

For both of these backup modes, the mode is changed to *ASIS*. This change is required because it is not possible to restore the snapshot because the raw device-mapping disks are not present on the restored virtual machine. In this case, a VMware virtual machine snapshot is not performed before the actual hardware snapshot. The snapshot that is created through this process is crash consistent only. A warning message is issued when this backup mode change occurs.

**VM Backup mode:** *SUSPEND*

This mode is not changed regardless of whether the virtual machine has raw device-mapping disks or not. In this case, a VMware virtual machine snapshot is not created before the actual hardware snapshot.

**Note:** The backup mode change occurs for a Tivoli Storage FlashCopy Manager for VMware backup only. The mode is not changed when you do a snapshot backup with a subsequent offload to Tivoli Storage Manager. The restore process from Tivoli Storage Manager server, maintains a file system level consistency, for backup modes *SNAPSHOT\_INCL\_MEM* and *SNAPSHOT\_EXCL\_MEM*.

When Tivoli Storage FlashCopy Manager for VMware is integrated with Tivoli Storage Manager for Virtual Environments, you still can achieve a file system level consistency backup by using one of the following methods:

- Direct backup to Tivoli Storage Manager for Virtual Environments.
- Create a backup task that offloads the Tivoli Storage FlashCopy Manager for VMware snapshot to Tivoli Storage Manager. The backup mode *SNAPSHOT\_INCL\_MEM* or *SNAPSHOT\_EXCL\_MEM* is not altered in this case, so that a restore from Tivoli Storage Manager, maintains file system level consistency.

Other options to consider when you backup a virtual machine that contains one or more raw device-mapping disks:

- Metadata for the raw device-mapping disks is included in the backup but this metadata cannot be restored.
- Tivoli Storage Manager for Virtual Environments can offload a virtual machine from a Tivoli Storage FlashCopy Manager for VMware backup to Tivoli Storage Manager. The raw device-mapping disks are not included in the offload. This type of offload occurs when Tivoli Storage FlashCopy Manager for VMware is integrated with Tivoli Storage Manager for Virtual Environments. Ensure that the parameters in the VMCLI section of the profile file that relate to Tivoli Storage Manager for Virtual Environments are configured.
- If you use the Data Protection for VMware command-line interface or Tivoli Storage FlashCopy Manager for VMware GUI to back up virtual machines, a warning is issued listing all the raw device-mapping disks that are not included in the backup.
- Tivoli Storage FlashCopy Manager for VMware removes the raw device-mapping disks from the virtual machine configuration after a restore process.

The following restrictions apply when you restore or attach virtual machines that include raw device-mapping disks:

- You cannot restore raw device-mapping disks because the content of the raw device-mapping volume is not part of the backup. The VMware snapshots that are created by the user before the backup are no longer available.

- You cannot attach raw device-mapping disks from a virtual machine backup. In the Tivoli Storage FlashCopy Manager for VMware GUI, the raw device-mapping disks are not displayed.
- You cannot use the Data Protection for VMware command-line interface to attach disks by specifying the disk-key of a raw device-mapping disk.

**Related tasks:**

Creating a backup

**Related reference:**

VMWARE parameters

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## Virtual machine template and vApp

A virtual machine template is a master image of a virtual machine. A *vApp* is a logical entity that consists of one or more virtual machines. With IBM Tivoli Storage FlashCopy Manager for VMware, you can back up and restore virtual machine templates and virtual machines that are contained in a vApp.

A virtual machine template can include a guest operating system and a set of applications. You can back up and restore virtual machine templates. When you restore a virtual machine template, you can restore the virtual machine template to the original virtual machine, or to a new location and datastore. You can attach a backup on an ESX host to a target virtual machine, to enable a single disk restore. However, you cannot attach a single virtual disk from a previous backup to a template.

You can back up and restore virtual machines that are contained within a vApp logical entity. By using a vApp, you can specify and include all components of a multitier application. A vApp also includes the operational policies and associated service levels of the application that is contained in the vApp. You can select and back up the vApp logical entity. From the Tivoli Storage FlashCopy Manager for VMware GUI interface, only the virtual machines that are contained within the vApp are displayed.

When you restore a virtual machine that was contained within a vApp, they are restored to one of the following locations:

- If the vApp is available with the same resource pool path, the virtual machine is added back to the vApp. This location is used even if the vApp was moved within the logical folder hierarchy.
- If the vApp does not exist or its resource pool path has changed, the virtual machine is restored to the root resource pool of the ESX host. The virtual machine is restored under the logical folder and path where the original vApp was at backup time. If the path does not exist, this path is created.
- If you restore the virtual machine to an alternative location, the virtual machine is restored to the root resource pool and root logical folder of the ESX host.



---

## Chapter 3. Installing and upgrading

To install IBM Tivoli Storage FlashCopy Manager for VMware, you can use the installation wizard, the console, or the console in silent mode.

### About this task

The Tivoli Storage FlashCopy Manager for VMware installation packages are delivered as InstallAnywhere files. You can access the product software from an installation DVD or from an image that is downloaded from IBM Passport Advantage®. These files use the following naming format: 4.1.0.0-TIV-TSFCM-VMware.bin.

You must use the root user ID for the installation.

Before you install Tivoli Storage FlashCopy Manager for VMware, review the requirements. For the current requirements, review the *Hardware and Software Requirements* technote that is associated with the Tivoli Storage FlashCopy Manager release. This technote is available in the *Tivoli Storage FlashCopy Manager - All Requirement Documents* website at: <https://www.ibm.com/support/docview.wss?uid=swg21427692>. Follow the link to the requirements technote for your specific release or update level and review the pre-installation checklist and planning worksheet.

---

## Configuring the environment for the installation

You must ensure that all installation requirements are met before you install IBM Tivoli Storage FlashCopy Manager for VMware.

### Setting up a role with minimum privileges to access the vCenter Server

To use Tivoli Storage FlashCopy Manager for VMware to back up and recover virtual machines, Tivoli Storage FlashCopy Manager for VMware must authenticate to the vCenter Server. The user ID you use to authenticate must have sufficient privileges to perform these operations. In the VMware vCenter Server, a set of privileges is collectively defined as a role. A role can be applied to an object for a specified user or group to create a permission.

To create a vCenter Server role for backup and recovery operations, add a role, for example named FCM for VMware, by using the vSphere Client. The following table shows the privileges that must be assigned to this role.

*Table 4. Objects and privileges to assign to the FCM for VMware role for backup and recovery operations*

Object	Privilege
Datastore	Allocate space, Browse datastore, Configure datastore, Remove datastore, Rename datastore, Low-level file operations, Update virtual machine files
Folder	Create folder, Delete folder, Rename folder

Table 4. Objects and privileges to assign to the FCM for VMware role for backup and recovery operations (continued)

Object	Privilege
Host Configuration	Storage partition configuration, System Management, System resources
Network	Assign network
Resource	Assign virtual machine to resource pool
Virtual machine Configuration	Add existing disk, Add new disk, Add or Remove device, Advanced, Change CPU count, Change resource, Disk change tracking, Disk Lease, Host USB device, Memory, Modify device setting, Raw device, Reload from path, Remove disk, Rename, Reset guest information, Settings, Swapfile placement, Upgrade virtual hardware
Virtual machine Interaction	Answer question, Back up operation on virtual machine, Power off, Power on, Reset, Suspend
Virtual machine Inventory	Create new, Register, Remove, Unregister
Virtual machine Provisioning	Allow disk access, Allow read-only disk access, Allow virtual machine download, Allow virtual machine files upload
Virtual machine State	Create snapshot, Remove snapshot, Revert to snapshot

The recovery operation requires privileges for operations on hosts, networks, and datastores. Therefore, apply this new role to the datacenter object or higher in the VMware vCenter Server hierarchy. Ensure that the check box **Propagate to Child Object** is selected when you add the permission.

**Tip:** You might consider adding other privileges to FCM for VMware role that might be needed to perform other tasks that are not related to back up and recovery.

## Installation directory and components

The installation directory for Tivoli Storage FlashCopy Manager for VMware is `/opt/tivoli/tsm/tdpvmware/fcm`. Depending on your environment, you can also use IBM Tivoli Storage Manager for Virtual Environments: Data Protection for VMware with Tivoli Storage FlashCopy Manager for VMware. See *IBM Tivoli Storage Manager for Virtual Environments: Data Protection for VMware Installation and User's Guide* for more information.

The following Tivoli Storage FlashCopy Manager for VMware software components are installed:

- All the Tivoli Storage FlashCopy Manager for VMware daemons for example, `acsd`, `acsgen`, `vmware`, and `fccli`
- All the message catalogs
- The setup script
- The Tivoli Storage FlashCopy Manager for VMware license file
- The IBM Global Security Kit (GSKit)



Tivoli Storage FlashCopy Manager for VMware and Data Protection for VMware vSphere share some common components. The following common components are installed:

- WebSphere® Application Server
- IBM User Interface Help System
- Tivoli Storage FlashCopy Manager for VMware GUI
- The Data Protection for VMware command-line interface (VMCLI) database
- Data Protection for VMware command-line interface

When Data Protection for VMware vSphere is installed on the vStorage backup server or a VM, the common components that are already installed and configured are not reinstalled.

The Tivoli Storage FlashCopy Manager for VMware installer provides wizard, console, and silent installation options.

If the wizard is used for the installation, you must complete the following steps.

- Ensure that the graphic X Window System is available.
- Ensure that the environment variable DISPLAY specifies host:display, where host identifies the host name of the X Server to be contacted and display is the display number.

All the common components are installed into the default installation directory. The installation directory, INSTALLDIR, is /opt/tivoli/tsm/tdpvmware/common. The installation directory cannot be changed.

The WebSphere Application Server is installed in the /opt/tivoli/tsm/tdpvmware/common/webserver directory.

During the installation, a new user is created or an existing user name can be specified. The default for the created user name is tdpvmware, which can be changed during the installation. All installation processes are run by using the root user name. A profile is created in the \$HOME/tdpvmware/config directory of the created user name. The name of the profile is profile. This profile contains the configuration information for Tivoli Storage FlashCopy Manager for VMware and the Data Protection for VMware command-line interface. The initialization scripts for WebSphere Application Server (/etc/init.d/webserver) and the Data Protection for VMware command-line interface (/etc/init.d/vmcli) entries are copied to the /etc/init.d/ directory. The WebSphere Application Server and Data Protection for VMware command-line interface entries are both running when the installation is completed. The vmcli database is in \$HOME/tdpvmware/VMCLIDB directory.

---

## Installing by using the installation wizard

The installation wizard provides step by step instructions that guide you through the Tivoli Storage FlashCopy Manager for VMware installation process.

### Before you begin

You must use the root user ID for the installation. Ensure that the *Preinstallation checklist* and *Installation planning sheet* is completed before you start the installation. Download the download image from IBM Passport Advantage or insert the Tivoli Storage FlashCopy Manager for VMware DVD into the DVD drive.

## About this task

There are two types of installation:

- **Default**, this method installs Tivoli Storage FlashCopy Manager for VMware by using standard values for the configuration of the Derby database and WebSphere Application Server.
- **Advanced**, this method installs Tivoli Storage FlashCopy Manager for VMware with installation options that you can customize.

## Procedure

To install Tivoli Storage FlashCopy Manager for VMware by using the installation wizard:

1. Log in to the vStorage Backup Server as root user ID. The vStorage Backup Server is either a virtual machine or a physical Linux system.
2. Specify the following command:  
`./4.1.0.0-TIV-TSFCM-VMware.bin`
3. Select the language to use for your installation. Click **OK**.
4. On the Introduction page, click **Next**.
5. Read and accept the terms of the software license agreement and click **Next**.
6. Select the installation type **Default** or **Advanced**.
  - To install with default options, select **Default**
  - To install with options to configure the parameters, select **Advanced**. This option is suitable for advanced users only.

After you select the installation type, click **Next**.

**Note:** If you chose a default installation, skip to step 8.

7. Specify advanced options:
  - a. On the User name page, specify the user name. Click **Next**.
  - b. On the Derby Database Configuration page, specify the database port. Click **Next**.
  - c. On the WebSphere Application Server - Port Configuration page, specify the WebSphere Application Server default port. Click **Next**.
8. On the vSphere protection GUI information page, select the options to start the Tivoli Storage FlashCopy Manager for VMware GUI:
  - Register GUI as vCenter plug-in
  - Enable access to the GUI by web browser
9. Optional: If you are accessing the GUI by using the vCenter plug-in, specify the vCenter information. On the Plug-in Registration vCenter page, register the Tivoli Storage FlashCopy Manager for VMware GUI with the vCenter. Specify the following options:
  - The vCenter Server IP address or name
  - The vCenter user name
  - The vCenter passwordClick **Next**.
10. Optional: If you are accessing the GUI by using a web browser, specify the Web Server information. On the Plug-in Registration vCenter page, specify the following options:
  - Web Server HTTP Port

- Web Server HTTPS Port
- Web Server keystore Password
- SLL Certificate Expiration (years)

Click **Next**.

11. Review the preinstallation summary. After you verify that the information is correct, click **Next** to start the installation process.
12. After the installation finishes, click **Done** to close the installation wizard.

## Results

Tivoli Storage FlashCopy Manager for VMware creates an installation log file. The `installation.log` file, is created in the `/opt/tivoli/tsm/tdpvmware` directory. It contains information that can help you troubleshoot problems that occur during installation. If an error occurs during the installation process, correct the errors and restart the installation procedure.

The status of Tivoli Storage FlashCopy Manager for VMware GUI installation is stored in the `vecommon_installation.log` file in the `/opt/tivoli/tsm/tdpvmware` installation directory.

---

## Installing in console mode

You can run the installer in console mode to install Tivoli Storage FlashCopy Manager for VMware by using an interactive text-mode interface.

### Before you begin

You must use the root user ID for the installation. Ensure that the *Preinstallation checklist* and *Installation planning sheet* is completed before you start the installation. Download the download image from IBM Passport Advantage or insert the Tivoli Storage FlashCopy Manager for VMware DVD into the DVD drive.

### Procedure

To install Tivoli Storage FlashCopy Manager for VMware in console mode:

1. Log in to the vStorage Backup Server as root user ID. The vStorage Backup Server is either a virtual machine or a physical Linux system.
2. Specify the following command:  

```
./4.1.0.0-TIV-TSFCM-VMware.bin -i console
```
3. Follow the prompts in the console window to complete the installation. The console installation process follows the same steps as the wizard installation process. For more information about specific responses during the installation, see the wizard installation instructions.

### Results

Tivoli Storage FlashCopy Manager for VMware creates an installation log file. The `installation.log` file, is created in the `/opt/tivoli/tsm/tdpvmware` directory. It contains information that can help you troubleshoot problems that occur during installation. If an error occurs during the installation process, correct the errors and restart the installation procedure.

The status of Tivoli Storage FlashCopy Manager for VMware GUI installation is stored in the `vecommon_installation.log` file in the `/opt/tivoli/tsm/tdpvmware` installation directory.

---

## Installing in silent mode

You can install Tivoli Storage FlashCopy Manager for VMware in silent mode with no user interaction.

### Before you begin

You must use the root user ID for the installation. Ensure that the *Preinstallation checklist* and *Installation planning sheet* is completed before you start the installation. Download the download image from IBM Passport Advantage or insert the Tivoli Storage FlashCopy Manager for VMware DVD into the DVD drive.

### Procedure

To install Tivoli Storage FlashCopy Manager for VMware in silent mode:

1. Log in to the vStorage Backup Server as root user ID. The vStorage Backup Server is either virtual machine or a physical Linux system.
2. To install in silent (unattended) mode, you must generate a properties file. To create the properties file, run the installation in console or GUI mode and record the responses:

```
./4.1.0.0-TIV-TSFCM-VMware.bin [-i console] -DRECORDFILE=/tmp/installer.properties
```

**Note:** To create the properties file containing all the required parameters, IBM Tivoli Storage Manager for Virtual Environments cannot be installed on the server when creating the properties file. If Tivoli Storage Manager for Virtual Environments is installed, modify the sample properties file rather than creating one.

3. Edit the `installer.properties` file and add the `VCENTER_PASSWORD` parameter. For example, `VCENTER_PASSWORD=password`.
4. Run the silent installation by using the properties file:

```
./4.1.0.0-TIV-TSFCM-VMware.bin -i silent -f installer.properties
```

Specify the full path name for the properties file.

#### Sample properties file

```
# Properties file for Tivoli Storage FlashCopy® Manager Installations
# Created on: May 8, 2012 4:18:38 PM
# This file contains the information, the installer needs to perform
# a successful installation in silent mode.
#
# Installation Directory
# -----
USER_INSTALL_DIR=/opt/tivoli/tsm/tdpvmware

# User name
# -----
USERNAME=tdpvmware

# VMCLI port
# -----
VMCLI_DB_PORT=1527

# vCenter credentials
# -----
VCENTER_HOSTNAME=esxvc2
```

```
VCENTER_USERNAME=Administrator
VCENTER_PASSWORD=password

# WebSphere Application Server Ports
# -----
WC_defaulthost=9080
WC_adminhost=9060
WC_defaulthost_secure=9443
WC_adminhost_secure=9043
BOOTSTRAP_ADDRESS=2809
SOAP_CONNECTOR_ADDRESS=8880
IPC_CONNECTOR_ADDRESS=9633
ORB_LISTENER_ADDRESS=9100
```

## Results

Tivoli Storage FlashCopy Manager for VMware creates an installation log file. The `installation.log` file, is created in the `/opt/tivoli/tsm/tdpvmware` directory. It contains information that can help you troubleshoot problems that occur during installation. If an error occurs during the installation process, correct the errors and restart the installation procedure.

The status of Tivoli Storage FlashCopy Manager for VMware GUI installation is stored in the `vcommon_installation.log` file in the `/opt/tivoli/tsm/tdpvmware` installation directory.

---

## Upgrading Tivoli Storage FlashCopy Manager for VMware

Follow these instructions to upgrade Tivoli Storage FlashCopy Manager for VMware and other components

### Upgrading Tivoli Storage FlashCopy Manager for VMware

You can upgrade your system from a previous version of Tivoli Storage FlashCopy Manager for VMware to version 4.1. It is not required to uninstall the earlier version.

#### Before you begin

Download the image from IBM Passport Advantage or insert the Tivoli Storage FlashCopy Manager for VMware DVD into the DVD drive.

#### Procedure

To upgrade Tivoli Storage FlashCopy Manager for VMware, complete the following steps:

1. Log in to the vStorage Backup Server by using the root user ID. The vStorage Backup Server is either a virtual machine or a physical Linux system.
2. Start the upgrade by entering the following command:  
`./4.1.0.0-TIV-TSFCM-VMware.bin`
3. On the Introduction page, click **Next**.
4. Read and accept the terms of the software license agreement and click **Next**.
5. An upgrade installation message is displayed that prompts you to verify the upgrade location. Click **OK**.
6. Review the preinstallation summary. After you verify that the information is correct, click **Next** to start the upgrade process.

## What to do next

After the installation, complete the following tasks:

- To enforce SP 800-131 compliant encryption, during the configuration of Tivoli Storage FlashCopy Manager for VMware, you must set the **ENFORCE\_TLS12** parameter to YES. This step requires that the certificate must meet the requirements as specified in SP 800-131 standard. Therefore, you must delete the self-signed certificates that were created by the previous version to allow Tivoli Storage FlashCopy Manager for VMware to create new self-signed certificates. To remove the existing self-signed certificates from the Tivoli Storage FlashCopy Manager for VMware installation directory, issue the following command:  

```
rm fmcert.*
```

Ensure that you run the setup script to configure Tivoli Storage FlashCopy Manager for VMware to create new self-signed certificates. The new self-signed certificates can be used regardless of whether the **ENFORCE\_TLS12** parameter is enabled or not. At any time, it is possible to delete the self-signed certificates and generate new certificates by running the setup script.

**Note:** Deleting the certificates does not apply to certificate authority (CA) signed certificates. The signed certificate can be from an internal or external CA. The signed certificate must comply with the standard as defined by the National Institute of Standards and Technology (NIST) SP 800-131 standard encryption. This standard requires longer key lengths and stronger cryptographic algorithms. The minimum requirement is key size = 2048 bits and signature algorithm = RSA with SHA224 or higher. If the current CA signed certificates does not meet these requirements, you must update them.

- After the upgrade, run the `./setup.sh` script to configure the profile file.
- If you do not run the `./setup.sh` script after the upgrade, remove the **USE\_CONSISTENCY\_GROUP** parameter in the profile file by using a text editor. This parameter must be removed to avoid errors when you run Tivoli Storage FlashCopy Manager for VMware. To avoid potential errors, the preferred method is to run the `./setup.sh` script.

### Related tasks:

Configuring using the setup script

## Upgrading Tivoli Storage FlashCopy Manager for VMware and Data Protection for VMware

You can upgrade your system from a previous version of Tivoli Storage FlashCopy Manager for VMware to version 4.1. You must also upgrade Data Protection for VMware to version 7.1, if this version is not installed. Both products must be upgraded together to ensure that all components are compatible.

### Before you begin

Download the image from IBM Passport Advantage or insert the Tivoli Storage FlashCopy Manager for VMware DVD into the DVD drive.

### Procedure

1. Log in to the vStorage Backup Server by using the root user ID. The vStorage Backup Server is either a virtual machine or a physical Linux system.
2. Start the upgrade by entering the following command:  

```
./4.1.0.0-TIV-TSFCM-VMware.bin
```
3. On the Introduction page, click **Next**.

4. Read and accept the terms of the software license agreement and click **Next**.
5. An upgrade installation message is displayed that prompts you to verify the upgrade location. Click **OK**.
6. Review the preinstallation summary. After you verify that the information is correct, click **Next** to start the upgrade process.
7. After the upgrade finishes, a message is displayed that prompts you to upgrade Data Protection for VMware and Tivoli Storage Manager Backup-Archive Client (data mover) packages.

## What to do next

After the upgrade, you must set up your environment and upgrade all components from the Data Protection for VMware package:

- To enforce SP 800-131 compliant encryption, during the configuration of Tivoli Storage FlashCopy Manager for VMware, you must set the **ENFORCE\_TLS12** parameter to YES. This step requires that the certificate must meet the requirements as specified in SP 800-131 standard. Therefore, you must delete the self-signed certificates that were created by the previous version to allow Tivoli Storage FlashCopy Manager for VMware to create new self-signed certificates. To remove the existing self-signed certificates from the Tivoli Storage FlashCopy Manager for VMware installation directory, issue the following command:

```
rm fmcert.*
```

Ensure that you run the setup script to configure Tivoli Storage FlashCopy Manager for VMware to create new self-signed certificates. The new self-signed certificates can be used regardless of whether the **ENFORCE\_TLS12** parameter is enabled or not. At any time, it is possible to delete the self-signed certificates and generate new certificates by running the setup script.

**Note:** Deleting the certificates does not apply to certificate authority (CA) signed certificates. The signed certificate can be from an internal or external CA. The signed certificate must comply with the standard as defined by the National Institute of Standards and Technology (NIST) SP 800-131 standard encryption. This standard requires longer key lengths and stronger cryptographic algorithms. The minimum requirement is key size = 2048 bits and signature algorithm = RSA with SHA224 or higher. If the current CA signed certificates does not meet these requirements, you must update them.

- After the Tivoli Storage FlashCopy Manager for VMware upgrade is complete, you must run the `./setup.sh` script to configure extra parameters in the profile file.

If you do not run the `./setup.sh` script after the upgrade, remove the **USE\_CONSISTENCY\_GROUP** parameter in the profile file by using a text editor. This parameter must be removed to avoid errors when you run Tivoli Storage FlashCopy Manager for VMware. To avoid potential errors, the preferred method is to run the `./setup.sh` script.

- If Data Protection for VMware V6.2, V6.3 or V6.4 is installed, upgrade to version 7.1. See *IBM Tivoli Storage Manager for Virtual Environments: Data Protection for VMware Installation and User's Guide*.
- You must upgrade all data mover nodes to Tivoli Storage Manager Backup-Archive Client 7.1 level. See *IBM Tivoli Storage Manager for Virtual Environments: Data Protection for VMware Installation and User's Guide*.

### Related tasks:

Configuring using the setup script

---

## Uninstalling Tivoli Storage FlashCopy Manager for VMware

You can uninstall Tivoli Storage FlashCopy Manager for VMware by using the uninstallation wizard in graphical mode, console mode, or silent mode.

### About this task

Run the uninstallation wizard **uninstall-FCM-VMware** to uninstall Tivoli Storage FlashCopy Manager for VMware. You must run the uninstallation wizard in the `/opt/tivoli/tsm/tdpvmwre/fcm/uninstall` directory. You can run the wizard in the graphical, console, or silent mode.

**To uninstall in graphical mode, use the following command:**

```
/opt/tivoli/tsm/tdpvmwre/fcm/uninstall/uninstall-FCM-VMware
```

**To uninstall in console mode, use the following command:**

```
/opt/tivoli/tsm/tdpvmwre/fcm/uninstall/uninstall-FCM-VMware -i console
```

**To uninstall in the silent mode, use the following command:**

```
/opt/tivoli/tsm/tdpvmwre/fcm/uninstall/uninstall-FCM-VMware-i silent  
-f properties file
```

This application unregisters the Data Protection for VMware vCenter plug-in in the vCenter and removes the Tivoli Storage FlashCopy Manager for VMware files. During the uninstallation process, you must specify the vCenter user name and the vCenter password to unregister the Data Protection for VMware vCenter plug-in. If you use a silent uninstallation, the properties file must contain the following parameters that are needed to unregister the Data Protection for VMware vCenter plug-in:

- VCENTER\_HOSTNAME
- VCENTER\_USERNAME
- VCENTER\_PASSWORD
- WEBSERVER\_HOSTNAME

If Tivoli Storage Manager for Virtual Environments is not installed, the uninstallation wizard also uninstalls the following common components:

- Embedded WebSphere Application Server
- IBM User Interface Help System
- The Data Protection for VMware vCenter plug-in
- The vmcli database
- The Data Protection for VMware command-line interface
- IBM GSKit components

The Data Protection for VMware vCenter plug-in files are removed during uninstallation only if no other installation of Tivoli Storage FlashCopy Manager for VMware or Tivoli Storage Manager for Virtual Environments remains on the system.



---

## Chapter 4. Configuring Tivoli Storage FlashCopy Manager for VMware

After installing, you must configure Tivoli Storage FlashCopy Manager for VMware for your environment. The setup script and the profile, target volume, and password configuration files are used to configure Tivoli Storage FlashCopy Manager for VMware to operate in different environments.

### About this task

To configure Tivoli Storage FlashCopy Manager for VMware you must use the setup script to create and edit the profile and password files. In addition, you must edit the target volumes file, by using an editor of your choice.

#### The profile file

The profile file is stored in `$HOME/tdpvmware/config/profile` where `$HOME` is the home directory of the user name created during the installation. It contains all the profile parameters used to configure the Tivoli Storage FlashCopy Manager for VMware. In the profile file, parameters are categorized into GLOBAL, ACSD, VMWARE, VMCLI, and DEVICE\_CLASS sections.

#### The target volumes file

You must create and edit the target volumes file for DS8000 systems. The target volumes file is required and specifies the target volumes to be used for a Tivoli Storage FlashCopy Manager for VMware backup operation. For Storwize V7000 and SAN Volume Controller storage systems, you can use either the **TARGET\_NAMING** parameter or the target volumes file. The target volumes file is not required for other storage systems.

#### The password file

You must set or modify passwords by using the setup script, `setup.sh`. The passwords are stored in the password file.

#### The setup script, `setup.sh`.

This script creates, changes, and updates the Tivoli Storage FlashCopy Manager for VMware profile file and sets and changes passwords.

---

## Tivoli Storage FlashCopy Manager for VMware profile

Profile parameters are needed to run IBM Tivoli Storage FlashCopy Manager for VMware. The parameters are contained in a profile file.

A profile file must be available on the server where the management agent, the `acsd` daemon, is running. The Tivoli Storage FlashCopy Manager for VMware profile is created or updated by using the setup script. The standard profile is called *profile* and is in the `$HOME/tdpvmware/config/` directory. The following symbolic links reference the profile file:

- `vmcliprofile` in the `/opt/tivoli/tsm/tdpvmware/common/scripts` directory
- `profile` in the `/opt/tivoli/tsm/tdpvmware/fcm` directory

The elements of the profile are not case-sensitive. By convention, the section and the parameter names are shown in uppercase in the profile file. The `ACS_DIR` profile parameter is used to define the configuration directory.

## Tivoli Storage FlashCopy Manager for VMware profile sections

In the Tivoli Storage FlashCopy Manager for VMware profile file, the profile parameters are categorized into sections. Each section of the profile file contains information that is relevant to that section. The profile is structured into five named sections.

- GLOBAL
- ACSD
- VMWARE
- VMCLI
- DEVICE\_CLASS

The profile file can have more than one DEVICE\_CLASS section, and each section must have a unique instance name. The DEVICE\_CLASS sections can be named and renamed by using the setup script. Each occurrence of the DEVICE\_CLASS section has a unique set of parameters.

The named sections of the profile are described in the following paragraphs:

### GLOBAL section

The GLOBAL section contains information that is used by all Tivoli Storage FlashCopy Manager for VMware components. Each Tivoli Storage FlashCopy Manager for VMware component evaluates this section once, when Tivoli Storage FlashCopy Manager for VMware is started. Changes within this section require a restart of Tivoli Storage FlashCopy Manager for VMware before they become effective. The GLOBAL section is also used to specify the location for logging, tracing, and password files.

### ACSD section

The ACSD section contains information that is used by the management agent (acsd). This section includes the ACS\_REPOSITORY parameter, which specifies the directory where the management agent stores the backup repository. This repository is the most important collection of Tivoli Storage FlashCopy Manager for VMware data. If the repository is lost, any previously created backup cannot be restored.

**Important:** You must back up the snapshot backup repository regularly. This backup does not happen automatically.

### VMWARE section

The VMWARE section contains the parameters that are related to backups and restores in a virtual system. The parameters in the VMWARE section specify options that are related to the VMware vCenter Server and its environment.

### VMCLI section

The VMCLI section contains parameters that specify the vmcli database and the Data Protection for VMware command-line interface.

### DEVICE\_CLASS section

The DEVICE\_CLASS section contains parameters that are related to the storage system. At least one DEVICE\_CLASS section is required to configure the management agent. A DEVICE\_CLASS section describes the characteristics of a storage device and is dependent on the specific storage subsystem. You can specify multiple DEVICE\_CLASS sections within one profile and assign unique names to each section. The parameter values for each device class section are recorded in the Tivoli Storage FlashCopy Manager for VMware repository to identify the appropriate

DEVICE\_CLASS section that is used during restore processing. For each storage device, a password is required. The setup script prompts you to enter parameter values that are specific to your storage system, the vCenter password, the acsd management agent password, and the device class passwords. The following command starts the setup script:

```
setup.sh
```

The passwords can also be set by using the `fmcli` command `fmcli -f password`. These passwords are used by Tivoli Storage FlashCopy Manager for VMware to authenticate to the storage subsystem that is represented by the associated DEVICE\_CLASS section.

A profile is created in the `$HOME/tdpvmware/config/profile` directory where `$HOME` is the home directory of the user name created during the installation. The profile contains the configuration information for Tivoli Storage FlashCopy Manager for VMware. Changes to the profile take effect immediately, except when the GLOBAL or ACS\_D sections of the profile file are modified. Run the `./setup.sh` script to configure additional parameters in the profile file. See the topic “Configuring using the setup script” in the Configuring Tivoli Storage FlashCopy Manager for VMware section for details.

**Related tasks:**

Configuring using the setup script

---

## Tivoli Storage FlashCopy Manager for VMware target set definitions

The target volumes file identifies the set of target volumes that are to be used for a Tivoli Storage FlashCopy Manager for VMware backup. The target set definitions are not required on the XIV system.

To schedule backup operations successfully for multiple target disks on storage systems, ensure that the following configuration prerequisites are met:

- A dedicated DEVICE\_CLASS section in the Tivoli Storage FlashCopy Manager for VMware profile file for each datastore or group of datastores that you want to back up together.
- A unique list of target set names must be associated with each DEVICE\_CLASS section. The **TARGET\_SETS** parameter specifies the target volumes or lists the target set names to use in the copy operation. The names must be unique to all device class sections specified in the profile file.

Each backup schedule that is run must use a dedicated DEVICE\_CLASS section that is specified for each datastore or datastores in the Tivoli Storage FlashCopy Manager for VMware profile file.

### Target set definition with the target volumes file

During a Tivoli Storage FlashCopy Manager for VMware backup on DS8000, SAN Volume Controller or Storwize V7000, a set of target volumes, the target set is required. A target set is required for each set of source volumes that are to be copied. More than one target set can be defined for use in different Tivoli Storage FlashCopy Manager for VMware backups. The volumes in each target set that are used in a backup must be specified in a similar way in a target volumes file, the `.fct` file. For SAN Volume Controller or Storwize V7000, the `.fct` file is not mandatory. The target set section name, in the target volumes file, starts with the prefix `TARGET_SET` if the **VOLUMES\_FILE** parameter is used. The name is appended

with a target set name that differentiates the various target set sections. The target set name can be any alphanumeric value.

## Target set definition with target naming patterns

To simplify target mapping on SAN Volume Controller or Storwize V7000, when you use the **TARGET\_SETS** parameter, you can specify a naming convention for your target volumes. Tivoli Storage FlashCopy Manager for VMware can map source volumes to suitable target volumes without the requirement to manually list all targets in the target volumes file.

### Related concepts:

“Examples of target volume files setup” on page 39

“Examples of target naming setup” on page 43

## Target set definitions

Tivoli Storage FlashCopy Manager for VMware requires target sets to be defined for SAN Volume Controller, DS8000, and Storwize V7000.

Define targets by using target set definition files (SAN Volume Controller, DS8000, and Storwize V7000) or by using a naming convention (SAN Volume Controller and Storwize V7000 only). This convention determines the name of the target from both the source volume name and the target set name as specified for the current operation.

### Target set definition files

A target set definition file contains a list of target volumes that are organized into target sets.

Tivoli Storage FlashCopy Manager for VMware attempts to match source volumes to suitable targets within a target set during backup. To determine source and target relations in advance, specify a source name with a target in the definition file. In this situation, the relationship between the source and target is required. Backup processing fails if one of the targets is unavailable for the specified source.

For DS8000, Tivoli Storage FlashCopy Manager for VMware does not support dynamic assignment of the target volumes to the auxiliary ESX host. The volumes of the target set must be assigned statically to the auxiliary ESX host that is used for attach, restore, and Tivoli Storage Manager backup operations. You must assign all target volumes used, within a target set, to the auxiliary ESX host. This also applies to the SAN Volume Controller when **PREASSIGNED\_VOLUMES** is used as the value for the **HOST\_NAME\_MAPPING** parameter.

### Referring to target set definitions from the profile

The target set definition file must be specified in the **DEVICE\_CLASS** section of the profile.

In the following example profile, the keywords **TARGET\_SETS** and **VOLUMES\_FILES** are shown within the context of the **DEVICE\_CLASS** section:

```
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE Storwize V7000
COPYSERVICES_PRIMARY_SERVERNAME <hostname> #
TARGET_SETS          VOLUMES_FILE
VOLUMES_FILE       <name of target set definition file>
FLASHCOPY_TYPE        INCR
<<<
```

If multiple `DEVICE_CLASS` configuration sections are specified within the profile, associate each `DEVICE_CLASS` section with a unique target set definition file for best results.

## Examples of target volume files setup

Examples are shown to explain the setup of the target volumes file and the profile including the VMware datastore, virtual machine, and the storage volume layout.

### Example 1

The first example shows a setup where all three datastores are part of a single backup operation. The storage volume layout provides three target volumes for each of the source volumes. This results in a simple setup with one `DEVICE_CLASS` specified in the profile. In this `DEVICE_CLASS` the parameter, `VOLUMES_FILE`, points to the target volumes file. In the target volumes file, there are three target sets defined.

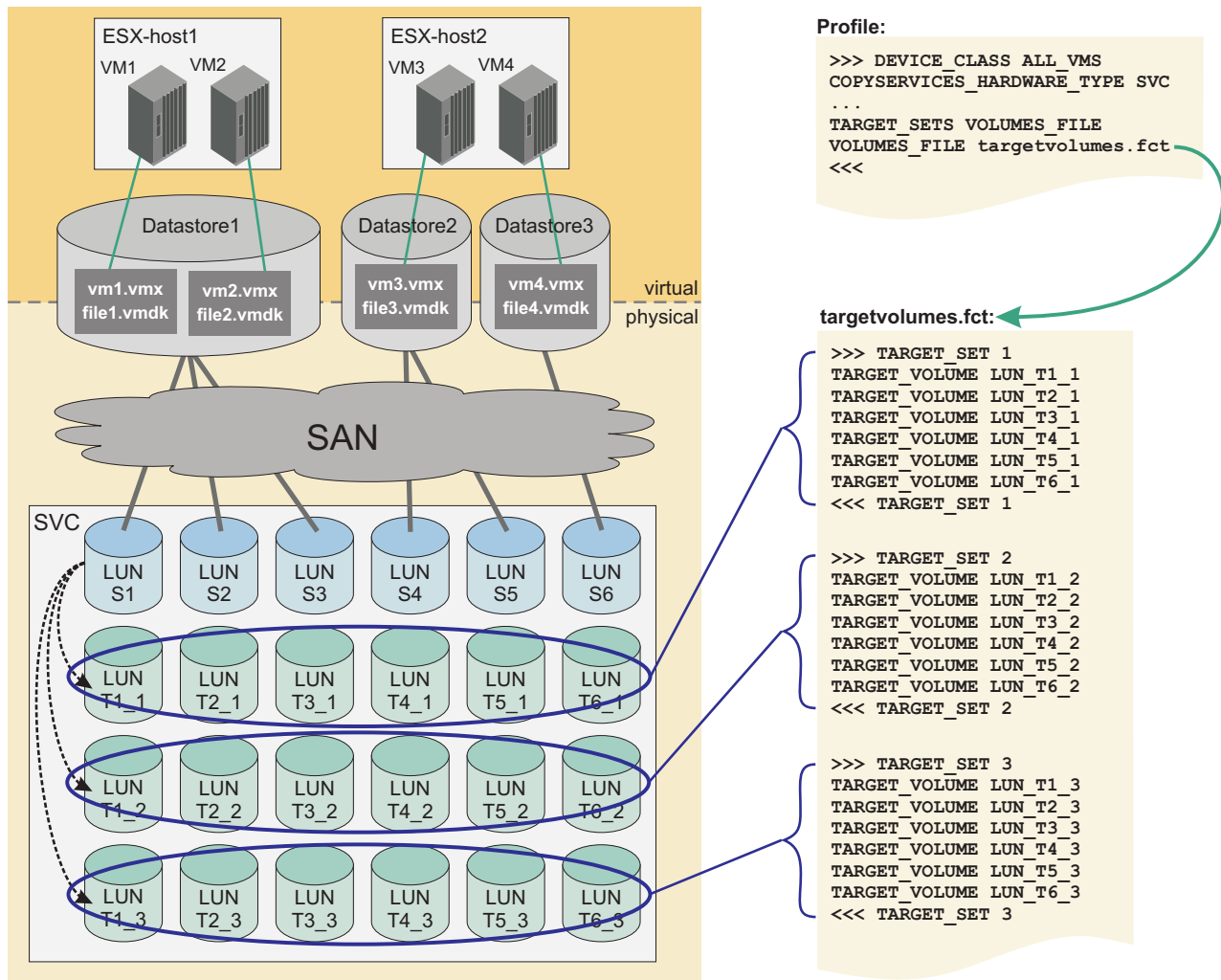


Figure 4. Tivoli Storage FlashCopy Manager for VMware target volumes files example 1

### Example 2

The second example shows a setup where the three datastores are handled in three dedicated backup operations. The storage volume layout provides three target

volumes for each of the source volumes. This results in a complex setup with three DEVICE\_CLASS parameters specified in the profile. In each of the DEVICE\_CLASS parameters, the parameter VOLUMES\_FILE points to the target volumes file. In the target volumes file, there are three target sets defined for each of the DEVICE\_CLASS parameters. Each DEVICE\_CLASS parameter represents one datastore.

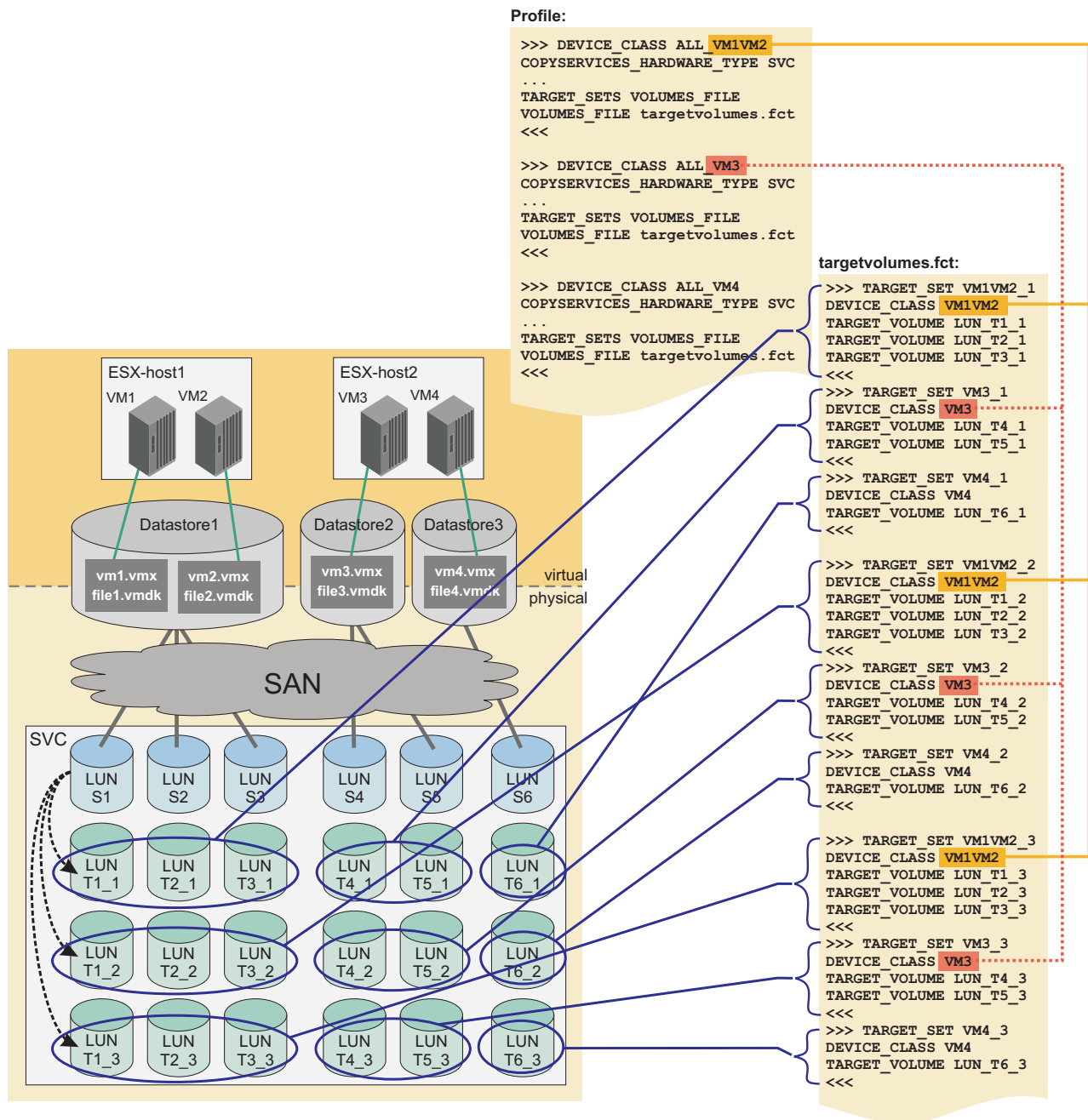


Figure 5. Tivoli Storage FlashCopy Manager for VMware target volumes files example 2

### Example 3

The third example shows a setup where two of the datastores are handled in one backup operation and the third datastore is handled in a different backup operation. Two of the datastores are located on a second storage system. The

storage volume layout provides three target volumes for each of the source volumes. This results in a complex setup with two `DEVICE_CLASS` parameters specified in the profile. Each of the `DEVICE_CLASS` parameters handles all the storage volumes on one storage system. In each of the `DEVICE_CLASS` parameters, the parameter `VOLUMES_FILE` points to a dedicated target volumes file. In the target volumes file, there are three target sets defined for each of the storage source volumes.

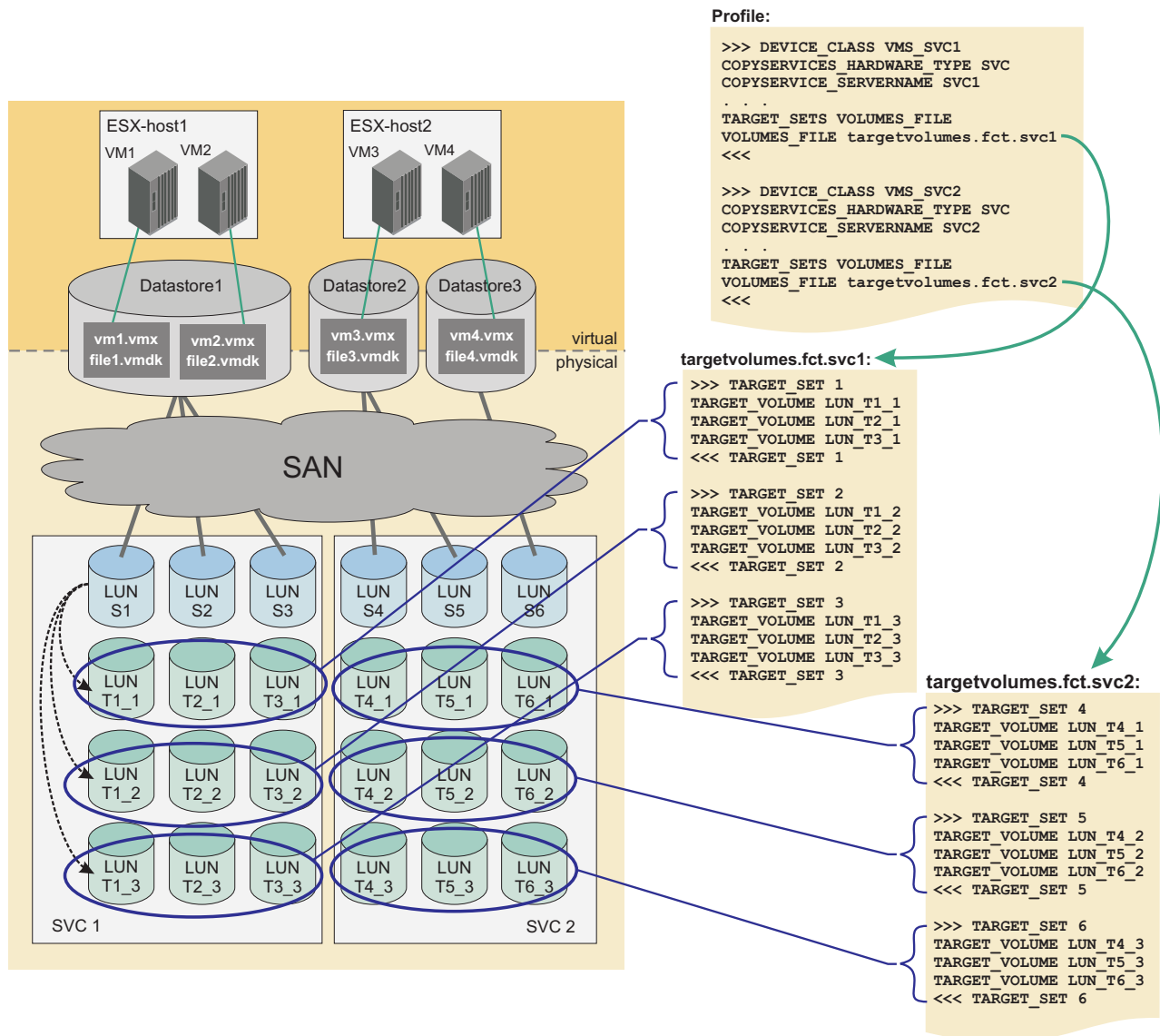


Figure 6. Tivoli Storage FlashCopy Manager for VMware target volumes files example 3

## Providing target set definitions by using the naming convention

Target set definitions can also be provided by using a naming convention on SAN Volume Controller and Storwize V7000.

Tivoli Storage FlashCopy Manager for VMware uses a naming convention, instead of a definition file, for the target set definitions on SAN Volume Controller and Storwize V7000. Tivoli Storage FlashCopy Manager for VMware determines the target volume names from the name of the target set used for the current backup and the name of the source volume. Target sets are specified directly in the DEVICE\_CLASS configuration section of the profile (TARGET\_SETS 1 2 3). The names are generated from TARGET\_SETS in a round-robin fashion, "1", "2", "3", "1", "2", and so on. When target sets are defined in the profile, the name must be unique within the entire defined device class section of the profile. For example, you cannot have the TARGET\_SETS parameter, set to t1 for more than one device class. The following example shows multiple device classes that are named in the DEVICE\_CLASS configuration section of the profile:

```
>>> Device_Class SVC_01
.
.
TARGET_SETS t1 t2
.
.
<<<
>>> Device_Class SVC_02
.
.
TARGET_SETS t3 t4
.
.
<<<
>>> Device_Class SVC_03
.
.
TARGET_SETS t5 t6
.
.
<<<
```

A TARGET\_NAMING rule is also specified that determines the name of the target volume from the name of the source. The following example of the DEVICE\_CLASS configuration section of the profile demonstrates this naming convention:

```
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE Storwize V7000
COPYSERVICES_PRIMARY_SERVERNAME <hostname> #
TARGET_SETS 1 2 3
TARGET_NAMING %SOURCE_bt%TARGETSET
FLASHCOPY_TYPE NOCOPY
<<<
```

The given TARGET\_SETS or TARGET\_NAMING definition results in the following target volume names:

```
name of source volume_bt1
name of source volume_bt2
name of source volume_bt3
```



## Examples of target naming setup

Examples are shown to explain the setup of the target naming and the profile including the VMware datastore, virtual machine, and the storage volume layout.

### Example 1

The first example shows a setup where all three datastores are part of a single backup operation. The storage volume layout provides three target volumes for each of the source volumes. This results in a simple setup with one `DEVICE_CLASS` specified in the profile. In this `DEVICE_CLASS` the parameters `TARGET_SETS` and `TARGET_NAMING` must specify a valid target naming schema:

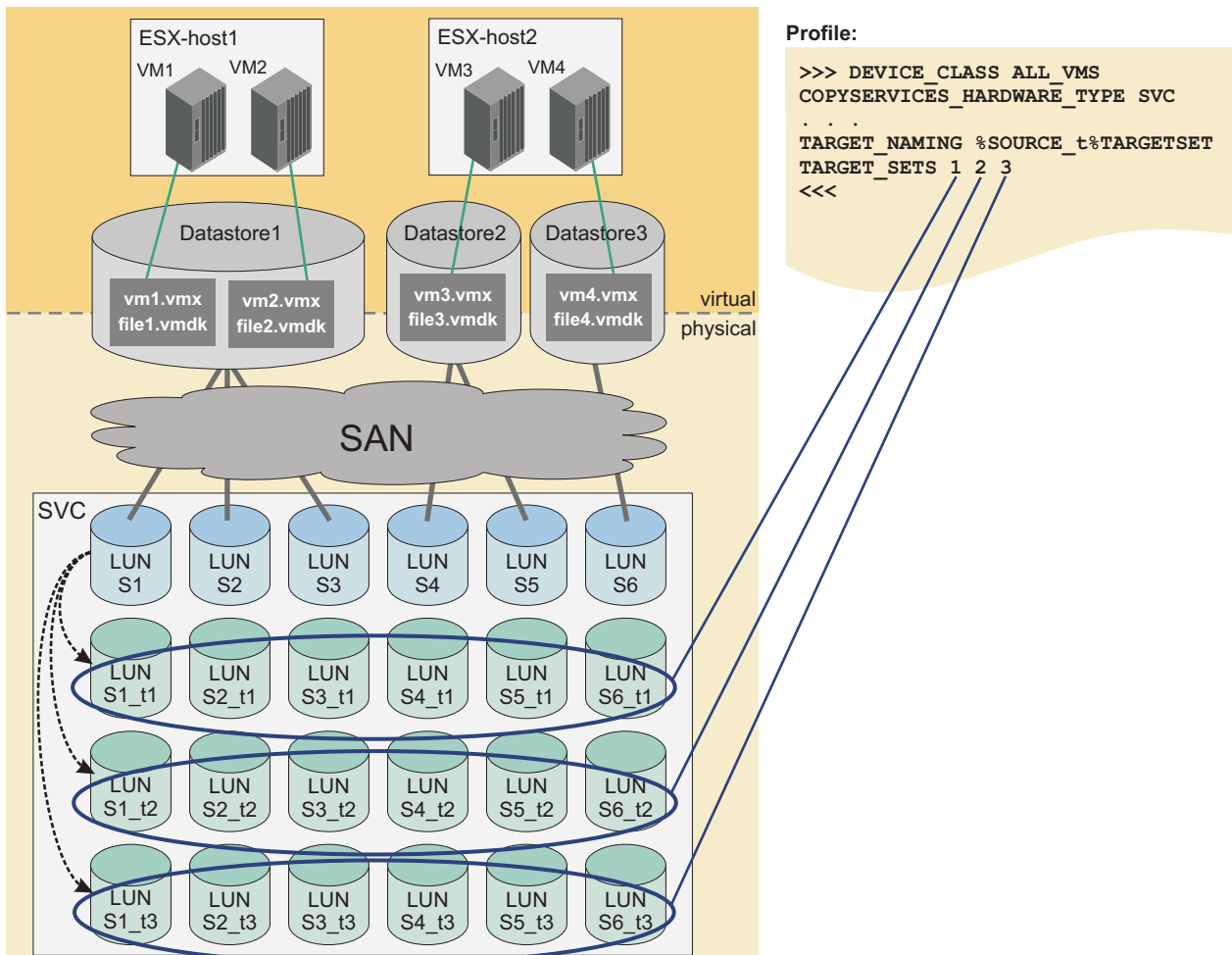


Figure 7. Tivoli Storage FlashCopy Manager for VMware target naming example 1

### Example 2

The second example shows a setup where the three datastores are handled in three dedicated backup operations. The storage volume layout provides three target volumes for each of the source volumes. This results in a complex setup with three `DEVICE_CLASS` parameters specified in the profile. In each of the `DEVICE_CLASS` parameters, the parameters `TARGET_SETS` and `TARGET_NAMING` must specify a valid target naming schema. Each `DEVICE_CLASS` parameter represents one datastore:

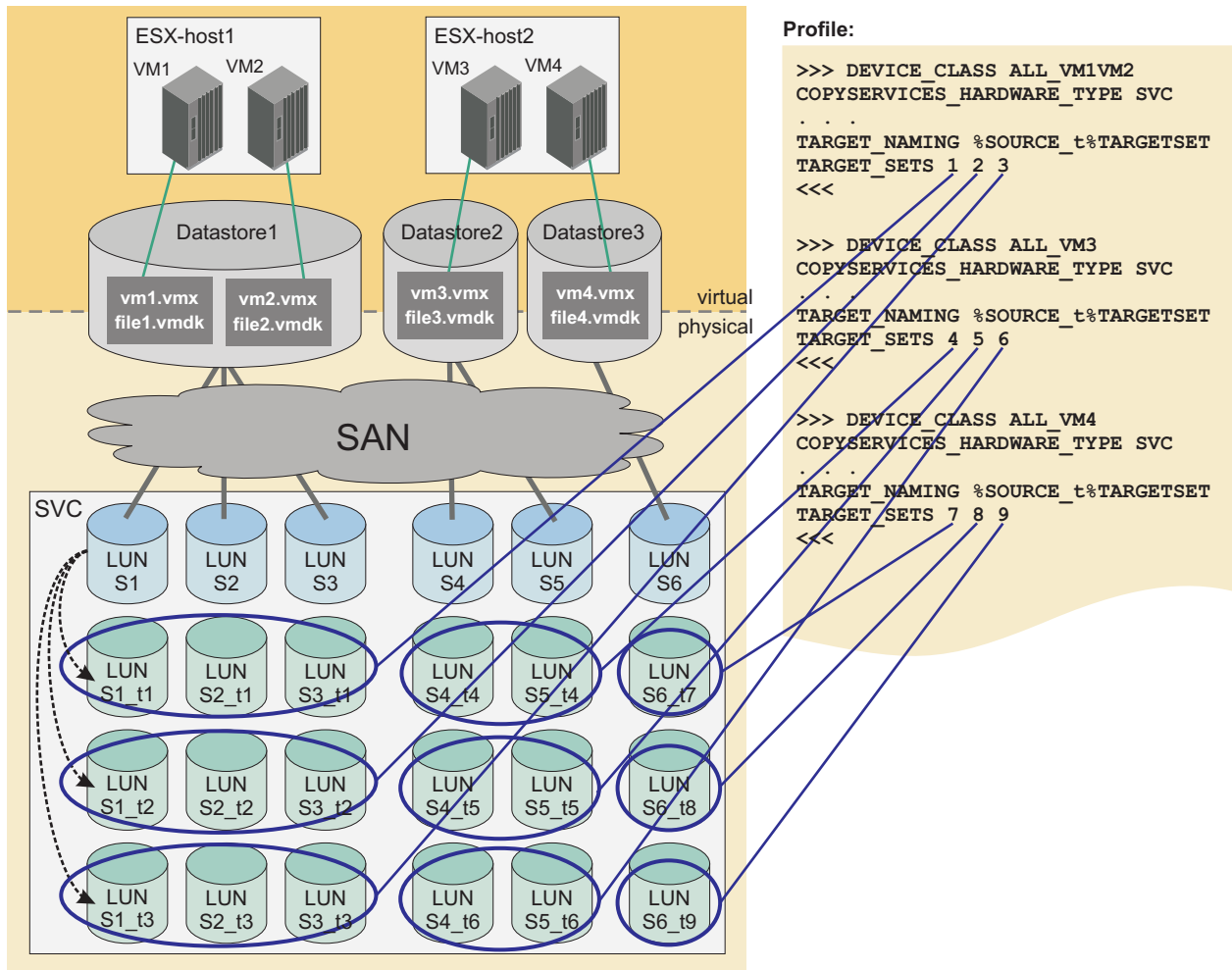


Figure 8. Tivoli Storage FlashCopy Manager for VMware target naming example 2

### Example 3

The third example shows a setup where two of the datastores are handled in one backup operation and the third datastore is handled in a different backup operation. Two of the datastores are located on a second storage system. The storage volume layout provides three target volumes for each of the source volumes. This results in a complex setup with two DEVICE\_CLASS parameters specified in the profile. Each of the DEVICE\_CLASS parameters handles all the storage volumes on one storage system. In each of the DEVICE\_CLASS parameters, the parameters TARGET\_SETS and TARGET\_NAMING must specify a valid target naming schema.

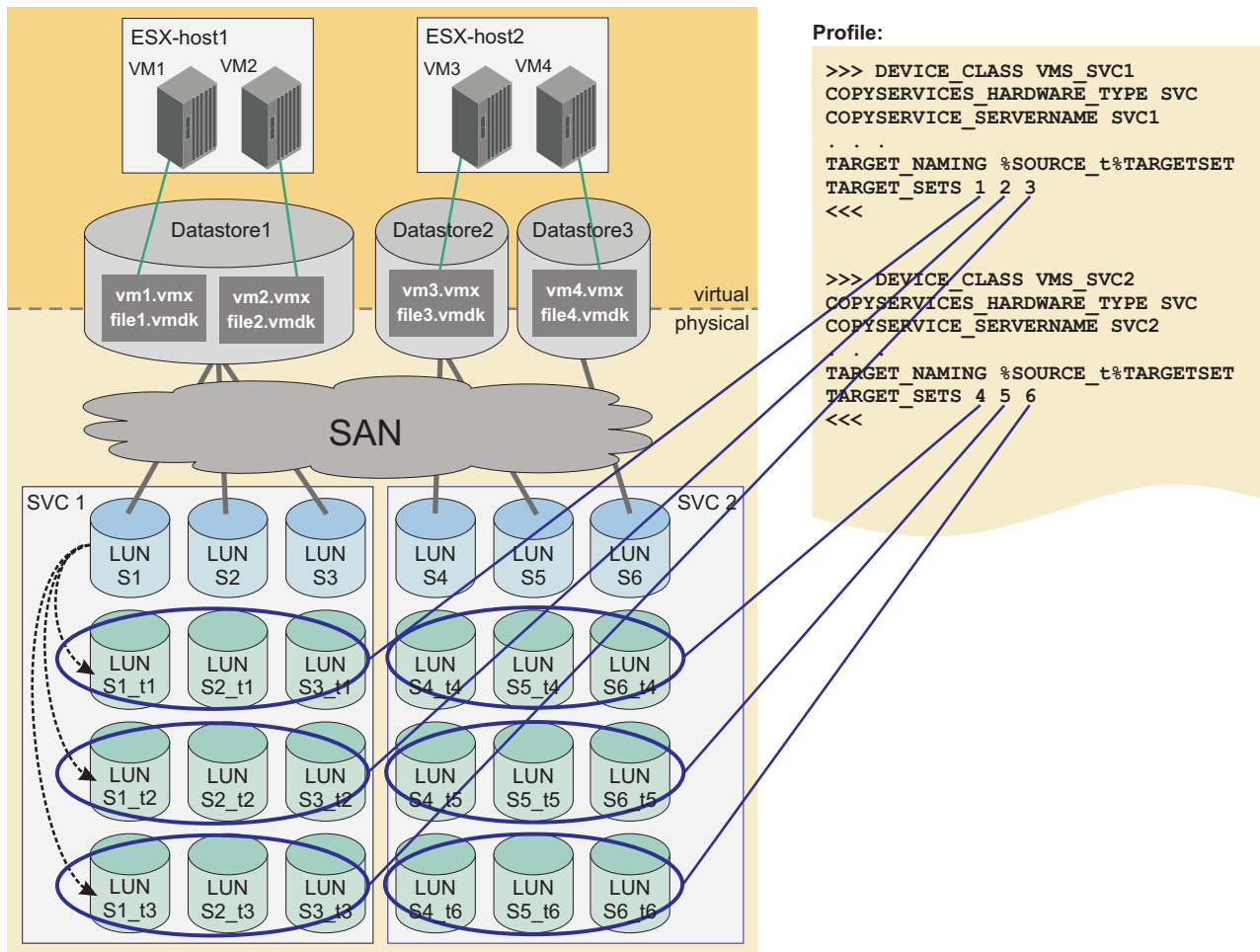


Figure 9. Tivoli Storage FlashCopy Manager for VMware target naming example 3

## Configuring Tivoli Storage FlashCopy Manager for VMware

To configure Tivoli Storage FlashCopy Manager for VMware, you must start the setup script, `setup.sh`. This script configures the profile (GLOBAL, ACSD, VMWARE, VMCLI, DEVICE\_CLASS sections). In addition, the script creates and edits the password file, and starts the daemons (`acsd`, `acsgen -D`, `acsgen -D -M`, and `fccli -D`).

### About this task

After you complete an installation or upgrade, you must run the setup script, `setup.sh`, to set up Tivoli Storage FlashCopy Manager for VMware for use with your environment. You are required to set up your environment after the initial installation or upgrade of the product. The script is in `/opt/tivoli/tsm/tdpvmware/fcm` directory.

The setup script uses this command syntax: `setup.sh [-a action] [-advanced]`

Where `-a` indicates the action. One of the following actions can be specified: `install_agents`, `start`, `stop`, or `uninstall_agents`.

You can use the setup script for initial configuration or to reconfigure Tivoli Storage FlashCopy Manager for VMware.

## Procedure

To run the setup script, `setup.sh`, complete the following steps:

1. Log in by using the user name that was created during the installation. The default user name is `tdpvmware`.
2. To run the setup script, use one of the following methods:
  - a. From a command prompt window, enter this command: `./setup.sh`.
  - b. From a command prompt window, enter this command: `./setup.sh -advanced`. In advanced mode, you can specify additional parameters.

## Results

During initial setup, Tivoli Storage FlashCopy Manager for VMware creates the following files and directories.

- `ACS_DIR`, the configuration directory as specified in the profile.
- A profile within the `$HOME/tdpvmware/config` configuration directory.
- A link from the Tivoli Storage FlashCopy Manager for VMware installation directory, `/opt/tivoli/tsm/tdpvmware/fcm`, to the profile in the `ACS_DIR` configuration directory, `/home/username/tdpvmware/config`.
- A password file in the `ACS_DIR/shared` directory.
- Entries in the `/etc/inittab` file for the daemon processes. For Red Hat Enterprise Linux 6, the daemon processes are started automatically with Upstart.

### Related reference:

Chapter 8, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 81

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## Selecting the FLASHCOPY\_TYPE

SAN Volume Controller, DS8000, and Storwize V7000 support various FlashCopy<sup>®</sup> types. These types provide different capabilities for your backup strategy.

Using different FlashCopy types for different backup generations is a valid strategy for Tivoli Storage FlashCopy Manager for VMware. To implement such a backup strategy, you can define multiple `DEVICE_CLASS` sections in the profile, where each section specifies the same storage device. The only difference is that each section specifies a different FlashCopy type. You can select the appropriate `DEVICE_CLASS` section for the next backup in the Tivoli Storage FlashCopy Manager for VMware GUI. You can use different backup tasks for different `DEVICE_CLASS` definitions.

If the `FLASHCOPY_TYPE` parameter is changed for one `DEVICE_CLASS`, complete the following steps:

1. Detach the backup if it is attached.
2. Delete the backup with the `delete force` option, using the Data Protection for VMware command-line interface command `vmcli -f delete`.
3. Change the `FLASHCOPY_TYPE` in the `DEVICE_CLASS` and run a new backup with the new `FLASHCOPY_TYPE`.

The `FLASHCOPY_TYPE` parameter values are explained in the following table.

Table 5. Selecting the FLASHCOPY\_TYPE for SAN Volume Controller, DS8000, and Storwize V7000

FLASHCOPY_TYPE	DS8000	SAN Volume Controller and Storwize V7000
COPY	Protects from physical failures of the source volumes when the background copy is completed.	Protects from physical failures of the source volumes when the background copy is completed. Avoid creating a COPY FlashCopy to a space-efficient target because the target eventually becomes fully allocated due to background copying of data.
INCR	An option for DS8000. Same characteristics as COPY FLASHCOPY_TYPE but with less data being copied in the background. DS8000 allows at most one incremental FlashCopy® per source volume. For DS8000, there must be only one target set specified in the target volumes file .fct for incremental snapshots. CIM errors might occur when more than one target set is specified.	Same characteristics as COPY FlashCopy® but with less data being copied in the background. Avoid creating an incremental FlashCopy to a space-efficient target. The target eventually becomes fully allocated because the data is copied in the background.
NOCOPY		Can be used to create a FlashCopy to a space-efficient target, but does not offer protection from physical failures to the source volume. <b>Note:</b> Space-efficient target volumes can reach capacity limits in which case they go offline. When this situation occurs, you lose the current backup and all older backups that are not FULL_COPY. You can choose to create space-efficient targets with the AUTOEXPAND option. In this case, the target is allocated more physical storage to prevent going offline.
<b>Note:</b> See “SAN Volume Controller and Storwize V7000 features” on page 17 for planning and configuration details when using SAN Volume Controller 5.1, or later.		

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## Attaching a backup of an NFS datastore on IBM System Storage N series and NetApp storage systems

Profile parameters are needed to run the IBM Tivoli Storage FlashCopy Manager for VMware. You must add the parameter **HOST\_NAME\_MAPPING** in the profile configuration file to specify the mapping for IBM System Storage N series and NetApp storage systems.

The following example shows you how to add the parameter **HOST\_NAME\_MAPPING** in the VMWARE section to specify the mapping for IBM System Storage N series and NetApp storage systems. To attach a backup of an NFS datastore to a different ESX host, the IP address of the VMkernel interface of this host must be known to Tivoli Storage FlashCopy Manager for VMware. The following example shows you how to use the parameter **HOST\_NAME\_MAPPING** in the VMWARE section to specify the relationship:

```
AUXILIARY_ESX_HOST esx01.domain.com
HOST_NAME_MAPPING esx01.domain.com:192.168.1.1
```

In this example, the backup is attached to the ESX host `esx01.domain.com`. The host name specifies the management interface of this ESX host but the NFS traffic is transferred over a different interface (VMkernel interface). In this example, the IP address of this VMkernel interface is `192.168.1.1`. Therefore, Tivoli Storage FlashCopy Manager for VMware uses the exports settings for this volume on the storage system so that the IP address `192.168.1.1` is allowed to access the attached volumes.

---

## Starting and stopping services for Tivoli Storage FlashCopy Manager for VMware

You can start, stop, restart, and verify the status of the services that are started after the installation of Tivoli Storage FlashCopy Manager for VMware completes.

### Procedure

1. To add, start, and stop services, complete the following steps:
  - To add entries for the Tivoli Storage FlashCopy Manager for VMware daemons into `/etc/inittab`, enter the following command:  

```
./setup.sh -a install_agents
```
  - To start the entries for the Tivoli Storage FlashCopy Manager for VMware daemons in `/etc/inittab`, enter the following command:  

```
./setup.sh -a start
```
  - To stop the entries for the Tivoli Storage FlashCopy Manager for VMware daemons in `/etc/inittab`, enter the following command:  

```
./setup.sh -a stop
```
  - To remove the entries from `/etc/inittab`, enter the following command:  

```
./setup.sh -a uninstall_agents
```

The script stops the daemons and then removes the entries from the `inittab` file.

2. To verify that the VMCLI daemon and WebSphere Application Server service is running, complete the following steps:
  - To verify that the VMCLI daemon is running, enter the following command:  

```
/etc/init.d/vmcli status
```

- To verify that the WebSphere Application Server service is running, enter the following command:  
`/etc/init.d/websvr status`
3. To start, stop, and restart the VMCLI daemon complete the following steps:
    - To start the VMCLI daemon, enter the following command:  
`/etc/init.d/vmcli start`
    - To stop the VMCLI daemon, enter the following command:  
`/etc/init.d/vmcli stop`
    - To restart the VMCLI daemon, enter the following command:  
`/etc/init.d/vmcli restart`
  4. To start, stop, and restart the WebSphere Application Server service complete the following steps:
    - To start the WebSphere Application Server service, enter the following command:  
`/etc/init.d/websvr start`
    - To stop the WebSphere Application Server service, enter the following command:  
`/etc/init.d/websvr stop`
    - To restart the WebSphere Application Server service, enter the following command:  
`/etc/init.d/websvr restart`

---

## Password administration

You can use the `setup.sh` script or the `fccli -f password` command to change Tivoli Storage FlashCopy Manager for VMware passwords.

The `fccli -f password` command supports an interactive and a non-interactive mode. If no passwords are provided as arguments on the command-line interface, the interactive mode is entered automatically. When working in the interactive mode, the following information is requested:

- The master password, which is the password of the Management Agent, `acsd`.
- The VMware vCenter password for the user that is specified by the profile parameter **VCENTER\_SERVER\_USER**.
- The passwords for the disk storage subsystems that are referenced by the `DEVICE_CLASS` sections in the specified profile file.

If the specified profile contains multiple `DEVICE_CLASS` sections that reference the same physical disk storage subsystem, the password is queried one time by combining these `DEVICE_CLASS` sections.

The interactive mode is the preferred method for setting passwords. The interactive method also has the advantage of verifying passwords by doing test connections to the corresponding storage devices, Management Agent, or VMware vCenter. The non-interactive mode performs basic syntax checks but does not verify the passwords by itself.

**Note:** The minimum length of the master password is eight characters. The password must contain at least one number and one letter. The use of special symbols increases the strength of the password.

Use the following syntax to change the passwords for intercommunication between IBM Tivoli Storage FlashCopy Manager components and storage devices.

## fccli command: -f password

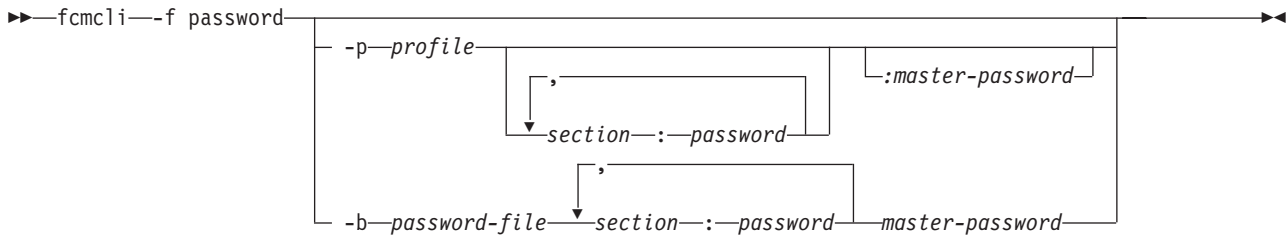


Table 6. *fccli* command options for changing passwords

Option	Description	Default	Overrides profile parameter
-f password	Set or change passwords. <b>Note:</b> If you want to ensure that the backup servers are updated as well (if OpenSSH is used), do not call <b>fccli -f password</b> directly. Instead, set or change passwords by using the setup scripts.		
-p profile	Full path and name of the profile that is used.  In interactive mode, the command searches the profile for the VMWARE and DEVICE_CLASS sections, and then queries for the respective passwords.  When the password file name is not specified, the command reads the respective file name from the GLOBAL section of the profile.	The profile in the current working path is used.	
-b password-file	The password file to be created or updated.	The shared/acsd.pwd file is in the directory that is specified by the <b>ACS_DIR</b> parameter. This parameter is included in the GLOBAL section. This information is read from one of the following profiles: <ul style="list-style-type: none"> <li>• When -p is not specified, profile is used.</li> <li>• When -p is specified, the profile that is specified is used.</li> </ul>	(No corresponding profile parameter.)



Table 6. *fccli* command options for changing passwords (continued)

Option	Description	Default	Overrides profile parameter
<code>&lt;sectionname&gt;:&lt;password&gt;</code>	Sets password for the user account referenced by the VMWARE and DEVICE_CLASS sections. For DEVICE_CLASS sections, the <code>&lt;sectionname&gt;</code> follows the syntax <code>DEVICE_CLASS:&lt;instance name&gt;</code> , for example <code>DEVICE_CLASS:STANDARD</code> . The syntax of the complete option in this case is <code>DEVICE_CLASS:&lt;device class name&gt;:&lt;password&gt;</code> .  No spaces are allowed between <code>&lt;sectionname&gt;:&lt;password&gt;</code> .		
<code>:&lt;masterpassword&gt;</code>	Master password that is used to authenticate a library or agent to the Management Agent, <code>acsd</code> .		

## GSKit configuration

IBM Global Security Kit (GSKit) supports Federal Information Processing Standards (FIPS140-2) and is also certified to provide SP800-131 compliant encryption. GKit is automatically installed by Tivoli Storage FlashCopy Manager for VMware.

Tivoli Storage FlashCopy Manager for VMware uses the security suite IBM Global Security Kit (GSKit), for Secure Socket Layer (SSL) and Transport Layer Security (TLS) TCP/IP connections. GSKit is certified to provide SP800-131 compliant encryption and uses the SSL protocol TLS V1.2. To enforce SP800-131 encryption during the configuration of Tivoli Storage FlashCopy Manager for VMware, the **ENFORCE\_TLS12** parameter must be set to YES, otherwise the SSL protocol TLS version 1.0 and 1.1 is enabled.

The following files are essential for the correct operation of IBM GSKit:

- A key database file, `fcmcert.kdb`, is in the installation directory.

The KDB file contains a new key pair and a self-signed certificate.

The root certificates for a number of trusted root certificates are stored in this database. You can import a certificate authority (CA) signed certificate and this certificate replaces the self-signed certificate in the database. This signed certificate must comply with the standard as defined by the National Institute of Standards and Technology (NIST) SP800-131 standard encryption. This standard requires longer key lengths and stronger cryptographic algorithms. This standard requires a minimum key size = 2048 and a bits signature algorithm = RSA with SHA224 or higher. Import the CA signed certificate to the key database on the production server.

**Note:** This requirement applies only when during the installation of Tivoli Storage FlashCopy Manager for VMware the **ENFORCE\_TLS12** parameter is set to YES.

- A request database file, `fcmcert.rdb`, in the installation directory.

The request database file is used to store certificate requests that are associated with the key database and is automatically created when Tivoli Storage FlashCopy Manager for VMware creates a key database file. This file is created with the same name as the key database file, but with a `.rdb` extension.

- An encrypted stash file, `fcncert.sth`.

The password that is protecting the key database file is generated automatically and is stored in the encrypted stash file.

- An ASCII encoded binary file, `fcncselfcert.arm`.

The file is used to export the public part of the self-signed certificate and import it to the backup and cloning servers. You must not delete this file unless you import a CA signed certificate to the key database `fcncert.kdb` replacing the self-signed one.

- A certificate revocation list file, `fcncert.crl`.

The file contains a list of revoked certificates.

The `.kdb`, `.rdb`, `.crl` and the `.sth` files contain critical security parameters (CSP) and these parameters must be protected against unauthorized access by mechanisms that are provided by the operating system. The files are generated by the setup script. It is advisable to back up the key database files regularly, especially if you are using a CA signed certificate.

If you are using a CA signed certificate, you must use the GSKit command-line utilities to import the certificate to the server.

**Related reference:**

“GSKit Commands”

---

## GSKit Commands

If you use a CA signed certificate, you must use GSKit commands to complete the manual setup.

### CA Certificate

You can use a CA signed certificate for Tivoli Storage FlashCopy Manager for VMware.

If you are using an untrusted CA signed certificate, you must import the CA root certificate into the key database file, `fcncert.kdb`, by using GSKit command-line utilities. The root certificate of a trusted CA certificate is in the key database. GSKit has the following trusted root certificates by default:

- Entrust.net Global Secure Server Certification Authority
- Entrust.net Global Client Certification Authority
- Entrust.net Client Certification Authority
- Entrust.net Certification Authority (2048)
- Entrust.net Secure Server Certification Authority
- VeriSign Class 3 Public Primary Certification Authority
- VeriSign Class 2 Public Primary Certification Authority
- VeriSign Class 1 Public Primary Certification Authority
- VeriSign Class 4 Public Primary Certification Authority - G2
- VeriSign Class 3 Public Primary Certification Authority - G2
- VeriSign Class 2 Public Primary Certification Authority - G2
- VeriSign Class 1 Public Primary Certification Authority - G2

- VeriSign Class 4 Public Primary Certification Authority - G3
- VeriSign Class 3 Public Primary Certification Authority - G3
- VeriSign Class 2 Public Primary Certification Authority - G3
- VeriSign Class 1 Public Primary Certification Authority - G3
- Thawte Personal Premium CA
- Thawte Personal Freemail CA
- Thawte Personal Basic CA
- Thawte Premium Server CA
- Thawte Server CA
- RSA Secure Server Certification Authority
- Secure Server Certification Authority

The following example shows the command to request a CA signed certificate:

```
gsk8capicmd_64 -certreq -create -db fmcert.kdb -stashed -label "FCM server certificate request"
-dn dist_name -target fcmservercertreq.arm
```

For SP800-131 compliance, when the **ENFORCE\_TLS12** parameter is set to YES in the Tivoli Storage FlashCopy Manager for VMware profile, ensure that the certificate meets the minimum requirement by adding the following two options:

- -size 2048 (or higher)
- -sigalg sha224 (or higher)

**Note:** Tivoli Storage FlashCopy Manager for VMware creates a self-signed certificate that is signed with SHA512, and the size is 4086 bits.

The **label** parameter can have any value except FCM server certificate. This value is already used by the self-signed certificate in the key database.

If you are using a CA signed certificate that is signed by an untrusted CA, import the CA root certificate into the key database (KDB) files. This task must be completed before the certificate is received or imported. The following example shows the command to import the root certificate:

```
gsk8capicmd_64 -cert -add -db fmcert.kdb -stashed -label "CA root certificate name"
-file path to CARootCertificate.arm
```

The following example shows the command to import a signed certificate when it is received from a CA:

```
gsk8capicmd_64 -cert -receive -file fcmservercertsigned.arm -db fmcert.kdb -stashed
```

The CA signed certificate is now ready for use but its label must be renamed to FCM server certificate so that Tivoli Storage FlashCopy Manager for VMware can use it. Usually, the key database still contains the self-signed certificate, it must be deleted and the CA signed certificate can be renamed. To remove the self-signed certificate, from the key database use the following command:

```
gsk8capicmd_64 -cert -delete -db fmcert.kdb -stashed -label "FCM server certificate"
```

To rename the CA signed certificate use the following command:

```
gsk8capicmd_64 -cert -rename -db fmcert.kdb -stashed -label
"FCM server certificate request" -new_label "FCM server certificate"
```

## Monitoring the expiry date of certificates

When a self-signed certificate is created, an expiry date can be specified. The expiration time of the certificate is specified in days. The default is 365 days. The duration is 1-7300 days (20 years). The Tivoli Storage FlashCopy Manager for VMware setup script creates the self-signed certificate. The expiration time of all self-signed certificates that is generated by the setup script is 20 years. If you are using CA signed certificates, the expiration date is set by the certificate authority. You must monitor certificates for expiry and remove any expired certificates. If the key database does not contain a valid certificate with the label FCM server certificate and the setup script is rerun, a new self-signed certificate is generated and the .kdb, .rdb, .arm and .sth files are rewritten.

### Related information:



[ftp://ftp.software.ibm.com/software/webserver/appserv/library/v80/GSK\\_CapiCmd\\_UserGuide.pdf](ftp://ftp.software.ibm.com/software/webserver/appserv/library/v80/GSK_CapiCmd_UserGuide.pdf)

---

## Chapter 5. Integrating with VMware vCenter Site Recovery Manager

IBM Tivoli Storage FlashCopy Manager for VMware can restore a virtual machine to its original location at a VMware vCenter Site Recovery Manager (SRM) protected site. After a VMware vCenter Site Recovery Manager (SRM) failover or a migration to protect your environment at the recovered site, you must reconfigure Tivoli Storage FlashCopy Manager for VMware.

---

### Restoring a virtual machine protected with VMware vCenter Site Recovery Manager

To restore a VM at a VMware vCenter Site Recovery Manager (SRM) protected site, you must first remove the protection for the VM at the protected site. Then, restore the VM and reapply the protection.

#### Procedure

To restore a virtual machine that is protected with SRM, complete the following steps:

1. Open a vSphere Client and connect to the vCenter server at the protected site.
  - a. On the vSphere Client home page, click **Site Recovery**.
  - b. In the Site Recovery tree view, go to the protection group that lists the virtual machine that you want to restore.
  - c. Click the **Virtual Machines** tab.
  - d. Right-click the VM that you want to restore, and then click **Remove Protection**.
  - e. A confirmation message is displayed, click **OK**.
2. To restore the VM, start the Tivoli Storage FlashCopy Manager for VMware GUI.
  - a. Click the **Restore** tab to open the Restore pane.
  - b. Expand **data center > esx host > virtual machine** to view available backups.
  - c. Right-click the backup version that you want to restore, and then click **Restore** to open the Restore Virtual Machine wizard.
  - d. Click **Next**. Follow the instructions on each page of the wizard to select the type of restore to perform and to specify the location for the restore.
  - e. On the Summary page, review your restore settings and click **Finish**.
3. To reconfigure SRM protection, in the Site Recovery tree view, go to the protection group that lists the VM that was restored. The protection status is displayed as not configured.
  - a. Right-click the virtual machine that you want to configure, and then click **Configure Protection**.
  - b. A confirmation message is displayed, click **OK**.

---

## Reconfiguring Tivoli Storage FlashCopy Manager for VMware after a failover or migration

You must reconfigure Tivoli Storage FlashCopy Manager for VMware after a VMware vCenter Site Recovery Manager (SRM) failover or a migration to protect your environment at the recovered site.

### Procedure

To reconfigure Tivoli Storage FlashCopy Manager for VMware after a failover or migration, complete the following steps:

**Tip:** Alternatively, you can uninstall Tivoli Storage FlashCopy Manager for VMware at the original site and reinstall at the recovered site.

1. Log in to the vStorage backup server or virtual machine where Tivoli Storage FlashCopy Manager for VMware is installed by using the `tdpvmware` user ID.
2. To run the setup script, enter the following command from the `/opt/tivoli/tsm/tdpvmware/fcm` directory:  

```
./setup.sh
```

  - a. Change the following parameters in the Tivoli Storage FlashCopy Manager for VMware profile file:
    - Change the vCenter Server IP address or host name to the vCenter Server IP address or host name of the recovery site.
    - Change the vCenter user name to the vCenter user name of the recovery site.
    - Change the auxiliary ESX host name or IP address to the auxiliary ESX host name or IP address of the recovery site.
  - b. Create a device class for the storage device at the recovery site.
  - c. Enter the password for the acsd management agent. This password is used by device and application agents to authenticate to the management agent.
  - d. Enter the password for the storage device at the recovery site.
3. To stop the WebSphere Application Server, enter the following command:  

```
/etc/init.d/webserver stop
```
4. Update the WebSphere Application Server properties, go to the `/opt/tivoli/tsm/tdpvmware/common/webserver/usr/servers/vProfile/tsmVmGUI` directory. Open the `vmcliConfiguration.xml` file with an editor and replace the vCenter Server URL with the URL for the recovery site.

The following example shows `https://gollum/sdk` as the URL for the vCenter Server:

```
<vmcliAdaptor>
  <VMCLISimulator>off</VMCLISimulator>
  <VMCLISimulatorPath>C:/simulation/</VMCLISimulatorPath>
  <VMCLIPath>/opt/tivoli/tsm/tdpvmware/common/scripts</VMCLIPath>
  <interruptDelay>120000</interruptDelay>
  <vcenter_url>https://gollum/sdk</vcenter_url>
</vmcliAdaptor>
```

5. Register the Tivoli Storage FlashCopy Manager for VMware GUI. Go to the `/opt/tivoli/tsm/tdpvmware/common/scripts/` directory and enter the following command on one line:

```
../jre/jre/bin/java -jar reg.jar vCenterServer vCenterUser_ID
vCenter_Password GUI_Web_Server_Hostname
GUI_Web_Server_address GUI_Web_Server_Port_number
```

Where:

**vCenterServer**

Specifies the name of the vCenter Server.

**vCenterUser\_ID**

Specifies the user name to log in to the vCenter Server.

**vCenter\_Password**

Specifies the password.

**GUI\_Web\_Server\_Hostname**

Specifies the host name for the GUI web server.

**GUI\_Web\_Server address**

Specifies the address of the GUI web server.

**GUI\_Web\_Server\_Port\_number**

Specifies the port number of the GUI web server.

The following example registers the vCenter Server, GUI web server and defines the port number at the recovery site:

```
java -jar reg.jar gollum.boeblingen.de.ibm.com root mySecurePassword  
fcmcli2.boeblingen.de.ibm.com fcmcli2.boeblingen.de.ibm.com 9080
```

The command must be entered on one line.

6. Enter the following command to start the WebSphere Application Server:  
`/etc/init.d/webserver start`
7. Create a Tivoli Storage FlashCopy Manager backup schedule for the recovery site.

## What to do next

You can now back up datastores at this site. Before you restore a backup, that was created at the original protected site, you must complete the following actions:

1. Attach the storage device that was used at the protected site to an ESX host at the recovery site.
2. Specify a new location for the restore operation as the original location is no longer available.

**Related tasks:**

“Backing up virtual machines” on page 63

“Creating a backup” on page 66

“Attaching and detaching the virtual disks of a backup to a target virtual machine” on page 71

“Restoring a backup” on page 73





---

## Chapter 6. Backing up and restoring virtual machines from Tivoli Storage FlashCopy Manager for VMware GUI

The Tivoli Storage FlashCopy Manager for VMware GUI accesses VM data on the vCenter Server. You can use this GUI to back up and restore VMware virtual machines with IBM Tivoli Storage FlashCopy Manager for VMware. The Tivoli Storage FlashCopy Manager for VMware GUI is an extension of the VMware vSphere Client.

### About this task

There are two methods to access this GUI:

- A plug-in that integrates with the VMware vSphere Client. This plug-in is accessed as a vCenter Client extension in the **Solutions and Applications** panel of the vSphere windows client or the **Classic Solutions** panel in the vSphere Web Client.
- A stand-alone web browser GUI. This GUI is accessed through a URL bookmark to the GUI web server. For example:

`https://guihost.mycompany.com:9081/TsmVMwareUI/`

**Note:** The port number to access the GUI web server is specified during the installation.

The language that is displayed is dependent on the preferred language that is set for your browser.

To back up virtual machines, you can use the GUI with Tivoli Storage FlashCopy Manager for VMware to create storage hardware snapshots of virtual machines. In addition, it can work with IBM Tivoli Storage Manager for Virtual Environments to send the snapshots to the Tivoli Storage Manager server. You can also restore virtual machines or datastores by using the Tivoli Storage FlashCopy Manager for VMware GUI.

---

## Starting Tivoli Storage FlashCopy Manager for VMware GUI

Follow these instructions to start Tivoli Storage FlashCopy Manager for VMware GUI from a plug-in that integrates with the VMware vSphere Client.

### Before you begin

Tivoli Storage FlashCopy Manager for VMware GUI is installed on the vStorage Backup Server where either IBM Tivoli Storage FlashCopy Manager for VMware, IBM Tivoli Storage Manager for Virtual Environments, or both are installed. Each Tivoli Storage FlashCopy Manager for VMware GUI manages a backup domain that consists of a single vCenter that contains one or more VMware datacenters. By default, a domain contains all datacenters that are associated with a vCenter. You can use the Tivoli Storage FlashCopy Manager for VMware GUI to limit a domain to one or more VMware datacenters. Alternatively, you can use a stand-alone web browser GUI to access the Tivoli Storage FlashCopy Manager for VMware GUI.

## About this task

**Tip:** This procedure provides an overview of how to start the Tivoli Storage FlashCopy Manager for VMware GUI, complete product information is provided in the online help shipped with the Tivoli Storage FlashCopy Manager for VMware GUI.

Follow the instructions to start the Tivoli Storage FlashCopy Manager for VMware GUI:

### Procedure

1. Start the vSphere Client and log on to the vCenter. If the vSphere Client was already running before the completion of the Tivoli Storage FlashCopy Manager for VMware GUI installation, you must close and restart it.
2. Start the Tivoli Storage FlashCopy Manager for VMware GUI by clicking the icon in the Solutions and Applications window of the vSphere Client. For more information, see Figure 10 on page 61.

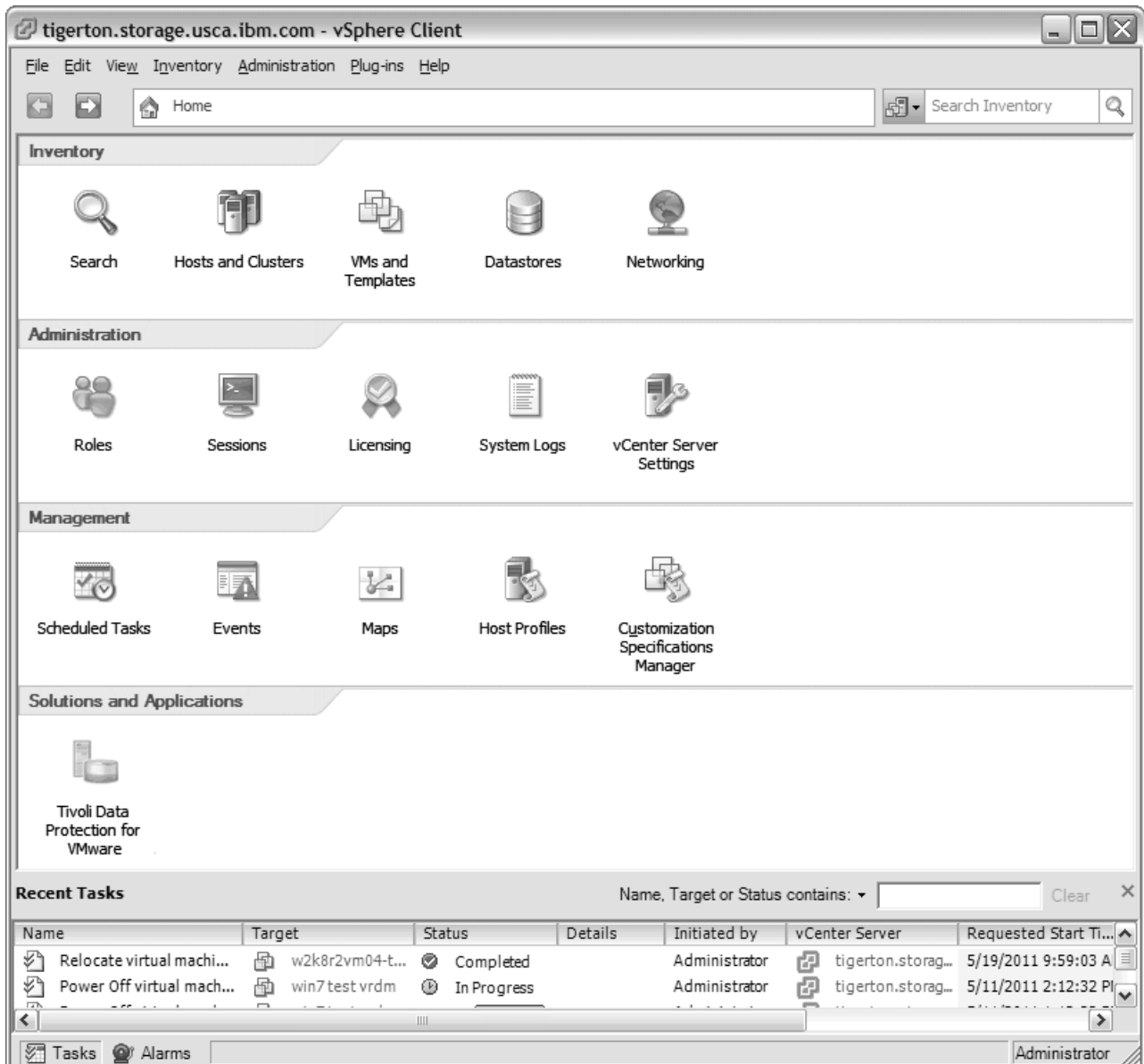


Figure 10. Tivoli Storage FlashCopy Manager for VMware GUI icon shown in the Solutions and Applications of the vSphere Client

**Tip:** If the icon is not shown, then the Tivoli Storage FlashCopy Manager for VMware GUI was not registered or a connection error occurred. To resolve this issue, complete the following steps:

- a. In the vSphere **Client** menu, go to **Plug-ins > Manage Plug-ins** to start the plug-in Manager.
- b. If you find the Tivoli Storage FlashCopy Manager for VMware GUI, check the error column for possible problems. If a connection error occurred, complete these tasks:
  - 1) Verify connectivity to the server where the Tivoli Storage FlashCopy Manager for VMware GUI is installed by issuing the ping command.
  - 2) Verify that the Tivoli Storage FlashCopy Manager for VMware GUI, IBM WebSphere Application Server is running.
  - 3) You must re-register Tivoli Storage FlashCopy Manager for VMware GUI when the following events occur:

- The IP address changes on the system where the Tivoli Storage FlashCopy Manager for VMware GUI is installed.
- The GUI is not present in the plug-in Manager.

To re-register the GUI, complete the following steps:

- a) Log in to the vStorage Backup Server as root user ID. The vStorage Backup Server is where Tivoli Storage FlashCopy Manager for VMware is installed.
  - b) Go to the `cd /opt/tivoli/tsm/tdpvmware/common/scripts/` directory.
  - c) To register the plug-in enter the command: `../jre/jre/bin/java -jar reg.jar vCenterServer vCenterUser vCenterPassword new guiHostnameShort new guiHostnameFull 9080`. A `config.xml` file is created.
  - d) Copy the `config.xml` file to `/opt/tivoli/tsm/tdpvmware/common/webserver/usr/servers/veProfile/apps/tsmVmGUI.war/plugin/` directory.
  - e) Restart the embedded WebSphere Application Server by entering the following command: `/etc/init.d/webserver restart`.
  - f) Refresh the window and confirm that the plug-in is now registered.
3. When Tivoli Storage Manager for Virtual Environments is installed and the Tivoli Storage FlashCopy Manager for VMware GUI starts for the first time, edit the Tivoli Storage Manager server settings by going to **Configuration window > Tivoli Storage Manager Server > Edit**. Click **Learn More** to open the online help for assistance.

---

## Starting Tivoli Storage FlashCopy Manager for VMware GUI from a web browser

You can access the Tivoli Storage FlashCopy Manager for VMware GUI from a web browser.

### Before you begin

For the current requirements that include supported web browsers, review the *Hardware and Software Requirements* technote that is associated with the Tivoli Storage FlashCopy Manager release. This technote is available in the *Tivoli Storage FlashCopy Manager - All Requirement Documents* website at: <https://www.ibm.com/support/docview.wss?uid=swg21427692>. Follow the link to the requirements technote for your specific release or update level and review the current supported web browsers.

### Procedure

1. In a web browser, go to the GUI web server.  
`https://guihost.mycompany.com:9081/TsmVMwareUI/`

**Note:** The port number to access the GUI web server is specified during the installation.

2. Log in by using the vCenter Server user name and password.

---

## Backing up virtual machines

You can back up a virtual machine and store the backup on a storage device that is defined in the IBM Tivoli Storage FlashCopy Manager for VMware profile file. You can run the task immediately or schedule it to run at a later time.

### Before you begin

Verify that the storage device and target disks are defined in device class section of the Tivoli Storage FlashCopy Manager for VMware profile file.

### Procedure

To back up a virtual machine, using the Tivoli Storage FlashCopy Manager for VMware GUI, complete the following steps:

1. Click the **Backup** tab to open the Managing backup schedules pane.
2. Click **Schedule a backup** to open the Schedule a backup wizard.
3. Click **Next**. Follow the instructions on each page of the wizard to specify the name of the schedule, to select the virtual machine, snapshot type, and the location for the backup.
4. On the Schedule page, you can choose to run the backup now or schedule the backup to run at a later time.
  - To begin the backup, click **Execute immediately**.
  - To schedule the backup to run at a later time, click **Schedule for later (repeated) execution** and enter the required information.
5. On the Summary page, review your backup settings and click **Finish**. If you selected to run the backup now, the backup operation begins when you click **Finish**. A confirmation message is displayed, click **OK** to monitor the task now.

### What to do next

To view the tasks that are finished and their completion status, click the **Reports** tab.

---

## Restoring virtual machines

You can restore a single virtual machine or virtual disk to its original location or to an alternative location.

### Before you begin

To restore a virtual machine to a new datastore, you must create the datastore before starting the restore wizard.

### Procedure

To restore a single virtual machine, using the Tivoli Storage FlashCopy Manager for VMware GUI, complete the following steps:

1. Click the **Restore** tab to open the Restore Points pane. Only virtual machines that have a backup are displayed.
2. Select **Virtual Machines** from the list in the navigation pane.
3. Expand **datacenter > esx host** and select a Virtual Machine.

4. Select a backup version from the list of restore points, and then click **Restore** to open the Restore Virtual Machine wizard.
5. Click **Next**. Follow the instructions on each page of the wizard to select the type of restore to perform and to specify the location for the restore.
6. On the Summary page, review your restore settings and click **Finish**. A confirmation message is displayed, click **OK** to monitor the task now.

### What to do next

To view the tasks that are finished and their completion status, click the **Reports** tab.

---

## Restoring datastores

You can restore a datastore or datastores and their associated virtual machines that were included in the snapshot backup at a specific point in time.

### About this task

When you restore a datastore, it overwrites the existing datastore with the virtual machines and files that it contains at the original location. Tivoli Storage FlashCopy Manager for VMware reverts the snapshot backup to the state it was in when the snapshot was taken.

### Procedure

To restore a datastore or datastores by using the Tivoli Storage FlashCopy Manager for VMware GUI, complete the following steps:

1. Click the **Restore** tab to open the Restore Points pane.
2. Select **Datastores** from the list in the navigation pane.
3. Expand the **Datacenter** and click the datastore to restore.
4. Select one backup restore point from the list of restore points.
5. Optional: Repeat steps 3 and 4 to select another datastore to restore. All datastores that you select must belong to the same backup that is they must have the same backup ID.
6. Click **Restore** to open the instant restore wizard.
7. Click **Next**. Follow the instructions on each page of the wizard to select the virtual machines to register and startup after the restore.
8. On the Summary page, review your restore settings and acknowledgement statements. Click both acknowledgment statements and click **Finish**. A confirmation message is displayed, click **OK** to monitor the task now.

### What to do next

To view the tasks that are finished and their completion status, click the **Reports** tab.

---

## Chapter 7. Operating the Data Protection for VMware command-line interface

You can use the Data Protection for VMware command-line interface to back up and restore a virtual machine with Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments.

Data Protection for VMware command-line interface maintains metadata about each backup. An index of the backup objects and their relationships is kept by the vmcli database. From the command line, you can query the vmcli database and schedule backup tasks.

You can also obtain detailed backup information for Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments backups.

**Restriction:** Support for virtual machine backup and restore operations is limited to virtual machine names and datacenter names that contain English 7-bit ASCII characters only. Virtual machine names and datacenter names that use other language characters are not supported currently.

Tivoli Storage FlashCopy Manager for VMware GUI is the preferred way to run tasks in a virtualized environment. The GUI provides full integration of Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments backups in a single view. However, you can run backup, restore, inquire, and delete operations from the command line.

---

### Using the command-line interface

The Data Protection for VMware command-line interface can be used to run backup, restore, inquire, and delete tasks in a virtualized environment.

#### Before you begin

#### About this task

The Data Protection for VMware command-line interface provides a full-function command set. You can use Data Protection for VMware command-line interface for the following scenarios:

- Create a backup of a datastore for immediate or scheduled execution
- View the status and details of a backup
- Attach and detach the virtual disks of a backup to a target virtual machine
- Restore VMware virtual machines
- Restore single disks on a virtual machine
- Delete a backup or a scheduled task

These scenarios are described in detail in the following sections.

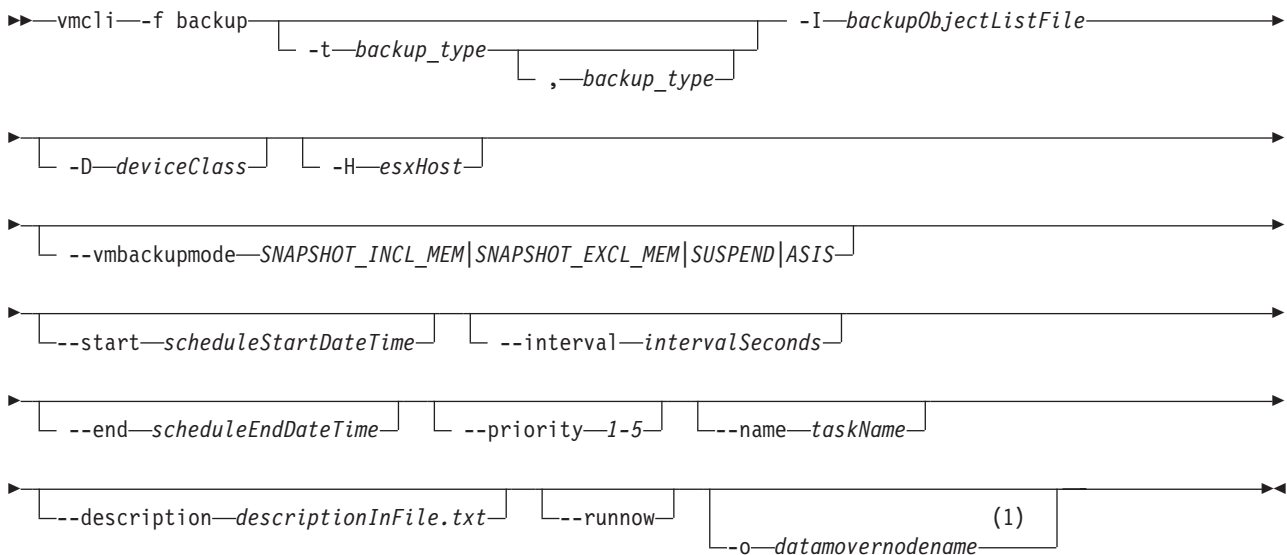
## Creating a backup

The Data Protection for VMware command-line interface can be used to run backup tasks in a virtualized environment.

### About this task

If Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments are installed and configured you can select the type of backup to create with the parameter, **-t backupType**. The following syntax diagram shows the Tivoli Storage FlashCopy Manager for VMware backup command:

#### vmcli command



#### Notes:

- 1 Use this parameter to specify the data mover. The data mover is used only to offload a backup to Tivoli Storage Manager.

You can start the task immediately or create a schedule for it by using the **--start**, **--interval**, and **--end** parameters. The **--start** parameter postpones the task until a specified date and time. If you specify the **--interval** parameter, with the **--start** parameter, the task reruns at the specified interval. The **--end** parameter indicates the date and time when the task rerun ends.

You must specify the datastores that you want to back up in the input file that is specified by the **-I backupObjectListFile** parameter. You can specify a name for the task with the **--name** parameter and descriptive information for the task with the **--description** parameter.

To specify the data mover to use to offload a backup to Tivoli Storage Manager use the **-o** parameter. For example, `./vmcli -f backup -t FCM_TSM_LATEST -I backupInfile --name FCM_TSM_backup --runnow -o datamovernode1.`

**Note:** Before, running an offloaded backup to Tivoli Storage Manager that has a backup type of incremental, you must enable changed block tracking (CBT) manually for all virtual machines. Alternatively, run a Tivoli Storage Manager for

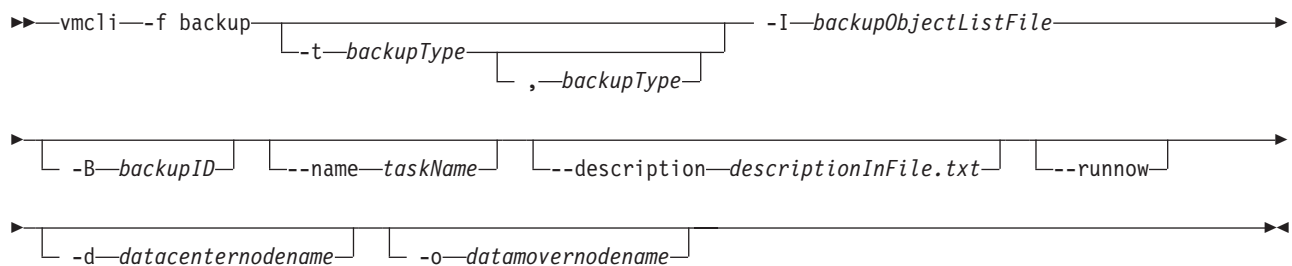


Virtual Environments backup that includes these virtual machines before you run the first offloaded backup to Tivoli Storage Manager.

If Tivoli Storage Manager for Virtual Environments is not installed, the backup type is always FCM and you can omit this parameter from the backup commands. For a Tivoli Storage FlashCopy Manager for VMware backup, you can overwrite the **AUXILIARY\_ESX\_HOST** and **VM\_BACKUP\_MODE** parameters in the Tivoli Storage FlashCopy Manager for VMware profile with command-line parameters **-H** and **--vmbackupmode**.

For backups to Tivoli Storage Manager for Virtual Environments, schedules cannot be defined. The **--runnow** parameter must be used. The following syntax diagram shows the Tivoli Storage Manager for Virtual Environments backup command:

### vmcli command



The backup snapshots are sent to the Tivoli Storage Manager server storage asynchronously by the `fccli` daemon.

### Procedure

To back up a datastore, enter the following command:

```
vmcli -f backup -I backupObjectListFile
```

Where:

**-I** *backupObjectListFile*

Specifies a file that contains a list of objects to back up. The *backupObjectListFile* has the following requirements:

- Each line can contain only one identifier and its value, which is separated by a colon.
- The valid datastore identifiers are the `datastoreurl`, `datastoreurl`, and the datastore name `datastorename`.
- Exclude statements are allowed and begin with an exclamation point `!`. These statements can contain a `vminstanceuuid`, `vmname`, `datastoreurl`, or `datastorename`. Name statements can contain wildcard characters. Wildcard characters `?` and `*` are allowed for the `datastorename` or `vmname`.
- Specify include or exclude statements but not both in the same file. For example, to back up all virtual machines in a datastore and not to include newly added virtual machines in future runs, list each virtual machine to include. To back up all virtual machines in a datastore and to include newly added virtual machines in future runs, list each virtual machine to exclude.

**Restriction:** Support for virtual machine backup and restore operations is limited to virtual machine names and data center names that contain English

7-bit ASCII characters only. Virtual machine names and data center names that use other language characters are not supported currently.

The following example shows how to include objects in *backupObjectListFile*:

```
# Lines starting with # and blank lines will be ignored
#
# Wildcards ? and * are supported
# ? - any single character
# * - any character sequence (also empty)
# Wildcards are allowed for datastorename and
# vmname identifier
#
# Include statements are optional
# Includes may comprise datastoreurl and datastorename identifier
#
# Exclude statements are optional
# Exclude statements begin with a "!"
# Excludes may comprise datastorename, datastoreurl,
# vminstanceuuid and vmname identifier
#

#Include datastore with this URL in the backup
datastoreurl:dsUrl
#Include datastore with this name in the backup
datastorename:dsName
#Include datastores matching the wildcard string in the backup datastorename:
datastorename:ds?am*
#Include VM matching this instance uuid in the backup. Fails if it is not
#found within the included datastores which additionally need to be specified
#in the infile when this option is used
vminstanceuuid:vmInstanceUuid
```

Comments are allowed and must be marked with a '#' sign at the beginning of the line.

The following example shows how to exclude objects in *backupObjectListFile*:

```
# Lines starting with # and blank lines will be ignored
#
# Wildcards ? and * are supported
# ? - any single character
# * - any character sequence (also empty)
# Wildcards are allowed for datastorename and
# vmname identifier
#
# Include statements are optional
# Includes may comprise datastoreurl and datastorename identifier
#
# Exclude statements are optional
# Exclude statements begin with a "!"
# Excludes may comprise datastorename, datastoreurl,
# vminstanceuuid and vmname identifier
#

#Exclude VM with this uuid from the backup
!vminstanceuuid:vmUuid
#Exclude VM with this name from the backup (needs to be unique)
!vmname:vmName
#Exclude all vms matching this wildcard string from the backup
!vmname:vmN*
#Exclude datastore with this URL from the backup
!datastoreurl:dsUrl
#Exclude all datastores matching this wildcard string from the backup
!datastorename:ds?am*
```

Comments are allowed and must be marked with a '#' sign at the beginning of the line.

**Related concepts:**

Chapter 9, “Integrating Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments,” on page 101

**Related reference:**

VMCLI backup command

## Viewing the status and details of a backup

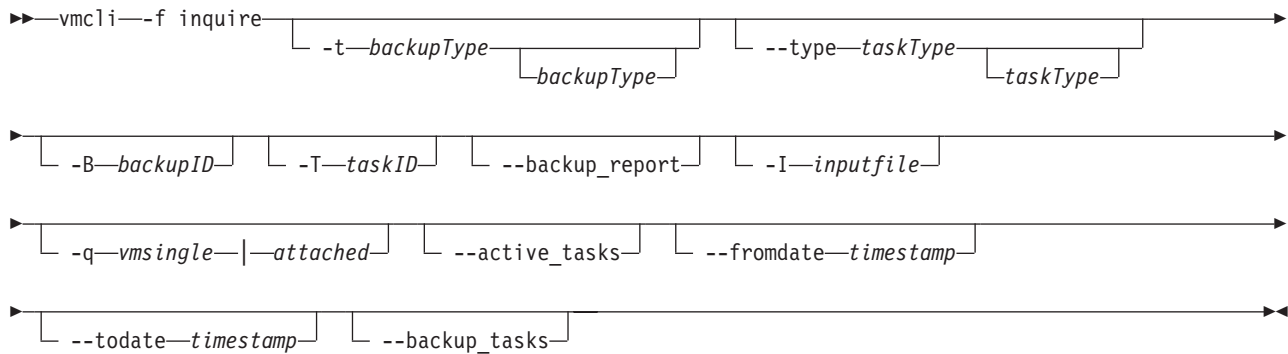
The Data Protection for VMware command-line interface can be used to view the status and details of a backup in a virtualized environment.

### About this task

Backup status and details can be obtained from the vmcli database, the Tivoli Storage FlashCopy Manager for VMware, and Tivoli Storage Manager for Virtual Environments repositories through the Data Protection for VMware command-line interface. The commands are `vmcli -f inquire`, and `vmcli -f inquire_detail`.

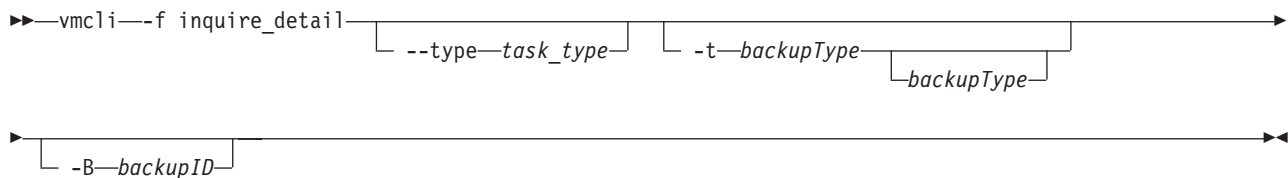
The following syntax diagram shows the **inquire** command:

**vmcli command**



The following syntax diagram shows the **inquire\_detail** command:

**vmcli command**



The inquire command gathers information from the vmcli database. The inquire\_detail command retrieves additional information from the specified backup type. If no backup type is specified, this information is retrieved from all installed products that is Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments. Use the --type, -t, -B, and -T parameters to set filters for the tasks.

You can use the inquire command for Tivoli Storage FlashCopy Manager for VMware to run a staged approach to query for virtual machine backups.

The command `vmcli -f inquire -I inputfile` queries all virtual machine backups from the datacenter specified in the *inputfile*. The input file syntax is:

```
datacenter:datacentername
```

The command `vmcli -f inquire -t FCM -q vmsingle -I inputfile` queries for all the backups for the virtual machine, *vmname*, on the datacenter, *dataCenterName*, when the input file contains:

```
datacenter:datacentername  
vmname:vmname
```

The command `vmcli -f inquire --backup_report -I inputfile --fromdate timestamp --todate timestamp`, shows the status of all successful virtual machine backups for a specified date range and datacenter. If you do not specify a date then all backup attempts including those attempts that are unsuccessful are displayed. The *inputfile* file must contain:

```
datacenter:datacentername
```

You view all tasks that are in the running state by using the `vmcli -f inquire --active_tasks` command, and all backup tasks by using the `vmcli -f inquire --backup_tasks` command.

You can view all tasks from a specified time frame by using the `vmcli -f inquire --fromdate timestamp --todate timestamp` command.

Other examples of inquire commands are:

- `vmcli -f inquire` or `vmcli -f inquire -t FCM,TSM`  
This command inquires about all tasks with all runs.
- `vmcli -f inquire -t FCM --type backup, restore`  
This command inquires about all Tivoli Storage FlashCopy Manager for VMware tasks with runs of type backup or restore that are currently not running.
- `vmcli -f inquire -t FCM --type backup,restore -B backupID`  
This command inquires about all Tivoli Storage FlashCopy Manager for VMware backup and restore tasks with runs that are currently not running and are associated with the specified *backupID*.
- `vmcli -f inquire -B backupID`  
This command inquires about all task with runs that are currently not running and are associated with the specified *backupID*.
- `vmcli -f inquire -T 572`  
This command inquires about all the runs for the task with the specified *taskid*.
- `vmcli -f inquire --active_tasks`  
This command shows all active tasks.
- `vmcli -f inquire -t FCM --type backup --active_tasks`  
This command shows all active backup tasks for Tivoli Storage FlashCopy Manager for VMware.
- `vmcli -f inquire -t TSM --backup_tasks`  
This command shows all Tivoli Storage Manager for Virtual Environments backup tasks with their latest run.
- `vmcli -f inquire --backup_tasks`

This command shows all backup tasks with their latest run.

- `vmcli -f inquire --type attach --fromdate 20110822000000`

This command shows all attach tasks and runs from 20110822000000 until today.

- `vmcli -f inquire --backup_report --fromdate 20120507214045`

This command shows the last valid backup for every virtual machine that was created in the last seven days.

**Related reference:**

“VMCLI inquire” on page 113

---

## Attaching and detaching the virtual disks of a backup to a target virtual machine

The Data Protection for VMware command-line interface can be used to attach and detach the virtual disks of a backup to a target virtual machine in a virtualized environment.

### About this task

Using the command-line interface, from a backup you can attach one or more specified virtual disks to a target virtual machine in your vSphere environment. You can also use the Tivoli Storage FlashCopy Manager for VMware GUI to attach virtual disks from a backup. This attachment is possible even if another virtual machine in the same backup is already attached to the same or another target virtual machine. You can attach a datastore to an ESX host even if a datastore in the same backup is already attached to another ESX host. Similarly, you can attach virtual machines that are contained in a vApp environment.

Using the Data Protection for VMware command-line interface, you can attach a complete virtual machine to a specified ESX host. The virtual machine is registered on the ESX host with the name *original\_vmname backupid* when the *sourcevminstanceuuid* is specified in the *attachObjectListFile*. For example:

```
vminstanceuuid:sourcevminstanceuuid
```

A virtual machine template if present is registered on the ESX host with the name *template\_name\_backupid*. You can attach or detach a single virtual disk from a template back up to a virtual machine. However, it is not possible to attach or detach virtual disks from a template or virtual machine backup to a virtual machine template.

The following syntax diagram shows the **attach** command:

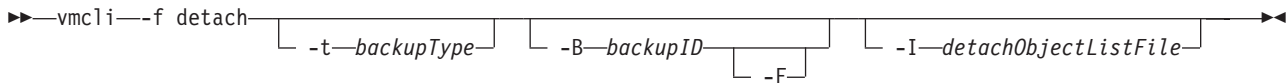
### vmcli command

```
▶▶—vmcli—-f attach— -B—backupID—┬── -I—attachObjectListFile—▶▶  
└── -H—esxHost—┘
```

If the `-H` parameter is not specified, the value as specified by the `AUXILIARY_ESX_HOST` profile parameter is used as the target virtual machine. The `-H` parameter is used to overwrite the profile setting for the `AUXILIARY_ESX_HOST` parameter. The `attachObjectListFile` file specifies the virtual machine that contains the virtual disks to attach to the target virtual machine. The file contains one virtual machine identifier in each line, optionally specifying an alternative target virtual machine.

The detach command is used to disconnect the virtual disks that are attached to the ESX host. You can detach all the virtual disks in a virtual machine. In the detach command, you specify the virtual machine that contains the attached virtual disks. Similarly, you can detach virtual machines that are contained in a vApp environment. The following syntax diagram shows the detach command:

### vmcli command



The **-F** parameter forces a detach operation even if the corresponding backup task is still running. The **-I** parameter specifies the *detachObjectListFile* file. All the attached disks for the virtual machine, which is specified in the *detachObjectListFile* file, are detached. If the virtual machine is registered on the ESX host, Tivoli Storage FlashCopy Manager for VMware unregisters the virtual machine.

Several virtual machines in the same backup can be attached to the same ESX host. To detach only the virtual disks in a specified virtual machine, you must include the virtual machine in the *detachObjectListFile* file in the detach command. The mounted datastore is not unmounted if any virtual disks in the datastore are still attached to a virtual machine on the ESX host. Similarly, if a virtual machine is still registered the datastore is not unmounted. When the detach command detaches the last attached virtual disk in the datastore and no VM is registered, Tivoli Storage FlashCopy Manager for VMware automatically unmounts the datastore.

### Procedure

To attach a backup on an ESX host to a target virtual machine, enter the following command:

```
vmcli -f attach -B backupID -I attachObjectListFile
```

Where:

**-B** *backupID*

Specifies the ID of the backup to be attached.

**-I** *attachObjectListFile*

Specifies the file that contains the list of disks in the backup to attach to the VM. The *attachObjectListFile* has the following requirements:

- The file contains one VM identifier per line, optionally specifying an alternative target VM.
- All the disks in a backup can be attached to an existing VM that is specified after the **::** symbol.
- If no disks are specified, all the backup disks are attached to the specified VM.
- The specified disks in the backup are attached to the target VM and added to the VM configuration.

The following example shows a sample *attachObjectListFile*:

```
# vminstanceuuid:sourceVmInstanceUuid[:vminstanceuuid:targetVmInstanceUuid]
# [diskkey:key1,key2,...]

# attach all backed-up virtual disks of vm2InstanceUuid to the (same)
# source VM
vminstanceuuid:vm2InstanceUuid::vminstanceuuid:vm2InstanceUuid
```

```
# attach all backed-up virtual disks of vm3InstanceUuid to vm4InstanceUuid
vminstanceuuid:vm3InstanceUuid::vminstanceuuid:vm4InstanceUuid

# attach the disks with the specified keys of vm3InstanceUuid to vm4InstanceUuid
vminstanceuuid:vm3InstanceUuid::vminstanceuuid:vm4InstanceUi diskkey:2000,2001

# register the complete VM vm4InstanceUuid
vminstanceuuid:vm4InstanceUuid
```

To detach the last mounted backup, enter the following command:

**vmcli -f detach**

**Related reference:**

“VMCLI attach” on page 104

VMCLI detach command

## Restoring a backup

The Data Protection for VMware command-line interface can be used to restore a backup in a virtualized environment.

### About this task

The following syntax diagram shows the **restore** command:

#### vmcli command

```
▶▶ vmcli -f restore [ -t backup_type ] -I restoreObjectListFile [ -H esxHost ] ▶▶
```

If Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments are installed and configured, you can select the type of backup to restore with the **-t backupType** parameter. The `restoreObjectListFile` file specifies the list of objects to restore. The file must contain one virtual machine identifier per line, optionally specifying an alternative target virtual machine and datastore. You can use the **-H** parameter to overwrite the profile setting for the **AUXILIARY\_ESX\_HOST** parameter. The **-H** parameter specifies the ESX host where the datastores in the selected backup are attached.

For Tivoli Storage Manager for Virtual Environments restore operations, the **-s**, **-p**, and **-n** parameter values are taken from the profile. The following syntax diagram shows the restore command:

#### vmcli command

```
▶▶ vmcli -f restore [ -t TSM ] -I restoreObjectListFile [ -s tsmservername ] ▶▶
▶ [ -p tsmserverport ] [ -n tsmcliNode ] -d datacenterNodeName -o proxynodeName ▶▶
```

### Procedure

To restore a backup, enter the following command:

**vmcli -f restore -I restoreObjectListFile**

Where:

**-I restoreObjectListFile**

Specifies an input file that contains a list of objects to restore. The *restoreObjectListFile* represent a file. This file must have one backup ID and one VM identifier per line. Optionally, you can specify a different target VM, an alternative datastore, an ESX host, and virtual disks to be restored. Support for virtual machine backup and restore operations is limited to virtual machine names and datacenter names that contain English 7-bit ASCII characters only. Virtual machine names and datacenter names that use other language characters is not supported currently.

An example *restoreObjectListFile* is provided here:

```
# restore of a VM with vminstanceuuid "vm1instanceUuid"
# In case the original VM still exists, it is unregistered, the files
#are overwritten and registered with the same name afterwards
# In case the original VM has been deleted, the files are copied into
#the original DS into the folder as named during backup and registered
#with the same name afterwards
backupid:PID1 vminstanceuuid:vm1InstanceUuid

# restore of a VM with vminstanceuuid "vm2instanceUuid"
#using the new vmname "vm2newName"
# The files are copied into the original DS into a new folder
#and registered with the given new name
backupid:PID2 vminstanceuuid:vm2InstanceUuid::vmname:vm2newName

# redirected restore of a VM with vminstanceuuid "vm3instanceUuid"
#to the new datastore with url "ds1newUrl"
# The files are copied into the (new) DS into a (new) folder
#(in case the one stored in the backup does not exist in this DS).
#Afterwards the VM is registered with the original VM name
# The [NEWDS] option is not allowed for distributed VMs
backupid:PID3 vminstanceuuid:vm3InstanceUuid
datastoreurl:ds1Url::datastoreurl:ds1newUrl

# redirected restore of a VM with vminstanceuuid "vm4instanceUuid"
#using the new vmname "vm4new" to the new datastore with url "ds1newUrl"
# The files are copied into the (new) DS into a (new) folder
#(in case the one stored in the backup does not exist in this DS).
#Afterwards the VM is registered with the given VM name
# The [NEWDS] option is not allowed for distributed VMs
backupid:PID4 vminstanceuuid:vm4InstanceUuid::vmname:vm4new
datastoreurl:ds1Url::datastoreurl:ds1newUrl

# restore of a VM with vminstanceuuid "vm7instanceUuid" and
#registration of this VM with ESX host "esxHost1Name"
backupid:PID7 vminstanceuuid:vm7InstanceUuid esxhostname:esxHost1Name

# restore the disks with the specified keys of vm3InstanceUuid,
#original disk files are overwritten
backupid:PID8 vminstanceuuid:vm3InstanceUuid diskkey:2000,2001

# restore the disks with the specified keys of vm3InstanceUuid to
#vm4InstanceUuid as new disks
backupid:PID9 vminstanceuuid:vm3InstanceUuid::vminstanceuuid:vm4InstanceUuid
diskkey:2000,2001
```

**Related reference:**

“VMCLI restore” on page 123



---

## Restoring single disks of a virtual machine

The Data Protection for VMware command-line interface can be used to restore single disks of a virtual machine in a virtualized environment.

### About this task

You can use the `restore` command to restore single disks of a virtual machine. You must specify one or more keys of the disks to restore in the `restoreObjectListFile` file, as shown in the following example:

```
# restore the disks with the specified keys of vm3InstanceUuid, original disk files
are overwritten backupid:BD8 vminstanceuuid:vm3InstanceUuid diskkey:2000,2001
```

```
# restore the disks with the specified keys of vm3InstanceUuid to vm4InstanceUuid
as new disks backupid:BD9 vminstanceuuid:vm3InstanceUuid::vminstanceuuid:
vm4InstanceUuid diskkey:2000,2001
```

You must specify a valid backup to use in restore operation, with the **-B backupID** parameter. You can overwrite the target ESX host setting for this restore operation with the **-H** parameter.

#### Related reference:

VMCLI restore

---

## Restoring datastores

You can restore a datastore or datastores by using the **instant\_restore** command. This command, restores a datastore or datastores and their associated virtual machines that were included in the snapshot backup at a specific point in time. You can restore from network-attached storage (NAS) or storage area network (SAN) storage systems. This type of restore is referred to as an instant restore.

### About this task

When you restore a datastore, it overwrites the existing datastore with the virtual machines and files that it contains at the original location. Tivoli Storage FlashCopy Manager for VMware reverts the snapshot backup to the state it was in when the snapshot was taken. You specify the datastores to restore by using an input text file.

### Procedure

To restore a datastore, enter the following command:

```
vmcli -f instant_restore -I restoreObjectListFile [-B backup_ID]
```

Where the *restoreObjectListFile* represents an input text file that contains a list of datastores to restore. This file must have one datastore identifier per line. The identifier can be the URL or name of the datastore.

For example, `datastoreurl:ds:///vmfs/volumes/50ade558-4fa9960d-db2c-e41f136af7c8/` or `datastorename:Datastore1`.

For a virtual machine that spans a number of datastores, you must list all the datastores in the input text file. Otherwise, you must exclude the virtual machine from the restore.

- To exclude a virtual machine from a datastore, on a separate line specify an exclamation ! character. This character must be followed by the universal unique identifier (UUID) and value for the virtual machine. The UUID and its value are separated by a colon.

For example, !vminstanceuuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78.

The excluded virtual machine is unregistered and the virtual machine and all its objects on the restored datastore are overwritten. This virtual machine is not registered as the virtual machine might end up in an inconsistent state. At a future date to restore the excluded virtual machine, use the **restore** command to restore the virtual machine to its original location after the instant restore.

- To specify the backup to restore, use the -B option followed by the backup ID (*backup\_ID*). This option is not mandatory and if not specified the most recent snapshot backup is restored.

During an instant restore, the datastore is assigned a new URL when writeable snapshots are restored and the datastore backup was attached previously to any ESX host. A writeable snapshot can exist on SAN Volume Controller, DS8000, and Storwize V7000 storage systems. A writeable snapshot can also exist on a XIV Storage System when the Tivoli Storage FlashCopy Manager for VMware profile **USE\_WRITABLE\_SNAPSHOTS** parameter is configured as yes. If the URL is changed, Tivoli Storage FlashCopy Manager for VMware outputs the original URL from the backup and the new URL for each datastore after a datastore is restored.

**Note:** Tivoli Storage FlashCopy Manager for VMware creates a list of virtual machines from the datastores and omits any excluded virtual machines that are listed in the input text file. This list is compared to the current list of virtual machines that exist for these datastores on the vCenter Server. To restore, the list of current virtual machines must be a subset or equal to those virtual machines that are listed in the input file.

For example, the datastore named Datastore1 contains one virtual machine named VM1. After the backup snapshot of Datastore1, an extra virtual machine VM2 is added to the datastore. To restore the datastore named Datastore1, the input file must specify Datastore1 as the datastore to restore and must exclude the virtual machine named VM2.

## Example

The following example restores datastores from the latest snapshot backup.

```
vmcli -f instant_restore -I restoreObjectListFile
```

The datastores to restore are defined in the *restoreObjectListFile* file. The following example shows a *restoreObjectListFile* file that identifies three datastores and excludes two virtual machines to restore.

```
#List of datastores that should be instant restored
datastoreurl:ds:///vmfs/volumes/50ade558-4fa9960d-db2c-e41f136af7c8/
datastoreurl:ds:///vmfs/volumes/47ade579-4fa9887d-db2c-k89f158ff67b3/
datastorename:Datastore1

#List of VMs that are currently contained in the listed datastores
#but which will not be part of the instant restore.
#these VMs are maybe not part of the backup or they should be excluded from the restore
!vminstanceuuid:8a2d7ae7-02dd-c4be-63g5-c44a1desfb75
!vminstanceuuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78
vminstanceuuid:ba2dga57-02d5-c43e-63g5-c44a1desf34:on
```

The following sample shows what is displayed when a datastore is assigned a new URL. The output for each parameter is displayed on one line.

```
#PARAM DSURL_CHANGED=YES
#PARAM datastoreurl:ds:///vmfs/volumes/50adfa95-208599ce-b7a4-e41f136af7c8
::newdatastoreurl:ds:///vmfs/volumes/58fdfae4-308de4ce-f45r-441ft364fdk5
#PARAM datastoreurl:ds:///vmfs/volumes/74ewfa95-208599ce-b7a4-e41f136af7s31
::newdatastoreurl:ds:///vmfs/volumes/12adae4-308de4ce-f45r-441ft364fds2
```

The parameter **DSURL\_CHANGED** is set to YES. In this sample, two datastore URLs are changed from the original URLs at backup time.

The following format is used to identify when a URL is changed: #PARAM  
datastoreurl: *datastore URL from backup time*::*newdatastoreurl*:*new datastore URL after an instant restore*.

**Related reference:**

“VMCLI instant\_restore” on page 121

---

## Deleting a backup

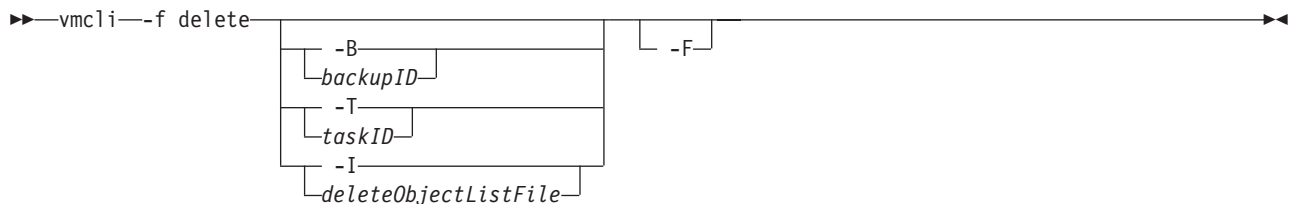
The Data Protection for VMware command-line interface can be used to delete a backup in a virtualized environment.

### About this task

You can use the **vmcli -f delete** command to delete a backup or a task. Use one of the following options:

- Specify a backup by using the **-B** parameter value. This parameter requires a backup ID attribute.
- Specify a task by using the **-T** parameter value. This parameter requires a task ID attribute.
- Specify a list of objects to delete by providing an input file. All the objects that are specified in the file must be backup or task types but not both. Use the **-I** parameter to specify an input file.

### vmcli command



If a backup is deleted, this command returns the delete task and the corresponding run. The **-F** parameter forces a delete even if the corresponding task is still running or if a backup is not completed. The **-F** parameter also triggers the deletion of the source or target relations in the storage system. Only Tivoli Storage FlashCopy Manager for VMware backups and backup schedules can be deleted.

### Example

The following example provides instructions on how to select and delete a Tivoli Storage FlashCopy Manager for VMware backup in your environment.

To find and delete a backup, complete the following steps:

1. Enter the following command to display a list of all Tivoli Storage FlashCopy Manager for VMware backups and their backup IDs:  
`./vmcli -f inquire_detail -t FCM`
2. From the list, select the backup ID that you want to delete and enter the following command:

```
./vmcli -f delete -B backup id -F
```

The following example shows an example of a typical *deleteObjectListFile* file and rules that apply to creating this file.

**-I *deleteObjectListFile***

Specify the file that contains the list of objects to delete. The *deleteObjectListFile* file has the following requirements:

- Each line must contain one *taskid:taskId* or *backupid:backupId* statement.
- Lines starting with # and blank lines are ignored.

An example of the *deleteObjectListFile* file is provided.

```
#objectType:objectIdentifier  
backupid:backup1ID  
backupid:backup54ID  
backupid:backup63ID
```

All the objects specified in the file must be backup or task types but not both.

**Related tasks:**

“Viewing the status and details of a backup” on page 69

**Related reference:**

“VMCLI delete” on page 111

---

## The vmcli database

The Data Protection for VMware command-line interface (vmcli) database is installed during the installation of Tivoli Storage FlashCopy Manager for VMware and stores metadata about all backup, restore, and delete tasks.

The location of the vmcli database is specified by the Tivoli Storage FlashCopy Manager for VMware profile parameter, **DERBY\_HOME**.

The vmcli database must remain in sync with the Tivoli Storage FlashCopy Manager for VMware repository. This repository contains information about Tivoli Storage FlashCopy Manager for VMware backups. The **VMCLI\_RECON\_INTERVAL\_FCM** parameter specifies the interval between reconciliation operations on the vmcli database with the Tivoli Storage FlashCopy Manager for VMware repository. Reconciliation operations delete metadata for backups that are no longer available.

When Tivoli Storage Manager for Virtual Environments is installed in combination with Tivoli Storage FlashCopy Manager for VMware, the vmcli database must remain in sync with the Tivoli Storage Manager for Virtual Environments repository. The **VMCLI\_RECON\_INTERVAL\_TSM** parameter specifies the interval between reconciliation operations on the vmcli database with the Tivoli Storage Manager for Virtual Environments repository. Reconciliation operations delete metadata for backups that are no longer available.

The **VMCLI\_TASK\_EXPIRATION\_TIME** parameter specifies the time that a task is stored in the vmcli database. This parameter applies to attach, detach, delete, inquire\_config, tape\_backup, and used\_capacity task types. The **VMCLI\_RESTORE\_TASK\_EXPIRATION\_TIME** parameter specifies the time a restore task is stored in the vmcli database. There is no expiration date for backup tasks. A *run* is a task that completed, either immediately or with a schedule.

---

## Backing up the vmcli database

You must ensure that a backup strategy is in place for the integrated vmcli database.

### About this task

The vmcli database contains valuable information about the virtual machine backups created by Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments. Without this information a restore is impossible. You must regularly create a backup of this database to the file system. The backup interval is configurable using the **VMCLI\_DB\_BACKUP** parameter in the Tivoli Storage FlashCopy Manager for VMware profile. You must ensure that the file system backup is included in the regular system backup. You can specify backup intervals to be daily at a configurable time or after every newly created Tivoli Storage FlashCopy Manager for VMware or Tivoli Storage Manager for Virtual Environments backup.

The Data Protection for VMware command-line interface **vmcli -f db\_backup** command is used to back up the vmcli database. The following syntax diagram shows the **db\_backup** command:

#### vmcli command

▶▶—vmcli—-f db\_backup—▶▶

The default location for the backups of the database is *install\_dir/derby\_backups*. You can use the optional argument **TO path** in the **VMCLI\_DB\_BACKUP** parameter to specify a custom path. For more information, see “VMCLI section” on page 87.

The **vmcli -f db\_restore** command restores a backup of the vmcli database. The following syntax diagram shows the **db\_restore** command:

#### vmcli command

▶▶—vmcli—-f db\_restore—▶▶

The **vmcli -f db\_inquire** command inquires for available backups of the vmcli database. The following syntax diagram shows the **db\_inquire** command:

#### vmcli command

▶▶—vmcli—-f db\_inquire—▶▶

The **vmcli -f db\_compact** command reclaims unused space in the vmcli database. The following syntax diagram shows the **db\_compact** command:

#### vmcli command

▶▶—vmcli—-f db\_compact—▶▶

For more information about the Data Protection for VMware command-line interface database commands, see “VMCLI db\_backup” on page 126.



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## Chapter 8. Tivoli Storage FlashCopy Manager for VMware configuration files

You must ensure the configuration files contain all the information Tivoli Storage FlashCopy Manager for VMware needs to perform its functions.

Tivoli Storage FlashCopy Manager for VMware uses the following configuration files:

- Profile
- Target volumes file
- Password file

### Tivoli Storage FlashCopy Manager for VMware profile parameters

You must use the profile parameters to configure Tivoli Storage FlashCopy Manager for VMware. The profile parameters are categorized into different sections in the Tivoli Storage FlashCopy Manager for VMware profile file.

The Tivoli Storage FlashCopy Manager for VMware profile file contains the following five sections.

- GLOBAL
- ACS\_D
- VMWARE
- VMCLI
- DEVICE\_CLASS

#### Related concepts:

Storage solutions

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## GLOBAL section

The profile parameters in the GLOBAL section contain basic configuration information, such as on which port Tivoli Storage FlashCopy Manager for VMware is listening, and where the logs are located. The parameters are independent of the storage device.

Table 7. Tivoli Storage FlashCopy Manager for VMware profile parameters - GLOBAL section

Name	Description	Default value	Advanced mode only
ACS_DIR	<p>The path of the Tivoli Storage FlashCopy Manager for VMware directory. This parameter is required.</p> <p>The Tivoli Storage FlashCopy Manager for VMware directory contains the following subdirectories:</p> <ul style="list-style-type: none"><li>• The logs subdirectory contains all log and trace information that Tivoli Storage FlashCopy Manager for VMware generates.</li><li>• The shared subdirectory contains only the pwd.acsd password file. This file maintains passwords for all devices that are specified within the profile, in the DEVICE_CLASS section. The <i>master password</i> that is used by all components to authenticate when they connect to the management agent is also maintained in this file.</li></ul>	None	No

Table 7. Tivoli Storage FlashCopy Manager for VMware profile parameters - GLOBAL section (continued)

Name	Description	Default value	Advanced mode only
ACSD	<i>hostname port</i>  The host name and the port of the system on which the management agent acsd is running. Separate the values with a space.	localhost 57328	No
ENFORCE_TLS12	Tivoli Storage FlashCopy Manager for VMware uses the security suite, IBM® Global Security Kit (GSKit) for Secure Socket Layer / Transport Layer Security (SSL/TLS) TCP/IP connections. GSKit is able to provide SP800-131 compliant encryption by using the protocol TLS V1.2. To enforce the use of this protocol, select the option YES, otherwise the TLS version 1.0 and 1.1 is enabled by default.	No	Yes
TRACE	Activates tracing. Wait for instructions from support before you set the values.  <b>YES</b> Enable tracing.  <b>NO</b> Disable tracing.	None	Yes

## ACSD section

The profile parameters in the ACSD section contain information that is used by the acsd management agent. Except where noted, the parameters are independent of the storage device.

Table 8. Tivoli Storage FlashCopy Manager for VMware profile parameters - ACSD section

Name	Description	Default value	Advanced mode only
ACS_REPOSITORY	The path to the ACS repository directory. This parameter is required. ACS_REPOSITORY parameter specifies the directory in which the Tivoli Storage FlashCopy Manager for VMware repository is located.  <b>Attention:</b> The repository is critical for restore processing. It must be placed in a secure location. If the repository is lost, all backups are effectively deleted. Do not place the Tivoli Storage FlashCopy Manager for VMware repository in the main Tivoli Storage FlashCopy Manager for VMware directory (ACS_DIR). Place the repository in a subdirectory of ACS_DIR.  ACS_DIR/acsrepository	None	No
REPOSITORY_LABEL	A prefix that is added to each volume name on the XIV Storage System. You must specify 3 characters in the range [a-z] [A-Z] [0-9]. This optional parameter is only used with the XIV Storage Systems. The default value is TSM. If the repository label is changed, backups that are created with the previous repository label are excluded from reconciliation.	TSM	Yes



## VMWARE section

The parameters in the VMWARE section of the profile specify options for the VMware vCenter server and the virtual machines.

Table 9. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section

Name	Description	Default value	Advanced mode only
AUXILIARY_ESX_HOST	The auxiliary ESX host is used whenever a snapshot backup must be temporarily mounted. For example, during a restore or when offloading backups to IBM Tivoli Storage Manager for Virtual Environments. Specify the fully qualified ESX host name as it is defined in the vCenter. The auxiliary ESX host is also used as the default in a command when an ESX host is not specified. The auxiliary ESX host and production ESX host typically are separate entities. However, if a separate production ESX host does not exist, the auxiliary ESX host can function as the production host. Similarly, the production host can take on the functions of an auxiliary ESX host if one does not exist. There is no limitation that the auxiliary ESX host must be a separate host.	None	No
FCM_VM_NAME	If you installed Tivoli Storage FlashCopy Manager for VMware in a virtual machine within a vSphere environment, you must specify the virtual machine display name as the FCM_VM_NAME parameter value. Using this parameter value, Tivoli Storage FlashCopy Manager for VMware can avoid conflicts by ensuring that this virtual machine is automatically excluded from any backup and restore operations. If Tivoli Storage FlashCopy Manager for VMware is installed on a physical machine or a virtual machine in another vSphere environment that is not protected by this Tivoli Storage FlashCopy Manager for VMware instance, this parameter is optional and you can omit it.	None	Yes

Table 9. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section (continued)

Name	Description	Default value	Advanced mode only
HOST_NAME_MAPPING	<p>This parameter specifies how an auxiliary ESX host in the vSphere environment is mapped to the host name that is used for this server on the storage subsystem. It also applies to any ESX host where a backup is mounted, for example in the case of an attach operation. Multiple auxiliary ESX hosts can be mapped to the same host name by using a cluster that is defined on a storage subsystem, for example XIV, that covers more than one ESX host. In this case the parameter value that is specified is the name of this cluster. If an auxiliary ESX host does not have a mapping that is specified by this parameter, Tivoli Storage FlashCopy Manager for VMware derives the host name from the given auxiliary ESX host by using the first part, up to the first dot, of the fully qualified ESX host name. This parameter can be specified multiple times within this section of the profile. The parameter value format is Auxiliary ESX host name : storage subsystem host name. If HOST_NAME_MAPPING is esxserv1.domain.com:esxserv1_xivname, esxserv1.domain.com is the fully qualified ESX server host name as defined in the vSphere environment and esxserv1_xivname is the name of this host as defined on the XIV system.</p> <p>The following attribute is optional:</p> <p><b>USE_FOR</b> Use to restrict the application of a mapping statement to a particular set of device classes. The format is: <i>Auxiliary ESX host name : storage subsystem host name [USE_FOR device class names]</i>.</p> <p>Multiple device classes can be listed, separate the device classes with the space character. A specific mapping statement for a device class (with USE_FOR attribute) matching a given ESX host and device class overrides a general mapping statement (without USE_FOR attribute) matching the same host. The USE_FOR attribute is useful where there are different types of storage subsystems in your environment and the host names on storage subsystems cannot be unified.</p> <p>For DS8000 storage device, you do not need to specify the parameter HOST_NAME_MAPPING as an internal mapping to PREASSIGNED_VOLUMES is performed for any given ESX host. For SAN Volume Controller, use PREASSIGNED_VOLUMES as the <i>storage subsystem host name</i>, if you use static volume mapping to the auxiliary ESX server.</p> <p>For NFS datastores on IBM System Storage N series and NetApp storage systems the <i>storage subsystem host name</i> is the IP address of the VMkernel interface of the ESX host.</p>	None	No
MAX_VERSIONS	<p>This parameter specifies the number of FlashCopy or snapshot backups of a datastore to be retained on a storage device. Specify one of the following options:</p> <p><b>ADAPTIVE</b> The maximum number varies depending on the available space. Tivoli Storage FlashCopy Manager for VMware reuses the oldest target set as the target for the current backup.</p> <p><b>n</b> Specify the maximum number of snapshot versions to be maintained. When this number is reached, the oldest version is deleted.</p>	ADAPTIVE	No

Table 9. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section (continued)

Name	Description	Default value	Advanced mode only
NUMBER_CONCURRENT_VM_TASKS	<p>This parameter specifies the number of operations that can be run concurrently at backup time. The optimum value for this parameter depends on the specific characteristics of your vSphere environment and must be evaluated empirically.</p> <p>For example if VM_BACKUP_MODE is set to SNAPSHOT_EXCL_MEM, NUMBER_CONCURRENT_VM_TASKS specifies the number of VMware snapshots that are run concurrently, to speed up the process.</p>	1	Yes
TIMEOUT_FLASH	<p>Specify the maximum time (in seconds) that the Tivoli Storage FlashCopy Manager for VMware application agent waits for a response to the management agent call during the <i>flash</i> phase. If the Tivoli Storage FlashCopy Manager for VMware application agent does not receive a response within the specified time, an error message is issued.</p>	300 seconds	Yes
TIMEOUT_PHASE	<p>Specify the maximum time (in seconds) that the Tivoli Storage FlashCopy Manager for VMware application agent waits for a response to the management agent call during the <i>PHASE</i> phase. If the Tivoli Storage FlashCopy Manager for VMware application agent does not receive a response within the specified time, the backup or restore operation ends and an error message is issued. See Note for details of the values for <i>PHASE</i>.</p>	3600 seconds	YES

Table 9. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section (continued)

Name	Description	Default value	Advanced mode only
VM_BACKUP_MODE	<p>This parameter specifies how virtual machines selected for backup are processed before the actual hardware snapshot of the datacenter. Specify one of the following options:</p> <p><b>SNAPSHOT_INCL_MEM</b> Create a VMware snapshot that includes a working memory for each virtual machine included in the backup. The virtual machine can be resumed after restore. The achieved consistency level is <i>filesystem</i> consistency.</p> <p><b>SNAPSHOT_EXCL_MEM</b> Create a VMware snapshot without a working memory image for every virtual machine included in the backup. The virtual machine must be started after the restore. The achieved consistency level is <i>filesystem</i> consistency. This consistency level is only achieved depending on precautions that must be adhered to in the guest operating system. Depending on your environment, it might be necessary to complete one of the following items:</p> <ul style="list-style-type: none"> <li>• Install VMware tools file system sync driver</li> <li>• Create appropriate freeze and thaw scripts</li> <li>• Appropriately configure VSS (Windows operating system)</li> </ul> <p><b>SUSPEND</b> Suspend each virtual machine that is selected for backup. The virtual machine can be resumed after restore. A VMware virtual machine snapshot is not created. This option suspends each virtual machine that is selected for backup so that it is halted for a moment. The achieved consistency level is <i>filesystem</i> consistency.</p> <p><b>ASIS</b> Do not perform any action before the actual hardware snapshot. The virtual machine must be started after a restore. The achieved consistency level is <i>crash consistency</i>.</p> <p>When you use the Tivoli Storage FlashCopy Manager for VMware GUI to create backups, you can specify the backup type for each backup task individually, overwriting the VM_BACKUP_MODE specified in the profile. When using the Data Protection for VMware command-line interface to create backups, you can also overwrite the VM_BACKUP_MODE specified in the profile by using a command-line option to specify the backup mode.</p>	SNAPSHOT_EXCL_MEM	No
VCENTER_SERVER	This parameter specifies the host name or IP address of the vCenter server that is managing the vSphere environment that is protected by this installation.	None	No
VCENTER_SERVER_USER	This parameter specifies the user name that is used to log on to the vCenter server.	Administrator	No

Table 9. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section (continued)

Name	Description	Default value	Advanced mode only
VCENTER_SERVER_VM_NAME	This parameter is used to specify the display name of the vCenter server virtual machine so that it can be excluded from backup operations. If you are running the vCenter server as a virtual machine within a vSphere environment, specify the virtual machine name. Using this parameter value, Tivoli Storage FlashCopy Manager for VMware can avoid conflicts by ensuring that this virtual machine is automatically excluded from any backup and restore operations. If the vCenter server is running on a physical machine or a virtual machine in another vSphere environment that is not protected by this Tivoli Storage FlashCopy Manager for VMware instance, this parameter is optional and you can omit it.	None	Yes
<p><b>Note:</b> You can specify one of these <i>PHASE</i> values for the <i>TIMEOUT_PHASE</i> parameter for a backup:</p> <ul style="list-style-type: none"> <li>• PARTITION</li> <li>• PREPARE</li> <li>• FLASH</li> <li>• VERIFY</li> <li>• CLOSE</li> </ul>			

## VMCLI section

The parameters in the VMCLI section of the profile specify options for the vmcli database and the Data Protection for VMware command-line interface.

Table 10. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section

Name	Description	Default value	Advanced mode only
DERBY_HOME	This parameter specifies the location of the vmcli database.	None	No
VE_DATACENTER_NAME	This parameter maps a datacenter name in the vSphere server to the Tivoli Storage Manager for Virtual Environments node name for this datacenter. This parameter must be specified for each datacenter in the vSphere that has a different Tivoli Storage Manager for Virtual Environments datacenter node name. However, Tivoli Storage Manager for Virtual Environments does not support datacenters with the same name in the vCenter. This parameter can have multiple occurrences if the vCenter manages multiple datacenters. The value of this parameter is a tuple of <i>datacentername</i> and <i>datacenternodename</i> . For example, <i>VE_DATACENTER_NAME datacenter1::datacenternodename1</i> or <i>VE_DATACENTER_NAME datacenter2::datacenternodename2</i> . See Note 1	None	No
VE_TSM_SERVER_NAME	This parameter specifies the name of the Tivoli Storage Manager for Virtual Environments server that is used for user data backups. See Note 1	None	No
VE_TSMCLI_NODE_NAME	This parameter specifies the node name under which the backup-archive client GUI or CLI operations are issued. See Note 1.	None	No
VE_VCENTER_NODE_NAME	This parameter specifies the Tivoli Storage Manager for Virtual Environments virtual node. The node that represents all the datacenters or a subset of datacenters, within a vCenter domain. See Note 1	None	No

Table 10. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section (continued)

Name	Description	Default value	Advanced mode only
VMCLI_DB_BACKUP	<p>This parameter controls the backup of the vmcli database containing the metadata of the Data Protection for VMware command-line interface. Specify one of the following values:</p> <p><b>NO</b> This option does not perform a backup of the vmcli database.</p> <p><b>AT [day[, day[,...]]] time_in _24_H</b> This option creates a backup on the specified day or days at the specified time, which is triggered by the scheduler. The day format is {MON TUE WED THU FRI SAT SUN}. If the day value is not specified, a daily backup is created.</p> <p><b>AFTER_BACKUP</b> This option creates a backup of the vmcli database after each Tivoli Storage FlashCopy Manager for VMware or Tivoli Storage Manager for Virtual Environments backup operation.</p> <p>The default location for the backups of the vmcli database is <i>install_dir/derby_backups</i>. Specify <i>T0 path</i> to set a custom path.</p>	AT 00:00	No
VMCLI_DB_BACKUP_VERSIONS	This parameter defines the maximum number of backup generations that are maintained for the vmcli database, before the oldest version is overwritten by a new version. This parameter applies to only backups of the vmcli database containing metadata. It has no effect on the number of backup generations that are maintained for the backups of a vSphere environment.	3	No
VMCLI_LOG_DIR	This parameter specifies the absolute location or the relative location of the installation directory path where Data Protection for VMware command-line interface stores its log files.	logs directory	No
VMCLI_SCHEDULER_INTERVAL	This parameter defines the interval, in seconds, between scheduler checks for scheduled tasks due for execution.	60 seconds	No
VE_TSM_SERVER_PORT	This parameter specifies the port of the Tivoli Storage Manager for Virtual Environments server. See Note 1	1500	Yes
VMCLI_RECON_INTERVAL_FCM	This parameter specifies the time interval between reconciliation operations on the vmcli database with the Tivoli Storage FlashCopy Manager for VMware repository. Reconciliation operations delete metadata for backups that are no longer available, ensuring that the vmcli database remains in synch with the Tivoli Storage FlashCopy Manager for VMware repository.	600 seconds (10 minutes)	Yes
VMCLI_RECON_INTERVAL_TSM	This parameter specifies the time interval between reconciliation operations on vmcli database with the IBM Tivoli Storage Manager for Virtual Environments. Reconciliation operations delete metadata for backups that are no longer available, ensuring vmcli database remains in synch with the Tivoli Storage Manager for Virtual Environments repository.	1200 seconds (20 min)	Yes
VMCLI_RESTORE_TASK_EXPIRATION_TIME	This parameter specifies the time that a restore task history is stored in the vmcli database. This parameter applies to restore tasks.	2592000 seconds (30 days)	Yes

Table 10. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section (continued)

Name	Description	Default value	Advanced mode only
VMCLI_TASK_EXPIRATION_TIME	This parameter specifies the time that a task history is stored in the vmcli database. This parameter applies to following tasks: attach, detach, delete, inquire_config, tape_backup, and used_capacity.	864000 seconds (10 days)	Yes
VMCLI_TRACE	This parameter activates tracing files. Activate tracing only when instructed to do so by IBM Software Support.	None	Yes

**Note:** 1 The profile parameters with names *VE\_\** are only applicable when Tivoli Storage Manager for Virtual Environments with Tivoli Storage FlashCopy Manager for VMware are used.

## DEVICE\_CLASS section

The Tivoli Storage FlashCopy Manager for VMware profile contains one or more DEVICE\_CLASS sections. Each section is used to configure Tivoli Storage FlashCopy Manager for VMware for use with a particular storage device.

Table 11. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE\_CLASS section

Device	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000 IBM XIV Storage Systems IBM System Storage N series NetApp storage systems	<b>COPYSERVICES_HARDWARE_TYPE</b>	<p>This parameter specifies one of the following storage systems:</p> <p><b>DS8000</b> This value specifies IBM System Storage DS8000</p> <p><b>SVC</b> This value specifies IBM System Storage SAN Volume Controller or IBM Storwize v7000</p> <p><b>XIV</b> This value specifies IBM XIV Storage Systems.</p> <p>On the console, any notifications that refer to this value are displayed as COPYSERVICES_HARDWARE_TYPE=GENERIC. Similarly, when you view the log or trace files in the ACS_DIR/logs directory, any references that are related to this value are displayed as COPYSERVICES_HARDWARE_TYPE=GENERIC.</p> <p><b>NAS_NSERIES</b> When you use the <b>NAS_NSERIES</b> option, the datastore is on network-attached IBM System Storage N series and NetApp storage systems.</p> <p><b>SAN_NSERIES</b> When you use the <b>SAN_NSERIES</b> option, the datastore is on SAN-attached IBM System Storage N series and NetApp storage systems.</p>	None	No

Table 11. Tivoli Storage FlashCopy Manager for VMware profile parameters - *DEVICE\_CLASS* section (continued)

Device	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000 IBM XIV Storage Systems IBM System Storage N series NetApp storage systems	<b>COPYSERVICES_SERVERNAME</b>	This parameter identifies the TCP/IP host name of the storage system where the data to protect is located.	None	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>COPYSERVICES_PRIMARY_SERVERNAME</b>	This parameter defines the TCP/IP address of the host that is running the CIM agent for the DS Open API. The host manages the primary and secondary copy services servers of the IBM System Storage DS8000 cluster, the SAN Volume Controller master console, or the embedded CIM agent. For SAN Volume Controller, the <b>COPYSERVICES_PRIMARY_SERVERNAME</b> parameter, must point to the SAN Volume Controller cluster with the embedded CIM server. Specify the server name or TCP/IP address.	localhost	No
IBM System Storage DS8000	<b>COPYSERVICES_SECONDARY_SERVERNAME</b>	This parameter specifies the name of the backup copy services server that is located within a snapshot devices cluster. You can specify either the IP address or the DNS name of the server. This parameter is used only for IBM System Storage DS8000 in combination with the proxy CIM agent.	None	Yes
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000 IBM XIV Storage Systems IBM System Storage N series NetApp storage systems	<b>COPYSERVICES_USERNAME</b>	This parameter specifies the user name.  <i>cim user</i> CIM agent for DS Open API, which can manage the primary and secondary copy services servers of the IBM System Storage DS8000 cluster.  <i>svc user</i> SAN Volume Controller master console or cluster.  <i>XIV user</i> The user name to log in to the XIV Storage Systems.  <i>user</i> For IBM System Storage N series and NetApp storage systems, this option identifies the user name. This name is used when you log on to the IBM System Storage N series and NetApp storage systems.	superuser	No
IBM XIV Storage Systems	<b>PATH_TO_XCLI</b>	This parameter specifies the path where the XIV Storage Systems command-line interface, XCLI, is installed. This parameter is only valid when the <b>COPYSERVICES_HARDWARE_TYPE</b> parameter is specified with a value of <i>XIV</i> .	None	No



Table 11. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE\_CLASS section (continued)

Device	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>COPYSERVICES_SERVERPORT</b>	This parameter specifies the port number on the host that is running the CIM agent for DS Open API. This port can manage the primary and secondary copy services servers of the IBM System Storage DS8000 cluster, the SAN Volume Controller master console, or embedded CIM agent).	See Note 1.	Yes
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>COPYSERVICES_TIMEOUT</b>	This parameter specifies the maximum length of time, in minutes that the CIM Client waits for the response to a call issued to the CIMOM, the CIM Agent. If the CIM Client does not receive a response within the specified time, an error message is issued.	6	Yes
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>COPYSERVICES_COMMPROTOCOL</b>	This parameter specifies the protocol to be used for communication with the CIM agent. Specify one of the following values:  <b>HTTP</b> Communication in unsecure mode  <b>HTTPS</b> Communication in secure mode	HTTPS	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>COPYSERVICES_CERTIFICATEFILE</b>	See Note 2.	No certificate	Yes
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>FLASHCOPY_TYPE</b>	This parameter specifies whether the storage system does a bit-level copy of data from one logical volume to another.  <b>COPY</b> Directs the storage system to perform a bit-level copy of the data from one physical volume to another. Specify this value when the following conditions are true: <ul style="list-style-type: none"> <li>You intend to do a fast snapshot restore of a backup.</li> <li>A copy of the data on the target volume is available.</li> </ul> <b>INCR</b> Copies those tracks that were modified since the previous incremental FlashCopy was created.  <b>NOCOPY</b> Directs the storage system to perform a bit-level copy of a track if the data is modified after the FlashCopy request. See Note 3.	COPY	No

Table 11. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE\_CLASS section (continued)

Device	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>TARGET_SETS</b>	This parameter specifies the target volumes to be used in the FlashCopy operation by using one of the following values: <ul style="list-style-type: none"> <li>VOLUMES_FILE</li> <li><i>list of target set names</i> (only SAN Volume Controller and Storwize V7000) <ul style="list-style-type: none"> <li>TARGET_NAMING <i>string with wildcards</i> %SOURCE and %TARGETSET</li> </ul> </li> </ul> <p>See Note 4 and “Tivoli Storage FlashCopy Manager for VMware target set definitions” on page 37.</p>	None	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>VOLUMES_FILE</b>	Specify the name of the target volumes file (.fct).  See “Tivoli Storage FlashCopy Manager for VMware target set definitions” on page 37. You must specify this parameter if TARGET_SETS is set to VOLUMES_FILE.	None	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>TARGET_NAMING &lt;string with wildcards %SOURCE and %TARGETSET&gt;</b>	Specify the naming convention for target volumes.  Whenever a backup volume is required, Tivoli Storage FlashCopy Manager for VMware identifies the name of the target set for the current operation and the name of the source volume to back up.  The name of the target volume that stores the backup is the name that is specified after the strings %SOURCE and %TARGETSET are replaced with the respective values in the current operation. You must specify this parameter if <b>TARGET_SETS</b> is set to <i>list of target set names</i> .	None	No
IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>SVC_COPY_RATE</b>	This parameter specifies the priority that the SAN Volume Controller gives to the FlashCopy background process for the current backup or restore operation. Enter a value of 0 - 100.  See Note 5.	50	No
IBM System Storage SAN Volume Controller IBM Storwize v7000	<b>SVC_CLEAN_RATE</b>	Specify the cleaning rate for the FlashCopy mapping. Enter a value from 1 to 100.	50	Yes
IBM XIV Storage Systems	<b>USE_WRITABLE_SNAPSHOTS</b>	YES NO AUTO  Specify whether writable snapshots are used. The AUTO setting automatically selects the value that is based on your environment.	AUTO	Yes

Table 11. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE\_CLASS section (continued)

Device	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000	<b>RECON_INTERVAL</b>	Specify the reconciliation interval in hours.	12 hours	Yes
IBM System Storage SAN Volume Controller				
IBM Storwize v7000				
IBM XIV Storage Systems				
IBM System Storage N series				
NetApp storage systems				

## COPYSERVICES\_SERVERPORT

### Note: 1

The default port number depends on the settings of the COPYSERVICES\_HARDWARE\_TYPE and COPYSERVICES\_COMMPROTOCOL parameters:

COPYSERVICES_HARDWARE_TYPE	COPYSERVICES_COMMPROTOCOL	Default Port
IBM System Storage DS8000	HTTPS	5989
	HTTP	5988
DS8000 embedded CIM agent	HTTPS	6989
	HTTP	5988
SAN Volume Controller	HTTPS	5989
	HTTP	5988
Storwize V7000	HTTPS	5989
	HTTP	5988

## COPYSERVICES\_CERTIFICATEFILE

### Note: 2

If COPYSERVICES\_COMMPROTOCOL parameter is set, or defaults, to HTTPS the following parameters are required:

#### *certificate file name*

The name of a certificate file that was created for secure communication between the CIM Client and the CIM Agent.

#### **NO\_CERTIFICATE**

Select null trust provider mode.

By default, the CIM Agent for DS8000, which is preinstalled on the HMC, requires communication in secure mode. In this case, clients such as Tivoli Storage FlashCopy Manager for VMware must connect with HTTPS instead of HTTP. This requires that the CIM Client must first obtain the public key that is used for encryption from the 'truststore' certificate in the CIM Agent. Then, the CIM Client must authenticate by using the user name and password.

To enable the HTTPS protocol, the Tivoli Storage FlashCopy Manager for VMware profile parameter COPYSERVICES\_COMMPROTOCOL must specify HTTPS

(default value). In this case, parameter `COPYSERVICES_CERTIFICATEFILE` can define a *certificate file name*, and Tivoli Storage FlashCopy Manager for VMware exports the certificate by using this file.

The CIM Agent also provides another communication mode that is known as *null trust provider*. In this case, the CIM Agent does not verify that the certificate passed by the client matches a known certificate. It accepts any certificate from the client, including a null string for the file name. To enable this mode, the value of `COPYSERVICES_CERTIFICATEFILE` must be `NO_CERTIFICATE`. This mode is recommended only if the production and backup systems, and the storage system, are protected by a firewall. If `NO_CERTIFICATE` is in effect, the `cimom.properties` parameter `DigestAuthentication` must be set to 'false'.

## FLASHCOPY TYPE

**Note:** 3

- This parameter applies to all snapshot devices, except the XIV system. The values `INCR` and `NOCOPY` apply only to FlashCopy devices.
- `COPY`, `INCR`, or `NOCOPY` is needed if you plan to run a snapshot restore when using SAN Volume Controller 5.1 or later or Storwize V7000,
- Specify `INCR` if you want Tivoli Storage Manager to back up data from disk copies. Specify `INCR` when you intend to schedule frequent backups of your datastore. In a System Storage DS8000 environment, you can specify only one target set in the target volumes file for incremental snapshots. CIM errors might occur when more than one target set is specified.
- Specify `NOCOPY` when the following conditions are true:
  - A complete copy of the source volumes, which contains the datastore, to the target volumes is not needed.
  - Backup time constraints are a concern

You can back up VMs from a datastore to Tivoli Storage Manager server even if the parameter is set to `NOCOPY`. For SAN Volume Controller or Storwize V7000, the `SVC_COPY_RATE` parameter is set to 0 when you specify the `FLASHCOPY_TYPE` parameter as `NOCOPY` or `INCR`.

## TARGET\_SETS

**Note:** 4

Specify the target volumes to be used in the FlashCopy operation by using one of these values:

### VOLUMES\_FILE

Specify the name of the target volumes file.

**list of target set names for SAN Volume Controller and Storwize V7000 only**

Specify a list of target set names, for example `TARGET_SETS 1 2 3`. To define the naming convention for the target volumes, specify the `TARGET_NAMING` parameter.

### TARGET\_NAMING <string with wildcards %SOURCE and %TARGETSET>

Defines the naming convention for target volumes. Whenever a backup volume is required at backup time, Tivoli Storage FlashCopy Manager for VMware has already determined the name of the target set for the current operation and the name of the source volume to be backed up. The name

of the target volume storing the backup is the name specified after the strings %SOURCE and %TARGETSET are replaced with the respective values in the current operation.

## SVC\_COPY\_RATE

**Note:** 5

The parameter value represents a priority in the range 0 - 100. The responsiveness of the storage system is greatest when SVC\_COPY\_RATE is 100. A value of 0 suppresses the background copy process and forces the FLASHCOPY\_TYPE parameter to be set to NOCOPY.

If Tivoli Storage FlashCopy Manager for VMware is installed, you can change the copy rate for an active FlashCopy operation dynamically with the `fccli -f modify_copyrate` function.

---

## Tivoli Storage FlashCopy Manager for VMware password file

Tivoli Storage FlashCopy Manager for VMware requires a password file to access the storage subsystem where the volumes are stored. The password file also contains the VMware vCenter credentials.

### About this task

This password file also contains a *master password*, which is required by the Management Agent to authenticate the Offload Agent.

A password file can be created during the initial setup of Tivoli Storage FlashCopy Manager for VMware using the setup script, which also updates `/etc/inittab` appropriately. The password file is stored as

```
ACS_DIR/shared/pwd.acsd
```

where `ACS_DIR` is the value of the `ACS_DIR` parameter in the profile.

---

## Tivoli Storage FlashCopy Manager for VMware target volumes file

The target volumes file, `.fct`, identifies the target volumes to be used for a Tivoli Storage FlashCopy Manager for VMware backup.

During a Tivoli Storage FlashCopy Manager for VMware backup on DS8000, SAN Volume Controller, or Storwize V7000 a set of target volumes, the target set, are required for each set of source volumes that are to be copied. Several target sets can be defined for use in different FlashCopy backups. The volumes in each target set that are used in a backup must be specified in a similar way in a separate target set topic. These target sets are specified in a target volumes file, the `.fct` file. The target set section name begins with the prefix `TARGET_SET`. If `VOLUMES_FILE` is used, append it with a target set name. Appending the target set name differentiates the various target set sections. The target set name can be any alphanumeric value. The target set definitions are not required on the XIV system.

In each topic section in the target volumes file, use one `TARGET_VOLUME` parameter for each target volume to be used in the target set, as shown in the following example:

```

>>> TARGET_SET 1
TARGET_VOLUME ...
.
.
TARGET_VOLUME ...
<<<

```

To specify multiple target sets in the target volumes file, add the next target set section with a unique target set ID as shown in this example:

```

>>> TARGET_SET 2
TARGET_VOLUME ...
.
.
TARGET_VOLUME ...
<<<

```

Comments are permitted before the first target set section only and are indicated by a "#" character in the first column of each line. Tab characters are permitted.

When VOLUMES\_FILE is specified in the profile, the target volumes file can have any file name and does not conform to any naming convention.

## Managing target volumes by storage system

Different methods of target volume mapping are available based on the available storage system as shown in the following table:

Table 12. Managing target volume LUNs by storage system

DS8000	SAN Volume Controller or Storwize V7000	XIV system	IBM System Storage N series or NetApp
Manual target LUN creation using the target volumes file (.fct) with the VOLUMES_FILE.	Manual target LUN creation using the target volumes file (.fct) with the VOLUMES_FILE.  or  Naming convention using the TARGET_NAMING parameter	Automatic target LUN creation without using the target volumes file (.fct)	Automatic target LUN creation without using the target volumes file (.fct)

On DS8000 and SAN Volume Controller or Storwize V7000 storage systems, use the TARGET\_SETS parameter to specify the target volumes file (VOLUMES\_FILE). The VOLUMES\_FILE can be used to share a target volume file between multiple device classes by restricting a target set to a specific DEVICE\_CLASS.

To further simplify target mapping on SAN Volume Controller, a naming convention can be specified for the target volumes when using the TARGET\_NAMING parameter. This enables Tivoli Storage FlashCopy Manager for VMware to map source volumes to suitable target volumes without requiring the storage administrator to manually list all targets in the target volumes file.

Tivoli Storage FlashCopy Manager for VMware uses the following criteria to associate a target volume to a source volume:

- The source volume and target volume must be located in the same storage system.
- The source volume and target volume must have the same size.

Tivoli Storage FlashCopy Manager for VMware selects a target volume to be validated as a suitable target volume for the given source volume depending on the value of the parameter TARGET\_SETS:

- SAN Volume Controller or Storwize V7000 only: The TARGET\_NAMING parameter naming convention specified:

The following sample explains the usage of the naming convention specified by the TARGET\_SETS and TARGET\_NAMING parameters:

- Assuming the source volumes are named A01pro\_1 and A01pro\_2
- Assuming the TARGET\_SETS profile parameter has a value of 1
- Assuming the TARGET\_NAMING parameter value as %SOURCE\_t  
%TARGETSET

Using this target naming definition, the source volume A01pro\_1, with target set named 1, results in target volume A01pro\_1\_t1, and source volume A01pro\_2 results in the target volume A01pro\_2\_t1.

- VOLUMES\_FILE:

A target volumes file, .fct, must be specified.

As a minimum, a list of target volumes must be specified in the target volumes file. The source volumes and the size are both optional. If no source is specified, then Tivoli Storage FlashCopy Manager for VMware first checks for each of the specified target volumes, if a FlashCopy relation exists between these target volumes and one of the source volumes. If a FlashCopy relation exists, it is reused for the next FlashCopy backup. If no FlashCopy relation exists to one of the source volumes, a new relation between one source volume and this target is created with the next FlashCopy backup. In the latter case, the created source-target pairs are unpredictable because they depend on the order of the target volumes listed in the target volumes file and also on the order of the source volumes as they occur in the operating system.

If you want predefined source-target pairs, you must either specify the dedicated source volume for each of the target volumes in the target volumes file, or all FlashCopy relations must already exist in the storage system before the start of the FlashCopy backup.

This example shows the syntax of target volumes files specified by the VOLUMES\_FILE parameter:

```
>>> TARGET_SET <target set name>
DEVICE_CLASS <device class name> # this parameter is optional and allows to
                                # restrict the use of this target set to a
                                # specific device class
TARGET_VOLUME <target> [<source>] [<size>]
[...]
```

```
<<<
[...]
```

To further simplify target mapping on SAN Volume Controller, the TARGET\_SETS parameter allows a naming convention to be specified for your target volumes. This enables Tivoli Storage FlashCopy Manager for VMware to map source volumes to suitable target volumes without requiring the storage administrator to manually list all targets in the target volumes file.

**Related reference:**

Chapter 8, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 81

## Target volume parameter settings for a DS8000 configuration

Each target volume planned for use must be specified by its serial number.

A snapshot backup operation looks for a source volume and a target volume correlation, or a target-volume-only specification.

Table 13. Parameters of the 'VOLUMES\_SET\_X' Topic (DS8000)

Parameter Name	Value
TARGET_VOLUME <target volume serial number> <source volume serial number> <source volume size>	<p>A target set definition file contains a list of target volumes that are organized into target sets. Tivoli Storage FlashCopy Manager for VMware attempts to match source volumes to suitable targets within a target set during backup. To determine source target relations in advance, specify a source serial number with a target serial number in the target set definition file. In this situation, the relation between the source and target is required and backup processing fails if one of the targets is unavailable for the specified source.</p> <p>This example shows a configuration where the DS8000 source volume with serial 75924811011 must be used in a FlashCopy with the target volume with serial number 75924811001.</p> <pre>TARGET_VOLUME 75924811001 75924811011 Size=2.0_GB</pre> <p>The source serial number and the size can be omitted completely or dashes can be entered in both fields as placeholders, as shown in the following example:</p> <pre>TARGET_VOLUME 75924811001 - -</pre> <p>The dashes will be ignored. Note the target volume requirements for a FlashCopy:</p> <ul style="list-style-type: none"> <li>• The size must be the same as that of the source volume</li> <li>• The source and target volumes that are listed in one TARGET_SET must be in the same storage subsystem</li> </ul> <p><b>Note:</b> Do not change the order of the parameters. The order is, target volume serial number, source volume serial number, size of source volume.</p> <p>See “Managing target volumes by storage system” on page 96 for detailed information about the criteria that are used to associate a target volume to a source volume.</p>

The FLASHCOPY\_TYPE parameter is only valid for DS8000 and SAN Volume Controller or Storwize V7000. You must use the VMCLI delete command with the force option if you need to make any of the following changes:

- Change the FLASHCOPY\_TYPE value of an existing target set.
- Remove a target volume from an existing target set.



- Remove a complete target set.

This command is described in the “VMCLI delete” on page 111 section of *Tivoli Storage FlashCopy Manager for VMware command-line interface*.

## Target volume parameter settings for SAN Volume Controller and Storwize V7000 configuration.

Each target volume that is planned for use must be specified by its virtual disk name.

A snapshot backup operation looks for a source volume and target volume correlation, or a target-volume-only specification.

Table 14. Parameters of the 'VOLUMES\_SET\_X' SAN Volume Controller and Storwize V7000

Parameter Name	Value
TARGET_VOLUME <target volume virtual disk name> <source volume virtual disk name> <source volume size>	<p>A target set definition file contains a list of target volumes that are organized into target sets. Tivoli Storage FlashCopy Manager for VMware attempts to match source volumes to suitable targets within a target set during backup. To determine source target relations in advance, specify a source virtual disk name with a target virtual disk name in the target set definition file. In this situation, the relation between the source and target is required. Backup processing fails if one of the targets is unavailable for the specified source.</p> <p>This example shows a configuration where the SAN Volume Controller source volume with virtual disk name svdfsrc4 is used in a FlashCopy with the target volume with virtual disk name svdftgt4.</p> <pre>TARGET_VOLUME svdftgt4 svdfsrc4 Size=2.0_GB</pre> <p>The source virtual disk name and size can be omitted completely or dashes can be entered in both fields as placeholders, as shown in the following example:</p> <pre>TARGET_VOLUME svdftgt4 - -</pre> <p>The dashes are ignored. A FlashCopy has the following target volume requirements:</p> <ul style="list-style-type: none"> <li>• The size must be the same as the source volume size</li> <li>• The source and target volumes that are listed in one TARGET_SET must be in the same SAN Volume Controller cluster.</li> </ul> <p><b>Note:</b> Do not change the order of the parameters. The order is target volume name, source volume name, size of source volume.</p> <p>See “Managing target volumes by storage system” on page 96 for detailed information about the criteria that are used to associate a target volume to a source volume.</p>

The FLASHCOPY\_TYPE parameter is only valid for DS8000, SAN Volume Controller and Storwize V7000. The following changes require you to use the **VMCLI delete** command with the force option:

- Change the FLASHCOPY\_TYPE parameter value of an existing target set.
- Remove a target volume from an existing target set.
- Remove a complete target set.

This command is described in the “VMCLI delete” on page 111 section of “Tivoli Storage FlashCopy Manager for VMware command-line interface”.

**Note:** SAN Volume Controller 5.1 (or later) and Storwize V7000: Tivoli Storage FlashCopy Manager for VMware allows the deletion of FlashCopy mappings only that are not dependent on other FlashCopy mappings. As a result, only the source and target FlashCopy mappings of the oldest backup can be deleted. If multiple backup generations are used and you want to delete a backup that is not the oldest, the background operation that actually deletes the mappings is delayed. The deletion does not occur until all older backups are also deleted or are reused by a new backup request.

The following example is a typical cascaded FlashCopy mapping:

S->T4->T3->T2->T1

S = Source volume

T1-T4 = Snapshots taken at t1, t2, t3, t4 where T1 is the oldest,  
T4 the most recent snapshot

T1 depends on T2,T3,T4,S

T2 depends on T3,T4,S

and so on...

Following the path from S to T1 is called "downstream"; the opposite direction is called "upstream".

**Example: T2 is overwritten by a new backup**

All downstream snapshot mappings are stopped: T1

---

## Chapter 9. Integrating Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments

Tivoli Storage FlashCopy Manager for VMware can be integrated with the Tivoli Storage Manager for Virtual Environments to offload VMware image hardware snapshot backups on Tivoli Storage Manager server storage.

### Backup overview

IBM Tivoli Storage FlashCopy Manager snapshot backup versions of virtual machines are stored as hardware snapshots for most recovery scenarios. This scenario is the standard backup feature of Tivoli Storage FlashCopy Manager for VMware. However, when Tivoli Storage Manager for Virtual Environments is installed, snapshot backup versions of virtual machines can also be sent to Tivoli Storage Manager for long-term retention. This archive capability can be integrated with various disaster recovery strategies. When a backup of a virtual machine is sent to Tivoli Storage Manager, the actual data movement is performed by a data mover node. This movement minimizes the impact on resources available to the virtual machines in the vCenter. In addition, multiple data mover nodes can be used so that the Tivoli Storage Manager backup workload can be distributed. You can also schedule backup operations to a Tivoli Storage Manager server.

When you monitor this task, from the Tivoli Storage FlashCopy Manager for VMware GUI the status shows when the Tivoli Storage FlashCopy Manager snapshot backup is complete. After this task is completed, the movement of the snapshot to Tivoli Storage Manager occurs asynchronously. This task occurs a few minutes after the Tivoli Storage FlashCopy Manager for VMware snapshot is finished. The following tasks are initiated when snapshots are sent to Tivoli Storage Manager:

- Attach the datastores and register the VMs to send to the auxiliary ESX host.
- Run the backup.
- Unregister the VMs and detach the datastores.

### Restore overview

When snapshot backup versions of virtual machines are available, they can be restored from Tivoli Storage FlashCopy Manager storage or from Tivoli Storage Manager storage. The following restore destinations are available:

- The original location
- The same datastore but to a new virtual machine with a new name
- A different datastore by using the same virtual machine name
- A different datastore to a new virtual machine with a new name

### Components

Tivoli Storage FlashCopy Manager for VMware uses the following components with Tivoli Storage Manager for Virtual Environments:

#### **Tivoli Storage FlashCopy Manager for VMware GUI**

The GUI is integrated with the VMware vSphere Client.

There are two methods to access this GUI:

- A plug-in that integrates with the VMware vSphere Client. This plug-in is accessed as a vCenter Client extension in the **Solutions and Applications** panel of the vSphere windows client or the **Classic Solutions** panel in the vSphere Web Client.
- A stand-alone web browser GUI. This GUI is accessed through a URL bookmark to the GUI web server. For example:  
<https://guihost.mycompany.com:9081/TsmVMwareUI/>

**Note:** The port number to access the GUI web server is specified during the installation.

Use this GUI as the primary interface from which to complete these Tivoli Storage Manager for Virtual Environments tasks:

- Initiate a backup of your virtual machines to a Tivoli Storage Manager server, or schedule a backup for a later time
- Initiate a full recovery of your virtual machines from a Tivoli Storage Manager server
- Issue reports concerning backup, restore, and configuration activity

#### **Data Protection for VMware command-line interface**

This component provides specific parameters for Tivoli Storage Manager for Virtual Environments to complete these tasks:

- Initiate a backup of your virtual machines to a Tivoli Storage Manager server, or schedule a backup for a later time
- View configuration information about the backup database and environment.
- Initiate a full recovery of your virtual machines, virtual machine files, or virtual machine Disks from a Tivoli Storage Manager server.

The Tivoli Storage FlashCopy Manager for VMware GUI is the primary interface to use for Tivoli Storage Manager for Virtual Environments tasks, the Data Protection for VMware command-line interface provides a useful secondary interface. For example, the Data Protection for VMware command-line interface can be used to implement a scheduling mechanism that is different from the one implemented by the Tivoli Storage FlashCopy Manager for VMware GUI. Also, the Data Protection for VMware command-line interface is useful when you are evaluating automation results with scripts.

See the *IBM Tivoli Storage Manager for Virtual Environments Installation and User's Guide* for more information about integrating Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments.

## **Requirements**

See the following web page to view the hardware and software applications that are required by Tivoli Storage FlashCopy Manager for VMware:  
<http://www.ibm.com/support/docview.wss?uid=swg21427692>.

If you want to offload a virtual machine template to IBM Tivoli Storage Manager, the option **VMENABLETEMPLATEBACKUPS** must be enabled (**VMENABLETEMPLATEBACKUPS** Yes) on the data mover node. The **VMENABLETEMPLATEBACKUPS** option specifies whether the client backs up VMware template virtual machines when it protects virtual machines in a vCenter server. Depending on the operating system, this option is set in the `dsm.opt` or `dsm.sys` options file.

---

## Appendix A. The Data Protection for VMware command-line interface

You can use the Data Protection for VMware command-line interface to back up and restore virtual machines. You can also use the command line to delete backups or backup schedules and view configuration information.

The Data Protection for VMware command-line interface maintains a common front end for Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments. This command-line interface can correlate the backups that are created by the two products and two or more backup runs can become one “logical” backup. The Data Protection for VMware command-line interface also include a simple backup scheduler. Using this scheduler, you can configure recurring backup tasks. The Data Protection for VMware command-line interface can also be used for custom scripting or specialized external schedulers.

The Data Protection for VMware command-line interface provides the following commands:

- “VMCLI attach” on page 104
- “VMCLI backup” on page 105
- “VMCLI delete” on page 111
- “VMCLI detach” on page 112
- “VMCLI inquire” on page 113
- “VMCLI inquire\_config” on page 118
- “VMCLI inquire\_detail” on page 120
- “VMCLI restore” on page 123
- “VMCLI set\_domain” on page 124
- “VMCLI tape\_backup” on page 125
- “VMCLI used\_capacity” on page 126
- “VMCLI db\_backup” on page 126
- “VMCLI db\_restore” on page 127
- “VMCLI db\_inquire” on page 127
- “VMCLI db\_compact” on page 127

### Command output

The Data Protection for VMware command-line interface sends its output to the stdout and errors to the stderr stream. The output contains messages that start with a “#” sign, followed by a message tag identifier and some additional text. All output is read line by line. Lines that do not start with a “#” are considered a multiple line message and belong to the last received tag identifier. Return codes are displayed at the end of the command-line output. Code 0 indicates that the command completed all operations successfully, 1 indicates that the command completed with at least one warning message. Investigate these warning messages to prevent issues later on. Code 2 indicates that the operation cannot be completed because an error occurred during the command execution. Alternatively, issue the following command to retrieve the return code:

## On Linux systems

echo \$?

You can also use these commands in a shell script to evaluate the return code. The output of each command is explained in the following command sections.

---

## VMCLI attach

You can use this command to attach a backup on an ESX host to a target virtual machine, to enable a single file or disk restore.

### Syntax

The `vmcli -f attach` command uses the following syntax:

```
vmcli -f attach -B backupID [-H esxHost] -I attachObjectListFile
```

### Parameters

**-B** *backupID*

Specifies the ID of the backup to be attached.

**-H** *esxHost*

Specifies the ESX host where the datastore in the selected backup is attached. If `-H` parameter is not specified, the value of the `AUXILIARY_ESX_HOST` profile parameter in the profile is used.

**-I** *attachObjectListFile*

Specifies the file that contains the list of disks in the backup to attach to the VM. The *attachObjectListFile* has the following requirements:

- The file contains one VM identifier per line, optionally specifying an alternative target VM.
- All the disks in a backup can be attached to an existing VM that is specified after the `::` symbol.
- If no disks are specified, all the backup disks are attached to the specified VM.
- The specified disks in the backup are attached to the target VM and added to the VM configuration.

The following example shows a sample *attachObjectListFile*:

```
# vminstanceuuid:sourceVmInstanceUuid[:vminstanceuuid:targetVmInstanceUuid]
# [diskkey:key1,key2,...]

# attach all backed-up virtual disks of vm2InstanceUuid to the (same)
# source VM
vminstanceuuid:vm2InstanceUuid::vminstanceuuid:vm2InstanceUuid

# attach all backed-up virtual disks of vm3InstanceUuid to vm4InstanceUuid
vminstanceuuid:vm3InstanceUuid::vminstanceuuid:vm4InstanceUuid

# attach the disks with the specified keys of vm3InstanceUuid to vm4InstanceUuid
vminstanceuuid:vm3InstanceUuid::vminstanceuuid:vm4InstanceUi diskkey:2000,2001

# register the complete VM vm4InstanceUuid
vminstanceuuid:vm4InstanceUuid
```

### Output

```
#TASK taskId attach task create date in format yyyyMMddHHmmssS
#PARAM OBJECT=vminstanceuuid:vminstanceuuid of a vm
#PARAM OBJECT=vminstanceuuid:vminstanceuuid of a vm#LANG country-code (en-US,de-DE)
```

```

#PARAM BACKUP_ID=backupID
#RUN 129 20110830230817768
#LANG en_US#PARAM
#PARAM BACKEND=FCM
#PARAM Version: 3.2.0.0 Build: 527
#PARAM AUXILIARY_ESX_HOST=esxHost
#PARAM BACKUP_ID=backupID
#PHASE_COUNT 1
#PARAM OBJECT=vminstanceuuid:vminstanceuuid
#PARAM OBJECT=vminstanceuuid:vminstanceuuid
#PHASE MOUNT
#PARAM COPYSERVICES_HARDWARE_TYPE=SVC
#PARAM FLASHCOPYTYPE=INCR
#PARAM DSURLS=oldDsUrl1 newDsUrl1
#CHILD sourcedatacenter:dataCenterName
#PARENT vmuuid:vmUuid
#CHILD sourceesxhost:esxHostName
#PARENT vmuuid:vmUuid
#CHILD vminstanceuuid:vmInstUuid
#PARENT vmuuid:vmUuid
#CHILD attachedvmname:vmName
#PARENT vmuuid:vmUuid
#CHILD sourcedatacenter:dataCenterName
#PARENT vmuuid:vmUuid
#CHILD sourceesxhost:esxHostName
#PARENT vmuuid:vmUuid
#CHILD vminstanceuuid:5vmInstUuid
#PARENT vmuuid:vmUuid
#CHILD attachedvmname:attachedvmname
#PARENT vmuuid:vmUuid
#PARAM STATUS=runStatus
#END RUN runID endRunDate
#END TASK taskID
#END

```

---

## VMCLI backup

You can use this command to run or schedule a backup task of your virtual machines.

### Syntax

The `vmcli -f backup` command uses the following syntax:

#### vmcli command

```

▶▶ vmcli -f backup -t backup_type -I backupObjectListFile
, backup_type
-D deviceClass -H esxHost
--vmbackupmode SNAPSHOT_INCL_MEM|SNAPSHOT_EXCL_MEM|SUSPEND|ASIS
--start scheduleStartDateTime --interval intervalSeconds
--end scheduleEndDateTime --priority 1-5 --name taskName

```

## Parameters

### **-t** *backupType*

Specify the type of backup from the following types:

**FCM** Specifies a Tivoli Storage FlashCopy Manager for VMware snapshot backup only. This snapshot backup is not used as a source for a subsequent tape backup operation.

### **FCM\_TSM\_YES**

Creates a Tivoli Storage Manager for Virtual Environments backup from a Tivoli Storage FlashCopy Manager for VMware snapshot. The target set can be reused if the Tivoli Storage FlashCopy Manager for VMware backup operation does not complete successfully.

### **FCM\_TSM\_LATEST**

Creates a Tivoli Storage Manager for Virtual Environments backup from a Tivoli Storage FlashCopy Manager for VMware snapshot. If the offloaded backup to Tivoli Storage Manager either did not start or fails, any new snapshot backup with this option removes the previous backup request to Tivoli Storage FlashCopy Manager for VMware.

**TSM** Creates a Tivoli Storage Manager for Virtual Environments backup.

When this option is selected, then by default TSM\_INCR is also selected.

### **TSM\_INCR**

Creates an incremental Tivoli Storage Manager for Virtual Environments backup by using the incremental option available with VMware.

### **TSM\_FULL**

Creates a full image Tivoli Storage Manager for Virtual Environments backup.

### **TSM\_IFFULL**

Creates an incremental forever full backup of the specified backup objects. When TSM\_IFFULL is specified, template VMs that are unchanged since the last backup are also included.

### **TSM\_IFINCR**

Creates an incremental forever incremental backup of the specified backup object. This option backs up only the data that has changed since the last backup.

**Note:** To specify a Tivoli Storage FlashCopy Manager for VMware snapshot that includes a subsequent offload to Tivoli Storage Manager, you specify the Tivoli Storage FlashCopy Manager for VMware backup type, followed by the Tivoli Storage Manager backup type. Use a comma to separate the two options, for example: *FCM\_TSM\_YES,TSM*. For a Tivoli Storage FlashCopy Manager for VMware only backup type, use only one option. Similarly, in the case of a Tivoli Storage Manager only backup type, only one option is required.

### **-I** *backupObjectListFile*

Specifies a file that contains a list of objects to back up. The *backupObjectListFile* has the following requirements:



- Each line can contain only one identifier and its value, which is separated by a colon.
- The valid datastore identifiers are the `datastoreurl`, `datastoreurl`, and the datastore name `datastorename`.
- Exclude statements are allowed and begin with an exclamation point `!`. These statements can contain a `vminstanceuuid`, `vmname`, `datastoreurl`, or `datastorename`. Name statements can contain wildcard characters. Wildcard characters `?` and `*` are allowed for the `datastorename` or `vmname`.
- Specify include or exclude statements but not both in the same file. For example, to back up all virtual machines in a datastore and not to include newly added virtual machines in future runs, list each virtual machine to include. To back up all virtual machines in a datastore and to include newly added virtual machines in future runs, list each virtual machine to exclude.

**Restriction:** Support for virtual machine backup and restore operations is limited to virtual machine names and data center names that contain English 7-bit ASCII characters only. Virtual machine names and data center names that use other language characters are not supported currently.

The following example shows how to include objects in *backupObjectListFile*:

```
# Lines starting with # and blank lines will be ignored
#
# Wildcards ? and * are supported
# ? - any single character
# * - any character sequence (also empty)
# Wildcards are allowed for datastorename and
# vmname identifier
#
# Include statements are optional
# Includes may comprise datastoreurl and datastorename identifier
#
# Exclude statements are optional
# Exclude statements begin with a "!"
# Excludes may comprise datastorename, datastoreurl,
# vminstanceuuid and vmname identifier
#

#Include datastore with this URL in the backup
datastoreurl:dsUrl
#Include datastore with this name in the backup
datastorename:dsName
#Include datastores matching the wildcard string in the backup datastorename:
datastorename:ds?am*
#Include VM matching this instance uuid in the backup. Fails if it is not
#found within the included datastores which additionally need to be specified
#in the infile when this option is used
vminstanceuuid:vmInstanceUuid
```

Comments are allowed and must be marked with a '#' sign at the beginning of the line.

The following example shows how to exclude objects in *backupObjectListFile*:

```
# Lines starting with # and blank lines will be ignored
#
# Wildcards ? and * are supported
# ? - any single character
# * - any character sequence (also empty)
# Wildcards are allowed for datastorename and
# vmname identifier
#
# Include statements are optional
# Includes may comprise datastoreurl and datastorename identifier
```

```

#
# Exclude statements are optional
# Exclude statements begin with a "!"
# Excludes may comprise datastorename, datastoreurl,
# vminstanceuuid and vmname identifier
#

#Exclude VM with this uuid from the backup
!vminstanceuuid:vmUuid
#Exclude VM with this name from the backup (needs to be unique)
!vmname:vmName
#Exclude all vms matching this wildcard string from the backup
!vmname:vmN*
#Exclude datastore with this URL from the backup
!datastoreurl:dsUrl
#Exclude all datastores matching this wildcard string from the backup
!datastorename:ds?am*

```

Comments are allowed and must be marked with a '#' sign at the beginning of the line.

**-D *deviceClass***

Specifies the Tivoli Storage FlashCopy Manager for VMware device class to be used in the backup operation. This device class must exist in the profile, otherwise the operation fails. The default is *STANDARD*.

**-H *esxHost***

Specifies the ESX host where the datastores are attached during a subsequent offload backup to Tivoli Storage Manager for Virtual Environments. The default is the value of *AUXILIARY\_ESX\_HOST* in the Tivoli Storage FlashCopy Manager for VMware profile.

**--vmbackupmode *vmsnapType***

Specifies if software snapshots are created for each virtual machine or if the virtual machines are suspended before the hardware snapshot. The default value is the value of the *VM\_BACKUP\_MODE* parameter in the Tivoli Storage FlashCopy Manager for VMware profile.

**--start**

Specifies a date/time when this scheduled backup is started

**--interval *intervalSeconds***

Specifies an interval in seconds after which the backup operation reruns. This parameter is only valid when *--start* is specified.

**--end *scheduleEndDate***

Specifies the end date/time when the scheduled reruns ends. This parameter is only valid when *--start* and *--interval* are specified.

**--priority *1-5***

If two backup tasks are scheduled to run at the same time, the task with a higher priority runs first. The priority is an integer value between 1 (lowest) and 5 (highest) priority.

**--name *taskName***

This string can be used to identify this backup task.

**--description *descriptionInFile***

This parameter specifies a text file which contains some textual description of this backup task.

**--runnow**

If scheduling options are set, this option can be used to start this task immediately.

## Output

```
#TASK taskID taskType dateCreated
#PARAM TASK_NAME=taskName
#PARAM BACKUP_TYPE=backupType[,backupType[,...]]
#PARAM AUXILIARY_ESX_HOST=esxHostname
#PARAM OBJECT=datastoreurl:datastoreurl
#PARAM OBJECT=vminstanceuuid:vminstanceuuid
#PARAM OBJECT=vminstanceuuid:vminstanceuuid
#RUN runID runDate
#LANG country-code (en-US,de-DE)
#PARAM BID=BID
#PARAM CHAIN_NUMBER=CHAIN_NUMBER
#PARAM BACKEND=backendType
#PARAM Version: 3.2.0.0 Build: 527
#PARAM AUXILIARY_ESX_HOST=esxHostname
#PARAM VM_BACKUP_MODE=SNAPSHOT_INCL_MEM|SNAPSHOT_EXCL_MEM|SUSPEND|ASIS
#PARAM DEVICE_CLASS=deviceClass
#PARAM BACKUP_TYPE=backupType
#PARAM BACKUP_ID=backupID
#PHASE_COUNT 4
#PARAM OBJECT=#datastoreurl:datastoreurl
#PARAM OBJECT=datastoreurl:datastoreurl
#PARAM OBJECT=# vmname
#PARAM OBJECT=#vmname:vmname
#PARAM OBJECT=vminstanceuuid:vminstanceuuid
#PARAM OBJECT=#vmname
#PARAM OBJECT=#vminstanceuuid:vminstanceuuid
#PARAM OBJECT=vmname
#PARAM OBJECT=vminstanceuuid:vminstanceuuid
#PARAM OBJECT=#distributedvm...
#PARAM OBJECT=#!vminstanceuuid:5vminstanceuuid
#PARAM OBJECT=#vmname:vmname
#CHILD datacentername:datacentername
#PARENT vmuuid:vmUuid
#CHILD vminstanceuuid:vmInstUuid
#PARENT vmuuid:vmUuid
#CHILD vmname:vmName
#PARENT vmuuid:vmUuid
#CHILD offloadstate:offloadstate
#PARENT vmuuid:vmUuid
#CHILD esxhostname:esxHostName
#PARENT vmuuid:vmUuid
#CHILD datacentername:datacentername
#PARENT vmuuid:vmUuid
#CHILD vminstanceuuid:vmInstUuid
#PARENT vmuuid:vmUuid
#CHILD vmname:vmName
#PARENT vmuuid:vmUuid
#CHILD offloadstate:TAPE_BACKUP_FAILED
#PARENT vmuuid:vmUuid
#CHILD esxhostname:esxHostName
#PARENT vmuuid:vmUuid
#PARAM COPYSERVICE_HARDWARE_TYPE=SVC|XIV|DS8000
#PARAM FLASHCOPYTYPE=COPY|NOCOPY|INCR //This parameter
is only set for storage types DS and XIV
#PHASE PARTITION
#CHILD lunid:lun_id
#PARENT datastoreurl:dsUrl
#CHILD datastorename:datastore_name
#PARENT datastoreurl:dsUrl
#CHILD datastoreurl:dsUrl
#PARENT vmuuid:vmUuid
#CHILD diskkey:key of virtual disk
#PARENT vmuuid:vmUuid
#CHILD disklabel:label of virtual disk
#PARENT diskkey:key of virtual disk
#CHILD disksize:disksize
```

```

#PARENT diskkey:key of virtual disk
#CHILD parentdiskfile:datastore path to vmdk file
#PARENT diskkey:key of virtual disk
#CHILD diskkey:key of virtual disk
#PARENT vmuuid:vmUuid
#CHILD disklabel:label of virtual disk
#PARENT diskkey:key of virtual disk
#CHILD disksize:disksize
#PARENT diskkey:key of virtual disk
#CHILD parentdiskfile:datastore path to vmdk file
#PARENT diskkey:key of virtual disk
#PHASE PREPARE
#PHASE FLASH
#PHASE VERIFY
#PARAM STATUS=runStatus
#END RUN runID endRunDate
#END TASK taskID
#END
#

```

## Rerun a defined backup task

This function is used to rerun a defined backup task against the corresponding backup server. It can be used to run a backup once and to schedule backup tasks.

### Input

```
vmcli -f backup -T taskID --runnow
```

## Change a backup task

This command changes a backup task. It can be used to edit or delete the details of a backup task. The taskID must be specified. The options for this command are the same as the backup function, except -I is an optional parameter. All parameters set for the task can now be overwritten with the new value. When a backup task is changed it is not run immediately. To start the backup task immediately, the --runnow parameter must be included in the command.

### Input

```

vmcli -f backup -T taskID[-t backupType][-I backupObjectListFile]
[-B backupID][-D deviceClass][-H esxHost]
[--vmbackupmode (SNAPSHOT_INCL_MEM|SNAPSHOT_EXCL_MEM|SUSPEND|ASIS)]
[--start scheduleStartDateTime[--interval intervalSeconds]
[--end scheduleEndDateTime]][--priority 1-5]
[--name taskName][--description descriptionInFile.txt][--runnow]

```

### Output

```

#TASK taskID taskType dateCreated
[ #PARAM TASK_NAME=taskName ]
[ #PARAM TASK_DESCRIPTION=text with \n chars
[ #PARAM TASK_SCHEDULE=startDateTime [intervalSeconds [endDateTime]] ]
[ #PARAM TASK_PRIORITY=1-5
[ #PARAM NEXT_DUE_DATE=date/time
[ #PARAM AUXILIARY_ESX_HOST=esxHostname
[ #PARAM VM_BACKUP_MODE=SNAPSHOT_INCL_MEM|SNAPSHOT_EXCL_MEM|SUSPEND|ASIS]
[ #PARAM DEVICE_CLASS=STANDARD|Name ]
[ #PARAM BACKUP_TYPE=[,backupType,[,..]] ]
[ #PARAM DELETE_DATE=date/time // only set if marked for deletion
#PARAM OBJECT=one line from backup object list file
[ #PARAM OBJECT=... ]
...
#END TASK taskID
#END

```

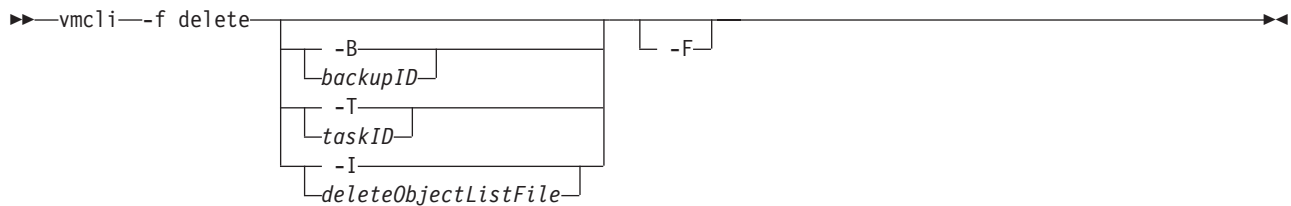
## VMCLI delete

You can use this command to delete a Tivoli Storage FlashCopy Manager for VMware backup or a backup schedule. From the GUI, you can delete a backup schedule but you must use **VMCLI delete** command to delete a Tivoli Storage FlashCopy Manager for VMware backup.

### Syntax

The `vmcli -f delete` command uses the following syntax:

#### vmcli command



This function runs a Tivoli Storage FlashCopy Manager for VMware delete operation. You can use the `-B` and include the `backupID`, or the `-T` and include the `taskID` to specify the backup or the backup schedule. Use the `-I` attribute and include the `deleteObjectListFile` to specify a file and list more than one backup ID or task ID. All the objects that are specified in the file must be backup or task types but not both. The `-F` option forces a delete even if the corresponding task is still running, or if a backup is not completed. The force option also triggers the deletion of the source or target relations in the storage system.

### Parameters

#### **-B** *backupID*

The ID of the backup to be deleted is required.

#### **-T** *taskID*

The taskID of the task to be deleted is required.

#### **-I** *deleteObjectListFile*

Specify the file that contains the list of objects to delete. The `deleteObjectListFile` file has the following requirements:

- Each line must contain one `taskid:taskId` or `backupid:backupId` statement.
- Lines starting with `#` and blank lines are ignored.

An example of the `deleteObjectListFile` file is provided.

```
#objectType:objectIdentifier  
backupid:backup1ID  
backupid:backup54ID  
backupid:backup63ID
```

All the objects specified in the file must be backup or task types but not both.

#### **-F**

This option forces a delete even if the corresponding task is still be running, or if a backup is not complete. The force option also triggers the deletion of the source or target relations in the storage system.

## Output

```
#PHASE_COUNT 1
#PHASE_DELETE
#END
```

---

## VMCLI detach

You can use this command to detach all attached virtual disks in a virtual machine or a backup from the ESX host. The disks were attached to the ESX host with the attach command.

### Syntax

The `vmcli -f detach` command uses the following syntax:

#### vmcli command

```
▶▶ vmcli --f detach [ -t backupType ] [ -B backupID ] [ -F ] [ -I detachObjectListFile ] ▶▶
```

### Parameters

#### -t *backupType*

**FCM** Specifies that the detach operation is run for Tivoli Storage FlashCopy Manager for VMware backups.

#### -B *backupID*

The ID of the backup to be detached.

#### -F

This parameter forces a detach operation even if the corresponding backup task is still running, or if a backup is not completed.

#### -I *detachObjectListFile*

Specify the file that contains the list of objects to detach. The *detachObjectListFile* file has the following requirements:

- Each line can contain only one identifier and its value, separated by a colon.
- Each line needs to contain a `vminstanceuuid:instanceuuid` statement that specifies which source virtual machine contained in the backup is to be detached. All disks of that source virtual machine that are attached will be detached from the target virtual machine or virtual machines.

An example *detachObjectListFile* file is provided here:

```
# Lines starting with # and blank lines will be ignored
#
# Each line need to contain a "vminstanceuuid:<instanceuuid> statement that specifies
which source VM contained in the backup is to be detached.
# That means all disks of that source VM that have been attached are detached from
the according target VM(s).
vminstanceuuid:vm1InstanceUuid
vminstanceuuid:vm2InstanceUuid
```

Comments are allowed and must be marked with a '#' character at the beginning of the line.

After the detach of a virtual machine is complete, if no other virtual machines in the backup are attached, Tivoli Storage FlashCopy Manager for VMware will automatically unmount the datastores for this backup.

## Output

```
#TASK taskID taskType dateCreated
#PARAM BACKUP_ID=backupID
#RUN runID runDate
#LANG country-code (en-US,de-DE)
#PARAM BACKEND=backupType
#PARAM Version: 3.2.0.0 Build: 527
#INFO FMM0005I Start of program at: Tue 30 Aug 2011 11:11:28 PM CEST.
#PARAM BACKUP_ID=backupID
#PHASE_COUNT 1
#PHASE UNMOUNT
#PARAM COPYSERVICES_HARDWARE_TYPE=SVC|XIV|DS8000
#PARAM FLASHCOPYTYPE=COPY|NOCOPY|INCR
#PHASE PARTITION
#PARAM STATUS=runStatus
#END RUN runID endRunDate
#END TASK taskID
#END
```

---

## VMCLI inquire

You can use this command to gather information from the vmcli database.

### Syntax

The vmcli -f inquire command uses the following syntax:

#### vmcli command

```
▶▶ vmcli -f inquire [ -t backupType ] [ --type taskType ]
                    [ -B backupID ] [ -T taskID ] [ --backup_report ] [ -I inputfile ]
                    [ -q vmsingle | --attached | --datastore ] [ --active_tasks ]
                    [ --fromdate timestamp --todate timestamp --by_end_date ] [ --backup_tasks ]
```

### Parameters

#### --type *taskType*

This parameter specifies the type of the task for this inquire command. You can specify one of the following task types for the inquire command.

#### backup

Specifies that the inquire operation shows backup tasks.

**delete** Specifies that the inquire operation shows delete tasks.

#### restore

Specifies that the inquire operation shows restore tasks.

**attach** Specifies that the inquire operation shows attach tasks.

**detach** Specifies that the inquire operation shows detach tasks.

#### -t *backupType*

**FCM** Specifies that the inquire operation is run for Tivoli Storage FlashCopy Manager for VMware backups.

**TSM** Specifies that the inquire operation is run for Tivoli Storage Manager for Virtual Environments backups.

**-B** *backupID*

The ID of the backup for the inquire command.

**-T** *taskID*

The taskID of the task for the inquire command.

**-q** *vmsingle* | *attached* | *datastore*

**vmsingle**

Specifies a query for all the backups of a virtual machine on a datacenter. The virtual machine and the datacenter are specified in the *inputfile* file.

**attached**

Specifies a query for a list of attached virtual machines on a datacenter that is specified in the *inputfile* file.

**datastore**

Specifies a query to list all datastores and active Tivoli Storage FlashCopy Manager for VMware backups available for the datastores.

**-I** *inputfile*

Specify the file that contains the list of objects for the inquire operation.

**--active\_tasks**

Specify all tasks that are in the running state.

**--fromdate** *timestamp*

Specify all tasks from a specified time frame.

**--todate** *timestamp*

Specify all tasks before a specified time frame.

**--by\_end\_date**

Specify all tasks that are completed within the date range that is specified in the from and to dates.

**--backup\_tasks**

Specify all backup tasks.

**--backup\_report**

Specify the status for the latest virtual machine backup.

The following lists the main types of inquire commands:

#### Inquire for task types

```
vmcli -f inquire [-t backupType,[backupType]] [--type taskType,  
[taskType]] | [-B backupID] [--active_tasks] | [--fromdate timestamp  
[--todate timestamp]] | [--backup_tasks]
```

Valid backup types are FCM and TSM. Valid task types are backup, restore, attach, and detach.

- `vmcli -f inquire [-t backupType,[backupType]] [--type taskType,[taskType]] [-B backupID]`

This command shows all tasks and runs associated with a backup specified by *backupID*.



- `vmcli -f inquire [-t backupType, [backupType]] [--type taskType, [--active_tasks]`  
This command shows currently active tasks and runs.
- `vmcli -f inquire [-t backupType, [backupType]] [--backup_tasks]`  
This command shows all backup tasks and their latest runs. Backups that are marked for deletion in the vmcli database are not included.
- `vmcli -f inquire [-t backupType, [backupType]] [--type taskType, [taskType]] [--fromdate timestamp [--todate timestamp]]`  
This command shows all 'runs' that are currently not running. All runs from the last 24 hours are displayed or you can specify a timeframe with the --fromdate and --todate parameters. If no --todate parameter is specified, the current time stamp is used. The syntax of the time stamp is YYMMDDhhmmss. This **inquire** command includes runs that are marked for deletion in the vmcli database.

### Inquire for task

```
vmcli -f inquire [-T taskID]
```

This command displays the task with all its runs.

### Inquire for virtual machines

```
vmcli -f inquire [-t backupType] [[-I inputFile [-q vmsingle|attached]] ]]
```

This command shows only Tivoli Storage FlashCopy Manager for VMware virtual machine backups. For Tivoli Storage Manager for Virtual Environments backups, the `inquire_detail -t TSM` command is used because the data is retrieved directly from the Tivoli Storage Manager for Virtual Environments server. The following three commands query virtual machines backups in a specified datacenter:

1. `vmcli -f inquire -t FCM -I infile`

Query a list of virtual machine backups from a datacenter. The *infile* contains the following information:

```
datacenter:datacentername
```

2. `vmcli -f inquire -t FCM -q vmsingle -I inputfile`

Query all backups for *vmsingle* on *dataCenterName*. The *infile* contains the following information:

```
datacenter:datacentername  
vmname:vmname
```

3. `vmcli -f inquire -t FCM -I inputfile -q attached`

Query a list of attached virtual machines in a specified datacenter. The *inputfile* contains the name of the specified datacenter.

```
datacenter:datacentername
```

### Inquire for status of backup

The following commands query the status of the backup:

- `vmcli -f inquire [--backup_report] [-I inputFile] [--fromdate timestamp [--todate timestamp]]`

This command shows the status of all successful virtual machine backups that started within the specified date range and datacenter. If you do not specify a date, then all backup attempts including those attempts that are unsuccessful are displayed. The *inputFile* contains the following information:

```
datacenter:datacentername
```

- `vmcli -f inquire [--backup_report] [-I inputFile] [--fromdate timestamp [--todate timestamp] [--by_end_date]`

This command shows the status of all completed virtual machine backups that ended within the specified date range and datacenter. The *inputFile* contains the following information:

`datacenter: datacentername`

### Inquire for a listing of datastores and their active Tivoli Storage FlashCopy Manager for VMware backups

The following command shows a list of all datastores:

`vmcli -f inquire -q datastore [-I inputFile]`

The optional *inputFile* contains the following information:

`datacenter: datacentername`

For example, `datacenter:FCM_DC3`.

### Output

The following example shows a typical output that is generated when you use the **vmcli -f inquiry** command to obtain general information about backup operations.

```
#TASK taskID taskType dateCreated in format yyyyMMddHHmmssS
#PARAM BACKUP_TYPE=backupType
#PARAM AUXILIARY_ESX_HOST=esxHost
#PARAM OBJECT=datastoreurl: datastoreurl
#PARAM OBJECT=vminstanceuuid: vminstanceuuid of a VM
#PARAM OBJECT=vminstanceuuid: vminstanceuuid of a VM
#RUN runID runDate in format yyyyMMddHHmmssS
#LANG en_US
#PARAM BID=2
#PARAM CHAIN_NUMBER=2
#PARAM BACKEND=backupType
#PARAM Version: 3.2.0.0 Build: 527
#PARAM AUXILIARY_ESX_HOST=esxHost
#PARAM VM_BACKUP_MODE=vmbackupmode
#PARAM DEVICE_CLASS=deviceClass
#PARAM BACKUP_TYPE=backupType
#PARAM BACKUP_ID=backupID
#PHASE_COUNT 4
#PARAM OBJECT=#datastoreurl: datastoreurl
#PARAM OBJECT=datastoreurl: datastoreurl
#PARAM OBJECT=# vmname
#PARAM OBJECT=#vmname: vmname
#PARAM OBJECT=vminstanceuuid: vminstanceuuid of a VM
#PARAM OBJECT=#vmname
#PARAM OBJECT=#vminstanceuuid: vminstanceuuid of a VM
#PARAM OBJECT=#vmname
#PARAM OBJECT=vminstanceuuid: vminstanceuuid of a VM
#PARAM OBJECT=#distributedvm...
#PARAM OBJECT=#!vminstanceuuid: vminstanceuuid of a VM
#PARAM OBJECT=#vmname: vmname
#CHILD datacentername: datacentername
#PARENT vmuuid: vmuuid
#CHILD vminstanceuuid: vminstanceuuid of a VM
#PARENT vmuuid: vmuuid
#CHILD vmname: vmname
#PARENT vmuuid: vmuuid
#CHILD offloadstate: offloadstate
#PARENT vmuuid: vmuuid
#CHILD esxhostname: esxHost
#PARENT vmuuid: vmuuid
```

```

#CHILD datacentername: datacentername
#PARENT vmuuid: vmuuid
#CHILD vminstanceuuid: vminstanceuuid of a VM
#PARENT vmuuid: vmuuid
#CHILD vmname: vmname
#PARENT vmuuid: vmuuid
#CHILD offloadstate: offloadstate
#PARENT vmuuid: vmuuid
#CHILD esxhostname: esxHost
#PARENT vmuuid: vmuuid
#PARAM COPYSERVICES_HARDWARE_TYPE=SVC
#PARAM FLASHCOPYTYPE=INCR
#PHASE PARTITION
#CHILD lunid: lunid
#PARENT datastoreurl: datastoreurl
#CHILD datastoreurl: datastoreurl
#PARENT vmuuid: vmuuid
#CHILD diskkey: diskkey
#PARENT vmuuid: vmuuid
#CHILD disklabel: disklabel
#PARENT diskkey: diskkey
#CHILD disksize: disksize
#PARENT diskkey: diskkey
#CHILD parentdiskfile: parentdiskfile
#PARENT diskkey: diskkey
#CHILD datastoreurl: datastoreurl
#PARENT vmuuid: vmuuid
#CHILD diskkey: diskkey
#PARENT vmuuid: vmuuid
#CHILD disklabel: disklabel
#PARENT diskkey: diskkey
#CHILD disksize: disksize
#PARENT diskkey: diskkey
#CHILD parentdiskfile: parentdiskfile
#PARENT diskkey: diskkey
#CHILD diskkey: diskkey
#PARENT vmuuid: vmuuid
#CHILD disklabel: disklabel
#PARENT diskkey: diskkey
#CHILD disksize: disksize
#PARENT diskkey: diskkey
#CHILD parentdiskfile: parentdiskfile
#PARENT diskkey: diskkey
#PHASE PREPARE
#PHASE FLASH
#PHASE VERIFY
#PARAM STATUS=success
#END RUN runID endRunDate in format yyyyMMddHHmssS
#END TASK taskID
#END

```

## Output from a datastore inquiry command

```

#TASK 0 inquire 20130109125621778
#PARAM BACKEND=FCM
#PARAM DATACENTER_NAME=FCM_DC3
#RUN 0 20130109125621779
#LANG en_US
#PARAM BACKEND=FCM
#CHILD backupid:A0HA166YCQ
#PARENT datastoreurl:ds:///vmfs/volumes/5036208e-00afa238-435e-001a646947ec/
#CHILD backupdate:20121115151142408
#PARENT datastoreurl:ds:///vmfs/volumes/5036208e-00afa238-435e-001a646947ec/
#CHILD backupid:A0HA123KGA
#PARENT datastoreurl:ds:///vmfs/volumes/5036208e-00afa238-435e-001a646947ec/
#CHILD backupdate:20121115151142408
#PARENT datastoreurl:ds:///vmfs/volumes/5036208e-00afa238-435e-001a646947ec/

```



**-p tsmserverport**

This parameter value overrides the value of the VE\_TSM\_SERVER\_PORT profile parameter. This parameter specifies the port of the Tivoli Storage Manager for Virtual Environments server and is only applicable when using Tivoli Storage Manager for Virtual Environments.

## Output

```
#TASK taskID taskType dateCreated in format yyyyMMddHHmmssS
#PARAM INSTALLED=FCM
#PARAM INSTALLED=TSM
#RUN runID runDate in format yyyyMMddHHmmssS
#LANG en-US
#PARAM BACKEND=backupType
#PARAM DATACENTER=datacentername
#SECTION GLOBAL
#PARAM ACS_DIR=path to the repository directory
#PARAM ACSD=hostname port_number
#PARAM TRACE=YES
#END SECTION GLOBAL
#SECTION ACSD
#PARAM ACS_REPOSITORY=ACS_REPOSITORY
#END SECTION ACSD
#SECTION VMWARE
#PARAM VCENTER_SERVER=VCENTER_SERVER
#PARAM VCENTER_SERVER_USER=VCENTER_SERVER_USER
#PARAM AUXILIARY_ESX_HOST=esxHost
#PARAM VM_BACKUP_MODE=SNAPSHOT_INCL_MEM|SNAPSHOT_EXCL_MEM|SUSPEND|ASIS
#PARAM HOST_NAME_MAPPING=Auxiliary ESX host name:storage subsystem host name
#PARAM HOST_NAME_MAPPING=Auxiliary ESX host name:storage subsystem host name
#END SECTION VMWARE
#SECTION VMCLI
#PARAM DERBY_HOME=path to vmcli database home directory
#PARAM VMCLI_TRACE=NO
#PARAM VE_TSMCLI_NODE_NAME=ve_tsmcli_node_name
#PARAM VE_VCENTER_NODE_NAME=vcenternodenname
#PARAM VE_DATACENTER_NAME=ve_datacenter_name
#PARAM VE_TSM_SERVER_NAME=tsmserverhostname
#PARAM VE_TSM_SERVER_PORT=tsmserverport
#PARAM VMCLI_RESTORE_TASK_EXPIRATION_TIME=vmcli_restore_task_expiration_time
#PARAM VMCLI_RECON_INTERVAL_FCM=vmcli_recon_interval_fcm
#PARAM VMCLI_DB_BACKUP=vmcli_db_backup
#PARAM VMCLI_DB_BACKUP_VERSIONS=vmcli_db_backup_versions
#PARAM VMCLI_LOG_DIR=vmcli_log_dir
#END SECTION VMCLI
#SECTION DEVICE_CLASS STANDARD
#PARAM COPYSERVICES_HARDWARE_TYPE=SVC|XIV|DS8000
#PARAM COPYSERVICES_PRIMARY_SERVERNAME=tsmserverhostname
#PARAM COPYSERVICES_USERNAME=copyservices_username
#PARAM SVC_COPY_RATE=svc_copy_rate
#PARAM COPYSERVICES_COMMPROTOCOL=HTTPS
#PARAM COPYSERVICES_CERTIFICATEFILE=NO_CERTIFICATE
#PARAM COPYSERVICES_SERVERPORT=tsmserverport
#PARAM FLASHCOPY_TYPE=INCR|COPY|NOCOPY
#PARAM TARGET_SETS=target_sets
#PARAM TARGET_NAMING=%SOURCE %TARGETSET
#END SECTION DEVICE_CLASS STANDARD
#SECTION DEVICE_CLASS SVC 61
#PARAM COPYSERVICES_HARDWARE_TYPE=SVC|XIV|DS8000
#PARAM COPYSERVICES_PRIMARY_SERVERNAME=tsmserverhostname
#PARAM COPYSERVICES_USERNAME=copyservices_username
#PARAM SVC_COPY_RATE=svc_copy_rate
#PARAM COPYSERVICES_COMMPROTOCOL=HTTPS
#PARAM COPYSERVICES_CERTIFICATEFILE=NO_CERTIFICATE
#PARAM COPYSERVICES_SERVERPORT=tsmserverport
#PARAM FLASHCOPY_TYPE=INCR|COPY|NOCOPY
```



- ALL** Specifies that the **inquire\_detail** operation is performed for all registered backup types.
- FCM** Specifies that the **inquire\_detail** operation is performed for Tivoli Storage FlashCopy Manager for VMware backups.
- TSM** Specifies that the **inquire\_detail** operation is performed for Tivoli Storage Manager for Virtual Environments backups.

**-B backupID**

The ID of the backup for the **inquire\_detail** command.

## Output

```
output inquire_details (example of a ./vmcli -f inquire_detail run):
#TASK 7 inquire_detail 20101117151222341
#RUN 8 20101117151222341
#LANG en-US
#PARAM BACKEND=FCM
#PARAM BACKUP_ID=<backup_ID>
#PARAM STATUS=<status>
#PARAM TARGET_SET=<TsNumber>
#PARAM USABILITY_STATES=<uStatesList>
#PARAM BYTES_TRANSFERED=<nr bytes>
#PARAM BYTES_TOTAL=<nr bytes>
[ #PARAM BLOCKS_CHANGED=<nr blocks>
[ #PARAM BLOCKS_TOTAL=<nr blocks>
[ #PARAM BLOCKS_COPIED=<nr blocks>
... (more backup details)
#PARAM STATUS=success
#END RUN 8 20101117151222455
#RUN 9 20101117151222341
#LANG en-US
#PARAM BACKEND=TSM
... (TSM backup details)
#PARAM STATUS=success
#END RUN 9 20101117151222536
#END TASK 7
#END
```

---

## VMCLI instant\_restore

Use the VMCLI instant restore command to restore one or more data stores from a snapshot backup. You can restore datastores from network-attached storage (NAS) or storage area network (SAN) storage. The datastores must be contained within one snapshot backup. After the restore operation, the virtual machines from the datastores are automatically registered in the vCenter Server.

### Syntax

The `vmcli -f instant_restore` command uses the following syntax:

#### vmcli command

```
▶▶—vmcli—-f instant_restore— -I—restoreObjectListFile— [ -B—backup_ID ] ▶▶
```

## Parameters

### -I *restoreObjectListFile*

Where the *restoreObjectListFile* represents an input file that contains a list of datastores to restore. The following rules must be adhered to when you create this file:

- Only one datastore identifier per line followed by its value. The identifier and its value must be separated by a colon(:). The identifier can be the URL or name of the datastore. For example, `datastoreurl:ds:///vmfs/volumes/50ade558-4fa9960d-db2c-e41f136af7c8/` or `datastorename:Datastore1`.
- You can exclude a virtual machine from a datastore. Exclude statements must begin with an exclamation ! character followed by the universal unique identifier (UUID) and value for the virtual machine. The UUID and its value are separated by a colon. For example, `!vminstanceuuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78`.

**Tip:** To automatically power on a virtual machine after the restore operation, specify the instance UUID of the virtual machine and its value, followed by the word `on`. The UUID and its value are separated by a colon. For example, `vminstanceuuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78:on`.

### -B *backup\_ID*

Specify the ID of the snapshot backup to restore. If no ID is specified, the latest snapshot backup is restored. This parameter is optional.

The following example shows a typical input file that lists datastores to restore but identifies specified virtual machines to exclude from the restore:

```
#List of datastores that should be instant restored
datastoreurl:ds:///vmfs/volumes/50ade558-4fa9960d-db2c-e41f136af7c8/
datastoreurl:ds:///vmfs/volumes/47ade579-4fa9887d-db2c-k89f158ff67b3/
datastorename:Datastore1

#List of VMs that are currently contained in the listed datastores
#but which will not be part of the instant restore.
#these VMs are maybe not part of the backup or they should be excluded from the restore
!vminstanceuuid:8a2d7ae7-02dd-c4be-63g5-c44a1desfb75
!vminstanceuuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78
vminstanceuuid:ba2dga57-02d5-c43e-63g5-c44a1desf34:on
```

## Output

The following example shows the output after an instant restore operation:

```
IBM Tivoli Storage FlashCopy(R) Manager for VMware
- Version 4, Release 1, Level 0.0 BETA for Linux x86_64 -
  Build: _@BUILD@_ generated on Apr  5 2013
(c) Copyright IBM Corporation, 2000, 2013, All Rights Reserved.

#PARAM Version: 4.1.0.0 Build: _@BUILD@_
FMM0005I Start of program at: Fri 05 Apr 2013 18:00:57 CEST.
#PARAM BACKUP_ID=LATEST
#PHASE_COUNT 3
#PHASE PREPARE RESTORE
FMM6501I Initializing 'query' request.
FMM6503I Terminating 'query' request.
#PARAM OBJECT=vminstanceuuid:50045b46-0d7f-3a32-e730-bcaa22c5ca2a:ON
#PARAM OBJECT=!vminstanceuuid:5004f5fb-97b1-4269-f7a8-55b244384763
#PARAM OBJECT=datastoreurl:ds:///vmfs/volumes/50c9ab5b-2af77003-fd39-e41f136af7c8/
#PARAM OBJECT=datastorename:JV_UT_XIV01_DS2
FMM6232I Looking for the latest backup.
FMM6233I Restoring backup with ID VMWAREA0HF5JG7I0.

FMM1510I New connection received from host neo.
FMM1514I ***** Device client connected.
FMM6901I Response to Init request.
FMM6904I Response to Restore request.
FMM0461I Created tracefile '/home/janvorb/Test/VMWare/logs/acsgen.neo.0.20130405180058.trace'
for process ID '19970'.
#PARAM COPYSERVICES_HARDWARE_TYPE=XIV
FMM6905I Response to Flash request.
#PHASE UNMOUNTING_DS
```



```

#CHILD vminstanceuuid:50045b46-0d7f-3a32-e730-bcaa22c5ca2a
#PARENT datastoreurl:ds:///vmfs/volumes/515eeeb9-b17ea4cc-7ffb-e41f136af7c8/
#CHILD vminstanceuuid:5004a665-3432-9863-2582-bd2fe0e1fe75
#PARENT datastoreurl:ds:///vmfs/volumes/515eeeb9-b17ea4cc-7ffb-e41f136af7c8/
#CHILD vminstanceuuid:50049418-8f78-9046-f1fb-96b79c40b813
#PARENT datastoreurl:ds:///vmfs/volumes/50c9ab5b-2af77003-fd39-e41f136af7c8/
#PHASE MOUNTING_DS
FMM6907I Response to Complete Restore request.
FMM6959I Script '/home/janvorb/Test/VMWare/jre/jre/bin/java -classpath /home/janvorb/Test/VMWare/
XivAdapter.jar com.ibm.storage.xiv.XivAdapter -x /home/janvorb/Programme/XIVGUI/ -t -f restore'
returned with code 0.
FMM0020I End of program at: Fri 05 Apr 2013 18:02:24 CEST.
FMM0021I Elapsed time: 01 min 27 sec.
FMM0024I Return code is: 0.

```

---

## VMCLI restore

This function runs a restore operation.

### Syntax

The `vmcli -f restore` command uses the following syntax:

#### vmcli command

```

▶▶—vmcli—-f restore— [ -t—backup_type ] — -I—restoreObjectListFile — [ -H—esxHost ] —▶▶

```

### Parameters

#### -t *backupType*

Specify the type of backup to restore. You can choose from one of the following types:

**FCM** Specifies that the restore operation runs on a backup that was generated by Tivoli Storage FlashCopy Manager for VMware. The hardware snapshot is used as a base for this type of restore. This option is the default restore Type if the option `-t` is not specified.

**TSM** Specifies that the restore operation is performed from a backup that was generated by Tivoli Storage Manager for Virtual Environments with backup types `FCM_TSM_YES`, `FCM_TSM_LATEST`, or `TSM`. The Tivoli Storage Manager for Virtual Environments backup must be used as base of the restore.

#### -I *restoreObjectListFile*

Specifies an input file that contains a list of objects to restore. The *restoreObjectListFile* represent a file. This file must have one backup ID and one VM identifier per line. Optionally, you can specify a different target VM, an alternative datastore, an ESX host, and virtual disks to be restored. Support for virtual machine backup and restore operations is limited to virtual machine names and datacenter names that contain English 7-bit ASCII characters only. Virtual machine names and datacenter names that use other language characters is not supported currently.

An example *restoreObjectListFile* is provided here:

```

# restore of a VM with vminstanceuuid "vminstanceUuid"
# In case the original VM still exists, it is unregistered, the files
#are overwritten and registered with the same name afterwards
# In case the original VM has been deleted, the files are copied into
#the original DS into the folder as named during backup and registered
#with the same name afterwards
backupid:BD1 vminstanceuuid:vminstanceUuid

```

```

# restore of a VM with vminstanceuuid "vm2instanceUuid"
#using the new vmname "vm2newName"
# The files are copied into the original DS into a new folder
#and registered with the given new name
backupid:PID2 vminstanceuuid:vm2InstanceUuid::vmname:vm2newName

# redirected restore of a VM with vminstanceuuid "vm3instanceUuid"
#to the new datastore with url "ds1newUrl"
# The files are copied into the (new) DS into a (new) folder
#(in case the one stored in the backup does not exist in this DS).
#Afterwards the VM is registered with the original VM name
# The [NEWDS] option is not allowed for distributed VMs
backupid:PID3 vminstanceuuid:vm3InstanceUuid
datastoreurl:ds1Url::datastoreurl:ds1newUrl

# redirected restore of a VM with vminstanceuuid "vm4instanceUuid"
#using the new vmname "vm4new" to the new datastore with url "ds1newUrl"
# The files are copied into the (new) DS into a (new) folder
#(in case the one stored in the backup does not exist in this DS).
#Afterwards the VM is registered with the given VM name
# The [NEWDS] option is not allowed for distributed VMs
backupid:PID4 vminstanceuuid:vm4InstanceUuid::vmname:vm4new
datastoreurl:ds1Url::datastoreurl:ds1newUrl

# restore of a VM with vminstanceuuid "vm7instanceUuid" and
#registration of this VM with ESX host "esxHost1Name"
backupid:PID7 vminstanceuuid:vm7InstanceUuid esxhostname:esxHost1Name

# restore the disks with the specified keys of vm3InstanceUuid,
#original disk files are overwritten
backupid:PID8 vminstanceuuid:vm3InstanceUuid diskkey:2000,2001

# restore the disks with the specified keys of vm3InstanceUuid to
#vm4InstanceUuid as new disks
backupid:PID9 vminstanceuuid:vm3InstanceUuid::vminstanceuuid:vm4InstanceUuid
diskkey:2000,2001

```

**-H *esxHost***

Specifies the ESX host where the datastores in the selected backup are attached. The default value is the value of AUXILIARY\_ESX\_HOST parameter in the Tivoli Storage FlashCopy Manager for VMware profile.

**Output**

```

#PHASE_COUNT 4
#PHASE_PREPARE_RESTORE
#CHILD datastoreurl:<dsUrl>
#PARENT vmuuid:<vmUuid>/
#PHASE MOUNT
#PHASE RESTORE
#PHASE UNMOUNT
#END

```

---

**VMCLI set\_domain**

Use this command to apply changes to the domain settings.

**Syntax**

The `vmcli -f set_domain` command uses the following syntax:

**vmcli command**

▶▶—vmcli—-f set\_domain— -I—domainObjectListFile—◀◀

The new domain value is stored in the vmcli database to be made available to the backup back-ends.

## Parameters

**-I** *domain ObjectListFile*

The *domainObjectListFile* has the following requirements:

- The file contains one datacenter identifier per line.
- The valid identifier is the datacenter name. Names may include wildcards.

If no domain is configured, the current Tivoli Storage FlashCopy Manager for VMware instance is used to manage all datacenters that are available in the vCenter. When the `vmcli -f set_domain` command is run without `-I` parameter, the domain configuration is deleted.

An example *domainObjectListFile* is provided here:

```
#datacentername:datacenterName
datacentername:datacenterXYZ
datacentername:datacenterA*
datacentername:datacenterB*
...
```

## Output

The following example shows the output that is generated from the command:

```
vmcli -f set_domain -I domainInfile
FMM16081I The domain configuration is stored.
#PARAM DOMAIN=datacentername:Temp_DC
#INFO FMM16014I The return code is 0
#END
```

The following example shows the output that is generated from the command:

```
vmcli -f set_domain
#INFO FMM16080I The domain configuration is deleted .
#INFO FMM16014I The return code is 0.
#END
```

---

## VMCLI tape\_backup

Use this function to rerun a failed offloaded tape backup to Tivoli Storage Manager for Virtual Environments.

## Syntax

The `vmcli -f tape_backup` command uses the following syntax:

### vmcli command

▶▶—vmcli—-f tape\_backup—◀◀

## Output

```
Backup Timestamp: 20110128104856942
#END
```

---

## VMCLI used\_capacity

This function reports the managed capacity per source disk and the total source capacity managed by Tivoli Storage FlashCopy Manager for VMware.

### Syntax

The `vmcli -f used_capacity` command uses the following syntax:

#### vmcli command

```
▶▶—vmcli—-f used_capacity—┬───┬───▶▶  
                             └─t—backupType—┘
```

```
vmcli -f used_capacity [-t backupType]
```

### Parameters

#### -t backupType

The following options are valid:

- ALL** Specifies that the operation is performed for all registered backup types.
- FCM** Specifies that the operation is performed for Tivoli Storage FlashCopy Manager for VMware backups.
- TSM** Specifies that the operation is performed for Tivoli Storage Manager for Virtual Environments backups.

### Output

```
#TASK taskId used_capacity dateCreated  
#PARAM TASK_NAME=used_capacity  
#PARAM TASK_DESCRIPTION=used_capacity  
#PARAM BACKUP_TYPE=FCM  
#RUN runId startRunDate  
#LANG en-US  
#PARAM BACKEND=FCM  
#PARAM SOURCE_VOLUME=<volume ID>  
#PARAM MANAGED_CAPACITY=<size in GB>  
... (more SOURCE_VOLUME / MANAGED_CAPACITY pairs)  
#PARAM TOTAL_MANAGED_CAPACITY=<size in GB>  
#PARAM STATUS=runStatus  
#END RUN runID endRunDate  
#END TASK taskId  
#END
```

---

## VMCLI db\_backup

Use this command to create a backup of the vmcli database.

### Syntax

The `vmcli -f db_backup` command uses the following syntax:

#### vmcli command

```
▶▶—vmcli—-f db_backup—▶▶
```

This command creates a backup of the vmcli database. The VMCLI\_DB\_BACKUP profile parameter does not control this command. The VMCLI\_DB\_BACKUP\_VERSIONS profile parameter must be a value greater than 0 to allow this command to create a backup. This is an online backup so it can run while the Data Protection for VMware command-line interface daemon is running. If the daemon is not running, the vmcli database is not started. The db\_backup command starts the vmcli database.

---

## VMCLI db\_restore

You can use this command to restore a backup of the vmcli database.

### Syntax

The **vmcli -f db\_restore** command uses the following syntax:

#### vmcli command

```
▶▶—vmcli—-f db_restore— -B—backup_id—▶▶
```

This command restores a backup of the vmcli database. During the restore process, if the vmcli database is running, it is shut down. Stop the Data Protection for VMware command-line interface daemon before the restore and restart it afterward.

### Parameters

**-B** *backup\_id*  
Specifies the backup ID of the vmcli database backup to be restored.

---

## VMCLI db\_inquire

Use this command to inquire about available backups of the vmcli database.

### Syntax

The **vmcli -f db\_inquire** command uses the following syntax:

#### vmcli command

```
▶▶—vmcli—-f db_inquire—▶▶
```

This command inquires about available backups of the vmcli database.

---

## VMCLI db\_compact

Use this command to reclaim unused space in the vmcli database.

### Syntax

The **vmcli -f db\_compact** command uses the following syntax:

## vmcli command

▶▶—vmcli—-f db\_compact—▶▶

This command reclaims unused space in the vmcli database. This function requires an exclusive lock for each table that is compacted. Stop the Data Protection for VMware command-line interface daemon before the execution of this function and to restart it afterward.

---

## Appendix B. Tivoli support information

You can find support information for Tivoli and other IBM products from various sources.

From the IBM Support Portal at <http://www.ibm.com/support/entry/portal/>, you can select the products that you are interested in and search for a wide variety of relevant information.

---

## Communities and other learning resources

In addition to product documentation, many forms of assistance are available to help you get started as you deploy and use the Tivoli Storage Manager family of products. These resources can also help you to solve problems that you might have.

You can use forums, wikis, and other social media tools to ask questions, talk to experts, and learn from others.

### User groups

#### Tivoli Global Storage Virtual User Group

Access this user group at <http://www.tivoli-ug.org/storage>.

This group makes it possible for individuals from many different industries and types of organizations to share information and work directly with the IBM product experts. Local chapters also exist where members meet in person to share experiences and hear from guest speakers.

#### ADSM.ORG

Access this mailing list at <http://adsm.org>.

This independently managed Storage Management discussion forum started when Tivoli Storage Manager was known as ADSTAR Distributed Storage Manager (ADSM). The members of this forum have many years of experience with Tivoli Storage Manager in almost every type of IT environment.

To subscribe to the forum, send an email to [listserv@vm.marist.edu](mailto:listserv@vm.marist.edu). The body of the message must contain the following text: `SUBSCRIBE ADSM-L your_first_name your_family_name`.

### Tivoli Storage Manager community on Service Management Connect

Access Service Management Connect at <http://www.ibm.com/developerworks/servicemanagement>. In the Storage Management community of Service Management Connect, you can connect with IBM in the following ways:

- Become involved with transparent development, an ongoing, open engagement between users and IBM developers of Tivoli products. You can access early designs, sprint demonstrations, product roadmaps, and prerelease code.
- Connect one-on-one with the experts to collaborate and network about Tivoli and the Tivoli Storage Manager community.
- Read blogs to benefit from the expertise and experience of others.

- Use wikis and forums to collaborate with the broader user community.

## **Tivoli Storage Manager wiki on developerWorks**

Access this wiki at <https://www.ibm.com/developerworks/servicemanagement/sm/index.html>.

Find the latest best practices, white papers, and links to videos and other resources. When you log on, you can comment on content, or contribute your own content.

## **Tivoli Support Technical Exchange**

Find information about upcoming Tivoli Support Technical Exchange webcasts at [http://www.ibm.com/software/sysmgmt/products/support/supp\\_tech\\_exch.html](http://www.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html). Replays of previous webcasts are also available.

Learn from technical experts who share their knowledge and then answer your questions. The sessions are designed to address specific technical issues and provide in-depth but narrowly focused training.

## **Other social media sites**

### **LinkedIn**

You can join groups on LinkedIn, a social media site for professionals. For example:

- **Tivoli Storage Manager Professionals:** <http://www.linkedin.com/groups/Tivoli-Storage-Manager-Professionals-54572>
- **TSM:** <http://www.linkedin.com/groups?gid=64540>

### **Twitter**

Follow @IBMStorage on Twitter to see the latest news about storage and storage software from IBM.

## **Tivoli education resources**

Use these education resources to help you increase your Tivoli Storage Manager skills:

### **Tivoli Education and Certification website**

View available education at <http://www.ibm.com/software/tivoli/education>.

Use the Search for Training link to find local and online offerings of instructor-led courses for Tivoli Storage Manager.

### **Education Assistant**

Access resources at <http://publib.boulder.ibm.com/infocenter/ieduasst/tivv1r0/index.jsp>.

Scroll to view the list of available training videos. Recorded product demonstrations are also available on a YouTube channel.



---

## Searching knowledge bases

If a problem occurs while you are using one of the Tivoli Storage Manager family of products, you can search several knowledge bases.

Begin by searching the Tivoli Storage Manager Information Center at <http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1>. Within the information center, you can enter words, phrases, or message numbers in the **Search** field to find relevant topics.

## Searching the Internet

If you cannot find an answer to your question in the Tivoli Storage Manager information center, search the Internet for the information that might help you resolve the problem.

To search multiple Internet resources, go to the IBM support website at <http://www.ibm.com/support/entry/portal/>. You can search for information without signing in.

Sign in using your IBM ID and password if you want to customize the site based on your product usage and information needs. If you do not already have an IBM ID and password, click **Sign in** at the top of the page and follow the instructions to register.

From the support website, you can search various resources:

- IBM technotes.
- IBM downloads.
- IBM Redbooks® publications.
- IBM Authorized Program Analysis Reports (APARs). Select the product and click **Downloads** to search the APAR list.

## Using IBM Support Assistant

IBM Support Assistant is a complimentary software product that can help you with problem determination. It is available for some Tivoli Storage Manager and Tivoli Storage FlashCopy Manager products.

IBM Support Assistant helps you gather support information when you must open a problem management record (PMR), which you can then use to track the problem. The product-specific plug-in modules provide you with the following resources:

- Support links
- Education links
- Ability to submit problem management reports

You can find more information and download the IBM Support Assistant web page at <http://www.ibm.com/software/support/isa>.

You can also install the stand-alone IBM Support Assistant application on any workstation. You can then enhance the application by installing product-specific plug-in modules for the IBM products that you use. Find add-ons for specific products at <http://www.ibm.com/support/docview.wss?uid=swg27012689>.

## Finding product fixes

A product fix to resolve a software problem might be available from the IBM software support website.

### Procedure

Determine what fixes are available by checking the IBM software support website at <http://www.ibm.com/support/entry/portal/>.

**If you previously customized the site based on your product usage:**

1. Click the link for the product, or a component for which you want to find a fix.
2. Click **Downloads**, and then click **Search for recommended fixes**.

**If you have not previously customized the site:**

Click **Downloads** and search for the product.

## Receiving notification of product fixes

You can receive notifications about fixes, flashes, upgrades, and other news about IBM products.

### Procedure

1. From the support page at <http://www.ibm.com/support/entry/portal/>, click **Sign in** and sign in using your IBM ID and password. If you do not have an ID and password, click **register now** and complete the registration process.
2. Click **Manage all my subscriptions** in the Notifications pane.
3. Click the **Subscribe** tab, and then click **Tivoli**.
4. Select the products for which you want to receive notifications and click **Continue**.
5. Specify your notification preferences and click **Submit**.

---

## Contacting IBM Software Support

You can contact IBM Software Support if you have an active IBM subscription and support contract, and if you are authorized to submit problems to IBM.

### Procedure

1. Ensure that you have completed the following prerequisites:
  - a. Set up a subscription and support contract.
  - b. Determine the business impact of the problem.
  - c. Describe the problem and gather background information.
2. Follow the instructions in “Submitting the problem to IBM Software Support” on page 134.

## Setting up and managing support contracts

You can set up and manage your Tivoli support contracts by enrolling in IBM Passport Advantage. The type of support contract that you need depends on the type of product you have.

### Procedure

Enroll in IBM Passport Advantage in one of the following ways:

- **Online:** Go to the Passport Advantage website at <http://www.ibm.com/software/lotus/passportadvantage/>, click **How to enroll**, and follow the instructions.
- **By telephone:** For critical, system-down, or high-severity issues, you can call 1-800-IBMSERV (1-800-426-7378) in the United States. For the telephone number to call in your country, go to the IBM Software Support Handbook web page at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html> and click **Contacts**.

## Determining the business impact

When you report a problem to IBM, you are asked to supply a severity level. Therefore, you must understand and assess the business impact of the problem you are reporting.

Severity level	Description
Severity 1	<b>Critical</b> business impact: You are unable to use the program, resulting in a critical impact on operations. This condition requires an immediate solution.
Severity 2	<b>Significant</b> business impact: The program is usable but is severely limited.
Severity 3	<b>Some</b> business impact: The program is usable with less significant features (not critical to operations) unavailable.
Severity 4	<b>Minimal</b> business impact: The problem causes little impact on operations, or a reasonable circumvention to the problem has been implemented.

## Describing the problem and gathering background information

When explaining a problem to IBM, it is helpful to be as specific as possible. Include all relevant background information so that IBM Software Support specialists can help you solve the problem efficiently.

To save time, know the answers to these questions:

- What software versions were you running when the problem occurred?
- Do you have logs, traces, and messages that are related to the problem symptoms? IBM Software Support is likely to ask for this information.
- Can the problem be re-created? If so, what steps led to the failure?
- Have any changes been made to the system? For example, hardware, operating system, networking software, and so on.
- Are you using a workaround for this problem? If so, be prepared to explain it when you report the problem.

## Submitting the problem to IBM Software Support

You can submit the problem to IBM Software Support online or by telephone.

### Online

Go to the IBM Software Support website at [http://www.ibm.com/support/entry/portal/Open\\_service\\_request/Software/Software\\_support\\_\(general\)](http://www.ibm.com/support/entry/portal/Open_service_request/Software/Software_support_(general)). Sign in to access IBM Service Requests and enter your information into the problem submission tool.

### By telephone

For critical, system-down, or severity 1 issues, you can call 1-800-IBMSERV (1-800-426-7378) in the United States. For the telephone number to call in your country, go to the IBM Software Support Handbook web page at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html> and click **Contacts**.

---

## Appendix C. Accessibility features for the Tivoli Storage Manager product family

Accessibility features help users who have a disability, such as restricted mobility or limited vision to use information technology products successfully.

### Accessibility features

The IBM Tivoli Storage Manager family of products includes the following accessibility features:

- Keyboard-only operation using standard operating-system conventions
- Interfaces that support assistive technology such as screen readers

The command-line interfaces of all products in the product family are accessible.

Tivoli Storage Manager Operations Center provides the following additional accessibility features when you use it with a Mozilla Firefox browser on a Microsoft Windows system:

- Screen magnifiers and content zooming
- High contrast mode

The Operations Center and the Tivoli Storage Manager Server can be installed in console mode, which is accessible.

The Tivoli Storage Manager Information Center is enabled for accessibility. For information center accessibility information, see “Accessibility features in the information center” ([http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1/topic/com.ibm.help.ic.doc/iehs36\\_accessibility.html](http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1/topic/com.ibm.help.ic.doc/iehs36_accessibility.html)).

### Vendor software

The Tivoli Storage Manager product family includes certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for the accessibility information about its products.

### IBM and accessibility

See the IBM Human Ability and Accessibility Center (<http://www.ibm.com/able>) for information about the commitment that IBM has to accessibility.



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## Glossary

This glossary provides terms and definitions for Tivoli Storage Manager, Tivoli Storage FlashCopy Manager, and associated products.

The following cross-references are used in this glossary:

- *See* refers you from a nonpreferred term to the preferred term or from an abbreviation to the spelled-out form.
- *See also* refers you to a related or contrasting term.

For other terms and definitions, see the IBM Terminology website at [www.ibm.com/software/globalization/terminology](http://www.ibm.com/software/globalization/terminology).

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### A

#### **absolute mode**

In storage management, a backup copy-group mode that specifies that a file is considered for incremental backup even if the file has not changed since the last backup. See also *mode*, *modified mode*.

#### **access control list (ACL)**

In computer security, a list associated with an object that identifies all the subjects that can access the object and their access rights.

#### **access mode**

An attribute of a storage pool or a storage volume that specifies whether the server can write to or read from the storage pool or storage volume.

**ACK** See *acknowledgment*.

#### **acknowledgment (ACK)**

The transmission of acknowledgment characters as a positive response to a data transmission.

**ACL** See *access control list*.

#### **activate**

To validate the contents of a policy set and then make it the active policy set.

#### **active-data pool**

A named set of storage pool volumes that contain only active versions of client

backup data. See also *server storage*, *storage pool*, *storage pool volume*.

#### **active file system**

A file system to which space management has been added. With space management, tasks for an active file system include automatic migration, reconciliation, selective migration, and recall. See also *inactive file system*.

#### **active policy set**

The activated policy set that contains the policy rules currently in use by all client nodes assigned to the policy domain. See also *policy domain*, *policy set*.

#### **active version**

The most recent backup copy of a file stored. The active version of a file cannot be deleted until a backup process detects that the user has either replaced the file with a newer version or has deleted the file from the file server or workstation. See also *backup version*, *inactive version*.

#### **activity log**

A log that records normal activity messages that are generated by the server. These messages include information about server and client operations, such as the start time of sessions or device I/O errors.

#### **adaptive subfile backup**

A type of backup that sends only changed portions of a file to the server, instead of sending the entire file. Adaptive subfile backup reduces network traffic and increases the speed of the backup.

#### **administrative client**

A program that runs on a file server, workstation, or mainframe that administrators use to control and monitor the server. See also *backup-archive client*.

#### **administrative command schedule**

A database record that describes the planned processing of an administrative command during a specific time period. See also *central scheduler*, *client schedule*, *schedule*.

#### **administrative privilege class**

See *privilege class*.

**administrative session**

A period of time during which an administrator user ID communicates with a server to perform administrative tasks. See also client node session, session.

**administrator**

A person responsible for administrative tasks such as access authorization and content management. Administrators can also grant levels of authority to users.

**agent node**

A client node that has been granted proxy authority to perform operations on behalf of another client node, which is the target node.

**aggregate**

An object, stored in one or more storage pools, consisting of a group of logical files that are packaged together. See also logical file, physical file.

**aggregate data transfer rate**

A performance statistic that indicates the average number of bytes that were transferred per second while processing a given operation.

**application client**

A program that is installed on a system to protect an application. The server provides backup services to an application client.

**archive**

To copy programs, data, or files to another storage media, usually for long-term storage or security. See also retrieve.

**archive copy**

A file or group of files that was archived to server storage

**archive copy group**

A policy object containing attributes that control the generation, destination, and expiration of archived files. See also copy group.

**archive-retention grace period**

The number of days that the storage manager retains an archived file when the server is unable to rebind the file to an appropriate management class. See also bind.

**association**

The defined relationship between a client

node and a client schedule. An association identifies the name of a schedule, the name of the policy domain to which the schedule belongs, and the name of a client node that performs scheduled operations.

**audit** To check for logical inconsistencies between information that the server has and the actual condition of the system. The storage manager can audit information about items such as volumes, libraries, and licenses. For example, when a storage manager audits a volume, the server checks for inconsistencies between information about backed-up or archived files that are stored in the database and the actual data that are associated with each backup version or archive copy in server storage.

**authentication rule**

A specification that another user can use to either restore or retrieve files from storage.

**authority**

The right to access objects, resources, or functions. See also privilege class.

**authorization rule**

A specification that permits another user to either restore or retrieve a user's files from storage.

**authorized user**

A user who has administrative authority for the client on a workstation. This user changes passwords, performs open registrations, and deletes file spaces.

**AutoFS**

See automounted file system.

**automatic detection**

A feature that detects, reports, and updates the serial number of a drive or library in the database when the path from the local server is defined.

**automatic migration**

The process that is used to automatically move files from a local file system to storage, based on options and settings that are chosen by a root user on a workstation. See also demand migration, threshold migration.

**automounted file system (AutoFS)**

A file system that is managed by an

automounter daemon. The automounter daemon monitors a specified directory path, and automatically mounts the file system to access data.

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## **B**

### **backup-archive client**

A program that runs on a workstation or file server and provides a means for users to back up, archive, restore, and retrieve files. See also administrative client.

### **backup copy group**

A policy object containing attributes that control the generation, destination, and expiration of backup versions of files. A backup copy group belongs to a management class. See also copy group.

### **backup retention grace period**

The number of days the storage manager retains a backup version after the server is unable to rebind the file to an appropriate management class.

### **backup set**

A portable, consolidated group of active versions of backup files that are generated for a backup-archive client.

### **backup set collection**

A group of backup sets that are created at the same time and which have the same backup set name, volume names, description, and device classes. The server identifies each backup set in the collection by its node name, backup set name, and file type.

### **backup version**

A file or directory that a client node backed up to storage. More than one backup version can exist in storage, but only one backup version is the active version. See also active version, copy group, inactive version.

**bind** To associate a file with a management class name. See also archive-retention grace period, management class, rebind.

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## C

**cache** To place a duplicate copy of a file on random access media when the server migrates a file to another storage pool in the hierarchy.

### cache file

A snapshot of a logical volume created by Logical Volume Snapshot Agent. Blocks are saved immediately before they are modified during the image backup and their logical extents are saved in the cache files.

**CAD** See client acceptor daemon.

### central scheduler

A function that permits an administrator to schedule client operations and administrative commands. The operations can be scheduled to occur periodically or on a specific date. See also administrative command schedule, client schedule.

**client** A software program or computer that requests services from a server. See also server.

### client acceptor

A service that serves the Java applet for the web client to web browsers. On Windows systems, the client acceptor is installed and run as a service. On AIX®, UNIX, and Linux systems, the client acceptor is run as a daemon.

### client acceptor daemon (CAD)

See client acceptor.

### client domain

The set of drives, file systems, or volumes that the user selects to back up or archive data, using the backup-archive client.

### client node

A file server or workstation on which the backup-archive client program has been installed, and which has been registered to the server.

### client node session

A session in which a client node communicates with a server to perform backup, restore, archive, retrieve, migrate, or recall requests. See also administrative session.

### client option set

A group of options that are defined on

the server and used on client nodes in conjunction with client options files.

### client options file

An editable file that identifies the server and communication method, and provides the configuration for backup, archive, hierarchical storage management, and scheduling.

### client-polling scheduling mode

A method of operation in which the client queries the server for work. See also server-prompted scheduling mode.

### client schedule

A database record that describes the planned processing of a client operation during a specific time period. The client operation can be a backup, archive, restore, or retrieve operation, a client operating system command, or a macro. See also administrative command schedule, central scheduler, schedule.

### client/server

Pertaining to the model of interaction in distributed data processing in which a program on one computer sends a request to a program on another computer and awaits a response. The requesting program is called a client; the answering program is called a server.

### client system-options file

A file, used on AIX, UNIX, or Linux system clients, containing a set of processing options that identify the servers to be contacted for services. This file also specifies communication methods and options for backup, archive, hierarchical storage management, and scheduling. See also client user-options file, options file.

### client user-options file

A file that contains the set of processing options that the clients on the system use. The set can include options that determine the server that the client contacts, and options that affect backup operations, archive operations, hierarchical storage management operations, and scheduled operations. This file is also called the dsm.opt file. For AIX, UNIX, or Linux systems, see also client system-options file. See also client system-options file, options file.

**closed registration**

A registration process in which only an administrator can register workstations as client nodes with the server. See also open registration.

**collocation**

The process of keeping all data belonging to a single-client file space, a single client node, or a group of client nodes on a minimal number of sequential-access volumes within a storage pool.

Collocation can reduce the number of volumes that must be accessed when a large amount of data must be restored.

**collocation group**

A user-defined group of client nodes whose data is stored on a minimal number of volumes through the process of collocation.

**commit point**

A point in time when data is considered to be consistent.

**communication method**

The method by which a client and server exchange information. See also Transmission Control Protocol/Internet Protocol.

**communication protocol**

A set of defined interfaces that permit computers to communicate with each other.

**compression**

A function that removes repetitive characters, spaces, strings of characters, or binary data from the data being processed and replaces characters with control characters. Compression reduces the amount of storage space that is required for data.

**configuration manager**

A server that distributes configuration information, such as policies and schedules, to managed servers according to their profiles. Configuration information can include policy and schedules. See also enterprise configuration, managed server, profile.

**conversation**

A connection between two programs over a session that allows them to communicate with each other while processing a transaction. See also session.

**copy backup**

A full backup in which the transaction log files are not deleted so that backup procedures that use incremental or differential backups are not disrupted.

**copy group**

A policy object containing attributes that control how backup versions or archive copies are generated, where backup versions or archive copies are initially located, and when backup versions or archive copies expire. A copy group belongs to a management class. See also archive copy group, backup copy group, backup version, management class.

**copy storage pool**

A named set of volumes that contain copies of files that reside in primary storage pools. Copy storage pools are used only to back up the data that is stored in primary storage pools. A copy storage pool cannot be a destination for a backup copy group, an archive copy group, or a management class (for space-managed files). See also destination, primary storage pool, server storage, storage pool, storage pool volume.

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**D****daemon**

A program that runs unattended to perform continuous or periodic functions, such as network control.

**damaged file**

A physical file in which read errors have been detected.

**database backup series**

One full backup of the database, plus up to 32 incremental backups made since that full backup. Each full backup that is run starts a new database backup series. A number identifies each backup series. See also database snapshot, full backup.

**database snapshot**

A complete backup of the entire database to media that can be taken off-site. When a database snapshot is created, the current database backup series is not interrupted. A database snapshot cannot have incremental database backups associated with it. See also database backup series, full backup.

**data center**

In a virtualized environment, a container that holds hosts, clusters, networks, and data stores.

**data deduplication**

A method of reducing storage needs by eliminating redundant data. Only one instance of the data is retained on storage media. Other instances of the same data are replaced with a pointer to the retained instance.

**data manager server**

A server that collects metadata information for client inventory and manages transactions for the storage agent over the local area network. The data manager server informs the storage agent with applicable library attributes and the target volume identifier.

**data mover**

A device that moves data on behalf of the server. A network-attached storage (NAS) file server is a data mover.

**data storage-management application-programming interface (DSMAPI)**

A set of functions and semantics that can monitor events on files, and manage and maintain the data in a file. In an HSM environment, a DSMAPI uses events to notify data management applications about operations on files, stores arbitrary attribute information with a file, supports managed regions in a file, and uses DSMAPI access rights to control access to a file object.

**data store**

In a virtualized environment, the location where virtual machine data is stored.

**deduplication**

The process of creating representative records from a set of records that have been identified as representing the same entities.

**default management class**

A management class that is assigned to a policy set. This class is used to govern backed up or archived files when a file is not explicitly associated with a specific management class through the include-exclude list.

**demand migration**

The process that is used to respond to an

out-of-space condition on a file system for which hierarchical storage management (HSM) is active. Files are migrated to server storage until space usage drops to the low threshold that was set for the file system. If the high threshold and low threshold are the same, one file is migrated. See also automatic migration, selective migration, threshold migration.

**desktop client**

The group of backup-archive clients that includes clients on Microsoft Windows, Apple, and Novell NetWare operating systems.

**destination**

A copy group or management class attribute that specifies the primary storage pool to which a client file will be backed up, archived, or migrated. See also copy storage pool.

**device class**

A named set of characteristics that are applied to a group of storage devices. Each device class has a unique name and represents a device type of disk, file, optical disk, or tape.

**device configuration file**

1. For a storage agent, a file that contains the name and password of the storage agent, and information about the server that is managing the SAN-attached libraries and drives that the storage agent uses.
2. For a server, a file that contains information about defined device classes, and, on some servers, defined libraries and drives. The information is a copy of the device configuration information in the database.

**disaster recovery manager (DRM)**

A function that assists in preparing and using a disaster recovery plan file for the server.

**disaster recovery plan**

A file that is created by the disaster recover manager (DRM) that contains information about how to recover computer systems if a disaster occurs and scripts that can be run to perform some recovery tasks. The file includes information about the software and



hardware that is used by the server, and the location of recovery media.

**domain**

A grouping of client nodes with one or more policy sets, which manage data or storage resources for the client nodes. See also policy domain.

**DRM** See disaster recovery manager.

**DSMAPI**

See data storage-management application-programming interface.

**dynamic serialization**

Copy serialization in which a file or folder is backed up or archived on the first attempt regardless of whether it changes during a backup or archive. See also shared dynamic serialization, shared static serialization, static serialization.

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**E**

**EA** See extended attribute.

**EB** See exabyte.

**EFS** See Encrypted File System.

**Encrypted File System (EFS)**

A file system that uses file system-level encryption.

**enterprise configuration**

A method of setting up servers so that the administrator can distribute the configuration of one of the servers to the other servers, using server-to-server communication. See also configuration manager, managed server, profile, subscription.

**enterprise logging**

The process of sending events from a server to a designated event server. The event server routes the events to designated receivers, such as to a user exit. See also event.

**error log**

A data set or file that is used to record error information about a product or system.

**estimated capacity**

The available space, in megabytes, of a storage pool.

**event** An occurrence of significance to a task or system. Events can include completion or

failure of an operation, a user action, or the change in state of a process. See also enterprise logging, receiver.

**event record**

A database record that describes actual status and results for events.

**event server**

A server to which other servers can send events for logging. The event server routes the events to any receivers that are enabled for the sending server's events.

**exabyte (EB)**

For processor, real and virtual storage capacities and channel volume, 2 to the power of 60 or 1 152 921 504 606 846 976 bytes. For disk storage capacity and communications volume, 1 000 000 000 000 000 000 bytes.

**exclude**

The process of identifying files in an include-exclude list. This process prevents the files from being backed up or migrated whenever a user or schedule enters an incremental or selective backup operation. A file can be excluded from backup, from space management, or from both backup and space management.

**exclude-include list**

See include-exclude list.

**expiration**

The process by which files, data sets, or objects are identified for deletion because their expiration date or retention period has passed.

**expiring file**

A migrated or premigrated file that has been marked for expiration and removal from storage. If a stub file or an original copy of a premigrated file is deleted from a local file system, or if the original copy of a premigrated file is updated, the corresponding migrated or premigrated file is marked for expiration the next time reconciliation is run.

**extend**

To increase the portion of available space that can be used to store database or recovery log information.

**extended attribute (EA)**

Names or value pairs that are associated with files or directories. There are three

classes of extended attributes: user attributes, system attributes, and trusted attributes.

**external library**

A collection of drives that is managed by the media-management system other than the storage management server.

---

**F**

**file access time**

On AIX, UNIX, or Linux systems, the time when the file was last accessed.

**file age**

For migration prioritization purposes, the number of days since a file was last accessed.

**file device type**

A device type that specifies the use of sequential access files on disk storage as volumes.

**file server**

A dedicated computer and its peripheral storage devices that are connected to a local area network that stores programs and files that are shared by users on the network.

**file space**

A logical space in server storage that contains a group of files that have been backed up or archived by a client node, from a single logical partition, file system, or virtual mount point. Client nodes can restore, retrieve, or delete their file spaces from server storage. In server storage, files belonging to a single file space are not necessarily stored together.

**file space ID (FSID)**

A unique numeric identifier that the server assigns to a file space when it is stored in server storage.

**file state**

The space management mode of a file that resides in a file system to which space management has been added. A file can be in one of three states: resident, premigrated, or migrated. See also migrated file, premigrated file, resident file.

**file system migrator (FSM)**

A kernel extension that intercepts all file system operations and provides any space

management support that is required. If no space management support is required, the operation is passed to the operating system, which performs its normal functions. The file system migrator is mounted over a file system when space management is added to the file system.

**file system state**

The storage management mode of a file system that resides on a workstation on which the hierarchical storage management (HSM) client is installed. A file system can be in one of these states: native, active, inactive, or global inactive.

**frequency**

A copy group attribute that specifies the minimum interval, in days, between incremental backups.

**FSID** See file space ID.

**FSM** See file system migrator.

**full backup**

The process of backing up the entire server database. A full backup begins a new database backup series. See also database backup series, database snapshot, incremental backup.

**fuzzy backup**

A backup version of a file that might not accurately reflect what is currently in the file because the file was backed up at the same time as it was being modified.

**fuzzy copy**

A backup version or archive copy of a file that might not accurately reflect the original contents of the file because it was backed up or archived the file while the file was being modified.

---

**G**

**GB** See gigabyte.

**General Parallel File System (GPFS™)**

A high-performance shared-disk file system that can provide data access from nodes in a clustered system environment. See also information lifecycle management.

**gigabyte (GB)**

For processor storage, real and virtual storage, and channel volume, 10 to the

power of nine or 1,073,741,824 bytes. For disk storage capacity and communications volume, 1,000,000,000 bytes.

**global inactive state**

The state of all file systems to which space management has been added when space management is globally deactivated for a client node.

**Globally Unique Identifier (GUID)**

An algorithmically determined number that uniquely identifies an entity within a system. See also Universally Unique Identifier.

**GPFS** See General Parallel File System.

**GPFS node set**

A mounted, defined group of GPFS file systems.

**group backup**

The backup of a group containing a list of files from one or more file space origins.

**GUID** See Globally Unique Identifier.

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## H

**hierarchical storage management (HSM)**

A function that automatically distributes and manages data on disk, tape, or both by regarding devices of these types and potentially others as levels in a storage hierarchy that range from fast, expensive devices to slower, cheaper, and possibly removable devices. The objectives are to minimize access time to data and maximize available media capacity. See also hierarchical storage management client, recall, storage hierarchy.

**hierarchical storage management client (HSM client)**

A client program that works with the server to provide hierarchical storage management (HSM) for a system. See also hierarchical storage management, management class.

**HSM** See hierarchical storage management.

**HSM client**

See hierarchical storage management client.

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## I

**ILM** See information lifecycle management.

**image** A file system or raw logical volume that is backed up as a single object.

**image backup**

A backup of a full file system or raw logical volume as a single object.

**inactive file system**

A file system for which space management has been deactivated. See also active file system.

**inactive version**

A backup version of a file that is either not the most recent backup version, or that is a backup version of a file that no longer exists on the client system. Inactive backup versions are eligible for expiration processing according to the management class assigned to the file. See also active version, backup version.

**include-exclude file**

A file containing statements to determine the files to back up and the associated management classes to use for backup or archive. See also include-exclude list.

**include-exclude list**

A list of options that include or exclude selected files for backup. An exclude option identifies files that should not be backed up. An include option identifies files that are exempt from the exclusion rules or assigns a management class to a file or a group of files for backup or archive services. See also include-exclude file.

**incremental backup**

The process of backing up files or directories, or copying pages in the database, that are new or changed since the last full or incremental backup. See also selective backup.

**individual mailbox restore**

See mailbox restore.

**information lifecycle management (ILM)**

A policy-based file-management system for storage pools and file sets. See also General Parallel File System.

**inode** The internal structure that describes the individual files on AIX, UNIX, or Linux

systems. An inode contains the node, type, owner, and location of a file.

**inode number**

A number specifying a particular inode file in the file system.

**IP address**

A unique address for a device or logical unit on a network that uses the Internet Protocol standard.

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## J

**job file**

A generated file that contains configuration information for a migration job. The file is XML format and can be created and edited in the hierarchical storage management (HSM) client for Windows client graphical user interface. See also migration job.

**journal-based backup**

A method for backing up Windows clients and AIX clients that exploits the change notification mechanism in a file to improve incremental backup performance by reducing the need to fully scan the file system.

**journal daemon**

On AIX, UNIX, or Linux systems, a program that tracks change activity for files residing in file systems.

**journal service**

In Microsoft Windows, a program that tracks change activity for files residing in file systems.

---

## K

**KB** See kilobyte.

**kilobyte (KB)**

For processor storage, real and virtual storage, and channel volume, 2 to the power of 10 or 1,024 bytes. For disk storage capacity and communications volume, 1,000 bytes.

---

## L

**LAN** See local area network.

### **LAN-free data movement**

The movement of client data between a client system and a storage device on a storage area network (SAN), bypassing the local area network.

### **LAN-free data transfer**

See LAN-free data movement.

### **leader data**

Bytes of data, from the beginning of a migrated file, that are stored in the file's corresponding stub file on the local file system. The amount of leader data that is stored in a stub file depends on the stub size that is specified.

### **library**

1. A repository for demountable recorded media, such as magnetic disks and magnetic tapes.
2. A collection of one or more drives, and possibly robotic devices (depending on the library type), which can be used to access storage volumes.

### **library client**

A server that uses server-to-server communication to access a library that is managed by another storage management server. See also library manager.

### **library manager**

A server that controls device operations when multiple storage management servers share a storage device. See also library client.

### **local**

1. Pertaining to a device, file, or system that is accessed directly from a user system, without the use of a communication line. See also remote.
2. For hierarchical storage management products, pertaining to the destination of migrated files that are being moved. See also remote.

### **local area network (LAN)**

A network that connects several devices in a limited area (such as a single building or campus) and that can be connected to a larger network.

### **local shadow volume**

Data that is stored on shadow volumes localized to a disk storage subsystem.

**LOFS** See loopback virtual file system.

### **logical file**

A file that is stored in one or more server storage pools, either by itself or as part of an aggregate. See also aggregate, physical file, physical occupancy.

### **logical occupancy**

The space that is used by logical files in a storage pool. This space does not include the unused space created when logical files are deleted from aggregate files, so it might be less than the physical occupancy. See also physical occupancy.

### **logical unit number (LUN)**

In the Small Computer System Interface (SCSI) standard, a unique identifier used to differentiate devices, each of which is a logical unit (LU).

### **logical volume**

A portion of a physical volume that contains a file system.

### **logical volume backup**

A back up of a file system or logical volume as a single object.

### **Logical Volume Snapshot Agent (LVSA)**

Software that can act as the snapshot provider for creating a snapshot of a logical volume during an online image backup.

### **loopback virtual file system (LOFS)**

A file system that is created by mounting a directory over another local directory, also known as mount-over-mount. A LOFS can also be generated using an automounter.

**LUN** See logical unit number.

**LVSA** See Logical Volume Snapshot Agent.

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## M

### macro file

A file that contains one or more storage manager administrative commands, which can be run only from an administrative client using the MACRO command. See also Tivoli Storage Manager command script.

### mailbox restore

A function that restores Microsoft Exchange Server data (from IBM Data Protection for Microsoft Exchange backups) at the mailbox level or mailbox-item level.

### managed object

A definition in the database of a managed server that was distributed to the managed server by a configuration manager. When a managed server subscribes to a profile, all objects that are associated with that profile become managed objects in the database of the managed server.

### managed server

A server that receives configuration information from a configuration manager using a subscription to one or more profiles. Configuration information can include definitions of objects such as policy and schedules. See also configuration manager, enterprise configuration, profile, subscription.

### management class

A policy object that users can bind to each file to specify how the server manages the file. The management class can contain a backup copy group, an archive copy group, and space management attributes. See also bind, copy group, hierarchical storage management client, policy set, rebind.

### maximum transmission unit (MTU)

The largest possible unit of data that can be sent on a given physical medium in a single frame. For example, the maximum transmission unit for Ethernet is 1500 bytes.

**MB** See megabyte.

### media server

In a z/OS® environment, a program that provides access to z/OS disk and tape

storage for Tivoli Storage Manager servers that run on operating systems other than z/OS.

### megabyte (MB)

For processor storage, real and virtual storage, and channel volume, 2 to the 20th power or 1,048,576 bytes. For disk storage capacity and communications volume, 1,000,000 bytes.

### metadata

Data that describes the characteristics of data; descriptive data.

### migrate

To move data to another location, or an application to another computer system.

### migrated file

A file that has been copied from a local file system to storage. For HSM clients on UNIX or Linux systems, the file is replaced with a stub file on the local file system. On Windows systems, creation of the stub file is optional. See also file state, premigrated file, resident file, stub file.

### migration

The process of moving data from one computer system to another, or an application to another computer system.

### migration job

A specification of files to migrate, and actions to perform on the original files after migration. See also job file, threshold migration.

### migration threshold

High and low capacities for storage pools or file systems, expressed as percentages, at which migration is set to start and stop.

### mirroring

The process of writing the same data to multiple disks at the same time. The mirroring of data protects it against data loss within the database or within the recovery log.

**mode** A copy group attribute that specifies whether to back up a file that has not been modified since the last time the file was backed up. See also absolute mode, modified mode.

### modified mode

In storage management, a backup copy-group mode that specifies that a file

is considered for incremental backup only if it has changed since the last backup. A file is considered a changed file if the date, size, owner, or permissions of the file have changed. See also absolute mode, mode.

**mount limit**

The maximum number of volumes that can be simultaneously accessed from the same device class. The mount limit determines the maximum number of mount points. See also mount point.

**mount point**

A logical drive through which volumes are accessed in a sequential access device class. For removable media device types, such as tape, a mount point is a logical drive associated with a physical drive. For the file device type, a mount point is a logical drive associated with an I/O stream. See also mount limit.

**mount retention period**

The maximum number of minutes that the server retains a mounted sequential-access media volume that is not being used before it dismounts the sequential-access media volume.

**mount wait period**

The maximum number of minutes that the server waits for a sequential-access volume mount request to be satisfied before canceling the request.

**MTU** See maximum transmission unit.

---

## N

**Nagle algorithm**

An algorithm that reduces congestion of TCP/IP networks by combining smaller packets and sending them together.

**named pipe**

A type of interprocess communication that permits message data streams to pass between peer processes, such as between a client and a server.

**NAS file server**

See network-attached storage file server.

**NAS file server node**

See NAS node.

**NAS node**

A client node that is a network-attached

storage (NAS) file server. Data for the NAS node is transferred by a NAS file server that is controlled by the network data management protocol (NDMP). A NAS node is also called a NAS file server node.

**native file system**

A file system that is locally added to the file server and is not added for space management. The hierarchical storage manager (HSM) client does not provide space management services to the file system.

**native format**

A format of data that is written to a storage pool directly by the server. See also non-native data format.

**NDMP**

See Network Data Management Protocol.

**NetBIOS (Network Basic Input/Output System)**

A standard interface to networks and personal computers that is used on local area networks to provide message, print-server, and file-server functions. Application programs that use NetBIOS do not have to handle the details of LAN data link control (DLC) protocols.

**network-attached storage file server (NAS file server)**

A dedicated storage device with an operating system that is optimized for file-serving functions. A NAS file server can have the characteristics of both a node and a data mover.

**Network Basic Input/Output System**

See NetBIOS.

**Network Data Management Protocol (NDMP)**

A protocol that allows a network storage-management application to control the backup and recovery of an NDMP-compliant file server, without installing vendor-acquired software on that file server.

**network data-transfer rate**

A rate that is calculated by dividing the total number of bytes that are transferred by the data transfer time. For example, this rate can be the time that is spent transferring data over a network.

**node** A file server or workstation on which the

backup-archive client program has been installed, and which has been registered to the server.

**node name**

A unique name that is used to identify a workstation, file server, or PC to the server.

**node privilege class**

A privilege class that gives an administrator the authority to remotely access backup-archive clients for a specific client node or for all clients in a policy domain. See also privilege class.

**non-native data format**

A format of data that is written to a storage pool that differs from the format that the server uses for operations. See also native format.

---

**O****offline volume backup**

A backup in which the volume is locked so that no other system applications can access it during the backup operation.

**online volume backup**

A backup in which the volume is available to other system applications during the backup operation.

**open registration**

A registration process in which users can register their workstations as client nodes with the server. See also closed registration.

**operator privilege class**

A privilege class that gives an administrator the authority to disable or halt the server, enable the server, cancel server processes, and manage removable media. See also privilege class.

**options file**

A file that contains processing options. See also client system-options file, client user-options file.

**originating file system**

The file system from which a file was migrated. When a file is recalled, it is returned to its originating file system.

**orphaned stub file**

A file for which no migrated file can be found on the server that the client node is

contacting for space management services. For example, a stub file can be orphaned when the client system-options file is modified to contact a server that is different than the one to which the file was migrated.

---

**P**

**packet** In data communication, a sequence of binary digits, including data and control signals, that are transmitted and switched as a composite whole.

**page** A defined unit of space on a storage medium or within a database volume.

**partial-file recall mode**

A recall mode that causes the hierarchical storage management (HSM) function to read just a portion of a migrated file from storage, as requested by the application accessing the file.

**password generation**

A process that creates and stores a new password in an encrypted password file when the old password expires. Automatic generation of a password prevents password prompting.

**path** An object that defines a one-to-one relationship between a source and a destination. Using the path, the source accesses the destination. Data can flow from the source to the destination, and back. An example of a source is a data mover (such as a network-attached storage [NAS] file server), and an example of a destination is a tape drive.

**pattern-matching character**

See wildcard character.

**physical file**

A file that is stored in one or more storage pools, consisting of either a single logical file, or a group of logical files that are packaged together as an aggregate. See also aggregate, logical file, physical occupancy.

**physical occupancy**

The amount of space that is used by physical files in a storage pool. This space includes the unused space that is created when logical files are deleted from aggregates. See also logical file, logical occupancy, physical file.



**plug-in**

A separately installable software module that adds function to an existing program, application, or interface.

**policy domain**

A grouping of policy users with one or more policy sets, which manage data or storage resources for the users. The users are client nodes that are associated with the policy domain. See also active policy set, domain.

**policy privilege class**

A privilege class that gives an administrator the authority to manage policy objects, register client nodes, and schedule client operations for client nodes. Authority can be restricted to certain policy domains. See also privilege class.

**policy set**

A group of rules in a policy domain. The rules specify how data or storage resources are automatically managed for client nodes in the policy domain. Rules can be contained in management classes. See also active policy set, management class.

**premigrated file**

A file that has been copied to server storage, but has not been replaced with a stub file on the local file system. An identical copy of the file resides both on the local file system and in server storage. Premigrated files occur on UNIX and Linux file systems to which space management has been added. See also file state, migrated file, resident file.

**premigrated files database**

A database that contains information about each file that has been premigrated to server storage.

**premigration**

The process of copying files that are eligible for migration to server storage, but leaving the original file intact on the local file system.

**premigration percentage**

A space management setting that controls whether the next eligible candidates in a file system are premigrated following threshold or demand migration.

**primary storage pool**

A named set of volumes that the server uses to store backup versions of files, archive copies of files, and files migrated from client nodes. See also copy storage pool, server storage, storage pool, storage pool volume.

**privilege class**

A level of authority that is granted to an administrator. The privilege class determines which administrative tasks the administrator can perform. See also authority, node privilege class, operator privilege class, policy privilege class, storage privilege class, system privilege class.

**profile**

A named group of configuration information that can be distributed from a configuration manager when a managed server subscribes. Configuration information can include registered administrator IDs, policies, client schedules, client option sets, administrative schedules, storage manager command scripts, server definitions, and server group definitions. See also configuration manager, enterprise configuration, managed server.

**profile association**

On a configuration manager, the defined relationship between a profile and an object such as a policy domain. Profile associations define the configuration information that is distributed to a managed server when it subscribes to the profile.

---

**Q****quota**

1. For HSM on AIX, UNIX, or Linux systems, the limit (in megabytes) on the amount of data that can be migrated and premigrated from a file system to server storage.
2. For HSM on Windows systems, a user-defined limit to the space that is occupied by recalled files.

---

## R

### **randomization**

The process of distributing schedule start times for different clients within a specified percentage of the schedule's startup window.

### **raw logical volume**

A portion of a physical volume that is comprised of unallocated blocks and has no journaled file system (JFS) definition. A logical volume is read/write accessible only through low-level I/O functions.

### **rebind**

To associate all backed-up versions of a file with a new management class name. For example, a file that has an active backup version is rebound when a later version of the file is backed up with a different management class association. See also bind, management class.

**recall** To copy a migrated file from server storage back to its originating file system using the hierarchical storage management client. See also selective recall.

### **receiver**

A server repository that contains a log of server and client messages as events. For example, a receiver can be a file exit, a user exit, or the server console and activity log. See also event.

### **reclamation**

The process of consolidating the remaining data from many sequential-access volumes onto fewer, new sequential-access volumes.

### **reclamation threshold**

The percentage of space that a sequential-access media volume must have before the server can reclaim the volume. Space becomes reclaimable when files are expired or are deleted.

### **reconciliation**

The process of ensuring consistency between the original data repository and the larger system where the data is stored for backup. Examples of larger systems where the data is stored for backup are storage servers or other storage systems.

During the reconciliation process, data that is identified as no longer needed is removed.

### **recovery log**

A log of updates that are about to be written to the database. The log can be used to recover from system and media failures. The recovery log consists of the active log (including the log mirror) and archive logs.

### **register**

To define a client node or administrator ID that can access the server.

### **registry**

A repository that contains access and configuration information for users, systems, and software.

### **remote**

For hierarchical storage management products, pertaining to the origin of migrated files that are being moved. See also local.

### **resident file**

On a Windows system, a complete file on a local file system that might also be a migrated file because a migrated copy can exist in server storage. On a UNIX or Linux system, a complete file on a local file system that has not been migrated or premigrated, or that has been recalled from server storage and modified. See also file state.

### **restore**

To copy information from its backup location to the active storage location for use. For example, to copy information from server storage to a client workstation.

### **retention**

The amount of time, in days, that inactive backed-up or archived files are kept in the storage pool before they are deleted. Copy group attributes and default retention grace periods for the domain define retention.

### **retrieve**

To copy archived information from the storage pool to the workstation for use. The retrieve operation does not affect the archive version in the storage pool. See also archive.

**root user**

A system user who operates without restrictions. A root user has the special rights and privileges needed to perform administrative tasks.

---

**S**

**SAN** See storage area network.

**schedule**

A database record that describes client operations or administrative commands to be processed. See also administrative command schedule, client schedule.

**scheduling mode**

The type of scheduling operation for the server and client node that supports two scheduling modes: client-polling and server-prompted.

**scratch volume**

A labeled volume that is either blank or contains no valid data, that is not defined, and that is available for use. See also volume.

**script** A series of commands, combined in a file, that carry out a particular function when the file is run. Scripts are interpreted as they are run. See also Tivoli Storage Manager command script.

**Secure Sockets Layer (SSL)**

A security protocol that provides communication privacy. With SSL, client/server applications can communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

**selective backup**

The process of backing up certain files or directories from a client domain. The files that are backed up are those that are not excluded in the include-exclude list. The files must meet the requirement for serialization in the backup copy group of the management class that is assigned to each file. See also incremental backup.

**selective migration**

The process of copying user-selected files from a local file system to server storage and replacing the files with stub files on the local file system. See also demand migration, threshold migration.

**selective recall**

The process of copying user-selected files from server storage to a local file system. See also recall, transparent recall.

**serialization**

The process of handling files that are modified during backup or archive processing. See also shared dynamic serialization, shared static serialization, static serialization.

**server** A software program or a computer that provides services to other software programs or other computers. See also client.

**server options file**

A file that contains settings that control various server operations. These settings affect such things as communications, devices, and performance.

**server-prompted scheduling mode**

A client/server communication technique where the server contacts the client node when tasks must be done. See also client-polling scheduling mode.

**server storage**

The primary, copy, and active-data storage pools that are used by the server to store user files such as backup versions, archive copies, and files migrated from hierarchical storage management client nodes (space-managed files). See also active-data pool, copy storage pool, primary storage pool, storage pool volume, volume.

**session**

A logical or virtual connection between two stations, software programs, or devices on a network that allows the two elements to communicate and exchange data for the duration of the session. See also administrative session.

**session resource usage**

The amount of wait time, processor time, and space that is used or retrieved during a client session.

**shadow copy**

A snapshot of a volume. The snapshot can be taken while applications on the system continue to write data to the volumes.

**shadow volume**

The data stored from a snapshot of a volume. The snapshot can be taken while applications on the system continue to write data to the volumes.

**shared dynamic serialization**

A value for serialization that specifies that a file must not be backed up or archived if it is being modified during the operation. The backup-archive client retries the backup or archive operation a number of times; if the file is being modified during each attempt, the backup-archive client will back up or archive the file on its last try. See also dynamic serialization, serialization, shared static serialization, static serialization.

**shared library**

A library device that is used by multiple storage manager servers. See also library.

**shared static serialization**

A copy-group serialization value that specifies that a file must not be modified during a backup or archive operation. The client attempts to retry the operation a number of times. If the file is in use during each attempt, the file is not backed up or archived. See also dynamic serialization, serialization, shared dynamic serialization, static serialization.

**snapshot**

An image backup type that consists of a point-in-time view of a volume.

**space-managed file**

A file that is migrated from a client node by the hierarchical storage management (HSM) client. The HSM client recalls the file to the client node on demand.

**space management**

See hierarchical storage management.

**space monitor daemon**

A daemon that checks space usage on all file systems for which space management is active, and automatically starts threshold migration when space usage on a file system equals or exceeds its high threshold.

**sparse file**

A file that is created with a length greater than the data it contains, leaving empty spaces for the future addition of data.

**special file**

On AIX, UNIX, or Linux systems, a file that defines devices for the system, or temporary files that are created by processes. There are three basic types of special files: first-in, first-out (FIFO); block; and character.

**SSL** See Secure Sockets Layer.

**stabilized file space**

A file space that exists on the server but not on the client.

**stanza** A group of lines in a file that together have a common function or define a part of the system. Stanzas are usually separated by blank lines or colons, and each stanza has a name.

**startup window**

A time period during which a schedule must be initiated.

**static serialization**

A copy-group serialization value that specifies that a file must not be modified during a backup or archive operation. If the file is in use during the first attempt, the backup-archive client cannot back up or archive the file. See also dynamic serialization, serialization, shared dynamic serialization, shared static serialization.

**storage agent**

A program that enables the backup and restoration of client data directly to and from storage attached to a storage area network (SAN).

**storage area network (SAN)**

A dedicated storage network tailored to a specific environment, combining servers, systems, storage products, networking products, software, and services.

**storage hierarchy**

A logical order of primary storage pools, as defined by an administrator. The order is typically based on the speed and capacity of the devices that the storage pools use. The storage hierarchy is defined by identifying the next storage pool in a storage pool definition. See also storage pool.

**storage pool**

A named set of storage volumes that is the destination that is used to store client

data. See also active-data pool, copy storage pool, primary storage pool, storage hierarchy.

**storage pool volume**

A volume that has been assigned to a storage pool. See also active-data pool, copy storage pool, primary storage pool, server storage, volume.

**storage privilege class**

A privilege class that gives an administrator the authority to control how storage resources for the server are allocated and used, such as monitoring the database, the recovery log, and server storage. See also privilege class.

**stub** A shortcut on the Windows file system that is generated by the hierarchical storage management (HSM) client for a migrated file that allows transparent user access. A stub is the sparse file representation of a migrated file, with a reparse point attached.

**stub file**

A file that replaces the original file on a local file system when the file is migrated to storage. A stub file contains the information that is necessary to recall a migrated file from server storage. It also contains additional information that can be used to eliminate the need to recall a migrated file. See also migrated file, resident file.

**stub file size**

The size of a file that replaces the original file on a local file system when the file is migrated to server storage. The size that is specified for stub files determines how much leader data can be stored in the stub file. The default for stub file size is the block size defined for a file system minus 1 byte.

**subscription**

In a storage environment, the process of identifying the subscribers to which the profiles are distributed. See also enterprise configuration, managed server.

**system privilege class**

A privilege class that gives an administrator the authority to issue all server commands. See also privilege class.

---

## T

### **tape library**

A set of equipment and facilities that support an installation's tape environment. The tape library can include tape storage racks, mechanisms for automatic tape mounting, a set of tape drives, and a set of related tape volumes mounted on those drives.

### **tape volume prefix**

The high-level-qualifier of the file name or the data set name in the standard tape label.

### **target node**

A client node for which other client nodes (called agent nodes) have been granted proxy authority. The proxy authority allows the agent nodes to perform operations such as backup and restore on behalf of the target node, which owns the data.

**TCA** See trusted communications agent.

### **TCP/IP**

See Transmission Control Protocol/Internet Protocol.

### **threshold migration**

The process of moving files from a local file system to server storage based on the high and low thresholds that are defined for the file system. See also automatic migration, demand migration, migration job, selective migration.

### **throughput**

In storage management, the total bytes in the workload, excluding overhead, that are backed up or restored, divided by elapsed time.

### **timeout**

A time interval that is allotted for an event to occur or complete before operation is interrupted.

### **Tivoli Storage Manager command script**

A sequence of Tivoli Storage Manager administrative commands that are stored in the database of the Tivoli Storage Manager server. The script can run from any interface to the server. The script can include substitution for command parameters and conditional logic. See also macro file, script.

### **tombstone object**

A small subset of attributes of a deleted object. The tombstone object is retained for a specified period, and at the end of the specified period, the tombstone object is permanently deleted.

### **Transmission Control Protocol/Internet Protocol (TCP/IP)**

An industry-standard, nonproprietary set of communication protocols that provides reliable end-to-end connections between applications over interconnected networks of different types. See also communication method.

### **transparent recall**

The process that is used to automatically recall a migrated file to a workstation or file server when the file is accessed. See also selective recall.

### **trusted communications agent (TCA)**

A program that handles the sign-on password protocol when clients use password generation.

---

## U

**UCS-2** A 2-byte (16-bit) encoding scheme based on ISO/IEC specification 10646-1. UCS-2 defines three levels of implementation: Level 1-No combining of encoded elements allowed; Level 2-Combining of encoded elements is allowed only for Thai, Indic, Hebrew, and Arabic; Level 3-Any combination of encoded elements are allowed.

**UNC** See Universal Naming Convention.

### **Unicode**

A character encoding standard that supports the interchange, processing, and display of text that is written in the common languages around the world, plus many classical and historical texts.

### **Unicode-enabled file space**

Unicode file space names provide support for multilingual workstations without regard for the current locale.

### **Universally Unique Identifier (UUID)**

The 128-bit numeric identifier that is used to ensure that two components do not have the same identifier. See also Globally Unique Identifier.

**Universal Naming Convention (UNC)**

The server name and network name combined. These names together identify the resource on the domain.

**UTF-8** Unicode Transformation Format, 8-bit encoding form, which is designed for ease of use with existing ASCII-based systems. The CCSID value for data in UTF-8 format is 1208. See also UCS-2.

**UUID** See Universally Unique Identifier.

---

**V****validate**

To check a policy set for conditions that can cause problems if that policy set becomes the active policy set. For example, the validation process checks whether the policy set contains a default management class.

**version**

A backup copy of a file stored in server storage. The most recent backup copy of a file is the active version. Earlier copies of the same file are inactive versions. The number of versions retained by the server is determined by the copy group attributes in the management class.

**virtual file space**

A representation of a directory on a network-attached storage (NAS) file system as a path to that directory.

**virtual mount point**

A directory branch of a file system that is defined as a virtual file system. The virtual file system is backed up to its own file space on the server. The server processes the virtual mount point as a separate file system, but the client operating system does not.

**virtual volume**

An archive file on a target server that represents a sequential media volume to a source server.

**volume**

A discrete unit of storage on disk, tape or other data recording medium that supports some form of identifier and parameter list, such as a volume label or input/output control. See also scratch volume, server storage, storage pool, storage pool volume.

**volume history file**

A file that contains information about volumes that have been used by the server for database backups and for export of administrator, node, policy, or server data. The file also has information about sequential-access storage pool volumes that have been added, reused, or deleted. The information is a copy of volume information that is recorded in the server database.

**Volume Shadow Copy Service (VSS)**

A set of Microsoft application-programming interfaces (APIs) that are used to create shadow copy backups of volumes, exact copies of files, including all open files, and so on.

**VSS** See Volume Shadow Copy Service.

**VSS Backup**

A backup operation that uses Microsoft Volume Shadow Copy Service (VSS) technology. The backup operation produces an online snapshot (point-in-time consistent copy) of Microsoft Exchange data. This copy can be stored on local shadow volumes or on Tivoli Storage Manager server storage.

**VSS Fast Restore**

An operation that restores data from a local snapshot. The snapshot is the VSS backup that resides on a local shadow volume. The restore operation retrieves the data by using a file-level copy method.

**VSS Instant Restore**

An operation that restores data from a local snapshot. The snapshot is the VSS backup that resides on a local shadow volume. The restore operation retrieves the data by using a hardware assisted restore method (for example, a FlashCopy operation).

**VSS offloaded backup**

A backup operation that uses a Microsoft Volume Shadow Copy Service (VSS) hardware provider (installed on an alternate system) to move IBM Data Protection for Microsoft Exchange data to the Tivoli Storage Manager server. This type of backup operation shifts the backup load from the production system to another system.

## **VSS Restore**

A function that uses a Microsoft Volume Shadow Copy Service (VSS) software provider to restore VSS Backups (IBM Data Protection for Microsoft Exchange database files and log files) that reside on Tivoli Storage Manager server storage to their original location.

---

## **W**

### **wildcard character**

A special character such as an asterisk (\*) or a question mark (?) that can be used to represent one or more characters. Any character or set of characters can replace the wildcard character.

### **workload partition (WPAR)**

A partition within a single operating system instance.

### **workstation**

A terminal or personal computer at which a user can run applications and that is usually connected to a mainframe or a network.

### **worldwide name (WWN)**

A 64-bit, unsigned name identifier that is unique.

**WPAR** See workload partition.

**WWN** See worldwide name.



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